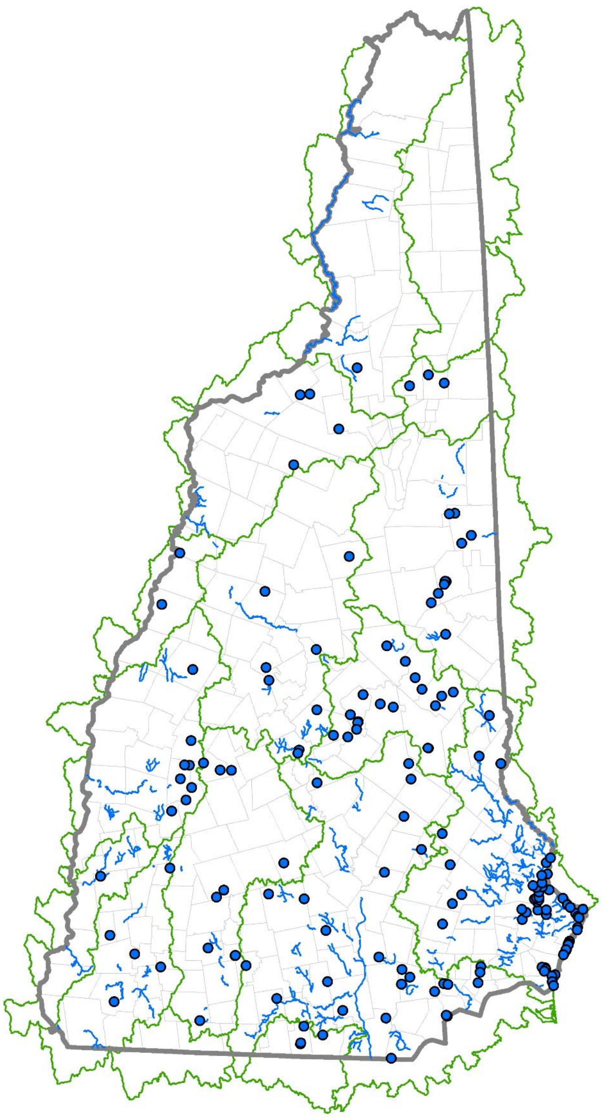
Final Report

New Hampshire Statewide
Total Maximum Daily Load (TMDL)

for Bacteria Impaired Waters



NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Final Report September, 2010

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New Hampshire Statewide Total Maximum Daily Load (TMDL)
for Bacteria Impaired Waters

State of New Hampshire
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List of Acronyms

AU	Assessment Unit
ADB	Assessment Database
BMP	Best Management Practice
CAFO	Concentrated Animal Feeding Operation
CALM	Consolidated Assessment and Listing Methodology
CDBG	Community Development Block Grant
CDFA	Community Development Finance Authority
CFR	Code of Federal Regulations
CNMP	Comprehensive Nutrient Management Plan
CSO	Combined Sewer Overflow
CWA	Clean Water Act
CWSRF	Clean Water State Revolving Loan Fund
DAMF	Department of Agriculture, Markets, and Food
DPW	Department of Public Works
GIS	Geographic Information System
GMWQS	Geometric Mean Water Quality Standard
HUC	Hydrologic Unit Code
IDDE	Illicit Discharge Detection and Elimination
LA	Load Allocation
MOS	Margin of Safety
MPN	Most Probable Number
MSD	Marine Sanitation Device
MS4	Municipal Separate Storm Sewer Systems
NDA	No Discharge Area
NHEP	New Hampshire Estuaries Partnership
NHDES	New Hampshire Dept. of Environmental Services
NEIWPCC	New England Interstate Water Pollution Control Commission
NPDES	National Pollutant Discharge Elimination System
NPS	Non-Point Source
NRPA	Natural Resource Protection Act
NSSP	National Shellfish Sanitation Program
OBD	Overboard Discharge
PREP	Piscataqua Region Estuaries Partnership
PS	Point Source
QA/QC	Quality Assurance/Quality Control
REPP	Regional Environmental Planning Program
RSA	Revised Statutes Annotated
SOP	Standard Operating Procedures
SSWQS	Single Sample Water Quality Standard
SWMP	Storm Water Management Plan
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
VLAP	Volunteer Lake Assessment Program
VRAP	Volunteer River Assessment Program
WMP	Watershed Management Plan
WLA	Waste Load Allocation
WLAc	Waste Load Allocations for Continuous Point Source Discharges
WQS	Water Quality Standards
WWTF	Wastewater Treatment Facility

1. INTRODUCTION

This *Statewide Total Maximum Daily Load (TMDL)* report provides a framework to address bacterial pollution in the surface waters of New Hampshire, including rivers and streams, impoundments, lakes and ponds, estuaries, and the Atlantic Ocean. Bacterial contamination of surface waters may result from a variety of sources including human waste, excrement from barnyard animals, pet feces, and agricultural applications of manure. Bacterial contamination may also result from wildlife, including large congregations of birds and small mammals. In coastal areas, illicit discharges of boat waste can also be a concern. Fecal contamination can degrade aquatic ecosystems and negatively affect public health, and may ultimately result in closures of shellfish beds, beaches and drinking water supplies (MADEP, 2007).

This bacteria TMDL report establishes the allowable bacterial loadings for the State's surface waters, provides documentation of impairment, and outlines the reductions needed to meet water quality standards. One goal of the New Hampshire TMDL process is to promote, encourage, and inform local community action for water quality improvement and protection of public health by addressing sources of bacterial contamination. To this end, this report also provides information to help communities, watershed groups, and other stakeholders to implement the TMDL in a phased, community-based approach that will ultimately result in attainment of water quality standards.

1.1. Background

Section 303(d) of the Federal Clean Water Act (CWA) and Federal Water Quality Planning and Management Regulations (40 CFR Part 130) require states to place waterbodies that do not meet established water quality standards (WQS) on a list of impaired waterbodies, commonly referred to as the "303(d) List". In New Hampshire, the Department of Environmental Services (DES) is responsible for the 303(d) Listing process. The 303(d) List is updated and issued for public comment every two years, with the final list submitted to the United States Environmental Protection Agency (USEPA) on April 1st of each even numbered year. DES recently submitted it's 2010 303(d) List to EPA for approval on April 1, 2010. The most recent 303(d) List approved by EPA was submitted in 2008.

The 303(d) List includes surface waters that: (1) are impaired or threatened by one or more pollutants; (2) are not expected to meet water quality standards even after implementation of technology-based controls; and (3) require a Total Maximum Daily Load (TMDL) study for the pollutant(s) causing the impaired or threatened status (NHDES, 2008a). A TMDL establishes the allowable loadings for specific pollutants that a waterbody can receive without exceeding water quality standards (USEPA, 2001). Water quality standards include numeric and narrative criteria that must be met to protect the uses of the surface water such as swimming, boating, aquatic life, and fish consumption. The TMDL process maps a course for states and watershed stakeholders to follow that should lead to restoration of the impaired water and its uses. In general, the components of the TMDL process include the following (NHDES, 2006a):

1. Identification of the major sources of pollutant(s);
2. Estimation of existing pollutant loadings from each major source;
3. Calculation of the maximum load (i.e. the TMDL) that the surface water can assimilate and still meet water quality standards;
4. Allocation of the maximum load among point and non-point sources;
5. Calculation of the reduction in pollutant load needed to achieve water quality standards;
6. Recommendations for implementing the TMDL so that water quality standards will ultimately be achieved;
7. Opportunity for public comment prior to finalizing the TMDL; and
8. Submission of the final TMDL by the State to the regional EPA office for final approval.

In New Hampshire, impaired waterbodies are included in Category 5 of the "*New Hampshire 2008 Section 305(b) and 303(d) Water Quality Report: Appendix 8 - 2008 List of Threatened or Impaired Waters That Require a TMDL*" (NHDES, 2008b). The methodology for assessing surface waters in New Hampshire is described in the State's Consolidated Assessment and Listing Methodology or CALM (NHDES, 2008a). As described in the CALM, water quality data is compared to the State's surface water quality standards to determine which designated uses are supported, which are not, and which uses cannot be assessed due to insufficient information. Designated uses for New Hampshire surface waters include:

- Primary contact recreation;
- Secondary contact recreation;
- Aquatic life;
- Fish consumption;
- Shellfish consumption in tidal waters;
- Drinking water after adequate treatment; and
- Wildlife.

To facilitate tracking and assessing surface water quality, all surface waters in New Hampshire are assigned a unique identification number (called an Assessment Unit or AU number), which serves as the basic unit of record for conducting and reporting water quality assessments. Surface waters in New

Hampshire have been divided into over 5,200 individual segments or assessment units (AUs). The ultimate goal is to have all surface waters assessed and supporting their designated uses (NHDES, 2008a).

1.2. Purpose of Report

According to New Hampshire's *2008 303(d) List*, there are 379 bacteria impaired segments, or assessment units, for which TMDLs must be developed. These assessment units are also listed as impaired on the 2010 303(d) List which was submitted to EPA for approval in April, 2010. Figure 1-1 contains a map of New Hampshire with watersheds and bacteria impaired waters indicated. The figure shows that the state may be presented spatially as 17 watersheds of a type known as Hydrologic Unit Code 8 (HUC 8). The impaired segments are spread among 15 of the 17 HUC 8 watersheds in New Hampshire, with the largest number of impaired segments in the Salmon Falls-Piscataqua Rivers (HUC 01060003), Merrimack River (HUC 01070006), and Connecticut-White River to Bellows Falls (HUC 01080106) watersheds (Figure 1-1). As shown in Table 1-1, nearly 54% of the impaired segments are rivers and streams, while the remaining segments consist of lakes/ponds, estuaries, impoundments, and ocean waters (NHDES, 2008a; Table 1-1). A complete list of all 379 impaired segments on the 2008 303(d) List is provided in Table 1-2 at the end of this chapter. Fifteen of the 379 segments are impaired due to two different types of bacteria and are listed twice in the table. Therefore, the total number of water quality impairments addressed by the TMDL document is 394, resulting in 394 individual TMDLs.

Table 1-1: Number of Bacteria Impaired Assessment Units in New Hampshire, by Waterbody Type.

Waterbody Type	Number of Impaired Assessment Units
River and stream	204
Lake and pond	100
Estuary	33
Impoundment	28
Ocean	14
TOTAL	**379**

Order addressed in report	HUC8 ID	Watershed name	# of impaired assessment units
1	01040002	Lower Androscoggin River	3
2	01060002	Saco River	18
3	01060003	Salmon Falls - Piscataqua Rivers	122
4	01070001	Pemigewasset River	17
5	01070002	Winnipesaukee River	23
6	01070003	Contoocook River	16
7	01070004	Nashua River	6
8	01070006	Merrimack River	81
9	01080101	Upper Connecticut River	16
10	01080103	Connecticut River - Johns River to Waits River	7
11	01080104	Connecticut River - Waits River to White River	3
12	01080106	Connecticut River - White River to Bellows	24
13	01080107	Connecticut River - Bellows Falls to Vernon	8
14	01080201	Connecticut River - Ashuelot River-Vernon Dam to Millers River	21
15	0100000	Coastal Impaired Segments	14
	TOTAL		379

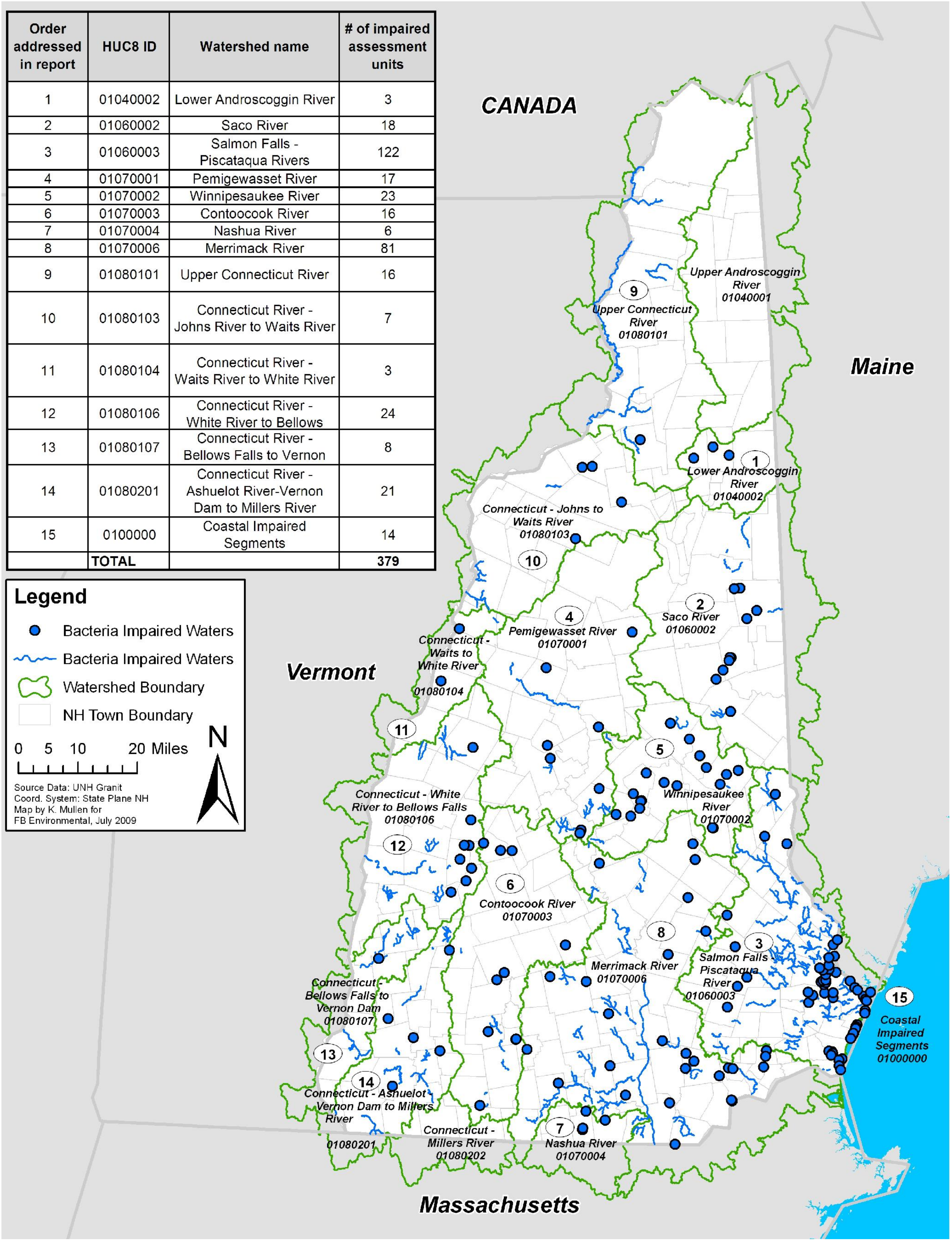

Figure 1-1: Map of Bacteria Impaired Waters in New Hampshire, by HUC 8 Watershed.

This *Statewide Total Maximum Daily Load (TMDL)* report contains concentration-based TMDLs for all 379 bacteria impaired segments in New Hampshire. Bacteria data for all the impaired segments are presented in Appendices A through O on a (HUC 8) watershed basis. Within each watershed, measured bacteria concentrations in each of the impaired segments are used to estimate the percent reduction needed to attain water quality standards. This statewide report, organized on a watershed basis with site-specific data presented for each impaired waterbody, highlights pollutant sources and problems while providing meaningful implementation targets for all sources. The TMDL allows the implementation and restoration process to begin sooner and provides a useful format for guiding both remediation and protection efforts in impaired watersheds. Using a watershed approach provides a coordinating framework for environmental management that supports efforts to systematically identify, evaluate and prioritize point and non-point sources of pollution using watershed or hydrologic boundaries to define the problem area.

The purpose of a TMDL is to calculate the amount of a pollutant that receiving waters can assimilate without exceeding water quality standards or designated uses. The pollutant load is then allocated to specific sources. This statewide TMDL report sets a goal of meeting bacteria water quality criteria for all sources in order to meet water quality standards throughout the affected waterbodies.

The purpose of this report is to:

1. Provide documentation of impairment;
2. Determine the TMDLs that will achieve water quality standards;
3. Calculate the reductions necessary to achieve the TMDLs;
4. Provide tools to help communities, watershed groups, and other stakeholders to implement the TMDL in a phased approach that will ultimately result in attainment of water quality standards.

As future monitoring identifies additional bacteria impaired segments of New Hampshire waters, these bacteria TMDLs may be applied to those waters and made available for public comment through New Hampshire's publicly reviewed 303(d) listing process every two years. Once EPA approves the TMDL modification as part of the 303(d) list approval, the newly proposed waterbodies will be addressed by the bacteria TMDLs presented in this report.

1.3. Report Format

This document contains the following sections:

- ***Water Quality Standards for Bacteria (section 2)*** **-** Provides an overview of potential pathogenic impacts of bacteria; the selection of indicator bacteria to assess pathogen levels in waterbodies; and a brief summary of New Hampshire bacteria standards for surface waters.

- ***Bacteria Pollution Sources (section 3)*** – Defines point and non-point sources of bacteria pollution and provides examples of bacteria sources that affect New Hampshire's waterbodies.

- ***Bacteria Impaired Waters (section 4)*** - Provides a brief introduction to all bacteria impaired waters in New Hampshire (based on the *2008 303(d) List*). This section also includes an overview of the 303(d) listing process; a summary of agencies that collect bacteria data in New Hampshire; and a description of the TMDL prioritization process.

- ***TMDL Development (section 5)*** - Provides a description of the TMDL calculation process and incorporates the key required elements for TMDL development.

- ***Implementation Plan (section 6)*** - Provides a description of the implementation process, including coordination with local stakeholders and development of watershed based plans, and a menu of mitigative actions (organized by type of source) to reduce bacteria loadings. Examples of implementation plans to remove bacteria impairment provided in Appendices Q and R.

- ***Funding and Community Resources (section 7)*** – Provides a description of funding sources available to address impaired waters in New Hampshire.

- ***Watershed-Specific Bacteria Data Summaries and Reductions (section 8)*** – References appendices A through O, organized by HUC 8 watershed, which contain available bacteria data, reductions needed for each impaired segment, and GIS maps of HUC watersheds and land cover.

- ***Examples of Implementation Plans to Remove Bacteria Impairment (section 9***) - To support stakeholders in restoring impaired waters, two examples of implementation plans are provided as appendices to this report. One example is a Watershed-based Restoration Plan and the other is a Storm Drain Illicit Discharge Detention and Elimination Investigation. These reports are introduced in section 9 and attached as Appendices Q and R.

Table 1-1: Bacteria Impaired Waters Covered by the TMDL, Based on the NH 2008 303(d) List

Watershed	Water Type	Waterbody Name	Assessment Unit #	Primary Town	Impairment
Salmon Falls - Piscataqua Rivers	Impoundment	SALMON FALLS RIVER - BAXTER MILL DAM POND	NHIMP600030405-04	ROCHESTER	Escherichia coli
		SALMON FALLS RIVER - LOWER GREAT FALLS DAM	NHIMP600030406-02	SOMERSWORTH	Escherichia coli
		SALMON FALLS RIVER - SOUTH BERWICK DAM	NHIMP600030406-04	ROLLINSFORD	Escherichia coli
		COCHECO RIVER - CITY DAM 1	NHIMP600030603-01	ROCHESTER	Escherichia coli
		COCHECO RIVER - GONIC DAM POND	NHIMP600030607-02	ROCHESTER	Escherichia coli
		COCHECO RIVER - WATSON-WALDRON DAM POND	NHIMP600030608-02	DOVER	Escherichia coli
		COCHECO RIVER - CENTRAL AVE DAM	NHIMP600030608-04	DOVER	Escherichia coli
		EXETER RIVER - EXETER RIVER DAM I	NHIMP600030805-04	EXETER	Escherichia coli
		UNKNOWN RIVER - WINNICUT RIVER DAM POND	NHIMP600030901-02	GREENLAND	Escherichia coli
		OYSTER RIVER	NHIMP600030902-04	DURHAM	Escherichia coli
		BEARDS CREEK	NHIMP600030902-06	DURHAM	Escherichia coli
		BELLAMY RIVER - SAWYERS MILL DAM POND	NHIMP600030903-02	DOVER	Escherichia coli
	Lake	LOVELL POND - TOWN BEACH	NHLAK600030401-01-02	WAKEFIELD	Escherichia coli
		MILTON POND - MILTON POND REC AREA BEACH	NHLAK600030404-01-03	MILTON	Escherichia coli
		SUNRISE LAKE - TOWN BEACH	NHLAK600030601-05-02	MIDDLETON	Escherichia coli
		BOW LAKE - TOWN BEACH	NHLAK600030604-01-02	STRAFFORD	Escherichia coli
		FRESH CREEK POND	NHLAK600030608-01	DOVER	Escherichia coli
		PAWTUCKAWAY LAKE - PAWTUCKAWAY SP BEACH	NHLAK600030704-02-02	NOTTINGHAM	Escherichia coli
		PAWTUCKAWAY LAKE - TOWN BEACH	NHLAK600030704-02-03	NOTTINGHAM	Escherichia coli
		LUCAS POND - TOWN BEACH	NHLAK600030705-02-02	NORTHWOOD	Escherichia coli
	River	PIKE BROOK	NHRIV600030401-02	BROOKFIELD	Escherichia coli
		BRANCH RIVER	NHRIV600030401-08	WAKEFIELD	Escherichia coli
		SALMON FALLS RIVER	NHRIV600030405-14	SOMERSWORTH	Escherichia coli
		SALMON FALLS RIVER	NHRIV600030406-03	SOMERSWORTH	Escherichia coli
		COCHECO RIVER	NHRIV600030601-02	NEW DURHAM	Escherichia coli
		DAMES BROOK	NHRIV600030601-07	MILTON	Escherichia coli
		COCHECO RIVER	NHRIV600030601-09	FARMINGTON	Escherichia coli
		AXE HANDLE BROOK - HOWARD BROOK	NHRIV600030602-03	ROCHESTER	Escherichia coli
		COCHECO RIVER	NHRIV600030603-01	FARMINGTON	Escherichia coli
		POKAMOONSHINE BROOK	NHRIV600030603-02	FARMINGTON	Escherichia coli
		COCHECO RIVER	NHRIV600030603-06	ROCHESTER	Escherichia coli
		COCHECO RIVER	NHRIV600030603-08	ROCHESTER	Escherichia coli
		WILLOW BROOK	NHRIV600030603-10	ROCHESTER	Escherichia coli
		ISINGLASS RIVER	NHRIV600030605-16	BARRINGTON	Escherichia coli
		ISINGLASS RIVER	NHRIV600030607-01	BARRINGTON	Escherichia coli
		BLACKWATER BROOK-CLARK BROOK	NHRIV600030608-02	DOVER	Escherichia coli
		COCHECO RIVER	NHRIV600030608-03	DOVER	Escherichia coli
		REYNERS BROOK	NHRIV600030608-04	DOVER	Escherichia coli
		COCHECO RIVER	NHRIV600030608-05	DOVER	Escherichia coli
		INDIAN BROOK	NHRIV600030608-06	DOVER	Escherichia coli
		FRESH CREEK - TWOMBLY BROOK	NHRIV600030608-08	ROLLINSFORD	Escherichia coli
		ROLLINS BROOK	NHRIV600030608-10	ROLLINSFORD	Escherichia coli
		FRESH CREEK	NHRIV600030608-11	ROLLINSFORD	Escherichia coli
		BERRY BROOK	NHRIV600030608-15	DOVER	Escherichia coli
		JACKSON BROOK	NHRIV600030608-16	DOVER	Escherichia coli
		LAMPREY RIVER - CARROLL LAKE BEACH	NHRIV600030703-07-02	RAYMOND	Escherichia coli
		LAMPREY RIVER	NHRIV600030703-15	EPPING	Escherichia coli
		LAMPREY RIVER	NHRIV600030703-18	EPPING	Escherichia coli
		NORTH RIVER	NHRIV600030706-02	NOTTINGHAM	Escherichia coli
		LITTLE RIVER	NHRIV600030707-07	LEE	Escherichia coli
		LAMPREY RIVER	NHRIV600030709-07	LEE	Escherichia coli
		EXETER RIVER	NHRIV600030802-03	SANDOWN	Escherichia coli
		TOWLE BROOK - TO PANDOLPIN DAM	NHRIV600030802-10	CHESTER	Escherichia coli
		EXETER RIVER	NHRIV600030803-01	FREMONT	Escherichia coli
		EXETER RIVER	NHRIV600030805-02	EXETER	Escherichia coli
		GREAT BROOK-BRICKYARD BROOK-HOBBS BROOK-YORK BROOK	NHRIV600030805-04	KENSINGTON	Escherichia coli
		NORRIS BROOK	NHRIV600030806-01	EXETER	Escherichia coli
		WHEELWRIGHT CREEK - PARKMAN BROOK	NHRIV600030806-04	STRATHAM	Escherichia coli
		UNNAMED BROOK - TO SQUAMSCOTT RIVER	NHRIV600030806-09	NEWFIELDS	Escherichia coli
		TRIB TO SQUAMSCOTT RIVER - STUART DAIRY FARM	NHRIV600030806-14	STRATHAM	Escherichia coli
		WINNICUT RIVER-BARTON BROOK-MARSH BROOK-THOMPSON BROOK	NHRIV600030901-02	GREENLAND	Escherichia coli

Watershed	Water Type	Waterbody Name	Assessment Unit #	Primary Town	Impairment
Salmon Falls - Piscataqua Rivers	River	HAINES BROOK	NHRIV600030901-03	GREENLAND	Escherichia coli
		OYSTER RIVER - CALDWELL BROOK	NHRIV600030902-02	BARRINGTON	Escherichia coli
		OYSTER RIVER	NHRIV600030902-03	LEE	Escherichia coli
		OYSTER RIVER - CHELSEY BROOK	NHRIV600030902-04	LEE	Escherichia coli
		OYSTER RIVER	NHRIV600030902-05	DURHAM	Escherichia coli
		LONGMARSH BROOK - BEAUDETTE BROOK	NHRIV600030902-06	DURHAM	Escherichia coli
		HAMEL BROOK	NHRIV600030902-08	DURHAM	Escherichia coli
		COLLEGE BROOK	NHRIV600030902-09	DURHAM	Escherichia coli
		RESERVOIR BROOK	NHRIV600030902-10	DURHAM	Escherichia coli
		JOHNSON CREEK - GERRISH BROOK	NHRIV600030902-13	MADBURY	Escherichia coli
		BELLAMY RIVER	NHRIV600030903-07	BARRINGTON	Escherichia coli
		BELLAMY RIVER - KELLY BROOK - KNOX MARSH BROOK	NHRIV600030903-08	MADBURY	Escherichia coli
		BELLAMY RIVER	NHRIV600030903-09	DOVER	Escherichia coli
		VARNEY BROOK - CANNEY BROOK	NHRIV600030903-11	DOVER	Escherichia coli
		GARRISON BROOK	NHRIV600030903-13	DOVER	Escherichia coli
		PICKERING BROOK	NHRIV600030904-06	PORTSMOUTH	Escherichia coli
		SHAW BROOK	NHRIV600030904-13	GREENLAND	Escherichia coli
		UNNAMED BROOK	NHRIV600030904-21	GREENLAND	Escherichia coli
		SAGAMORE CREEK	NHRIV600031001-03	PORTSMOUTH	Escherichia coli
		LOWER HODGSON BROOK	NHRIV600031001-04	PORTSMOUTH	Escherichia coli
		UPPER HODGSON BROOK	NHRIV600031001-05	PORTSMOUTH	Escherichia coli
		PAULS BROOK - PEASE AIR FORCE BASE	NHRIV600031001-07	PORTSMOUTH	Escherichia coli
		BORTHWICK AVE TRIBUTARY	NHRIV600031001-09	PORTSMOUTH	Escherichia coli
		NEWFILEDS DITCH	NHRIV600031001-10	PORTSMOUTH	Escherichia coli
		BERRY'S BROOK	NHRIV600031002-01	RYE	Escherichia coli
		UNNAMED BROOKS - TO ATLANTIC OCEAN AT CONCORD POINT	NHRIV600031002-03	RYE	Escherichia coli
		CAIN'S BROOK	NHRIV600031004-10	SEABROOK	Escherichia coli
		CAIN'S BROOK	NHRIV600031004-12	SEABROOK	Escherichia coli
Pemigewasset River	Impoundment	SNOWS BROOK - CORCORAN POND TOWN BEACH	NHIMP700010401-01-02	WATERVILLE VALLEY	Escherichia coli
	Lake	STINSON LAKE - CAMP HAPPY T RANCH BEACH	NHLAK700010306-01-02	RUMNEY	Escherichia coli
		LITTLE SQUAM LAKE - TOWN BEACH	NHLAK700010502-01-02	ASHLAND	Escherichia coli
		NEWFOUND LAKE - WELLINGTON STATE PARK BEACH	NHLAK700010603-02-05	BRISTOL	Escherichia coli
		NEWFOUND LAKE - CAMP WI-CO-SU-TA BEACH	NHLAK700010603-02-13	HEBRON	Escherichia coli
		HERMIT LAKE - TOWN BEACH	NHLAK700010802-03-02	SANBORNTON	Escherichia coli
		WEBSTER LAKE - GRIFFIN TOWN BEACH	NHLAK700010804-02-02	FRANKLIN	Escherichia coli
		WEBSTER LAKE - LEGACE TOWN BEACH	NHLAK700010804-02-03	FRANKLIN	Escherichia coli
	River	BAKER RIVER	NHRIV700010303-09-01	WENTWORTH	Escherichia coli
		BAKER RIVER	NHRIV700010303-12	WENTWORTH	Escherichia coli
		BAKER RIVER	NHRIV700010305-11	RUMNEY	Escherichia coli
		BAKER RIVER	NHRIV700010307-11	PLYMOUTH	Escherichia coli
		BOG BROOK	NHRIV700010602-09	ALEXANDRIA	Escherichia coli
		SALMON BROOK - EMERSON BROOK	NHRIV700010802-07	SANBORNTON	Escherichia coli
		WEEKS BROOK	NHRIV700010803-07	SANBORNTON	Escherichia coli
		SUCKER BROOK - UNNAMED BROOKS	NHRIV700010804-05	ANDOVER	Escherichia coli
		UNNAMED BROOK - TO SUCKER BROOK	NHRIV700010804-07	ANDOVER	Escherichia coli
Winnipesaukee River	Lake	LAKE WENTWORTH - ALBEE BEACH	NHLAK700020101-05-02	WOLFEBORO	Escherichia coli
		LAKE WENTWORTH - WENTWORTH STATE PARK BEACH	NHLAK700020101-05-03	WOLFEBORO	Escherichia coli
		MIRROR LAKE - MIRROR LAKE BEACH	NHLAK700020106-02-02	TUFTONBORO	Escherichia coli
		LAKE WINNIPESAUKEE - MELVIN VILLAGE LAKE TOWN PIER BEACH	NHLAK700020110-02-04	TUFTONBORO	Escherichia coli
		LAKE WINNIPESAUKEE - PUBLIC BEACH	NHLAK700020110-02-07	TUFTONBORO	Escherichia coli
		LAKE WINNIPESAUKEE - BREWSTER BEACH	NHLAK700020110-02-09	WOLFEBORO	Escherichia coli
		LAKE WINNIPESAUKEE - ALTON BAY TOWN BEACH	NHLAK700020110-02-10	ALTON	Escherichia coli
		LAKE WINNIPESAUKEE - PUBLIC DOCK TOWN BEACH	NHLAK700020110-02-11	ALTON	Escherichia coli
		LAKE WINNIPESAUKEE - ELACOYA STATE PARK BEACH	NHLAK700020110-02-12	GILFORD	Escherichia coli
		LAKE WINNIPESAUKEE - GILFORD TOWN BEACH	NHLAK700020110-02-13	GILFORD	Escherichia coli
		LAKE WINNIPESAUKEE - ENDICOTT PARK WEIRS BEACH	NHLAK700020110-02-14	LACONIA	Escherichia coli
		LAKE WINNIPESAUKEE - STATES LANDING TOWN BEACH	NHLAK700020110-02-17	MOULTONBOROUGH	Escherichia coli
		HUNKINS POND	NHLAK700020201-02	SANBORNTON	Escherichia coli
		LAKE WINNISQUAM - BARTLETTS BEACH	NHLAK700020201-05-03	LACONIA	Escherichia coli
		LAKE WINNISQUAM - BELMONT TOWN BEACH	NHLAK700020201-05-04	BELMONT	Escherichia coli
		LAKE WINNISQUAM - AHERN STATE PARK	NHLAK700020201-05-05	LACONIA	Escherichia coli
		OPECHEE BAY - OPECHEE POINT BEACH	NHLAK700020201-06-03	LACONIA	Escherichia coli
		OPECHEE BAY - OPECHEE PARK COVE BEACH	NHLAK700020201-06-04	LACONIA	Escherichia coli
	River	NORTH INLET TO RUST POND	NHRIV700020101-22	WOLFEBORO	Escherichia coli
		SHANNON BROOK	NHRIV700020103-12	MOULTONBOROUGH	Escherichia coli
		UNNAMED BROOK - TO WINONA LAKE	NHRIV700020108-01	ASHLAND	Escherichia coli
		UNNAMED BROOK - GOVERNORS PARK STREAM	NHRIV700020201-20	LACONIA	Escherichia coli
		WINNIPESAUKEE RIVER	NHRIV700020203-16	NORTHFIELD	Escherichia coli

Watershed	Water Type	Waterbody Name	Assessment Unit #	Primary Town	Impairment
Contoocook River	Impoundment	ELM BROOK - ELM BROOK STATE PARK BEACH	NHIMP700030503-01-02	HOPKINTON	Escherichia coli
	Lake	CONTOOCOOK LAKE - TOWN BEACH	NHLAK700030101-03-02	JAFFREY	Escherichia coli
		ZEPHYR LAKE - TOWN BEACH	NHLAK700030105-01-02	GREENFIELD	Escherichia coli
		OTTER LAKE - GREENFIELD SP PICNIC BEACH	NHLAK700030105-02-03	GREENFIELD	Escherichia coli
		OTTER LAKE - GREENFIELD SP MIDDLE BEACH	NHLAK700030105-02-04	GREENFIELD	Escherichia coli
		NORWAY POND - TOWN BEACH	NHLAK700030107-02-02	HANCOCK	Escherichia coli
		JACKMAN RESERVOIR - MANAHAN PARK TOWN BEACH	NHLAK700030202-03-02	HILLSBOROUGH	Escherichia coli
		PLEASANT LAKE - ELKINS BEACH	NHLAK700030402-02-02	NEW LONDON	Escherichia coli
		TANNERY POND - BEACH	NHLAK700030402-03-02	WILMOT	Escherichia coli
	River	UNNAMED TRIBUTARY - TO CONTOOCOOK LAKE	NHRIV700030101-05	JAFFREY	Escherichia coli
		CONTOOCOOK RIVER - US OF JAFFERY WWTF TO 3000 FT DS OF WWTF	NHRIV700030101-16	JAFFREY	Escherichia coli
		CONTOOCOOK RIVER - NORTH VILLAGE DAM TO US OF PETERBOROUGH WWTF	NHRIV700030104-17	PETERBOROUGH	Escherichia coli
		CONTOOCOOK RIVER - OTTER BK TO POWDER MILL POND	NHRIV700030106-08	PETERBOROUGH	Escherichia coli
		MOOSE BROOK	NHRIV700030107-07	HANCOCK	Escherichia coli
		UNNAMED BROOK - TO ISLAND POND	NHRIV700030204-04	WASHINGTON	Escherichia coli
		BEARDS BROOK - TOWN BEACH	NHRIV700030204-15-02	HILLSBOROUGH	Escherichia coli
Nashua River	Impoundment	NASHUA RIVER - JACKSON PLANT DAM POND	NHIMP700040402-05	NASHUA	Escherichia coli
	Lake	MELENDY POND - TOWN BEACH	NHLAK700040401-01-02	BROOKLINE	Escherichia coli
		LAKE POTANIPO - TOWN BEACH	NHLAK700040401-02-02	BROOKLINE	Escherichia coli
		POTANIPO POND - CAMP TEVYA BEACH	NHLAK700040401-02-03	BROOKLINE	Escherichia coli
	River	NASHUA RIVER	NHRIV700040402-08	NASHUA	Escherichia coli
		NASHUA RIVER	NHRIV700040402-09	NASHUA	Escherichia coli
Merrimack River	Impoundment	MERRIMACK RIVER - GARVINS FALLS	NHIMP700060302-07	CONCORD	Escherichia coli
		BERRY POND BROOK - TOWN BEACH	NHIMP700060501-03-02	PITTSFIELD	Escherichia coli
		MERRIMACK RIVER - AMOSKEAG DAM	NHIMP700060802-04	MANCHESTER	Escherichia coli
		SOUHEGAN RIVER	NHIMP700060902-01	GREENVILLE	Escherichia coli
		SOUHEGAN RIVER - PINE VALLEY MILL	NHIMP700060904-08	WILTON	Escherichia coli
		SOUHEGAN RIVER - MCLANE DAM	NHIMP700060906-08	MILFORD	Escherichia coli
	Lake	SONDOGARDY POND - GLINES PARK BEACH	NHLAK700060101-02-02	NORTHFIELD	Escherichia coli
		CRYSTAL LAKE-TOWN BEACH	NHLAK700060401-02-02	GILMANTON	Escherichia coli
		UPPER SUNCOOK LAKE - CAMP FATIMA BEACH	NHLAK700060402-10-03	BARNSTEAD	Escherichia coli
		JENNESS POND	NHLAK700060502-06	NORTHWOOD	Escherichia coli
		NORTHWOOD LAKE	NHLAK700060502-08-01	NORTHWOOD	Escherichia coli
		NORTHWOOD LAKE - TOWN BEACH	NHLAK700060502-08-02	NORTHWOOD	Escherichia coli
		CATAMOUNT POND - BEAR BROOK STATE PARK BEACH	NHLAK700060503-02-02	ALLENSTOWN	Escherichia coli
		WEARE RESERVOIR - CHASE PARK TOWN BEACH	NHLAK700060601-05-02	WEARE	Escherichia coli
		EVERETT LAKE - CLOUGH STATE PARK BEACH	NHLAK700060602-01-02	WEARE	Escherichia coli
		GLEN LAKE - PUBLIC (STATE OWNED) BEACH	NHLAK700060607-01-02	GOFFSTOWN	Escherichia coli
		NAMASKE LAKE	NHLAK700060607-02	GOFFSTOWN	Escherichia coli
		CRYSTAL LAKE-TOWN BEACH	NHLAK700060703-02-02	MANCHESTER	Escherichia coli
		BABOOSIC LAKE	NHLAK700060905-01-01	AMHERST	Escherichia coli
		BABOOSIC LAKE - TOWN BEACH	NHLAK700060905-01-02	AMHERST	Escherichia coli
		SILVER LAKE - STATE PARK BEACH	NHLAK700061001-02-02	HOLLIS	Escherichia coli
		NATICOOK LAKE - WASSERMAN PARK BEACH	NHLAK700061002-04-02	MERRIMACK	Escherichia coli
		ISLAND POND - CHASE'S GROVE	NHLAK700061101-01-02	DERRY	Escherichia coli
		WASH POND - TOWN BEACH	NHLAK700061101-03-02	HAMPSTEAD	Escherichia coli
		SUNSET LAKE - SUNSET PARK BEACH	NHLAK700061101-03-03	HAMPSTEAD	Escherichia coli
		CAPTAIN POND - CAPTAIN'S BEACH	NHLAK700061102-03-02	SALEM	Escherichia coli
		CAPTAIN POND - CAMP OTTER SWIM AREA BEACH	NHLAK700061102-03-03	SALEM	Escherichia coli
		BEAVER LAKE - GALLIEN'S BEACH	NHLAK700061203-02-02	DERRY	Escherichia coli
		HOODS POND - TOWN BEACH	NHLAK700061203-03-02	DERRY	Escherichia coli
		RAINBOW LAKE - KAREN-GENA BEACH	NHLAK700061203-05-02	DERRY	Escherichia coli
		ROBINSON POND	NHLAK700061203-06-01	HUDSON	Escherichia coli
		ROBINSON POND - TOWN BEACH	NHLAK700061203-06-02	HUDSON	Escherichia coli
		LONG POND - TOWN BEACH	NHLAK700061205-02-02	PELHAM	Escherichia coli
		COUNTRY POND - LONE TREE SCOUT RESV. BEACH	NHLAK700061403-03-03	KINGSTON	Escherichia coli
		GREAT POND - KINGSTON STATE PARK BEACH	NHLAK700061403-06-02	KINGSTON	Escherichia coli
		GREAT POND - CAMP BLUE TRIANGLE BEACH	NHLAK700061403-06-03	KINGSTON	Escherichia coli

Watershed	Water Type	Waterbody Name	Assessment Unit #	Primary Town	Impairment
Merrimack River	River	MERRIMACK RIVER	NHRIV700060101-12	FRANKLIN	Escherichia coli
		TANNERY BROOK - COLD BROOK	NHRIV700060102-07	BOSCAWEN	Escherichia coli
		GUES MEADOW BROOK	NHRIV700060201-09	CANTERBURY	Escherichia coli
		GUES MEADOW BROOK	NHRIV700060201-10	LOUDON	Escherichia coli
		SHAKER BRANCH	NHRIV700060202-09	LOUDON	Escherichia coli
		TURKEY RIVER - BOW BROOK	NHRIV700060301-13	CONCORD	Escherichia coli
		MERRIMACK RIVER	NHRIV700060302-24	CONCORD	Escherichia coli
		MERRIMACK RIVER - GARVINS FALLS BYPASS	NHRIV700060302-25-01	CONCORD	Escherichia coli
		PISCATAQUOG RIVER - CENTER BROOK	NHRIV700060602-06	WEARE	Escherichia coli
		PISCATAQUOG RIVER	NHRIV700060603-07	NEW BOSTON	Escherichia coli
		SOUTH BRANCH PISCATAQUOG RIVER	NHRIV700060606-05	NEW BOSTON	Escherichia coli
		HARRY BROOK	NHRIV700060607-15	GOFFSTOWN	Escherichia coli
		CATAMOUNT BROOK	NHRIV700060607-20	GOFFSTOWN	Escherichia coli
		COHAS BROOK - LONG POND BROOK	NHRIV700060703-05	MANCHESTER	Escherichia coli
		UNNAMED BR - FROM PINE ISLAND POND TO MERRIMACK R	NHRIV700060703-09	MANCHESTER	Escherichia coli
		MERRIMACK RIVER	NHRIV700060802-14-02	HOOKSETT	Escherichia coli
		PATTEN BROOK	NHRIV700060803-12	BEDFORD	Escherichia coli
		MERRIMACK RIVER	NHRIV700060803-14-02	MANCHESTER	Escherichia coli
		MERRIMACK RIVER	NHRIV700060804-11	MERRIMACK	Escherichia coli
		SOUHEGAN RIVER - FURNACE BROOK	NHRIV700060901-09	NEW IPSWICH	Escherichia coli
		SOUHEGAN RIVER - TUCKER BROOK	NHRIV700060902-05	WILTON	Escherichia coli
		SOUHEGAN RIVER	NHRIV700060902-13	WILTON	Escherichia coli
		STONY BROOK - TOWN BEACH (GOSS PARK)	NHRIV700060903-16-02	WILTON	Escherichia coli
		PURGATORY BROOK	NHRIV700060904-07	MILFORD	Escherichia coli
		SOUHEGAN RIVER - STONY BROOK	NHRIV700060904-13	WILTON	Escherichia coli
		SOUHEGAN RIVER	NHRIV700060904-14	MILFORD	Escherichia coli
		RIDDLE BROOK	NHRIV700060905-18	BEDFORD	Escherichia coli
		BEAVER BROOK	NHRIV700060906-01	MONT VERNON	Escherichia coli
		GREAT BROOK - OX BROOK	NHRIV700060906-12	MILFORD	Escherichia coli
		SOUHEGAN RIVER	NHRIV700060906-13	MILFORD	Escherichia coli
		SOUHEGAN RIVER	NHRIV700060906-16	AMHERST	Escherichia coli
		SOUHEGAN RIVER	NHRIV700060906-18	MERRIMACK	Escherichia coli
		SOUHEGAN RIVER	NHRIV700060906-25	MERRIMACK	Escherichia coli
		WITCHES BROOK	NHRIV700061001-02	HOLLIS	Escherichia coli
		PENNICHUCK BROOK - WITCHES BROOK	NHRIV700061001-07	MERRIMACK	Escherichia coli
		MERRIMACK RIVER	NHRIV700061002-13	MERRIMACK	Escherichia coli
		MERRIMACK RIVER	NHRIV700061002-14	NASHUA	Escherichia coli
		SALMON BROOK - HASSELLS BROOK - OLD MAIDS BROOK - HALE BROOK	NHRIV700061201-05	NASHUA	Escherichia coli
		SALMON BROOK	NHRIV700061201-07	NASHUA	Escherichia coli
		BEAVER BROOK	NHRIV700061203-09	DERRY	Escherichia coli
		BEAVER BROOK	NHRIV700061203-22	PELHAM	Escherichia coli
		LAUNCH BROOK	NHRIV700061203-26	HUDSON	Escherichia coli
		BEAVER BROOK - TONYS BROOK	NHRIV700061205-01	PELHAM	Escherichia coli
		MERRIMACK RIVER	NHRIV700061206-24	NASHUA	Escherichia coli
		KELLY BROOK - SEAVER BROOK	NHRIV700061401-04	PLAISTOW	Escherichia coli
Upper Connecticut River	Impoundment	CONNECTICUT RIVER - CANAAN HYDRO	NHIMP801010305-01	STEWARTSTOWN	Escherichia coli
	River	BISHOP BROOK - POND BROOK	NHRIV801010301-02	CLARKSVILLE	Escherichia coli
		HALLS STREAM	NHRIV801010303-02	PITTSBURG	Escherichia coli
		CONNECTICUT RIVER	NHRIV801010305-01	STEWARTSTOWN	Escherichia coli
		SIMMS STREAM - EAST BRANCH SIMMS STREAM	NHRIV801010403-01	COLUMBIA	Escherichia coli
		CONNECTICUT RIVER	NHRIV801010404-02	COLUMBIA	Escherichia coli
		CONNECTICUT RIVER	NHRIV801010405-03	COLUMBIA	Escherichia coli
		CONNECTICUT RIVER	NHRIV801010603-05	STRATFORD	Escherichia coli
		BURNSIDE BROOK	NHRIV801010805-04	NORTHUMBERLAND	Escherichia coli
		OTTER BROOK - CALEB BROOK - BONE BROOK	NHRIV801010805-05	LANCASTER	Escherichia coli
		OTTER BROOK	NHRIV801010805-06	LANCASTER	Escherichia coli
		WAUMBEK INN BROOK - TOWN BEACH	NHRIV801010806-03-02	JEFFERSON	Escherichia coli
		ISRAEL RIVER	NHRIV801010806-06	JEFFERSON	Escherichia coli
		ISRAEL RIVER	NHRIV801010806-09	LANCASTER	Escherichia coli
		CONNECTICUT RIVER	NHRIV801010902-02	NORTHUMBERLAND	Escherichia coli
		CONNECTICUT RIVER	NHRIV801010903-02	LANCASTER	Escherichia coli

Watershed	Water Type	Waterbody Name	Assessment Unit #	Primary Town	Impairment
Connecticut River - Johns River to Waits River	Lake	BURNS POND - PUBLIC BEACH	NHLAK801030101-01-02	WHITEFIELD	Escherichia coli
		FOREST LAKE - FOREST LAKE STATE PARK	NHLAK801030101-02-02	DALTON	Escherichia coli
		ECHO LAKE - FRANCONIA STATE PARK BEACH	NHLAK801030302-01-02	FRANCONIA	Escherichia coli
	River	TUTTLE BROOK - TWIN MTN REC AREA BEACH	NHRIV801030402-07-02	CARROLL	Escherichia coli
		AMMONOOSUC RIVER	NHRIV801030403-11	LITTLETON	Escherichia coli
		OLIVERIAN BROOK - MORRIS BROOK	NHRIV801030701-05	HAVERHILL	Escherichia coli
		CLARK BROOK	NHRIV801030703-02	HAVERHILL	Escherichia coli
Connecticut River - Waits River to White River	Lake	LAKE TARLETON	NHLAK801040201-03	PIERMONT	Escherichia coli
		POST POND - CHASE TOWN BEACH	NHLAK801040203-01-02	LYME	Escherichia coli
	River	BEAN BROOK-TOWN BEACH	NHRIV801040205-02-02	PIERMONT	Escherichia coli
Connecticut River - White River to Bellows Falls	Impoundment	SUGAR RIVER	NHIMP801060406-08	CLAREMONT	Escherichia coli
	Lake	CANAAN STREET LAKE - TOWN BEACH	NHLAK801060101-01-02	CANAAN	Escherichia coli
		KOLEMOOK LAKE - TOWN BEACH	NHLAK801060401-08-02	SPRINGFIELD	Escherichia coli
		LITTLE SUNAPEE LAKE - BUCKLIN TOWN BEACH	NHLAK801060402-04-02	NEW LONDON	Escherichia coli
		SUNAPEE LAKE - GEORGES MILL TOWN BEACH	NHLAK801060402-05-02	SUNAPEE	Escherichia coli
		SUNAPEE LAKE - DEWEY (TOWN) BEACH	NHLAK801060402-05-03	SUNAPEE	Escherichia coli
		SUNAPEE LAKE - BLODGETT'S LANDING BEACH	NHLAK801060402-05-04	NEWBURY	Escherichia coli
		SUNAPEE LAKE - SUNAPEE STATE PARK BEACH	NHLAK801060402-05-05	NEWBURY	Escherichia coli
		OTTER POND - MORGAN BEACH	NHLAK801060402-12-02	NEW LONDON	Escherichia coli
		RAND POND - PUBLIC WAY BEACH	NHLAK801060403-04-02	GOSHEN	Escherichia coli
	River	MASCOMA RIVER	NHRIV801060105-05	CANAAN	Escherichia coli
		LOVEJOY BROOK - SCALES BROOK	NHRIV801060105-08	HANOVER	Escherichia coli
		HARDY HILL BROOK	NHRIV801060106-03	LEBANON	Escherichia coli
		BLODGETT BROOK	NHRIV801060106-04	LEBANON	Escherichia coli
		BLODGETT BROOK	NHRIV801060106-05	LEBANON	Escherichia coli
		SOUTH BRANCH SUGAR RIVER - GUNNISON BROOK	NHRIV801060403-12	GOSHEN	Escherichia coli
		NORTH BRANCH SUGAR RIVER - PERKINS BROOK	NHRIV801060404-11	CROYDON	Escherichia coli
		SUGAR RIVER	NHRIV801060405-10	SUNAPEE	Escherichia coli
		SUGAR RIVER	NHRIV801060405-25	NEWPORT	Escherichia coli
		SUGAR RIVER	NHRIV801060405-27	NEWPORT	Escherichia coli
		SUGAR RIVER	NHRIV801060406-30	CLAREMONT	Escherichia coli
		SUGAR RIVER	NHRIV801060407-09-02	CLAREMONT	Escherichia coli
		SUGAR RIVER	NHRIV801060407-16	CLAREMONT	Escherichia coli
		CHASE BROOK	NHRIV801060701-05	UNITY	Escherichia coli
Connecticut River - Bellows Falls to Vernon Dam	Impoundment	COLD RIVER - VILAS POOL BEACH	NHIMP801070202-01-02	ALSTEAD	Escherichia coli
	River	COLD RIVER - UNDERWOOD BROOK	NHRIV801070201-08	ACWORTH	Escherichia coli
		COLD RIVER - BOWERS BROOK	NHRIV801070202-04	ACWORTH	Escherichia coli
		CRANE BROOK	NHRIV801070202-09	ACWORTH	Escherichia coli
		COLD RIVER - WARREN BROOK	NHRIV801070203-04	ALSTEAD	Escherichia coli
		COLD RIVER	NHRIV801070203-09	LANGDON	Escherichia coli
		PARTRIDGE BROOK	NHRIV801070503-02	CHESTERFIELD	Escherichia coli
		PARTRIDGE BROOK	NHRIV801070503-03	WESTMORELAND	Escherichia coli

Watershed	Water Type	Waterbody Name	Assessment Unit #	Primary Town	Impairment
Connecticut River - Ashuelot River-Vernon Dam to Millers River	Impoundment	ASHUELOT RIVER - HOMESTEAD WOOLEN MILL DAM	NHIMP802010401-01	SWANZEY	Escherichia coli
	Lake	MILLEN POND - TOWN BEACH	NHLAK802010101-06-02	WASHINGTON	Escherichia coli
		SURRY MOUNTAIN RESERVOIR - REC AREA BEACH	NHLAK802010104-02-02	SURRY	Escherichia coli
		OTTER BROOK - OTTER BROOK PK BEACH	NHLAK802010201-06-02	KEENE	Escherichia coli
		RUSSEL RESERVOIR - CHESHAM BEACH	NHLAK802010202-07-02	HARRISVILLE	Escherichia coli
		SWANZEY LAKE - RICHARDSON PARK TOWN BEACH	NHLAK802010302-01-02	SWANZEY	Escherichia coli
	River	ASHUELOT RIVER	NHRIV802010101-08	WASHINGTON	Escherichia coli
		UNNAMED BROOK - TO SAND POND	NHRIV802010101-19	MARLOW	Escherichia coli
		UNNAMED BROOK - TO SAND POND	NHRIV802010101-20	MARLOW	Escherichia coli
		ASHUELOT RIVER	NHRIV802010103-22	GILSUM	Escherichia coli
		ROBBINS BROOK	NHRIV802010202-16	MARLBOROUGH	Escherichia coli
		ASHUELOT RIVER - ASHUELOT RIVER DAM POND TO OTTER BR	NHRIV802010301-09	KEENE	Escherichia coli
		SOUTH BRANCH ASHUELOT RIVER - QUARRY BROOK	NHRIV802010303-11	TROY	Escherichia coli
		SOUTH BRANCH ASHUELOT RIVER	NHRIV802010303-12	TROY	Escherichia coli
		SOUTH BRANCH ASHUELOT RIVER	NHRIV802010303-18	TROY	Escherichia coli
		SOUTH BRANCH ASHUELOT RIVER	NHRIV802010303-20	MARLBOROUGH	Escherichia coli
		SOUTH BRANCH ASHUELOT RIVER	NHRIV802010303-23	SWANZEY	Escherichia coli
		ASHUELOT RIVER - SOUTH BRANCH TO HOMESTEAD DAM	NHRIV802010401-15	SWANZEY	Escherichia coli
		MIREY BROOK - BLACK BROOK	NHRIV802010402-06	WINCHESTER	Escherichia coli
		ASHUELOT RIVER - 300FT US OF WINCHESTER WWTF TO 3000FT DS OF WWTF	NHRIV802010403-07	WINCHESTER	Escherichia coli
		ASHUELOT RIVER - 300FT US OF HINSDALE WWTF TO CONNECTICUT R	NHRIV802010403-20	HINSDALE	Escherichia coli
Coastal Impaired Segments	Ocean	ATLANTIC OCEAN - NEW CASTLE BEACH	NHOCN000000000-02-02	NEW CASTLE	Enterococcus
		ATLANTIC OCEAN - PIRATES COVE BEACH	NHOCN000000000-02-04	RYE	Enterococcus
		ATLANTIC OCEAN - CABLE BEACH	NHOCN000000000-02-05	RYE	Enterococcus
		ATLANTIC OCEAN - SAWYER BEACH	NHOCN000000000-02-06	RYE	Enterococcus
		ATLANTIC OCEAN - SAWYER BEACH	NHOCN000000000-02-06	RYE	Fecal Coliform
		ATLANTIC OCEAN - JENNESS BEACH	NHOCN000000000-02-07	RYE	Enterococcus
		ATLANTIC OCEAN - STATE BEACH	NHOCN000000000-02-09	NORTH HAMPTON	Enterococcus
		ATLANTIC OCEAN - STATE BEACH	NHOCN000000000-02-09	NORTH HAMPTON	Fecal Coliform
		ATLANTIC OCEAN - HAMPTON BEACH STATE PARK BEACH	NHOCN000000000-02-10	HAMPTON	Enterococcus
		ATLANTIC OCEAN - SEABROOK TOWN BEACH	NHOCN000000000-02-11	SEABROOK	Enterococcus
		BASS BEACH BROOK OUTFALL AREA	NHOCN000000000-03-01	RYE	Enterococcus
		BASS BEACH BROOK OUTFALL AREA	NHOCN000000000-03-01	RYE	Fecal Coliform
		ATLANTIC OCEAN - BASS BEACH	NHOCN000000000-03-02	RYE	Enterococcus
		ATLANTIC OCEAN - BASS BEACH	NHOCN000000000-03-02	RYE	Fecal Coliform
		ATLANTIC OCEAN - CHAPEL BROOK	NHOCN000000000-04	OCEAN	Enterococcus
		ATLANTIC OCEAN - CHAPEL BROOK	NHOCN000000000-04	OCEAN	Fecal Coliform
		ATLANTIC OCEAN - EEL POND	NHOCN000000000-05	OCEAN	Fecal Coliform
		ATLANTIC OCEAN - LITTLE RIVER	NHOCN000000000-06	OCEAN	Enterococcus
		ATLANTIC OCEAN - LITTLE RIVER	NHOCN000000000-06	OCEAN	Fecal Coliform
		ATLANTIC OCEAN - PARSONS CREEK	NHOCN000000000-07	OCEAN	Enterococcus
		ATLANTIC OCEAN - PARSONS CREEK	NHOCN000000000-07	OCEAN	Fecal Coliform

2. WATER QUALITY STANDARDS FOR BACTERIA

2.1. Overview of Pathogens and Indicator Bacteria

Bacteria TMDLs are designed to support reduction of waterborne disease-causing organisms, known as pathogens, to reduce public health risk. Pathogens are easily carried by storm water runoff as well as other discharges into surface waterbodies. Once in a stream, lake, or estuary, they can infect humans through consumption of contaminated fish and shellfish, skin contact, or ingestion of water. Of the designated uses listed in Section 303(d) of the Clean Water Act, protection from pathogenic contamination is most important for waters designated for recreation (primary and secondary contact); public water supplies; aquifer protection; and protection and propagation of fish, shellfish, and wildlife (USEPA, 2001).

Infections due to pathogen-contaminated recreational waters include gastrointestinal, respiratory, eye, ear, nose, throat, and skin diseases (USEPA, 1986). Filter-feeding shellfish such as clams, oysters, and mussels, and other shellfish concentrate microbial contaminants in their tissues and may be harmful to humans when consumed raw or undercooked.

Wastes from warm-blooded animals are a source for many types of bacteria found in waterbodies, including the coliform group and Streptococcus, Lactobacillus, Staphylococcus, and Clostridia. Each gram of human feces contains approximately 12 billion bacteria that may include pathogenic bacteria, such as Salmonella, associated with gastroenteritis. In addition, feces may contain pathogenic viruses, protozoa and parasites (MADEP, 2007).

The numbers of pathogenic organisms present in waters are generally difficult to identify and isolate, and are often highly varied in their characteristic or type. Therefore, scientists and public health officials usually monitor nonpathogenic bacteria that are typically associated with harmful pathogens in fecal contamination but are more easily sampled and measured. These associated bacteria are called indicator organisms. Indicator bacteria are not themselves a health risk but are used to indicate the presence of pathogenic organisms. High densities of indicator bacteria increase the likelihood of the presence of pathogenic organisms (USEPA, 2001).

Some commonly used indicators include coliform bacteria and fecal streptococci. The relationship of indicator organisms is illustrated in Figure 2-1 below, with indicators used in New Hampshire highlighted in yellow. Indicator criteria specific to New Hampshire are provided in section 2.2 of this report. Coliform bacteria include total coliforms, fecal coliform and *Escherichia coli (E. coli).* Fecal coliform (a subset of total coliform) and *E. coli* (a subset of fecal coliform) are present in the intestinal tracts of warm blooded animals. Presence of coliform bacteria in water indicates fecal contamination and the possible presence of pathogens. Fecal streptococci bacteria are also used as indicator bacteria, specifically enterococci, a subgroup of fecal streptococci. These bacteria also live in the intestinal tract of animals but, because enterococci have a lower die-off rate, their presence is a better predictor of human gastrointestinal illness than fecal coliform (USEPA 2001).

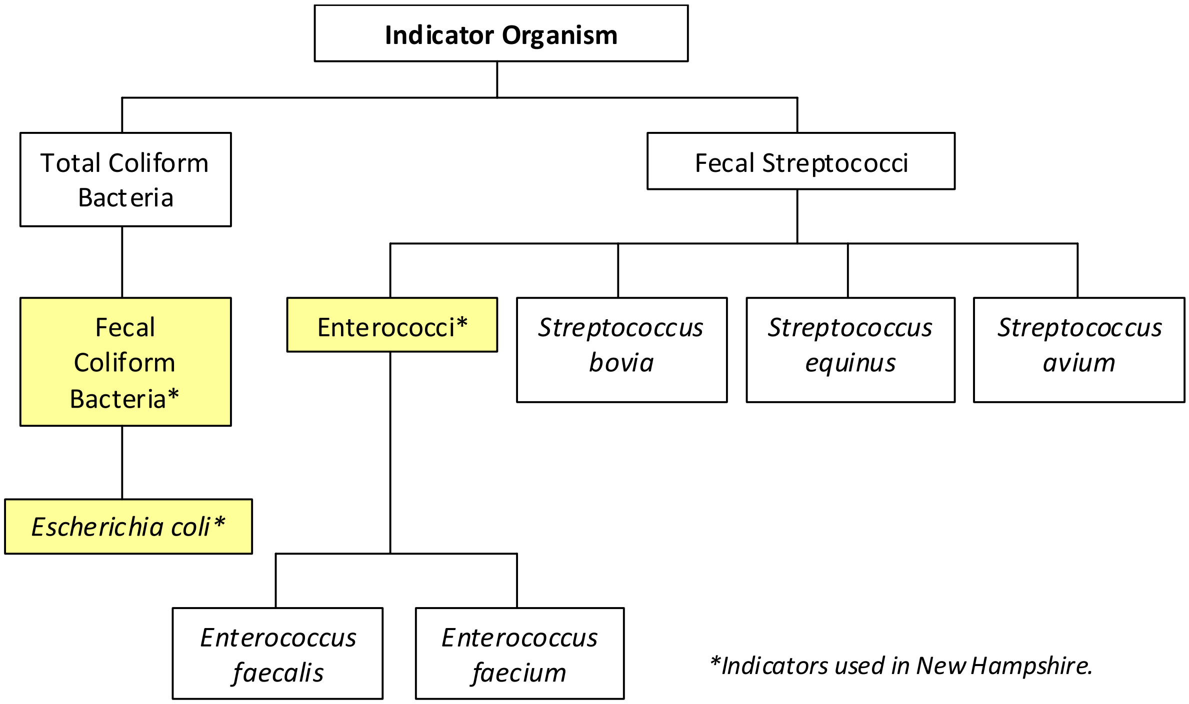

Figure 2-1: Relationship among Indicator Organisms (USEPA, 2001).

The State of New Hampshire uses *E. coli* as indicator organisms of potential harmful pathogens in fresh waters and enterococci for tidal recreational waters (RSA 485-A:8). To determine risk in shellfish harvesting areas, fecal coliform organisms are used (criteria recommended under the National Shellfish Sanitation Program; NSSP, 2007).

2.2. Water Quality Standards for Bacteria in New Hampshire Waters

Water Quality Standards determine the baseline water quality that all surface waters of the State must meet in order to protect their intended uses. They are the "yardstick" for identifying where water quality violations exist and for determining the effectiveness of regulatory pollution control and prevention programs. The standards are composed of three parts; classification and designated uses; criteria; and antidegradation regulations. Each of these parts is described below.

2.2.1. Classification and Designated Uses

Classification of surface waters is accomplished by state legislation under the authority of RSA 485-A:9 and RSA 485-A:10. By definition (RSA 485-A:2, XIV) "surface waters of the state means streams, lakes, ponds, and tidal waters within the jurisdiction of the state, including all streams, lakes, or ponds, bordering on the state, marshes, water courses and other bodies of water, natural or artificial." According to Env-Wq 1702.46, surface waters also include waters of the United States as defined in 40 CFR 122.2.

All State surface waters are either classified as Class A or Class B, with the majority of waters being Class B. NHDES maintains a list which includes a narrative description of all the legislative classified waters. According to State statute RSA 485-A:8, designated uses for each classification include the following:

- **Class A (RSA 485-A:8,I):** These are generally of the highest quality and are considered potentially usable for water supply after adequate treatment. Discharge of sewage or wastes is prohibited to waters of this classification.
- **Class B (RSA 485-A:8,II):** Of the second highest quality, these waters are considered acceptable for fishing, swimming and other recreational purposes, and, after adequate treatment, for use as water supplies.

However, based on a review of RSA 485-A:8 in conjunction with State surface water quality regulations (Env-Wq 1700), NHDES has concluded that the complete list of designated uses for New Hampshire's surface waters includes those shown in Table 2-1 (NHDES, 2008b).

Table 2-1: Designated Uses for New Hampshire Surface Waters.

Designated Use	Definition	Applicability
Aquatic Life	Waters that provide suitable chemical and physical conditions for supporting a balanced, integrated and adaptive community of aquatic organisms.	All surface waters
Fish Consumption	Waters that support fish free from contamination at levels that pose a human health risk to consumers.	All surface waters
Shellfish Consumption	Waters that support a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers.	All tidal surface waters
Drinking Water Supply	Waters that with adequate treatment will be suitable for human intake and meet state/federal drinking water regulations.	All surface waters
Primary Contact Recreation (i.e. swimming)	Waters suitable for recreational uses that require or are likely to result in full body contact and/or incidental ingestion of water.	All surface waters

Secondary Contact Recreation	Waters that support recreational uses that involve minor contact with the water.	All surface waters
Wildlife	Waters that provide suitable physical and chemical conditions in the water and the riparian corridor to support wildlife as well as aquatic life.	All surface waters

2.2.2. Water Quality Criteria

New Hampshire's water quality criteria for bacteria in Class A and B waters are included in RSA 485-A:8, I, II and V and the New Hampshire surface water quality regulations (Env-Wq 1700). Criteria assigned to each classification are designed to protect the legislative designated uses for each classification. A waterbody that meets the criteria for its assigned classification is considered to meet its intended use.

Ambient bacteria criteria for the protection of contact recreation and consumption of shellfish are presented in Table 2-2 and Table 2-3 respectively. To protect contact recreational uses such as swimming and boating, New Hampshire uses *Escherichia coli* (*E. coli*) as an indicator of pathogenic bacteria in freshwaters and enterococci in tidal waters. To protect shellfish consumers, fecal coliform is used as an indicator of pathogenic bacteria in shellfishing areas, in accordance with National Shellfish Sanitation Program (NSSP) guidance. Bacteria criteria for *E. coli* and enterococcus are expressed as a **geometric mean** and as an instantaneous, or single, sample. Similarly, criteria for fecal coliform are expressed as a geometric mean and 90th percentile concentration.

> *A* ***geometric mean*** *is a way to average a set of values, and is commonly used with bacterial water assessments which often show a great deal of variability. Unlike an arithmetic mean, a geometric mean reduces the effect of an occasional high or low value on the average.*

Table 2-2: Ambient Bacteria Criteria for Contact Recreation

Waterbody Class & Type	Designated Beach	Bacteria	Geometric Mean Criteria (GMC)*	Single Sample Maximum Criteria (SSMC)
Class A *Fresh water*	No	*Escherichia coli* (cts/100 mL)	47	153
Class A *Fresh Water*	Yes	*Escherichia coli* (cts/100 mL)	47	88

Class B *Fresh Water*	No	*Escherichia coli* (cts/100 mL)	126	406
Class B *Fresh Water*	Yes	*Escherichia coli* (cts/100 mL)	47	88
Class B *Tidal Water*	No	*Enterococcus* (cts/100 mL)	35	104
Class B *Tidal Water*	Yes	*Enterococcus* (cts/100 mL)	35	104

* Geometric mean criteria are based on at least 3 samples obtained over a 60-day period

The criteria in Table 2-2, above, are for the protection of primary contact recreation (i.e, swimming). There are no numeric bacteria criteria in state statute or regulation for secondary contact recreation (i.e., boating). However, when determining impaired waters for 305(b) and 303(d) reporting purposes, NHDES uses enterococci and *E. coli* concentrations greater than five times the primary contact recreation standards to determine secondary contact recreation use support (NHDES, 2008b). Consequently, since criteria for primary contact recreation is more stringent than secondary contact recreation, primary contact recreation bacteria criteria is also protective of secondary contact uses.

As shown in Table 2-2, criteria are also dependent on whether the surface water is a "designated beach". A designated beach is defined as "an area on a waterbody that is operated for bathing, swimming, or other primary water contact by any municipality, governmental subdivision, public or private corporation, partnership, association or educational institution, open to the public, members, guests, or students whether on a fee or free basis" (NHDES, 2008). Since more people are more apt to be swimming (and prone to ingestion of water) at beaches, bacteria criteria for designated beaches are more stringent than for other surface waters.

New Hampshire's fecal coliform criteria for tidal waters used for growing or taking of shellfish for human consumption are established in accordance with the National Shellfish Program Manual of Operation (NSSP, 2007). This document sets the acceptable levels of fecal coliform in seawater (Table 2-3, below). Based on fecal coliform criteria and other factors (e.g. the completion of sanitary surveys), NHDES is responsible for determining which growing areas meet standards for human consumption of molluscan shellfish (i.e, "Approved" status). The criteria for the approved classification of the NSSP require that "the growing area not be subject to human or animal fecal matter at levels that present an actual or potential public health risk, and not be contaminated with pathogenic organisms, poisonous or deleterious substances or marine biotoxin" (NSSP, 2007).

Table 2-3: Fecal Coliform Criteria for Shellfish Consumption (NSSP, 2007).

Classification	Fecal Coliform Geometric Mean Criteria (MPN/100 mL)*	Fecal Coliform 90th Percentile Criteria (MPN/100 mL)*
Approved	14	43

**MPN = most probable number.*

The bacteria standards discussed above apply in surface waters (i.e., ambient conditions). However, New Hampshire surface water quality regulations [Env-Wq 1703.06 (b)] also specify that bacteria criteria must be met at the end of discharge pipe(s) from wastewater treatment facilities. Further, Env-Wq 1703.06 (c) requires that the bacteria concentration in discharge pipe(s) from combined sewer overflows, or CSOs (i.e., pipes that convey a mixture of stormwater and untreated sewage during wet weather events) that discharge into non-tidal waters, must not exceed 1,000 *E. coli* per 100 mL (NHDES, 2008a).

State statute also includes provisions regarding the discharge of sewage or wastes. According to RSA 485-A:8, I, "there can be no discharge of sewage or wastes" into Class A waters. Sewage and waste is defined in RSA 485-A:2. The term sewage includes human waste such as fecal matter. For Class B waters, RSA 485-A:8, II, states "there shall be no disposal of sewage or waste" into Class B waters "except those which have received adequate treatment to prevent the lowering of the biological, physical, chemical or bacteriological characteristics below those given above, nor shall such disposal of sewage or waste be inimical to aquatic life or to the maintenance of aquatic life in said receiving waters". Since human waste can contain high levels of bacteria that can violate water quality standards, NHDES interprets RSA 485-A:8,II to mean there can be no discharge of untreated sewage or waste (i.e., wastewater) to Class B waters.

2.2.3. Antidegradation Provisions

Antidegradation provisions are designed to preserve and protect the existing beneficial uses of the State's surface waters and to limit the degradation allowed in receiving waters. Antidegradation regulations are included in Part Env-Wq 1708 of the New Hampshire Surface Water Quality Regulations (NHDES, 2008b). According to Env-Wq 1708.02, antidegradation applies to the following:

- All new or increased activity, including point and non-point source discharges of pollutants that would lower water quality or affect existing or designated uses;
- A proposed increase in loadings to a waterbody when the proposal is associated with existing activities;

- An increase in flow alteration over an existing alteration; and
- All hydrologic modifications, such as dam construction and water withdrawals.

2.3. Numeric Water Quality Target

The New Hampshire ambient water quality criteria for bacteria presented in section 2.2.2 are used as the numeric water quality targets for these bacteria TMDLs. As discussed in section 2.2.2, bacteria targets for surface waters vary depending on the designated use (e.g., recreation, or shellfish consumption), class (A or B), if it is a designated beach and if it is a fresh or tidal surface water (*E. coli* for freshwater, Enterococci for estuaries and marine recreational waters, and fecal coliform for shellfish harvesting areas in marine waters).

3. BACTERIA POLLUTION SOURCES

Sources of indicator bacteria and associated pathogens may be categorized into two major groups: *point source (PS)* pollution and *non-point source (NPS)* pollution, each of which are discussed below. As will become evident in the sections that follow, a stormwater discharge can be categorized as either a point source or a non-point source, depending on whether or not the discharge is regulated under the National Pollutant Discharge Elimination System (NPDES) permit program, which is a function of the location or source of the discharge. Municipal stormwater discharges located within urbanized areas federally designated under the Stormwater Phase I or II programs are considered point sources under the Clean Water Act, and require NPDES discharge permits. Municipal stormwater discharges located outside the federally designated urbanized areas are considered non-point source discharges and typically are not regulated under the National Pollutant Discharge Elimination System (NPDES) program (unless they are covered by another NPDES permit such as a multi-sector general permit or a construction general permit). For this reason, stormwater is listed as a source of bacteria in both categories of pollution below.

Information on strategies to reduce the impacts of many of these bacteria pollution sources, as well as information on applicable New Hampshire regulatory policies, is provided in section 7 of this report.

3.1. Point Source Pollution

Point source pollution can be traced back to a specific source such as a discharge pipe from a factory or treatment plant or a feedlot, making this type of pollution relatively easy to identify. According to the New Hampshire surface water quality regulations (NHDES 2008h) a point source is defined as follows:

Env-Wq 1702.38 "Point source" means a discernible, confined, and discrete conveyance from which pollutants are or might be discharged, excluding return flows from irrigated agriculture or agricultural stormwater runoff, and including but not limited to a:

a) Pipe;
b) Ditch;
c) Channel;
d) Tunnel;
e) Conduit;
f) Well;
g) Discrete fissure;
h) Container;
i) Rolling stock;
j) Concentrated animal feeding operation; or
k) Vessel or other floating craft.

This definition is very similar to the federal Clean Water Act definition which defines a point source as:

> "Any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture."

Section 402 of the federal Clean Water Act, requires all such point source discharges to be regulated under the NPDES permit program to control the type and quantity of pollutants discharged. The NPDES permit program covers municipal wastewater, industrial treatment plants as well as federally regulated stormwater. In New Hampshire, all NPDES permits are issued by EPA Region 1. As required by Section 401 of the Clean Water Act and State statute RSA 485-A:12, III, NPDES permits cannot be issued until New Hampshire reviews and provides certification that the permit will not cause or contribute to water quality standard violations.

In addition to NPDES permits, municipal and industrial treatment facilities in New Hampshire also need a state discharge permit in accordance with RSA 485-A:13 which states that any person or persons discharging or disposing of any sewage or waste to the surface water or groundwater of the state must first obtain a written permit from NHDES. To avoid confusion and duplication of effort, NHDES typically adopts the NPDES permit issued by EPA as the state discharge permit for municipal and industrial wastewater treatment facilities.

Bacteria point sources of pollution can be grouped as follows:

- NPDES Non-stormwater (i.e., WWTFs, CSOs, CAFOs)
- NPDES Stormwater (MS4, CGP, MSGP)
- Unauthorized Point Source Discharges of Untreated Wastewater (i.e., SSOs, Illicit Discharges, Boats)

Each of these point source categories is described below.

3.1.1 NPDES Non-stormwater (i.e., WWTFs, CSOs, CAFOs)

This category includes all point sources permitted under the NPDES permit program other than those that convey only stormwater. Examples include discharges from wastewater treatment facilities (WWTFs) combined sewer overflows (CSOs), and concentrated animal feeding operations (CAFOs) which are discussed below. Other discharges, such as those associated with non-contact cooling water for some industrial facilities, are also included in this category however they typically do not have the potential to discharge as much bacteria as WWTFs , CSOs and CAFOs.

WWTFs

Potentially harmful bacteria may enter surface waters via wastewater discharges, such as from sewage created by institutions, hospitals and commercial and industrial establishments, and household waste liquid from toilets, baths, showers, kitchens, and sinks. This wastewater, which contains a variety of organic and inorganic pollutants, is treated by WWTFs in order to remove harmful waste products and to render it environmentally acceptable.

CSOs

Combined sewers are pipes that collect both stormwater and municipal wastewater or sewage. Stormwater may enter the combined sewer system through catch basins installed in streets to alleviate flooding when it rains. Combined sewers are different from separated sewers, which are pipes that collect and convey only wastewater from businesses and residences.

During dry weather, combined sewers convey only wastewater to the municipal WWTF where it is treated before being discharged to a water body, such as a river or a stream. When it rains heavily, however, large amounts of stormwater may enter the combined sewer and rapidly fill the pipes. If the capacity of the combined sewer or the WWTF is exceeded, the combined sewer overflows. These wet weather discharges of untreated wastewater and stormwater are called combined sewer overflows (CSOs). CSOs are a potential source of water pollution as they discharge a combination of untreated domestic sewage, industrial wastewater, and stormwater. Because of this, they may pose a risk to public health, stress the aquatic environment and/or impact water uses such as swimming, fishing or shellfishing (NHDES, 2003a). Like WWTF discharges, CSO discharges are regulated under the NPDES permit program for point sources. There are currently 34 regulated CSO discharges in New Hampshire. For more information, see section 6.2.3.

CAFOs

CAFOs are generally defined as farms with 700 or more head of livestock confined for more than 45 days. Under the CWA [Section 502(14)] these operations are considered point sources. To be considered a CAFO, a facility must first be defined as an Animal Feeding Operation (AFO). AFOs generally congregate and feed animals, manage their manure, and have production operations on a small land area. Feed is brought to the animals rather than the animals grazing or feeding in pastures. For additional information, see section 7.

3.1.2 NPDES Stormwater (MS4GP, CGP, MSGP)

Stormwater runoff is water that doesn't soak into the ground during a rain storm, but instead flows over the surface of the ground until it reaches a waterbody. As the runoff moves, it picks up and carries away natural and human-made pollutants, such as soil and manure, eventually depositing them into surface and ground waters. Stormwater runoff is one of the leading sources of impairment of our nation's waters and often contains high concentrations of bacteria. Urbanization and associated impervious surfaces have a significant impact on the hydrology within a watershed by increasing stormwater runoff volume to receiving surface waters. This category includes all stormwater that qualifies for coverage under the federal NPDES stormwater permit program. This includes stormwater regulated under the following NPDES stormwater permits:

- Construction General Permit (CGP);
- Multisector General Permit (MSGP); and
- Municipal separate storm sewer system General Permit (MS4GP or MS4)

The CGP covers all stormwater from construction sites disturbing more than one acre and the MSGP covers certain industrial activities. In New Hampshire, EPA regulates "Small MS4" discharges in urbanized areas in 45 municipalities. The term MS4 includes municipalities; county facilities, such as prisons/hospitals; districts; federal facilities, such as military bases; and state facilities, such as highways (NHDES, 2003b).

Once permitted, each CGP or MSGP permittee is responsible for preparing and implementing a Stormwater Pollution Prevention Plan (SWPPP). Each MS4GP permittee is responsible for establishing a Stormwater Management Program (SWMP) and controlling stormwater pollutants to the maximum extent practicable. Narrative and structural best management practices are used to comply with permit requirements and protect water quality.

EPA may also designate additional currently unregulated sources of stormwater for permit coverage if they are significant contributors of pollutants to surface waters or if their discharges cause or contribute to water quality impairments.

3.1.3 Unauthorized Point Source Discharges of Untreated Wastewater (i.e., SSOs, Illicit Discharges, Boats)

This category includes all point source discharges that are not authorized (i.e., cannot be permitted) under the NPDES permit program or by the State because they will not meet water quality standards. Examples include the discharge of untreated wastewater from sources such as sanitary sewer overflows (SSOs) and illicit discharges to stormdrains. As discussed in section 2.2.2, untreated discharges of sewage (i.e., wastewater) are prohibited. Since such point discharges will not meet water quality standards, they must be eliminated (or treated) once discovered. As discussed below, this category also includes discharges of sewage from boats which is prohibited by state law.

Sanitary Sewer Overflows (SSOs)

Sanitary sewer overflows (SSOs) are discharges of untreated wastewater from municipal sewer systems. SSOs can be caused by blocked or cracked sewer pipes, excess infiltration and inflow, an undersized sewer system (piping and/or pumps), or equipment failure. Such untreated wastewater can find its way to surface waters and cause bacteria violations. Since 2005, there have been approximately 300 SSOs in 54 New Hampshire communities.

Illicit Discharges (to Stormwater Systems)

Illicit discharges include any discharges to stormwater systems that are not entirely composed of stormwater (NEIWPCC, 2003). These include intentional or unknown illegal connections from commercial or residential buildings, and improper disposal of sewage from campers and boats. Examples of illicit discharges commonly seen in urban communities in New Hampshire include sanitary wastewater piping that is directly connected from a home to a storm drainage pipe or a cross-connection between the municipal sewer to the storm sewer systems. As a result of these illicit connections, contaminated wastewater enters into storm drains and is then discharged to surface waters. These sources can contribute significantly to the load of bacteria in stormwater, particularly during periods of dry flow (MEDEP, 2009).

Boat Discharges

As discussed in section 3.1, Env-Wq 1702.38 of the New Hampshire's surface water quality regulations defines vessels or other floating craft as point source discharges. Boats have the potential to discharge pathogens in sewage from installed toilets and graywater (includes drainage from sinks, showers, and laundry). Sewage and graywater discharged from boats can contain pathogens (including bacteria, viruses, and protozoans), nutrients, and chemical products which can lead to water quality violations.

Graywater discharge from boats is prohibited in all inland (i.e., freshwater) New Hampshire waterbodies (RSA 487:3, Marine Toilets and Disposal of Sewage from Boats). With regards to discharge of boat sewage (which includes graywater), New Hampshire has established “No Discharge Areas” (NDAs) where the discharge of all boat sewage, whether treated or untreated, is prohibited (RSA 487:2). NDAs include all inland and coastal waters within three miles of the New Hampshire shoreline and the Isles of Shoals. Tidal and estuarine waters, including all bays and rivers to the tidal dams, are also incorporated in this designation. In waters that are not designated as No Discharge, federal law allows for overboard discharge of boat sewage that is first treated by an on-board marine sanitation device (MSD) but prohibits the discharge of untreated boat sewage.

3.2. Non-point Source Pollution

In contrast to point sources, non-point source (NPS) pollution comes from many diffuse sources and is more difficult to identify and control. NPS pollution can result from the direct deposition of pollutants to receiving waters or by the transport of pollutants to receiving waters by groundwater or overland runoff (e.g., agricultural runoff, or stormwater runoff in unregulated suburban and rural areas). NPS stormwater discharges (also called "Non-NPDES Stormwater" in this report) are generally characterized as runoff that is not regulated under the federal NPDES general stormwater permit program.

Examples of non-point sources that can contribute bacteria to surface waters via stormwater runoff, groundwater and/or by direct deposition are provided below.

- NPS Discharges of Untreated Wastewater (i.e., Failing septic systems);
- Pet waste;
- Wildlife waste;
- Agriculture;
- Contact Recreation (swimming or wading)

Each of these non-point sources is described below.

NPS Discharges of Untreated Wastewater (i.e., Failing Septic Systems)

As discussed in section 2.2.2, untreated discharges of sewage (i.e., wastewater) are prohibited regardless of whether it is from point or non-point sources. A good example of a non-point source discharge of untreated wastewater is bacteria from a failing septic system. When properly installed, operated, and maintained, septic systems effectively reduce bacteria concentrations in sewage. However, age, overloading, or poor maintenance can result in septic system failure and the release of bacteria and other pollutants into surface waters (USEPA, 2002b) Bacteria from failed septic systems can enter surface waters via groundwater or stormwater runoff.

Pet Waste

In residential areas, pet waste can be a significant contributor of bacteria to surface waters. For example, each dog is estimated to produce 200 grams of feces per day and pet feces can contain up to 23,000,000 fecal coliform colonies per gram (CWP, 1999). If the waste is not properly disposed of, these bacteria can be washed off the land and transported to surface waters by stormwater runoff. Pet waste can also enter surface waters by direct deposition of fecal matter from pets standing or swimming in the surface water.

Wildlife Waste

Fecal matter from wildlife is a significant source of bacteria in some watersheds. This is particularly true when human activities, including the feeding of wildlife and habitat modification, result in the congregation of wildlife. Therefore, wildlife can be major sources of bacteria, particularly in lakes and ponds where large resident populations have become established near beaches (CWP, 1999). Concentrations of geese, gulls, and ducks are of particular concern because they often deposit their waste directly into surface waters. Wildlife waste deposited on the land can also be washed off and transported to surface waters by stormwater runoff.

Agriculture

Agricultural land includes dairy farming, raising livestock and poultry, growing crops and keeping horses and other animals for pleasure or profit. Activities and facilities associated with agricultural land use can be sources of bacteria impairment to surface waters. Communities, farmers, horse owners, and others who confine animals are largely responsible for mitigating bacteria pollution. Direct deposition of fecal matter from farm animals standing or swimming in surface waters and washoff of farm animal waste on the land by stormwater runoff are considered the primary mechanisms for agricultural bacteria pollution in surface waters although there may be instances where groundwater transport of bacteria is important too. Most agricultural discharges are considered to be non-point sources, however, as mentioned in section 3.1.3, certain agricultural activities such as confined animal feeding operations or CAFOs are regulated under the NPDES permit program as point sources.

Agricultural activities and facilities with the potential to contribute to bacteria impairment include:

- Manure storage and application,
- Livestock grazing,
- Animal feeding operations and barnyards, and
- Paddock and exercise areas for horses and other animals.

Contact Recreation (swimming or wading)

Bacteria from people swimming or wading in surface waters can contribute to bacteria loads via direct deposition. When people enter the water, residual fecal matter may be washed from the body and contaminate the water with pathogens. In addition, small children in diapers may contribute to bacterial contamination of surface waters.

4. BACTERIA IMPAIRED WATERS

4.1. Data Collection and 303(d) Listing Process

In accordance with sections 305(b) and 303(d) of the Federal Clean Water Act (CWA), every two years New Hampshire must report to the EPA on the quality of its surface and groundwater resources (Section 305(b)) and provide a list of those waters where their designated uses are deemed "impaired" (Section 303(d)). Prior to 2002, New Hampshire and other states submitted separate 305(b) Reports and 303(d) Lists. In an effort to simplify the reporting and listing process, EPA developed guidance and a computer database (known as the Assessment Database or ADB) to facilitate integration of the 305(b) and 303(d) Lists. New Hampshire began using the ADB and integrated reporting approach in 2002 (NHDES, 2008a).

New Hampshire's "*Consolidated Assessment and Listing Methodology*" (or CALM; NHDES, 2008a) describes the process used to make surface water quality attainment decisions for 305(b) reporting and 303(d) listing purposes. The term "listing" refers to the process of placing (or listing) a water on the Section 303(d) List of impaired waters. Assessment methodologies are considered dynamic and are updated periodically as new information and assessment techniques become available (NHDES, 2008a).

As discussed earlier, New Hampshire's surface waters are divided into approximately 5,200 segments, or Assessment Units (AUs), which are the basic unit of record for conducting and reporting water quality assessments. During the integrated reporting process, each AU is assigned to one of the following seven assessment categories and entered into EPA's Assessment Database (NHDES, 2008a):

- **AU Category 1:** Attaining all designated uses and no use is threatened;
- **AU Category 2:** Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened (i.e., more data is needed to assess some of the uses);
- **AU Category 3:** Insufficient or no data and information is available to determine if any designated use is attained, impaired, or threatened (i.e., more monitoring is needed to assess any use);
- **AU Category 4A:** Impaired or threatened for one or more designated uses but does not require the development of a TMDL because a TMDL has been completed;
- **AU Category 4B:** Impaired or threatened for one or more designated uses but does not require the development of a TMDL because other pollution control requirements are reasonably expected to result in attainment of the water quality standard in the near future;

- **AU Category 4C:** Impaired or threatened for one or more designated uses but does not require the development of a TMDL because the impairment is not caused by a pollutant; and
- **AU Category 5:** Impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL (this is the 303(d) List).

Impaired or threatened waters are included in Categories 4A, 4B, 4C and 5. If a water is impaired or threatened and does not fall under any of the Category 4 waters, it must, by default, fall under Category 5, which is the 303(d) List (waters that are impaired or threatened by a pollutant(s) and require a TMDL).

The following process is used to determine which impaired or threatened waters belong on the 303(d) List and which should be listed in other impairment categories (4A, 4B, or 4C). This process is carried out for each individual pollutant that threatens or causes impairment in an AU (NHDES, 2008a):

- **Step 1: Is the cause of the threatened or impaired water a pollutant?** *If 'yes' or 'unknown', proceed to Step 2; if 'no', assign to Category 4C.*
- **Step 2: Has a TMDL already been completed for the pollutant?** *If 'no', proceed to Step 3; if 'yes', assign to Category 4A.*
- **Step 3: Is the source of the exceedance due to natural conditions?** *If 'no', proceed to Step 4; if 'yes', the waterbody is not considered impaired or threatened.*
- **Step 4: Are there other pollution control requirements that are reasonably expected to result in attainment of water quality standards in the future?** *If 'yes', assign to Category 4B; if 'no', assign to Category 5.*

Once a waterbody is in a particular AU category for one or more reporting cycles, it may be switched to another category based on new data or information, flaws in the original data analysis, or changes in the assessment methodology (NHDES, 2008a).

Bacteria data used for assessment purposes is collected and submitted by numerous groups and agencies, including:

- ***New Hampshire DES Ambient Monitoring Program* -** The ambient sampling program monitors approximately one hundred sites annually, collecting samples once monthly in June, July, and August. Additionally, 12 Primary Monitoring Network trend sites, and five National Water Quality Surveillance System sites are sampled every year and have been since 1974. *E. coli* is typically measured at each sampling station, along with other parameters.

- ***New Hampshire DES Beach Inspection Program* -** NHDES's Public Beach Inspection Program monitors beaches throughout the state for *E. coli* bacteria (at freshwater beaches) and Enterococcus (at saltwater beaches) from mid-June through Labor Day. About 170 public bathing beaches on lakes, rivers, and impoundments are inspected on a monthly basis, while about 16 coastal and estuarine beaches are inspected on a weekly or bi-weekly basis during the swim season. NHDES Beach Inspectors collect two to three bacteria samples from each beach per sampling day depending upon the length of the bathing area.
Online at: http://des.nh.gov/organization/divisions/water/wmb/beaches/index.htm

- ***New Hampshire DES Shellfish Program* -** The Shellfish Program regularly monitors fecal coliform bacteria levels at over 81 coastal locations in New Hampshire. Supplemental monitoring is conducted following pollution events such as heavy rain, accidental sewage discharges, and others. The Shellfish Program also conducts Sanitary Surveys of shellfish growing waters and the surrounding land areas. These surveys, which are required in order to open shellfish beds for harvesting, involve a variety of activities including ongoing pollution source surveys, general water quality monitoring and other studies.
Online at: http://des.nh.gov/organization/divisions/water/wmb/shellfish/index.htm

NHDES coordinates two volunteer monitoring programs that also collect data for assessment purposes:

- The ***Volunteer Lake Assessment Program (VLAP)***
Online at: http://des.nh.gov/organization/divisions/water/wmb/vlap/index.htm**)**; and
- The ***Volunteer River Assessment Program (VRAP)***
Online at: http://des.nh.gov/organization/divisions/water/wmb/vrap/index.htm**).**

Additionally, NHDES receives data from government agencies and local stewardship and monitoring groups. All data must meet certain quality and age requirements.

In order to be used for assessment purposes, submitted data for most waterbodies must be no more than 5 years old. Exceptions include lakes and ponds which, because of their large volume and long retention times, have a maximum data age requirement of 10 years (NHDES, 2008a). The above data age requirements apply to pollutants that are not currently causing impairment in a waterbody. Once a waterbody is listed as impaired, and assuming there is no new data indicating attainment of water quality standards, it remains impaired in future cycles regardless of how old the data used to make the original impairment decision has become.

Documentation of the data quality used to make a final assessment decision is also required. Data are categorized in one of four data quality groups, ranging from low to excellent quality. Rankings are based on whether an acceptable Quality Assurance/Quality Control (QA/QC) plan or Standard Operating Procedure (SOP) was utilized in the field and/or lab, and whether data collectors were adequately trained. All data obtained from NHDES and volunteers are ranked good to excellent (NHDES, 2008a).

4.2. Priority Ranking and TMDL Schedules

Section 303(d) of the Clean Water Act requires that waters on the 303(d) List be ranked in order of TMDL development priority. A TMDL schedule date shown on the 303(d) List indicates when the TMDL is expected to be completed. Generally, the sooner a TMDL is scheduled for completion, the higher its priority (NHDES, 2008a).

A two-step process is used to help prioritize TMDLs in New Hampshire. A preliminary rank of high, medium or low is first established based on whether the waterbody poses a threat to human health or to federally listed, threatened, or endangered species. The final TMDL priority ranking is then determined by considering other institutional and technical factors, such as public interest, funding, and potential legal factors that can influence the priority of TMDLs (NHDES, 2008a).

TDML priority dates for the 379 bacteria impaired assessment units listed on New Hampshire's *2008 303(d) List* range from 2013 to 2021 because at the time the 2008 303(d) List was developed NHDES did not have the resources and did not know that EPA Contractor assistance would be available to develop a statewide bacteria TMDL. Had this information been known prior to submittal of the 2008 303(d) List, the TMDL priority dates would have been changed to 2010. All of the impaired segments are currently considered high priority.

4.3. Watershed-Specific Bacteria TMDL Development Approach

This *Statewide Total Maximum Daily Load (TMDL)* report serves as TMDL documentation for 379 bacteria impaired waters in New Hampshire. As mentioned earlier, there are five bacteria impaired waterbody types in New Hampshire: rivers and streams; impoundments; lakes and ponds; estuaries; and the Atlantic Ocean.

The three designated uses of concern relative to bacterial impairment are primary contact recreation (i.e., swimming), secondary contact recreation (e.g., boating), and shellfish consumption. According to the *2008 303(d) List,* the majority of impaired segments (303) are impaired for primary contact recreation only, and there are 49 sites impaired for both primary and secondary contact recreation. Additionally, 6 segments are impaired for all three designated uses; 9 segments are impaired for both primary contact recreation and shellfish consumption; and 12 segments are impaired for shellfish consumption only (NHDES, 2008b).

Appendices A through O of this report contain recent (within 10 years) bacteria data for the impaired segments. The associated data tables and GIS maps are organized on a watershed-basis. Figure 4-1 shows the impaired segments by HUC 8 watershed, numbered in the order in which they appear in the appendices.

Using a watershed approach for TMDLs serves several purposes. As described earlier in the document, organizing the data by watershed and creating a statewide document makes the TMDL process more efficient, allowing the implementation process to begin sooner. More importantly, using a watershed approach to restore waterbodies allows stakeholders to systematically identify, evaluate, and prioritize point and non-point sources of pollution using watershed or hydrologic boundaries to define the problem area. A watershed approach is based on the premise that water quality restoration and protection are best addressed through integrated efforts within a defined geographic area.

The watershed approach is a coordinating framework for environmental management that focuses public and private sector efforts to address the highest priority problems within hydrologically-defined geographic areas, taking into consideration both ground and surface water flow. The approach has four principal components:

1. Prioritize problems and targeted solutions;
2. Establish and maintain a high level of active, local involvement;
3. Identify integrated solutions by taking advantage of the expertise and authority of a wide variety of agencies and stakeholders; and
4. Measure success through monitoring or other data gathering (NHDES, 2004).

Participation by local governments and citizens ensures that individuals most likely to be knowledgeable of watershed conditions will help identify problems and develop solutions. Community-based environmental protection is an iterative approach in which diverse stakeholders strive to achieve environmental objectives. One goal of this *Statewide Total Maximum Daily Load (TMDL)* is to provide the necessary tools and information to help communities, watershed groups, and other stakeholders to implement the TMDL in a phased, community-based approach that will ultimately result in attainment of water quality standards.

Order addressed in report	HUC8 ID	Watershed name	# of impaired assessment units
1	01040002	Lower Androscoggin River	3
2	01060002	Saco River	18
3	01060003	Salmon Falls - Piscataqua Rivers	122
4	01070001	Pemigewasset River	17
5	01070002	Winnipesaukee River	23
6	01070003	Contoocook River	16
7	01070004	Nashua River	6
8	01070006	Merrimack River	81
9	01080101	Upper Connecticut River	16
10	01080103	Connecticut River - Johns River to Waits River	7
11	01080104	Connecticut River - Waits River to White River	3
12	01080106	Connecticut River - White River to Bellows	24
13	01080107	Connecticut River - Bellows Falls to Vernon	8
14	01080201	Connecticut River - Ashuelot River-Vernon Dam to Millers River	21
15	0100000	Coastal Impaired Segments	14
	TOTAL		379

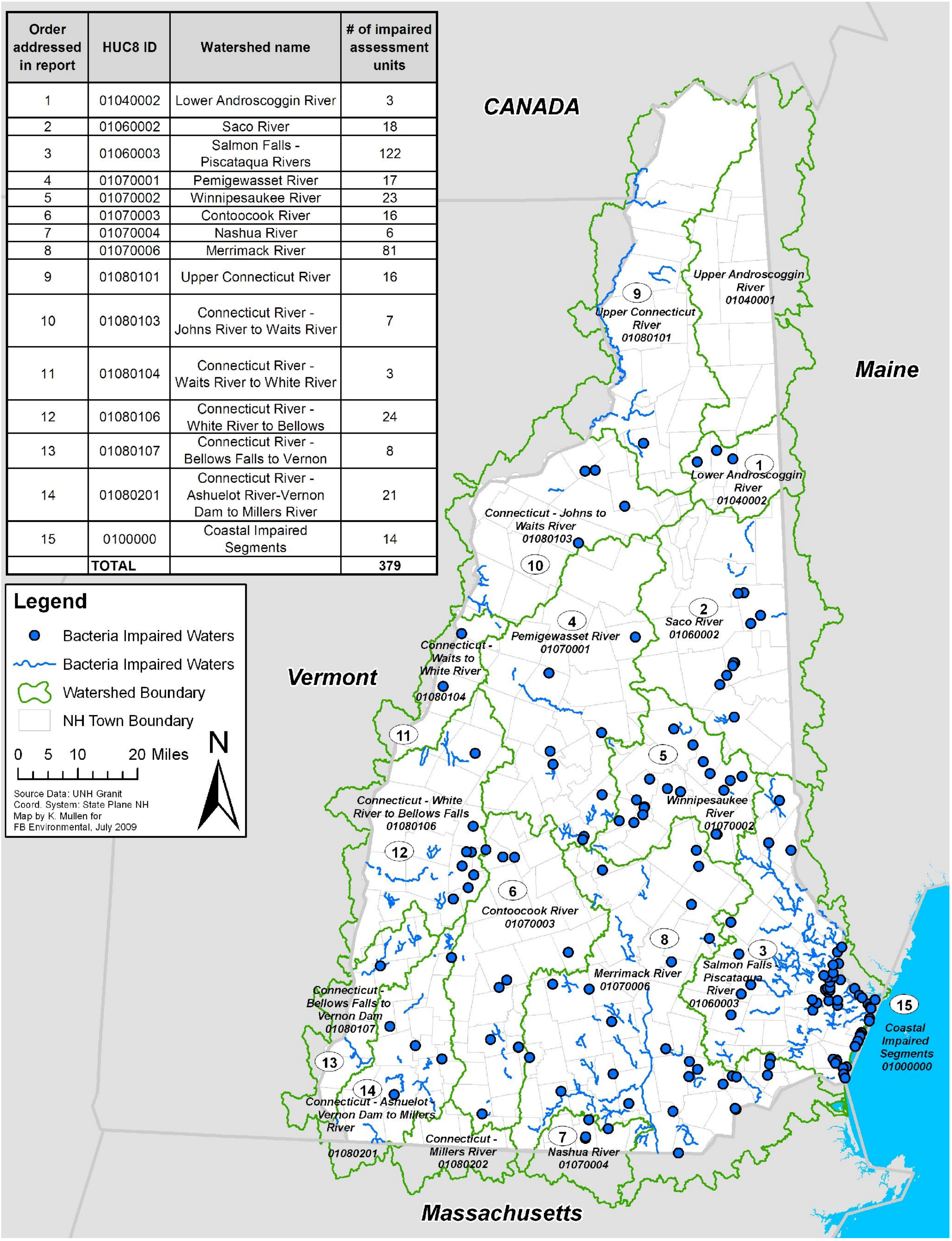

Figure 4-1: Map of Bacteria Impaired Waters in New Hampshire, by HUC 8 Watershed.

5. TMDL DEVELOPMENT

5.1. Definition of a TMDL

According to the Federal Code of Regulations that govern water quality and management [40 CFR Part 130.2], the TMDL for a waterbody is equal to the sum of the individual loads from point sources (i.e., waste load allocations or WLAs), and load allocations (LAs) from non-point sources (including natural background conditions). Section 303(d) of the Clean Water Act also states that the TMDL must be established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety (MOS) which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality.

In equation form, a TMDL is expressed as follows:

$$TMDL = WLA + LA + MOS$$

where:

WLA	=	Waste Load Allocation (i.e. loadings from point sources)
LA	=	Load Allocation (i.e., loadings from non-point sources including natural background)
MOS	=	Margin of Safety

TMDLs can be expressed in terms of either mass per time, concentration or other appropriate measure [40 CFR Part 130.2 (i)]. The MOS can either be *explicit* or *implicit*. If an *explicit* MOS is used, a portion of the total allowable loading is actually allocated to the MOS. If the MOS is *implicit*, a specific value is not assigned to the MOS. Use of an *implicit* MOS is appropriate when assumptions used to develop the TMDL are believed to be so conservative that they are sufficient to account for the MOS.

5.2. TMDL Allocations

The NH bacteria TMDLs are expressed as both daily loads and as concentrations. Daily load TMDLs are expressed in terms of billions of organisms / day and are included in Appendix P. The concentration-based TMDL endpoints are set equal to NH water quality criteria for bacteria, in terms of count/100mL. NHDES believes that the most useful way to express bacteria TMDLs is in terms of concentration because:

- The units are consistent with how compliance with ambient water quality criteria are expressed;
- The units are consistent with how compliance with ambient water quality criteria are determined;
- Concentration-based TMDLs are simpler and easier for the public to understand;
- Progress towards compliance is easier to measure and track than a TMDL expressed as load per day, which requires an estimate of flow and/or volume as well as concentration;

Concentration-based bacteria TMDLs set the WLA and LA equal to the ambient water quality criterion with no allowance for dilution or bacteria die-off (see section 5.4). Consequently, the New Hampshire bacteria TMDLs represent very conservative TMDL target-setting, so there is a high level of confidence that the TMDLs established are consistent with water quality standards, and the entire loading capacity can be allocated among sources. Therefore, the MOS is implicit, and the explicit MOS shown in the general TMDL formula in section 5.1 above is set equal to zero. For concentration-based bacteria TMDLs, which are not directly additive, the standard equation changes to:

$$TMDL = \text{Bacteria Water Quality Criterion} \geq WLA(p_1) \geq LA(n_1) \geq WLA(p_2) \geq \text{etc.}$$

Where:

$WLA(p_1)$ = allowable concentration for point source category 1
$LA(n_1)$ = allowable concentration for non-point source category 1
$WLA(p_2)$ = allowable concentration for point source category 2, etc.

These concentration-based bacteria TMDLs allocate the load among sources, identifying waste load allocations (WLA) for point sources, and load allocations (LA) for non-point sources and natural background. Tables 5-1 through 5-3 present concentration WLAs and LAs by designated use, waterbody class, and potential bacteria source, based on current water quality standards for primary contact recreation and shellfish consumption (see section 2.2.2). The numeric value of the WLA and LA depends on whether the source of bacteria is prohibited or allowable, and the appropriate water quality criterion for the receiving water, as follows:

- If the source of the bacteria load is prohibited (e.g., discharges of wastewater to Class A waters and discharges of untreated wastewater to any surface water from sources such as illicit discharges to stormwater systems, sanitary sewer overflows, boats, failed septic systems, etc.) , the WLA or LA is set equal to zero.
- If the source of the bacteria load is allowable, the WLA or LA is set equal to the applicable water quality criterion for bacteria in the receiving water.

The underlying assumption in setting a concentration-based TMDL for bacteria is that if all sources are less than or equal to the WQS, then the concentration of bacteria within the receiving water will attain WQS. This methodology implies a goal of meeting bacteria standards at the point of discharge for all sources. Although end of pipe bacteria measurements can identify and help prioritize sources that require attention, compliance with this TMDL will be based on ambient water quality and not water quality at the point of discharge (i.e., end of pipe).

Table 5-1: WLAs and LAs for Freshwater (Primary Contact Recreation)*

Class	Bacteria Source	Instantaneous E. coli (#/100 ml)		Geometric Mean E. coli (#/100 ml)	
		WLA [1]	LA [1]	WLA [1]	LA [1]
Class A Excluding Designated Beaches	NPDES Non-Stormwater [2, 4]	0		0	
	NPDES Stormwater [5]	153 or "as naturally occurs" if only source is wildlife [9]		47 or "as naturally occurs" if only source is wildlife [9]	
	Non-NPDES Stormwater and/or Groundwater [6]		153 or "as naturally occurs" if only source is wildlife [9]		47 or "as naturally occurs" if only source is wildlife [9]
	Discharges of Untreated Wastewater [4, 7]	0	0	0	0
	Direct Deposition to Surface Waters [8]		153 or "as naturally occurs" if only source is wildlife [9]		47 or "as naturally occurs" if only source is wildlife [9]
Class A at Designated Beaches	NPDES Non-Stormwater [2, 4]	0		0	
	NPDES Stormwater [5]	88 or "as naturally occurs" if only source is wildlife [9]		47 or "as naturally occurs" if only source is wildlife [9]	
	Non-NPDES Stormwater and/or Groundwater [6]		88 or "as naturally occurs" if only source is wildlife [9]		47 or "as naturally occurs" if only source is wildlife [9]
	Discharges of Untreated Wastewater [4, 7]	0	0	0	0
	Direct Deposition to Surface Waters [8]		88 or "as naturally occurs" if only source is wildlife [9]		47 or "as naturally occurs" if only source is wildlife [9]
Class B Excluding Designated Beaches	NPDES Non-Stormwater [2, 3]	406		126	
	NPDES Stormwater [5]	406 or "as naturally occurs" if only source is wildlife [9]		126 or "as naturally occurs" if only source is wildlife [9]	
	Non-NPDES Stormwater and/or Groundwater [6]		406 or "as naturally occurs" if only source is wildlife [9]		126 or "as naturally occurs" if only source is wildlife [9]
	Discharges of Untreated Wastewater [4, 7]	0	0	0	0
	Direct Deposition to Surface Waters [8]		406 or "as naturally occurs" if only source is wildlife [9]		126 or "as naturally occurs" if only source is wildlife [9]
Class B at Designated Beaches	NPDES Non-Stormwater [2, 3]	88		47	
	NPDES Stormwater [5]	88 or "as naturally occurs" if only source is wildlife [9]		47 or "as naturally occurs" if only source is wildlife [9]	
	Non-NPDES Stormwater and/or Groundwater [6]		88 or "as naturally occurs" if only source is wildlife [9]		47 or "as naturally occurs" if only source is wildlife [9]
	Discharges of Untreated Wastewater [4, 7]	0	0	0	0
	Direct Deposition to Surface Waters [8]		88 or "as naturally occurs" if only source is wildlife [9]		47 or "as naturally occurs" if only source is wildlife [9]

** See Table 5-4 for notes.*

Table 5-2: WLAs and LAs for Tidal Waters (Primary Contact Recreation)*.

Bacteria Source	Instantaneous Enterococci (#/100 ml)		Geometric Mean Enterococci (#/100 ml)	
	WLA [1]	LA [1]	WLA [1]	LA [1]
NPDES Non-Stormwater [2, 3]	104		35	
NPDES Stormwater [5]	104 or "as naturally occurs" if only source is wildlife [9]		35 or "as naturally occurs" if only source is wildlife [9]	
Non-NPDES Stormwater and/or Groundwater [6]		153 or "as naturally occurs" if only source is wildlife [9]		47 or "as naturally occurs" if only source is wildlife [9]
Discharges of Untreated Wastewater [4, 7]	0	0	0	0
Direct Deposition to Surface Waters [8]		153 or "as naturally occurs" if only source is wildlife [9]		47 or "as naturally occurs" if only source is wildlife [9]

**See Table 5-4 for notes.*

Table 5-3: WLAs and LAs for Tidal Waters (Shellfishing)*.

Bacteria Source	90th percentile Fecal Coliform (MPN/100 ml)		Geometric Mean Fecal Coliform (MPN/100 ml)	
	WLA [1]	LA [1]	WLA [1]	LA [1]
NPDES Non-Stormwater [2, 3]	43		14	
NPDES Stormwater [5]	43 or "as naturally occurs" if only source is wildlife [9]		14 or "as naturally occurs" if only source is wildlife [9]	
Non-NPDES Stormwater and/or Groundwater [6]		43 or "as naturally occurs" if only source is wildlife [9]		14 or "as naturally occurs" if only source is wildlife [9]
Discharges of Untreated Wastewater [4, 7]	0	0	0	0
Direct Deposition to Surface Waters [8]		43 or "as naturally occurs" if only source is wildlife [9]		14 or "as naturally occurs" if only source is wildlife [9]

**See Table 5-4 for notes.*

Approximations of the percent reduction needed to achieve the TMDLs for each of the 394 impairments are provided in Table 8-1 and appendices A through O. The estimated percent reduction needed is calculated based on the difference between measured bacteria data and the water quality criteria for bacteria. The highest measured concentrations of bacteria among all current samples taken within an impaired segment are compared to the appropriate water quality criterion. (For example, if the highest measured single sample from a Class B stream (WQS = 406 *E coli*/100mL) is 2,000 *E coli*/100mL, the percent reduction needed is [(2000 – 406)/2000] x 100 = 79.8%. Where applicable, the percent reduction is also calculated based on the geometric mean of the measured data. See Section 8.2 for more information on the percent reduction calculations. The reductions necessary to achieve the TMDLs are based on estimates of current loadings. Future development activities or land use changes have the potential to increase levels of bacteria or stormwater runoff associated with bacterial pollutants, and these future activities will need to meet the TMDLs and be addressed in applicable watershed management plans and by state or local requirements.

As noted above the TMDLs are also expressed as daily loads. See Appendix P for graphs, tables and equations that express the TMDLs as daily loads.

Table 5-4: Notes for WLA, LA Allocation Tables 5-1, 5-2 and 5-3.

1. Unless otherwise required by statute or regulation, compliance with this TMDL will be based on ambient concentrations and not end-of-pipe bacteria concentrations.
2. NPDES Non-Stormwater includes all point source discharges regulated under the federal NPDES permit program excluding point sources covered under the NPDES stormwater permit program. Examples include municipal and industrial wastewater treatment facilities (WWTFs), combined sewer overflows (CSOs) and concentrated animal feeding operations (CAFOs). Although meeting ambient bacteria standards at the point of discharge for all sources is the goal of this TMDL, compliance will be based on ambient water quality and not water quality at the point of discharge (i.e., end of pipe). In addition, per Env-Wq 1703.06(c), for non-tidal CSO discharges in Class B waters, a bacteria criteria of 1000 E. coli / 100 ml shall be applied at the end of pipe.
3. Per Env-Wq 1703.06(b), ambient bacteria criteria shall be applied at the end of a WWTF's discharge pipe.
4. Per RSA 485-A:8, I, and II there can be no discharge of sewage or waste into Class A waters, or of untreated sewage or waste in Class B waters that would impair any designated use. Sewage and waste (i.e., wastewater) are defined in RSA 485-A:2 and include human waste. All tidal waters are Class B.
5. NPDES Stormwater includes all stormwater regulated under the federal NPDES stormwater permit program such as stormwater under the Muncipal Separate Storm Sewer Systems (MS4) General Permit, the Construction General Permit (CGP) and the Multi-Sector General Permit (MSGP).
6. Non-NPDES Stormwater and/or Groundwater includes all stormwater not regulated under the federal NPDES stormwater permit program and all groundwater discharges to surface waters.
7. Discharges of untreated wastewater are prohibited (see note 4). Examples of point source (WLA) discharges of untreated wastewater include sanitary sewer overflows, illicit connections to storm drains, and discharges of sewage or graywater from boats (Env-Wq 1702.38(k) defines boat discharges as point sources). An example of a non-point source dischage of untreated wastewater is bacteria from a failed septic system that is conveyed to surface water by groundwater or Non-NPDES stormwater.
8. Direct deposition of bacteria into surface waters includes bacteria from humans swimming or wading in the surface water (i.e., bathing load) and/or from animals and birds located in or flying over the surface water.
9. Per Env-Wq 1702.29, "as naturally occurs" means conditions which exist in the absence of human influences.

5.4. Margin of Safety

As mentioned in section 5.1, the MOS accounts for assumptions or lack of knowledge about linking loading allocations with water quality impairment and can be either explicit or implicit. The two forms of the bacteria TMDL targets, described in more detail below, have different types of MOS due to the different calculations used for TMDL development.

Setting an explicit margin of safety for concentration-based TMDLs (section 5.2) was not considered necessary because there is a sufficient margin of safety *implicit* in the methodology used to establish the TMDL. For example, setting all sources less than or equal to the bacteria criteria is conservative because it does not account for mixing or dilution in the receiving water. In addition, the methodology assumes no losses of bacteria due to settling or die-off, which are known to take place in surface waters.

In contrast to the concentration-based bacteria TMDLs, the MOS in the TMDL expressed as a daily load (Appendix P) is *explicit* because flow and volume estimation introduces additional potential uncertainty. A discrete portion of the loading capacity is reserved to ensure that water quality standards will be attained. In these mass per unit time bacteria TMDLs, 10% of the loading capacity is reserved as the MOS, leaving 90% of the TMDL available for allocation among existing and future sources.

5.5. Seasonal Considerations

New Hampshire's bacteria water quality criteria are applicable at all times. Since the TMDLs are set equal to the bacteria criteria, they too are applicable at all times and are therefore protective of water quality under all conditions and seasons.

5.6. Public Participation

EPA regulations [40 CFR 130.7 (c) (ii)] require that calculations to establish TMDLs be subject to public review. The following is a description of the public participation process for this TMDL.

On June 14, 2010, a public notice announcing the availability of the draft TMDL for public review and comment was posted on the DES website. DES also notified by email the 144 Cities/Towns where the impaired waterbodies in this TMDL are located, the Lake and/or Watershed Associations (where applicable), of the availability of the draft report. In addition, on this date, the following were notified by email:

Appalachian Mountain Club
Audubon Society
Connecticut River Joint Commissions
Conservation Law Foundation
County Conservation Districts
Lake and River Local Management Advisory Committees
Maine Department of Environmental Protection
Manchester Conservation Commission
Massachusetts Department of Environmental Protection
Merrimack River Watershed Council
National Park Service
Natural Resources Conservation Service
New England Interstate Water Pollution Control Commission
NH Association of Conservation Commissions
NH Coastal Program
NH Department of Health and Human Services

NH Department of Fish and Game
NH Department of Resources and Economic Development
NH Department of Transportation
NH Department of Safety
NH Fish and Game Commission
NH Lakes Association
NH House, Senate and Governors Office
NH Homebuilders Association
NH Office of Energy and Planning
NH Planning Commision
NH Rivers Council
NH Sierra Club
NH Timberland Owners Association
NH Wildlife Federation
NH Water Pollution Control Association
NH Waterworks Association
North Country Council
Plymouth State University
Regional Planning Commissions
Society for the Protection of New Hampshire Forests
The Nature Conservancy
Trout Unlimited
Upper Merrimack River Local Advisory Committee
US Environmental Protection Agency
US Geological Survey
US Fish and Wildlife Service
US Forest Service
University of New Hampshire
Vermont Department of Environmental Conservation
Volunteer Lakes Assessment Program (VLAP) representatives
Volunteer Rivers Assessment Program (VRAP) repesentatives
Water Quality Standards Advisory Committee members which, in addition to many of the organizations listed above also includes representatives from the following organizations::

- NH Farm Bureau
- Consulting Engineers of NH
- NH Business and Industry Association (BIA)
- T.F. Moran, Inc.
- NH Association of Conservation Districts
- NH Fish and Game Department
- GZA Geoenvironmeantal, Inc.
- Monadnock Paper Company
- City of Portsmouth
- City of Concord, General Services Department

The public comment period ended on July 23, 2010.

A complete list of all comments received and the NHDES responses to those comments can be found in Appendix S of this report.

5.7. Monitoring Plans

Pending the availability of resources, the long term monitoring plan for New Hampshire's bacteria impaired waters includes several components:

1. Continue monitoring of rivers and streams through the NHDES Ambient Monitoring Program;
2. Continue monitoring bacteria levels at beaches through the NHDES Beach Inspection Program;
3. Continue NHDES Shellfish Program extensive year-round monitoring evaluations associated with assuring proposer classification of shellfish harvesting areas;
4. Continue to rely upon bacteria data collected by NHDES volunteer monitoring programs, including the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP);
5. Continue to utilize water quality monitoring data from government agencies and local stewardship and monitoring groups;
6. Continue to investigate complaints and inspect potential sources of bacteria (NHDES);
7. Support the implementation efforts of stakeholders at the local level, with the goal of meeting water quality standards; and
8. Continue to assess and develop strategies for planning and coordination among all organizations that collect water data in New Hampshire, as outlined in the "*State of New Hampshire Water Quality Monitoring Strategy*" (NHDES, 2005).

The monitoring plan is an ever-changing document that requires flexibility to add, change or delete sampling locations, sampling frequency, methods, and analysis. At a minimum, all bacteria monitoring should be conducted with a focus on:

- Capturing water quality under conditions when bacteria violations are most likely to occur;
- Establishing sampling locations in an effort to pin-point sources;
- Making management decisions that are data-driven, and framed on a watershed basis (NHDES, 2005); and
- Ensuring that data is accessible and interoperable, with documented data quality and metadata (NHDES, 2005).

5.8. Reasonable Assurance

EPA guidance requires that, in waters "impaired by both point and non-point sources, where a point source is given a less stringent wasteload allocation based on an assumption that non-point source load reductions will occur, reasonable assurance must be provided for the TMDL to be approvable" (USEPA, 2001). This TMDL does not include less stringent WLAs for point sources based on anticipation of LA reductions from non-point sources, and therefore, a reasonable assurance demonstration is not required.

Nonetheless, reasonable assurances that non-point allocations will be achieved are discussed below. Successful reduction in non-point sources, however, depends on the willingness and motivation of stakeholders to get involved and the availability of federal, state, and local funds.

- ***RSA 485-A:12 –*** This statute, which requires persons responsible for sources of pollution that lower the quality of waters below the minimum requirements of the classification to abate such pollution, will be enforced.

  Online at*:* http://www.gencourt.state.nh.us/rsa/html/L/485-A/485-A-12.htm

- ***Technical Assistance*** - Pending available resources, NHDES will work with watershed stakeholders to identify specific bacteria sources within the watershed and provide technical assistance for mitigation of bacteria sources. Requests for 319 funding to implement specific BMPs within the watershed shall receive high priority. The new NHDES Stormwater Manual provides information on site design techniques to minimize the impact of development on water quality as well as BMPs for erosion and sediment control and treatment of post-construction stormwater pollutants. Also of use to municipalities is the Innovative Land Use Planning Techniques Handbook, which provides model municipal ordinances including one on post-construction stormwater management. Both documents are accessible on the NHDES website at www.des.nh.gov.

- ***Rivers Management and Protection Program (Env-Wq 1800)*** **-** The Rivers Management and Protection Act of 1988 (RSA 483) established a statewide rivers program based on a two-tier approach to river management and protection: state designation of significant rivers and protection of instream values and local development and adoption of river corridor management plans to protect shorelines and adjacent lands. The Rivers Management and Protection Program is administered by the NHDES and is staffed by a rivers coordinator (NHDES, 2008c).

  Online at:

  http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq1800toc.pdf

- ***New Hampshire Clean Lakes Program (Env-Wq 1300)*** **-** The New Hampshire Clean Lakes Program was established in 1990 and is governed by RSA Chapter 487, section 487:15. At that time, the general court recognized that rapidly escalating pressures of shorefront development and recreational uses of public waters had placed increasing strains upon the state's lake resources, posing a threat to water quality. The general court further recognized the need to restore, preserve and maintain the state's lakes and ponds in order that these significant environmental, aesthetic and recreational assets will continue to benefit the social and economic well-being of the state's citizens.

Online at:
http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq1300.pdf

- ***Public Bathing Places Rules (Env-Wq 1100)*** **-** The purpose of New Hampshire's Public Bathing Place Rules (RSA 485-A:6; RSA 485-A:26) are to: (a) Establish the criteria and procedures for approving the design and installation of public bathing places; (b) Identify standards to protect water quality and the health and safety of persons using public bathing places; and (c) Ensure that public bathing places are maintained and operated safely for patrons. Public bathing places include designated beaches.
  Online at:
  http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq1100.pdf

- ***Septic Management Rules (Env-Wq 1600)*** **-** New Hampshire's Septic Management rules (RSA 485-A:4; RSA 485-A:6) establish standards, criteria, and procedures for a permit system to manage the removal, transportation, and disposal of septic waste, including processing and treatment, in order to protect human health and the environment and to encourage beneficial reuse and recycling of septic waste. These rules are and will continue to be enforced.
  Online at:
  http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq1600.pdf

Additional information regarding state and federal programs to address stormwater, CSOs, septic systems, pet waste, and other sources of bacteria pollution are included in section 6 (Implementation Plan). Sources of state and federal funding to assist with best management practice (BMP) implementation and other water quality protection projects are listed in section 7.

6. IMPLEMENTATION PLANS

The New Hampshire bacteria TMDLs quantify the necessary reductions in bacteria pollutant loadings to achieve water quality standards but do not provide any information on how the reductions might be achieved. To translate reductions specified in the TMDL into reductions in a watershed, an Implementation Plan is needed. Although not required by EPA for TMDL approval, implementation plans are typically provided in TMDL reports because of their importance in the restoration process. The success of TMDL implementation efforts rests largely with watershed stakeholders. To restore impaired water bodies as quickly as possible, it is recommended that TMDL implementation efforts, including the securement of funding, be expedited to the maximum extent practicable and in accordance with all laws and regulations.

This implementation plan provides general guidance for addressing water pollution caused by pathogenic bacteria in New Hampshire's surface waters. The plan provides a wide range of implementation techniques that may be applied to identify and eliminate various sources of bacterial pollution. As discussed in section 6.1, it is recommended that implementation be conducted on a watershed basis and that more specific watershed plans be developed, where appropriate, to focus and prioritize appropriate restoration measures. Development and implementation of detailed watershed plans may be eligible for federal funding under the Section 319 grant program.

The intended audience for this implementation plan includes, municipal officials, conservation districts, watershed groups, and private citizens responsible for, or interested in, mitigating bacterial pollution to surface waters. Municipal personnel include departments of public works, water and sewer commission, conservation commissions, boards of health, harbormasters, and others. Stakeholder participation, in the form of implementing the corrective actions laid out in the TMDL implementation plan, is critical to the success of restoration efforts and attainment of water quality standards.

Section 6.1 provides a description of the recommended watershed-based approach for implementing bacteria TMDLs; section 6.2 provides descriptions of mitigation measures for reducing or eliminating bacteria pollution such as enforceable NPDES permits for point sources and Best Management Practices for non-point sources. Relevant state and federal regulations are also provided for each source.

6.1. The Implementation and Restoration Process

As mentioned earlier, using a watershed approach is an effective way to manage water resource quality within specified drainage areas, or watersheds. Watershed-based planning offers a promising approach to protect and restore New Hampshire's water resources. The watershed approach includes stakeholder involvement and uses a series of cooperative, iterative steps to:

- Characterize existing conditions,
- Identify and prioritize problems, define management objectives,
- Develop protection or remediation strategies, and
- Implement and adapt selected actions as necessary.

The outcomes of this process are normally documented in a watershed management plan (WMP). A watershed management plan serves as a guide to protect and improve water quality in a defined watershed and includes the analyses, actions, participants, and resources related to developing and implementing the plan (USEPA, 2008). Figure 6-1 illustrates some of the steps and tools involved in the watershed management and implementation process, including the development of watershed management plans.

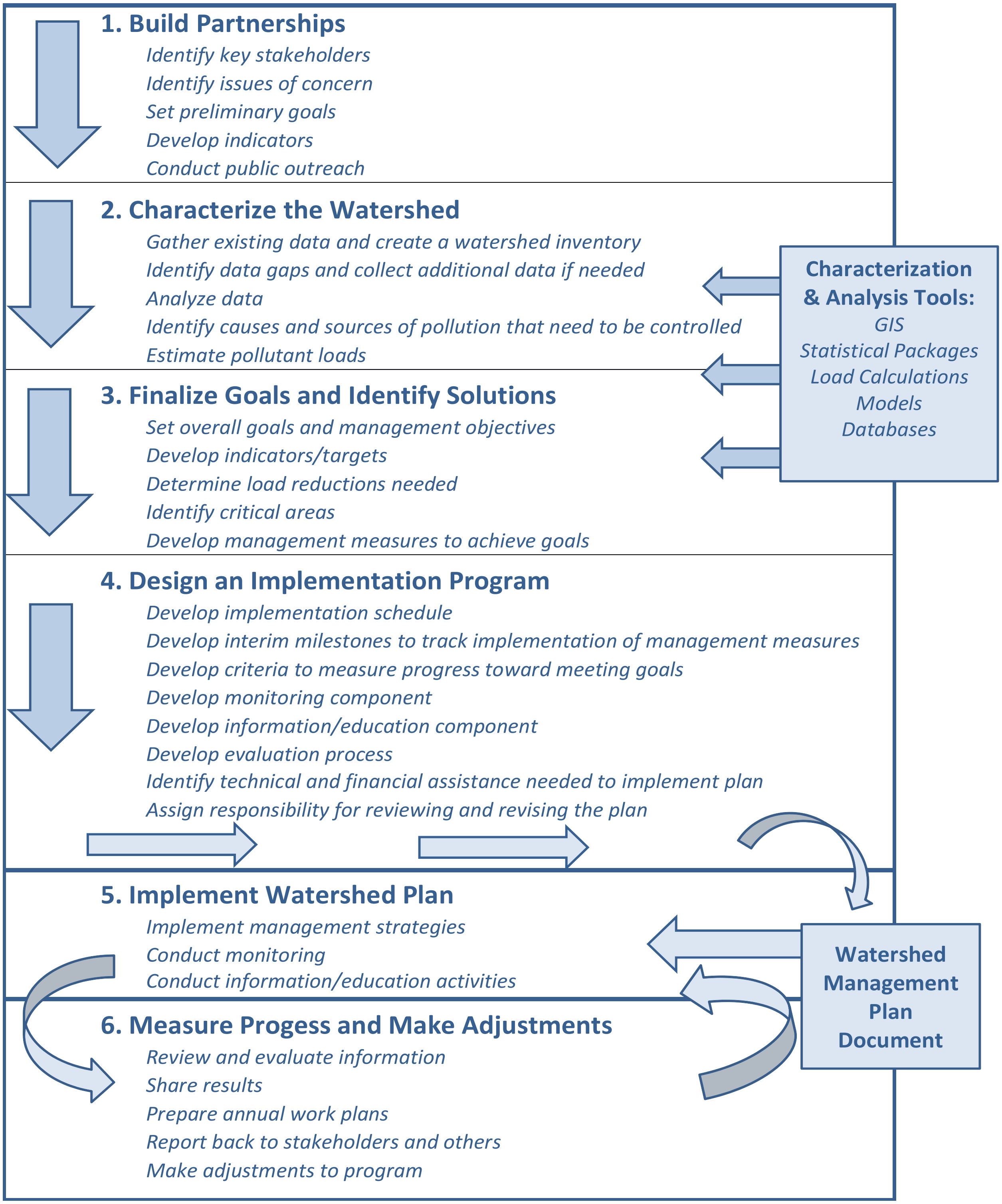

Figure 6-1: Steps in the Watershed Planning and Implementation Process (USEPA, 2008).

It is particularly important to develop and implement watershed management plans for waters that are impaired in whole or in part by non-point sources of pollution. For these waterbodies, plans should incorporate on-the-ground mitigation measures and practices that will reduce pollutant loads and contribute in measurable ways to reducing impairments and to meeting water quality standards (USEPA, 2008). For New Hampshire's bacteria impaired waters, where TMDLs for the affected waters have already been developed, watershed management plans should be designed to achieve the load reductions called for in the TMDLs. Figure 6-2 below illustrates the potential relationship between TMDLs and watershed management plans designed to implement TMDLs.

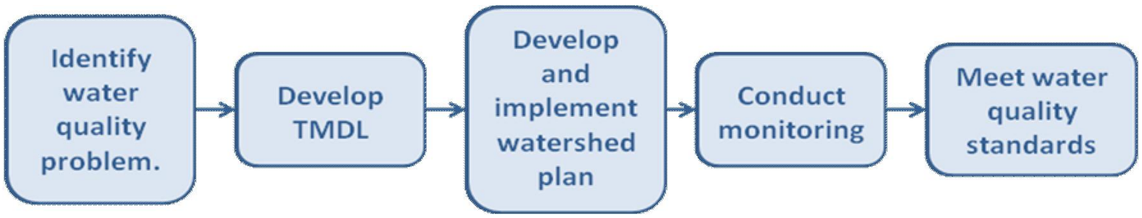

Figure 6-2: Relationship between TMDLs and Watershed Management Plans (USEPA, 2008).

Watershed management plans developed to implement the New Hampshire bacteria TMDLs should also consider other impairments and threats in the watershed. While TMDLs focus on specific waterbody segments and specific pollutant sources, watershed management plans should be holistic incorporating the pollutant- and site-specific TMDL into the larger context of the watershed, including additional water quality threats, pollutants, and sources (USEPA, 2008).

A watershed management plan should address a watershed area large enough to ensure that implementing the plan will address all the major sources and causes of impairments and threats to the waterbody of interest. Plans that bundle subwatersheds with similar sets of problems or address a common stressor (e.g., bacteria) across multiple related watersheds can be particularly useful in terms of planning and implementation efficiency and the strategic use of administrative resources (USEPA, 2008). Therefore, it is possible for multiple impaired segments within a New Hampshire HUC 8 watershed (Figure 4-1) to be addressed in the same watershed management plan.

*In 1978, Congress amended the Clean Water Act to establish the section **319 Non-point Source Management Program**. Under section 319, State, Territories, and Indian Tribes receive grant money which support a wide variety of activities including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and monitoring to assess the success of specific non-point source implementation projects.*

Although many different components may be included in a watershed based plan, EPA has identified nine key elements that are critical for achieving improvements in water quality. It is strongly recommended that these elements be included in all watershed management plans intended to address water quality impairments. In particular, EPA requires that these nine elements be addressed in watershed plans funded with Clean Water Act section 319 funds. In general, state water quality or natural resource agencies and EPA will review watershed plans that provide the basis for section 319-funded projects. Meeting the nine minimum requirements will help ensure that when work towards plan implementation begins, funding support can be found under the section 319 program.

EPA's nine required elements for watershed management plans include (USEPA, 2008):

1. ***Identification of causes of impairment and pollutant sources*** or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed management plan.
2. ***An estimate of the load reductions expected*** from management measures.
3. ***A description of the non-point source management measures that will need to be implemented*** to achieve load reductions in number 2, and a description of the critical areas in which those measures will be needed to implement this plan.
4. ***Estimate of the amounts of technical and financial assistance needed,*** associated costs, and/or the sources and authorities that will be relied upon to implement this plan.
5. ***An information and education component*** used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the non-point source management measures that will be implemented.
6. ***Schedule for implementing the non-point source management measures*** identified in this plan that is reasonably expeditious.
7. ***A description of interim measurable milestones*** for determining whether non-point source management measures or other control actions are being implemented.
8. ***A set of criteria that can be used to determine whether loading reductions are being achieved over time*** and substantial progress is being made toward attaining water quality standards.
9. ***A monitoring component*** to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under number 8 immediately above.\

A pilot watershed based plan for bacteria impaired waters has been developed in Furnace Brook, a tributary to the Souhegan River in New Ipswich, NH. This watershed based plan is attached as Appendix Q and provides a template for creating watershed based plans and seeking 319 funding to mitigate bacteria impairment. The Furnace Brook watershed based plan identifies and prioritizes several types of bacteria sources for mitigation, including developed area runoff, failing septic systems, and agricultural runoff. In addition, a pilot illicit discharge detection and elimination (IDDE) investigation of bacteria sources in a storm drain system was conducted in Greenville, NH, along the Souhegan River. The Greenville IDDE investigation provides a template for conducting investigations to remove bacteria sources from storm drainage systems and is attached in Appendix R. These two investigations provide stakeholders with templates for taking important next steps in the bacteria TMDL implementation process toward mitigation of impairment and restoration of our surface waters.

6.2. Types of Implementation Measures to Restore Impaired Waters

Sections 6.2.1 through 6.2.8 contain information on **Best Management Practices (BMPs)** to reduce pathogen loads to New Hampshire's surface waters. BMPs generally take two forms: structural and non-structural.

> ***Best Management Practices (BMPs)*** *are effective, practical, structural or nonstructural methods which prevent or reduce the movement of pollutants from the land to surface or ground water. BMPs are designed to protect water quality and to prevent new pollution.*

Structural BMPs are generally engineered, constructed systems that can be designed to provide water quality and/or water quantity control benefits. Structural BMPs are used to address both existing watershed impairments as well as the impacts of new development. A few examples of structural BMPs include: infiltration systems designed to capture a volume of stormwater runoff, retain it and infiltrate that volume into the ground; detention systems designed to temporarily store runoff and release it at a gradual and controlled rate; retention systems designed to capture a volume of runoff and retain that volume until it is displaced in part or whole by the next runoff event; constructed wetland systems to provide both water quality and water quantity control; and filtration systems, which use a media such as sand, gravel or peat in order to remove particulate pollutants found in stormwater runoff.

Non-structural BMPs are a broad group of practices that prevent pollution through maintenance and management measures. They are typically related to the improvement of operational techniques or the performance of necessary stewardship tasks that are of an ongoing nature. These include institutional and pollution-prevention practices designed to control pollutants at their source and to prevent pollutants from entering stormwater runoff. Non-structural measures can be very effective at controlling pollution generation at the source, thereby reducing the need for costly "end-of-pipe" treatment by structural BMPs. Examples of non-structural BMPs may include maintenance practices to help reduce pollutant contributions from various land uses and human operations, such as street and parking lot sweeping, road and ditch maintenance, or specifications regarding how and when to spread manure or sludge, among others.

Structural and non-structural BMPs are often used together. Effective pollution management is best achieved from a management systems approach, as opposed to an approach that focuses on individual practices. Some individual practices may not be very effective alone but, in combination with others, may provide a key function in highly effective systems.

Effective BMP implementation should focus not only on reducing existing pollutant loads, but on preventing new pollution. Once pollutants are present in a waterbody, or after it reaches a receiving waterbody, it is much more difficult and expensive to restore to an unimpaired condition. Therefore, management systems that rely first on preventing degradation of receiving waters are recommended.

The following sections include descriptions of various mitigation measures, useful web links to various resources, and relevant state and federal regulations for each of the bacteria sources shown below:

- Stormwater
- Illicit Discharges
- Combined Sewer Overflows
- Septic Systems
- Pet Waste
- Wildlife Waste
- Agriculture
- Beaches, Boats and Marinas

6.2.1. Stormwater

Stormwater runoff can be categorized in two forms: point source discharges and non-point source discharges (includes sheet flow or direct runoff). Stormwater covered under the federal NPDES stormwater program are defined as point sources. The Federal Water Quality Act of 1987 recognized that runoff from urban areas and industrial sites pollutes surface waters and required the EPA to address storm water discharges with National Pollutant Discharge Elimination System (NPDES) permits using a two-phased approach. The Phase I and Phase II regulations were published in 1990 and 1999, respectively (NHDES, 2003b).

In *Phase I*, EPA required medium and large municipal separate storm sewer system (MS4) operators to obtain permit coverage. These MS4s, none of which are located in New Hampshire, generally served areas with populations of 100,000 or more. Dischargers of "storm water associated with industrial activity" were also required to apply for permits. The Phase I industrial sources generally include heavy and light manufacturing facilities, hazardous/solid waste processing, recycling facilities including junkyards, mining (including sand and gravel), timber processing, power plants, vehicle maintenance, sewage/sludge treatment plants, and construction activities that disturb more than five acres (NHDES, 2003b).

Phase II regulates "Small MS4" discharges in urbanized areas located in 45 municipalities in New Hampshire (see list of towns below); "Storm Water Discharge Associated with Small Construction Activity"; and the Municipally Owned Industrial Activities that were exempted from regulation during Phase I (NHDES, 2003b). EPA's Stormwater Phase II Rule is focused on reducing the quantity of pollutants that stormwater picks up and carries into storm sewer systems during storm events. Common pollutants include oil and grease from roadways, pesticides from lawns, bacteria from animal and sometimes human waste, sediment from construction sites, and carelessly discarded trash, such as cigarette butts, paper wrappers, and plastic bottles. When deposited into nearby waterways through MS4 discharges, these pollutants can impair the waterways, thereby discouraging recreational use of the resource, contaminating drinking water supplies, and interfering with the habitat for fish, other aquatic organisms, and wildlife.

Phase II is intended to reduce adverse impacts to water quality and aquatic habitat by instituting the use of controls on the unregulated sources of stormwater discharges that have the greatest likelihood of causing continued environmental degradation. All Phase II facilities must either submit federal forms 1 and 2F for an individual NPDES permit or file a Notice of Intent (NOI) application form for coverage under a general NPDES permit. For most New Hampshire facilities, the general NPDES permit is the preferred option. The three general NPDES permits for storm water discharges in New Hampshire include (NHDES, 2003b):

- ***Construction General Permit (CGP)*** **–** The CGP applies to construction sites disturbing more than one acre. This permit requires preparation and implementation of a stormwater pollution prevention plan (SWPPP) to prevent erosion and control sediment using BMPs.

- ***Multi-Sector General Permit (MSGP)*** **–** The MSGP covers stormwater associated with industrial activity as defined by EPA in 40CFR 122.26(b)(14), including municipally-owned facilities including sand and gravel pits, recycling centers, school bus maintenance, and publicly owned treatment works (POTWs). Preparation and implementation of a SWPPP is also required under this permit, however the focus is on BMPs that minimize the exposure of raw materials, finished products, byproducts, etc., to precipitation.

- ***Municipal Separate Storm Sewer System General Permit (MS4GP or MS4)*** **–** The MS4 permit, which requires the development and implementation of a stormwater management program to address six minimum control measures, applies to small MS4 owners and operators in the following New Hampshire municipalities:

Amherst	Durham	Hooksett	Milford	Portsmouth
Atkinson	East Kingston*	Hudson	Milton	Rochester
Auburn	Exeter	Kingston	Nashua	Rollinsford
Bedford	Goffstown	Lee*	New Castle	Rye
Brentwood*	Greenland	Litchfield	Newington*	Salem
Chester*	Hampstead	Londonderry	Newton	Sandown
Danville	Hampton	Madbury*	North Hampton	Seabrook
Derry	Hampton Falls*	Manchester	Pelham	Somersworth
Dover	Hollis	Merrimack	Plaistow	Windham

* *Received waivers from EPA*

Best Management Practices - Storm Water

Minimum Control Measure for Regulated MS4s

For regulated MS4s, six minimum control measures must be implemented within five years of receiving the Phase II permit. Permittees must submit an annual report to EPA summarizing their progress toward achieving specific measurable goals in the six categories. EPA has issued guidance on recommended BMPs and developing measurable goals and conducted a series of workshops on the Phase II requirements (resources listed below). DES is providing technical and financial support whenever possible. Both MS4s and individual municipalities not regulated under the Phase I or II may implement the same six control measures for minimizing stormwater contamination (NHDES, 2004):

1. Public education and outreach on storm water impacts.
2. Public involvement/participation during program development.
3. Illicit discharge detection and elimination.
4. Construction site storm water runoff control.
5. Post-construction storm water management in new development and redevelopment.
6. Pollution prevention/good housekeeping for municipal operations.

Structural Stormwater BMPs

BMPs are most effective when a combination of structural and non-structural practices is implemented. The key distinction between non-structural BMPs and structural BMPs is that the former are intended to prevent stormwater generation or contamination, while the focus of the latter is on mitigating unavoidable stormwater-related impacts.

In developed areas, such as small MS4 areas, large areas of natural landscape cover have been replaced with non-porous, or impervious, surfaces (e.g., homes, businesses, streets and parking). Impervious surfaces change the character of runoff dramatically by causing water to remain on the land surface. Without slow percolation into the soil, water accumulates and runs off in larger quantities. This faster moving water washes soil from all earth surfaces that are not securely held in place by structural means or healthy vegetation. Structural BMPs generally function by reducing and disconnecting these impervious surfaces, and minimizing the adverse impacts to receiving waters. Structural stormwater BMPs also collect and treat stormwater runoff before it is discharged.

Although structural BMPs are generally more costly than non-structural BMPs, an effective maintenance program will extend the life of stormwater controls and BMPs and avert expensive repair costs. Examples of structural stormwater BMPs include buffers, constructed wetlands, sand filters, infiltration trenches, porous pavements, and rain gardens and other bioretention systems. Dense vegetative buffers facilitate bacteria removal through detention, filtration by vegetation, and infiltration into soil. More detailed descriptions of these and other BMPs can be found in the *University of New Hampshire Stormwater Center 2009 Annual Report* (UNHSC, 2007) online at **http://ciceet.unh.edu/news/releases/unhsc_report_2009/report.pdf**, and in the *New Hampshire Stormwater Manual* online at http://des.nh.gov/organization/divisions/water/stormwater/manual.htm. While the pollutant removal efficiency of BMPs will vary depending on local site characteristics and specific BMP design, construction, and maintenance considerations, the Center for Watershed Protection has reported that bioretention, sand filters, and constructed wetlands all typically perform well with respect to bacteria removal, based on available national performance data (see the Center for Watershed Protection's Urban Stormwater Retrofit Practices, 2007: http://www.cwp.org/store/free-downloads.html). While few studies have yet formally assessed the effectiveness of infiltration practices on bacteria removal, these practices are widely considered an effective option for bacteria as well, as they are designed to reduce stormwater runoff volume and make use of the filtering capacity of soil.

Resources - Storm Water

New Hampshire DES Resources:

- New Hampshire Stormwater Manual - The purpose of this manual, which consists of three volumes, is to provide communities, developers, designers and regulatory personnel with a reference guide for the selection, design and application of measures to manage stormwater from newly developed and redeveloped properties, while meeting environmental objectives in the New Hampshire regulatory setting.
  Online at: http://des.nh.gov/organization/divisions/water/stormwater/manual.htm

- ***NHDES Stormwater Information Page*** – Contains links to stormwater regulations, permit information, and other resources.
  Online at: http://des.nh.gov/organization/divisions/water/stormwater/index.htm

EPA Resources:

- ***NPDES Phase II Fact Sheets -*** The EPA publishes a series of fact sheets regarding NPDES Stormwater Phase II final rules.
  Online at: http://cfpub1.epa.gov/npdes/stormwater/swfinal.cfm?program_id=6

- ***National Menu of Stormwater Best Management Practices -*** The National Menu of Best Management Practices for Stormwater Phase II was first released in October 2000. EPA has renamed, reorganized, updated, and enhanced the features of the website. These revisions include the addition of new fact sheets and revisions of existing fact sheets. Because the field of stormwater is constantly changing, EPA expects to update this menu as new information and technologies become available.
  Online at: http://cfpub1.epa.gov/npdes/stormwater/menuofbmps/index.cfm

6.2.2. Illicit Discharges

Under EPA's Phase II storm water regulations illicit discharges are defined as "any discharge to a municipal separate storm sewer that is not comprised entirely of storm water, except discharges pursuant to an NPDES permit and discharges resulting from fire-fighting activities." Both direct and indirect illicit discharges may be categorized according to frequency. This categorization helps to identify the source of the discharge, and provides insight into which tracing method should be used to trace the discharge. The three primary frequency categories are (NHEP, 2006):

1. ***Transitory illicit discharges*** - One-time events resulting from spills, breaks, dumping, or accidents;
2. ***Intermittent illicit discharges*** – Occur occasionally over a period of time (several hours per day, or a few days per year), such as a legal sump pump connection that is illegally discharging anything other than groundwater; and
3. ***Continuous illicit discharges*** **-** Typically the result of a direct connection from a sanitary sewer, overflow from a malfunctioning septic system, inflow from a nearby subsurface sanitary sewer that is malfunctioning, or an illegal connection from a commercial or industrial facility.

As mentioned previously, EPA's Storm Water Phase II Final Rule states that municipalities are required to develop illicit discharge detection and elimination (IDDE) plans as one of the six minimum measures included in a storm water management program (NEIWPCC, 2003).

According to EPA, the components of a stormwater management program to address illicit discharges must incorporate (NEIWPCC, 2003):

1. ***Developing a Storm Sewer Map*** **-** If not already completed, a storm sewer system map showing the location of all outfalls, and the names and location of all waters that receive discharges from those outfalls must be developed.
2. ***Prohibiting Illicit Discharges*** - A municipal ordinance created to comply with Phase II regulations must include a prohibition of illicit discharges and an enforcement mechanism. It is also essential for the municipality to establish legal authority to inspect properties suspected of releasing contaminated discharges into the storm sewer system.
3. ***Developing and Implementing a Plan to Detect and Address Illicit Discharges*** **-** Municipalities must develop and implement a plan to detect and address illicit discharges, including illegal dumping, to the system. It is recommended that the plan include the following four components:
    a. Locating priority areas;
    b. Tracing the source of an illicit discharge;
    c. Removing the source of an illicit discharge; and
    d. Evaluating and assessing the program.
4. ***Outreach to Employees, Businesses, and the General Public*** – Municipalities must also inform public employees, businesses, and the general public of hazards associated with illegal discharges and improper disposal of waste.

In 1996, NHDES initiated illicit discharge detection investigations in an effort to identify pollution discharges to storm drainage systems in New Hampshire, beginning in the Coastal watershed (HUC8 01000000) communities. Since then, over 60 illicit discharges have been identified and removed in the Coastal watershed. Illicit discharge detection investigations were also initiated in the Merrimack watershed (HUC8 01070006) in 2001. In this watershed, investigations were completed in the City of Nashua, in the Winnipesauke River corridor, and along the Souhegan and Winnipesaukee Rivers (NEIWPCC, 2003). The program no longer manages illicit discharge detection investigations, but instead provides training and technical assistance to municipalities interested in initiating, improving, or enhancing local IDDE programs.

Best Management Practices - Illicit Discharges

A sample list of IDDE BMPs and measurable milestones is presented below. BMPs are listed in bold, followed by the measurable goals for each BMP. This list was excerpted from "*Illicit Discharge Detection and Elimination Manual: A Handbook for Municipalities*" (NEIWPCC, 2003):

1. **Create a storm sewer map**
   - Map a certain percentage of outfalls (adding up to 100% by the end of the permit term) or of the area of the town.

2. **Pass an illicit discharge ordinance**
   - Draft an IDDE ordinance (or storm water ordinance with IDDE component) or an amendment to existing bylaws.

3. **Prepare an IDDE plan**
   - Complete a final plan and obtain the signature of the person overseeing the plan.

4. **Conduct dry weather field screening of outfalls**
   - Screen a certain percentage of outfalls (adding up to 100% by the end of the permit term).

5. **Trace the source of potential illicit discharges**
   - Trace the source of a certain percentage of continuous flows (adding up to 100% by the end of the permit term); and
   - Trace the source of a certain percentage of intermittent flows and illegal dumping reports (100% may never be an achievable goal in this case).

6. **Eliminate illicit discharges**
   - Eliminate a certain number of discharges and/or a certain volume of flow, or a certain percentage of discharges whose source is identified (adding up to 100% by the end of the permit term).

7. **Implement and publicize a household hazardous waste collection program**
   - Hold a periodic (e.g., annual) hazardous waste collection day; and
   - Mail flyers about the hazardous waste collection program to all town residences.

8. **Create and distribute an informational flyer for homeowners about IDDE**
   - Mail the flyer to town residences; and
   - Print the flyer as a doorknob hanger and have water-meter readers distribute it.

9. **Create and distribute an informational flyer for businesses about IDDE**
   - Mail the flyer to targeted businesses.

10. **Work with community groups to stencil storm drains**
    - Stencil a certain percentage of drains.

11. **Create and publicize an illicit discharge reporting hotline**
    - Put the hotline in place;
    - Include an announcement of the hotline in sewer bills; and
    - Follow up on all hotline reports within 48 hours.

Resources - Illicit Discharges

- ***Guidelines and Standard Operating Procedures Illicit Discharge Detection and Elimination and Pollution Prevention/Good Housekeeping for Stormwater Phase II Communities in New Hampshire* -** This Manual assists New Hampshire's municipalities in meeting the Stormwater Phase II regulations, and can help jump start the communities' Illicit Discharge Detection and Elimination (IDDE) programs.
  Online at: http://des.nh.gov/organization/divisions/water/stormwater/documents/nh_idde_sop.pdf

- ***Storm Drain Stenciling* -** Storm drain stenciling is a community-based activity featuring volunteers painting stenciled messages on the street next to stormwater grates indicating that water entering storm drains discharges to surface waters. Cooperative Extension Water Resource Specialists in New Hampshire and in many other states around the country coordinate storm drain stenciling projects.

  - More information about storm drain stenciling in New Hampshire can be found at: http://extension.unh.edu/counties/grafton/present/StmDrain.pdf

- **Online at: *Illicit Discharge Detection and Elimination Manual*** - The New England Interstate Water Pollution Control Commission published a useful manual for communities titled Illicit Discharge Detection and Elimination Manual: A Handbook for Municipalities.
  Online at: www.neiwpcc.org.

- ***Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*** - Center for Watershed Protection's comprehensive manual that outlines practical, low cost, and effective techniques for stormwater program managers and

practitioners. The guidelines include details on creating and managing an IDDE program, timelines that estimate how long program implementation will take, information on estimating program costs in terms of capital and personnel expenses, and types of testing used to detect stormwater illicit discharges. This manual provides valuable guidance for communities and others seeking to establish IDDE programs.
Online at: http://www.epa.gov/npdes/pubs/idde_tableofcontents.pdf

EPA Resources:

- ***Model Ordinances*** - The EPA maintains a list of model ordinances designed to protect local resources through the elimination and prevention of illicit discharges. The list includes language to address illicit discharges in general, as well as illicit connections from industrial sites.
  Online at: http://www.epa.gov/nps/ordinance/discharges.htm

- ***Illicit Discharge Detection and Elimination Program Development BMP Fact Sheet*** - Communities addressing IDDE minimum measure should begin with EPA's IDDE program development BMP fact sheet. The additional BMPs listed below can be used to help implement an IDDE program.
  Online at:
  http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=111

6.2.3. Combined Sewer Overflows

During heavy rains, stormwater can enter municipal combined sewer systems which can cause the system to surcharge and overflow; this is known as a Combined Sewer Overflow (CSO). When this happens, sewage and stormwater may be discharged to surface waters without being treated. CSOs can be a major source of pathogens.

In 1994, under the National Pollutant Discharge Elimination System (NPDES) permitting program, EPA developed a Combined Sewer Overflow Control Policy which acts as a national framework for control of CSOs. The Policy provides guidance to municipalities and State and Federal permitting authorities on how to cost-effectively meet the Clean Water Act's pollution control goals (USEPA, 1999a).

The Policy contains four fundamental principles to ensure that CSO controls are cost-effective and meet local environmental objectives (USEPA, 1999a):

1. Establish clear levels of control to meet health and environmental objectives;

2. Provide flexibility to consider the site-specific nature of CSOs and find the most cost-effective way to control them;
3. Use phased implementation of CSO controls to accommodate a community's financial capability; and
4. Review and revise water quality standards during the development of CSO control plans to reflect the site-specific wet weather impacts of CSOs.

NHDES and EPA Region 1 work with permittees to incorporate these principles into NPDES permits. Communities with combined sewer systems are expected to develop long-term CSO control plans that will ultimately provide for full compliance with the Clean Water Act, including attainment of water quality standards.

To address the CSOs in the state, NHDES developed a CSO control strategy in 1990. This strategy consists of a two-step process (NHDES, 2003a):

1. The first step is to determine the volume and strength of the CSO discharges and their impact on the water quality of the receiving waters.
2. If it is determined that the CSOs violate state rules or regulations, the community is then required to determine the most cost-effective solution to abate the CSO pollution.

There are currently a total of 34 CSOs in the New Hampshire communities of Portsmouth, Manchester, Nashua, Lebanon, Berlin, and Exeter. These communities are now in various stages of developing and implementing their long-term control plans, including characterizing their combined sewer systems, monitoring the impacts of CSOs on waterways, and elimination of CSOs (NHDES, 2003).

Best Management Practices and/or Other Control Measures - CSOs

Mitigation measures to address CSOs include:

CSO Prevention Practices

CSO prevention practices are aimed at both minimizing the volume of pollutants entering a combined sewer system and reducing the frequency of CSOs. Stormwater management measures that reduce the volume and rates of runoff can also reduce the frequency of CSO events. Additionally, management measures that reduce pathogen sources to stormwater will reduce the pathogen concentrations in CSO discharges (MADEP, 2005).

As of 1997, all CSO communities are responsible for implementing EPA's 9 minimum technology-based controls. The nine minimum controls are measures that can reduce the prevalence and impacts of CSOs without significant engineering or construction (USEPA, 1999a). These controls include (MADEP, 2005):

1. Proper operation and maintenance of the collection system
2. Maximum use of the collection system for storage
3. Review of pretreatment programs to minimize CSO-related impacts
4. Maximum flow to the treatment plant
5. Prohibit dry-weather overflows
6. Control of solid and floatable materials
7. Pollution prevention
8. Public notification
9. Monitoring to characterize CSO improvements and remaining CSO impacts

Combined Sewer Separation

Sewer separation is the practice of separating the combined, single pipe system into separate sewers for sanitary and storm water flows. In a separate system, storm water is conveyed to a storm water outfall for discharge directly into the receiving water. Based on a comprehensive review of a community's sewer system, separating part or all of its combined systems into distinct storm and sanitary sewer systems may be feasible. Communities that elect for partial separation typically use other CSO controls in the areas that are not separated (USEPA, 1999b).

Resources - CSOs

New Hampshire DES Resources:

- In 2003, NHDES published a ***"Combined Sewer Overflow Environmental Fact Sheet"*** describing the basics of CSOs and the status of CSOs in New Hampshire.

Online at:http://des.nh.gov/organization/commissioner/pip/factsheets/wwt/documents/web-9.pdf

EPA Resources:

EPA has released a number of guidance documents explaining technical, financial, and permitting issues underlying implementation of the Combined Sewer Overflow Control Policy:

- ***Guidance: Coordinating Combined Sewer Overflow (CSO) Long-Term Planning with Water Quality Standards Reviews*** - Addresses impediments to implementing the water quality-based

provisions in the CSO Policy, and actions that State and Interstate Water Pollution Control Directors and CSO communities should take to overcome these impediments.
Online at: http://www.epa.gov/npdes/pubs/cover-cso.pdf

- ***Combined Sewer Overflows Guidance for Nine Minimum Control Measures*** -
  Provides information on nine minimum technology-based controls that communities are expected to use to address CSO problems, without extensive engineering studies or significant construction costs, before long-term measures are taken.
  Online at: http://www.epa.gov/npdes/pubs/owm0272.pdf

- ***Combined Sewer Overflows Guidance for Monitoring and Modeling* -**
  Provides guidelines for the use of monitoring and modeling in the development and implementation of a CSO control program. The document provides information on characterizing a combined sewer system, assessing the impact of wet weather on CSO discharges, and assessing the impact of CSOs on receiving water bodies.
  Online at: http://www.epa.gov/npdes/pubs/cover-cso.pdf

- ***Combined Sewer Overflow Management Fact Sheet: Sewer Separation*** – Describes the basic information regarding the separation of CSOs for combined sewer systems.
  Online at: http://www.epa.gov/OWM//mtb/sepa.pdf

- ***Combined Sewer Overflows Guidance for Financial Capability Assessment and Schedule Development*** - Discusses how community's financial capability and other factors identified in the CSO Policy may be used to negotiate reasonable compliance schedules for implementation of CSO controls. It presents a two-phase process for assessing financial capability, based on EPA's experience in the Construction Grants, State Revolving Fund, enforcement, and water quality standards programs.
  Online at: http://www.epa.gov/npdes/pubs/csofc.pdf

6.2.4. Septic Systems

A septic system is a two part treatment and disposal system designed to condition untreated liquid household waste (sewage) so that it can be readily dispersed and percolated into the subsoil. Percolation through the soil accomplishes much of the final purification of the effluent, including the destruction of disease-producing bacteria (NHDES, 2008f).

Failing private septic systems can be a significant source of pathogens. When properly installed, operated, and maintained, septic systems effectively reduce pathogen concentrations in sewage and help to maintain base flows in rivers and stream by replenishing the groundwater (versus sewering which can result in reductions in local base flow).. However, age, overloading, or poor maintenance can result in failure of septic systems and the release of pathogens and other pollutants. A septic system may become clogged and overflow on the ground or cause wastewater to back up into the house. A failed system is unhealthy, expensive to replace, and may contaminate nearby ground and/or surface waters, including nearby wells. Taking a few precautions can avoid costly septic system problems. To reduce the release of pathogens, practices can be employed to maximize the life of existing systems, identify failed systems, and replace or remove failed systems (MADEP, 2005).

The NHDES Subsurface Systems Bureau is the office responsible for:

- Reviewing applications for the subdivision of land and the design of individual septic systems.
- Performing on-site inspections of septic systems in order to ensure strict compliance with the approved plans.
- Implementing and administering the program for licensing both designers and installers of septic systems. No individual may submit an application nor install a septic system without first obtaining a license from this bureau unless the individual is the owner and the design of the installation is for his/her primary domicile.
- Investigating written complaints received by the NHDES relative to subsurface systems which are or may be causing degradation of the state's waters.
- Coordinating other necessary permits involved in a particular project or development.

However, cities and municipalities also have the right to regulate septic systems as they affect local health issues (especially groundwater contamination). So it is important to check with your local town hall before you install or expand your home septic system.

Best Management Practices– Septic Systems

Replacing Failed Septic Systems

New Hampshire RSA 485-A:2 defines failure as "the condition produced when a subsurface sewage or waste disposal system does not properly contain or treat sewage or causes or threatens to cause the discharge of sewage on the ground surface or into adjacent surface or groundwater."

According to NHDES, to ensure prompt and effective replacement of a failed subsurface system, the following steps must be taken (NHDES, 2008g):

1. The town health officer, or other local official responsible for health code enforcement, or a permitted designer must prepare a written statement verifying that the existing system is in failure. This statement must be submitted to NHDES with the application to replace the existing system.
2. Before construction approval is granted test pits and percolation tests must be completed. Septic system leach fields must be designed and constructed in locations with suitable soils. Test pits are holes that must be excavated into the soil within the area of a septic system's proposed leach bed. These pits determine the level of the seasonal high water table and/or the depth of impermeable substratum. Percolation tests are necessary to determine the soil's ability to leach liquid at an adequate rate.
3. If construction approval is granted, the construction must be completed within 90 days. Failure to complete construction and obtain operational approval of the system within the 90-day period will result in invalidation of NHDES approval.
4. In the event that a construction approval becomes invalid as a result of exceeding the 90-day construction period, a request for extension must be submitted to the Department of Environmental Services, Subsurface Systems Bureau. NHDES shall grant one 90-day extension. The request for extension must include all the information required by New Hampshire Administrative Rule Env-Wq 1004.11 (b).
5. NHDES is required to inspect all newly constructed subsurface disposal systems to verify that the proper materials have been used in the construction of the system and to ensure that the design intent has been met. The inspector will also note the distance from the system to seasonal high water, wetlands, and surface waters. Once the inspector determines that the system meets all of the requirements, a written "Approval for Operation" will be completed.

Maintenance Practices for Private Septic Systems

Proper septic system maintenance is the best way to reduce the occurrence of failed septic systems. According to NHDES Fact Sheet WD-SSB-2 "Care and Maintenance of Your Septic System", septic system owners should know the location of their septic tank and leach field and should do the following to ensure proper operation:

- Know the location of the septic tank and leach field,
- Inspect the septic tank yearly,
- Pump the septic tank as needed and at least every three years,
- Do not flush bulky items such as throw-away diapers or sanitary pads into your system,

- Do not flush toxic materials such as paint thinner, pesticides, or chlorine into your system as they may kill the bacteria in the tank which are essential to proper operation of the septic system,
- Repair leaking fixtures promptly,
- Be conservative with your water use and use water-reducing fixtures wherever possible,
- Keep deep-rooted trees and shrubs from growing on your leaching area, and
- Keep heavy vehicles from driving or parking on your leaching area.

Resources – Septic Systems

New Hampshire DES Resources:

- ***Septic System Fact Sheets*** - NHDES has a number of useful fact sheets that address common questions about making changes to existing wastewater treatment systems.
  Online at: http://des.nh.gov/organization/commissioner/pip/factsheets/ssb/index.htm

- ***On-Site Wastewater Disposal System Information Manual*** **-** This manual describes permitting, maintenance, and installation information for septic systems under New Hampshire state law (RSA 485-A:36).
  Online at:
  http://des.nh.gov/organization/commissioner/pip/forms/ssb/documents/ww_disposal_manual.pdf

EPA Resources:

- ***EPA Septic Website*** - This site offers valuable information and resources to manage onsite wastewater systems in a manner that is protective of public health and the environment and allows communities to grow and prosper.
  Online at: http://cfpub.epa.gov/owm/septic/home.cfm

6.2.5. Pet Waste

In residential and urban areas, pet waste can be a significant contributor of pathogens in stormwater. Each dog is estimated to produce 200 grams of feces per day, and pet feces can contain up to 23,000,000 fecal coliform colonies per gram (CWP, 1999). If the waste is not properly disposed of, these bacteria can wash into storm drains or directly into water bodies and contribute to pathogen impairment (MADEP, 2005).

Pet waste left anywhere may be a source of bacteria and nutrients in surface waters, and a potential public health risk. Pet waste on playing fields, sidewalks, or parks can be unhealthy and messy. Even at home, responsible pet owners should throw pet waste in the trash or flush it down the toilet to prevent water pollution associated with bacteria laden waste.

Encouraging pet owners to properly collect and dispose of pet waste is the primary means for reducing the impact of pet waste. To this end, NHDES encourages pet waste outreach campaigns modeled on a successful project in Dover, New Hampshire (NHDES, 2007b). As a result of the Dover New Hampshire outreach campaign, today when residents register their dogs at the Dover City Hall, they also receive a pledge sheet. In accepting the pledge, dog owners agree to dispose of their pets' waste in a responsible way.

Best Management Practices– Pet Waste

Pet Waste Outreach Campaigns

There are numerous reasons for communities to start pet waste outreach campaigns, including: improving water quality, reducing public health risks, increasing awareness, and building community spirit, among others.

The basics steps of a pet waste outreach campaign include:

- ***Step 1:*** Identify the problem.
- ***Step 2:*** Identify the desired outcomes, the audience, and the barriers to achieving the outcomes.
- ***Step 3:*** Determine what type of outreach campaign best fits the available resources.
- ***Step 4:*** Assemble and meet with the Pet Waste Committee.
- ***Step 5:*** Choose outreach activities.
- **Step 6:** Conduct a final evaluation.

A how-to manual, *"The Inside Scoop: How to Conduct a Pet Waste Outreach Campaign*" (NHDES, 2007b) provides a step by step guide to designing and implementing a well researched and sound pet waste outreach campaign. It shows communities how to work with local partners to motivate dog owners/walkers to pick up after their dogs and dispose of the waste in an environmentally sound and safe way. It also provides background information to help stakeholders decide if they want to start a pet waste outreach campaign, shows how to implement and promote a successful campaign, and provides suggested outreach activities, resources and examples to make the campaigns easier. NHDES staff are available to assist with using the manual and getting started.

Pet Waste BMPs for Communities (MADEP, 2005)

- Developing and enforcing local "pooper scooper" ordinances or bylaws requiring pet owners to correctly dispose of pet waste.
- Conducting public awareness campaigns that can include public service announcements, signs in areas frequented by pet owners, and mailings.
- Developing specific "pet waste stations" that include waste receptacles, collection bags, scoops, and shovels
- Ensuring areas, such as public beaches, are either off-limits to pets or subject to certain ordinances to control fecal contamination of swimming areas
- Maintaining areas with long grass. Dogs prefer defecating in long grass, and areas with long grass allow feces to degrade naturally.

Pet Waste BMPs for Pet Owners

- Always carry a plastic bag with you when you walk your dog. Re-using an old newspaper delivery bag or plastic grocery bag works well.
- Using the bag like a glove, you can then pick up the pet waste, turn the bag inside out around the waste, seal the bag, and dispose of it in a trash can. You can also flush un-bagged pet waste down the toilet.
- Don't place the bagged or un-bagged pet waste in a storm drain or hose the pet waste towards storm drains as they drain directly to a stream, river, lake or other waterbody.
- If you have a large yard, you may bury un-bagged pet waste in the yard at least five inches in the ground and away from vegetable gardens and waterways.
- Do not put pet waste into storm drains.

Resources – Pet Waste

New Hampshire DES Resources:

- ***Pet Waste Campaign Outreach Manual* -** This how-to manual provides a step by step guide to designing and implementing a well researched and sound pet waste outreach campaign. It will show you how to work with local partners to motivate dog owners and walkers to pick up after their dogs and dispose of the waste in an environmentally sound and safe way. It gives readers background information to help decide if they want to start a pet waste outreach campaign, shows how to implement and promote a successful campaign, and provides suggested outreach activities,

resources and examples to make the campaigns easier. A successful campaign in Dover, New Hampshire is also presented to give readers ideas and encouragement.
Online at:
http://des.nh.gov/organization/divisions/water/wmb/coastal/scoop_the_poop.htm#manual

EPA Resources:

- ***Source Water Protection Practices Bulletin*** - Managing Pet and Wildlife Waste to Prevent Contamination of Drinking Water.
  Online at: http://www.epa.gov/safewater/sourcewater/pubs/fs_swpp_petwaste.pdf

6.2.6. Wildlife Waste

Fecal matter from wildlife is a significant source of pathogens in some watersheds. This is particularly true when human activities, including the feeding of wildlife and habitat modification, result in the congregation of wildlife (MADEP, 2005). Concentrations of geese, gulls, and ducks are of particular concern because they often deposit their waste directly into surface waters. Therefore, they can be major sources of pathogens, particularly in lakes and ponds where large resident populations have become established near beaches (CWP, 1999). As a result, many mitigation measures are focused on waterfowl.

Best Management Practices - Wildlife

Reducing the impact of wildlife on pathogen concentrations in water bodies generally requires either reducing the concentration of wildlife in an area or reducing their proximity to the water body. The primary means for doing this is to eliminate human inducements for congregation. In addition, in some instances population control measures may be appropriate (MADEP, 2005). The following methods to reduce fecal contamination from wildlife were excerpted from "*Mitigation Measures to Address Pathogen Pollution in Surface Waters: A TMDL Implementation Guidance Manual for Massachusetts*" (MADEP, 2005).

- ***Reducing Animal Feeding*** **-** Educating the public about the potential impacts to water quality from feeding wildlife can reduce wildlife congregation. Education can take the form of fliers, signs, mailings, or other methods (see Table 2-1). In addition to education, bylaws may be enacted to prohibit the feeding of wildlife. An example of a bylaw prohibiting the feeding of waterfowl can be found at the link provided in the Resources – Wildlife section.

- ***Behavioral Modification*** **-** Methods can be used to change the behavior of wildlife to minimize congregation of wildlife in areas where they contribute to water quality problems. These methods include techniques for scaring wildlife out of an area, the introduction of physical barriers, or the modification of the environment to reduce its attractiveness to certain wildlife (Underhill 1999). Scaring wildlife using trained dogs or loud noises has been effective in some instances. Physical barriers may include fencing to either exclude wildlife from areas near water bodies or from areas containing food sources. Finally, changing landscaping may reduce the congregation of wildlife in areas near water.

- ***Population Control*** **-** If other measures fail to effectively control the impact of wildlife, population control measures may be appropriate. These include the introduction or expansion of a hunting season, culling, relocation, or the prevention of egg hatching (Underhill 1999). Wildlife agencies should be contacted and consulted to determine legal measures of population control.

Resources - Wildlife

An example of a bylaw prohibiting the feeding of wildlife: Prohibiting Feeding of Wildlife.
Town of Bourne Bylaws section 3.4.3.
Online: at: http://www.townofbourne.com/TownInfo/TownByLaws/tabid/65/Default.aspx

6.2.7. Agriculture

Agricultural activities in New Hampshire include: dairy farming, the raising of livestock (including hogs, fowl, horses, llamas, alpacas and other animals), and crop farming, among others. Agricultural land use can contribute to bacterial impairment of surface waters. Agricultural and uses with the potential to contribute to pathogen pollution include (MADEP, 2005):

- Manure storage and application,
- Livestock grazing, and
- Animal feeding operations and barnyards.

When appropriately applied to soil, animal manure can fertilize crops and restore nutrients to the land. When improperly managed, however, animal wastes can pose a threat to human health and the environment. Pollutants in animal waste and manure can enter surface waters through a number of pathways, including surface runoff and erosion, direct discharges to surface water, spills and other dry-weather discharges, and leaching into soil and ground water. These discharges of manure pollutants can originate from animal confinement areas, manure handling and containment systems, manure stockpiles, and cropland where manure is spread (USEPA, 2003).

Runoff of animal manure that is applied to land is more likely when rainfall occurs soon after application and when manure is over applied or improperly applied. Pollutants can be directly discharged to surface water when animals are allowed access to water bodies and when manure storage areas overflow. Dry weather discharges to surface waters associated with large animal confinement areas can occur through spills or other accidental discharges from lagoons and irrigation systems. Other discharges to surface waters are overflows from containment systems following rainfall, failure of manure containment systems, or from equipment malfunction, and breakage of pipes or retaining walls. However, there are numerous practices that can help minimize bacteria pollution from agricultural lands (USEPA, 2003).

In New Hampshire, under RSA 431:35, agricultural operations must conform to best management practices determined by the New Hampshire Department of Agriculture Markets & Food in consultation with the USDA Natural Resources Conservation Service and the UNH Cooperative Extension and the New Hampshire Department of Agriculture Markets & Food (NHDAMF, 2008). Below are recommended mitigation measures designed to reduce the contribution of pathogens from agriculture in the state.

Best Management Practices and/or Other Control Measures - Agriculture

Permits for Concentrated Animal Feeding Operations (CAFOS)

CAFOs are generally defined as farms with 700 or more head of livestock confined for more than 45 days. Under the CWA [section 502(14)] these operation are considered point sources. To be considered a CAFO, a facility must first be defined as an Animal Feeding Operation (AFO). AFOs generally congregate animals, feed, manure, and production operations on a small land area. Feed is brought to the animals rather than the animals grazing or feeding in pastures.

The federal National Pollutant Discharge Elimination System (NPDES) program requires concentrated animal feeding operations (CAFOs) to obtain discharge permits. Large CAFOs are determined by the number of animals on the site, and the threshold is specific to the type of animal. Medium CAFOs are determined by the number of animals and whether or not the facility discharges to surface water. Small facilities can be designated as CAFOs at the discretion of the permitting authority (EPA). Under this rule, any CAFO that discharges or proposes to discharge is required to seek permit coverage. CAFOs are also required to submit a nutrient management plan (NMP) with their application for an NPDES permit (USEPA, 2003).

Comprehensive Nutrient Management Plans (CNMPs)

A Comprehensive Nutrient Management Plan (CNMP) is a conservation system for your livestock agricultural operations. CNMPs are designed to address, at a minimum, the soil erosion and water quality concerns of agricultural operations. The CNMP encompasses the storage and handling of the manure as well as the utilization and application of the manure nutrients on the land. Manure and nutrient management involves managing the source, rate, form, timing, and placement of nutrients. The practice of nutrient management serves four major functions:

1. Supplies essential nutrients to soils for plant utilization to produce adequate food, forage, and fiber;
2. Provides for efficient and effective use of scarce nutrient resources so they are not wasted;
3. Helps maintain or improve the physical, chemical, and biological condition of the soil; and
4. Minimizes environmental degradation caused by excess nutrients in the environment.

Writing a Comprehensive Nutrient Management Plan (CNMP) is an ongoing process because it is a working document that changes over time. It takes time to set up and requires ongoing revision due to new or changing information.

There are seven basic steps in writing a CNMP:

1. Document information on manure production, nutrient content and application system.
2. Determine availability of manure nutrients. Manure, compost and sludge all differ in composition.
3. Determine nutrient requirements of the crops on your farm. Use the average yield over the years, not just "book values."
4. Prioritize farm fields for suitability for manure application.
5. Determine appropriate manure application rate and allocate manure to fields in this order. Usually N or P is used as the deciding factor.
6. Adjust calculated manure rates for practicality.
7. Nutrients applied - nutrients required = additional fertilizer.

Agricultural operators can obtain assistance in developing CNMPs from the Natural Resource Conservation Service, which can be accessed through the local county conservation district.

Manure Management BMPs

The BMPs presented below were excerpted from the *"Manual of Best Management Practices (BMPs) for Agriculture in New Hampshire"* (NHDAMF, 2008) and are intended to reduce pathogen pollution from manure spreading areas, pastures, and barnyards.

Barnyards and Pastures-

1. ***Control access of livestock to water bodies.*** Minimize the direct deposition of manure by controlling access of livestock to water bodies.
2. ***Control runoff from barnyards and feedlots.*** Divert clean runoff to reduce the amount of water that runs through these areas. Control the manure-related pollutants that run off barnyards and feedlots with filter strips, grass areas below the barnyards and feedlots, and/or settling basins.
3. ***Divert roof runoff away from barnyards and feedlots.*** Divert roof water to minimize the volume of runoff containing nutrients.
4. ***Manage barnyards and feedlots to minimize concentrations of manure.*** Timely cleaning and removal of manure will reduce buildup, retain nutrients and prevent runoff.
5. ***Manage pastures to reduce concentrations of manure.*** Careful placement of livestock watering facilities and herd management areas and paddock layout can reduce concentrations of manure and associated impact on water bodies.

Manure Spreading Areas-

1. ***Store manure in properly constructed facilities or field stack during periods when land application is not suitable.*** During periods when suitable sites for land application of manure are not available, the use of properly located and constructed manure storage facilities is recommended.
2. ***Utilize soil tests to determine background levels of nutrients and soil pH.*** Amount of available nutrients in the soil reduces the need for applying extra nutrients for crop production. Over application of nutrients causes potential leaching into ground water and added expense for crop production. Proper soil pH allows better utilization of soil nutrients.
3. ***Calibrate manure application equipment properly to guard against over fertilization and to achieve maximum benefit from the manure over the greatest amount of farmland.*** Improper calibration may result in over-fertilization, which threatens ground and surface water quality.
4. ***Incorporate manure applications where and when appropriate, as soon as possible after application.*** This practice can reduce bacteria, organic matter and nutrient contributions from manure applications to runoff water.
5. ***Avoid the application of manure on frozen ground or snow-covered fields.*** Manure applications on frozen ground or snow-covered fields usually increase the amount of manure-related pollutants that reach surface water bodies.
6. ***Avoid applying manure directly on exposed bedrock and reduce application rates on shallow soils.*** Manure should not be applied directly to exposed bedrock. Most bedrock is fractured and

those fractures provide excellent pathways for nutrient migration to ground water sources. Additionally, manure application rates should be reduced on shallow soils to reflect the reduced ability to retain nutrients for plant uptake.

7. ***Plant cover crops on fields after harvesting annual crops, when possible.*** By doing this, nutrients not utilized by the primary crop can be tied up and not subject to leaching. In addition, wind and water erosion rates are decreased by the cover crop, reducing the potential for nutrient transport to surface water bodies.

8. ***Maintain filter strips next to surface waters receiving runoff from crop fields where manure is applied.*** A filter strip of perennial vegetation maintained between agricultural lands and adjoining streams and lakes will filter out some of the nutrients and contaminants before they reach the water.

Resources - Agriculture

New Hampshire Resources:

- ***Manual of Best Management Practices for the Handling of Agricultural Compost, Fertilizer and Manure*** - Prepared by Agricultural Best Management Practices Task Force and the USDA Natural Resources Conservation Service for the NH Department of Agriculture, Markets & Food. **Online at:** http://des.nh.gov/organization/divisions/water/dwgb/dwspp/documents/agricultural_fs.pdf

- ***Good Neighbor Guide for Horse-Keeping: Manure Management***, - A joint publication by the NH Department of Agriculture, NH Department of Environmental Services, the UNH Cooperative Extension, and the US Department of Agriculture Soil (Natural Resources) Conservation Service. **Online at:** http://extension.unh.edu/resources/files/Resource000002_Rep2.pdf

EPA Resources:

- ***National Management Measures to Control Non-point Source Pollution from Agriculture***. USEPA 2003. Report: EPA 841-B-03-004. **Online at:** http://www.epa.gov/owow/nps/agmm/index.html

- ***Livestock Manure* Storage -** Software designed to assess the threat to ground and surface water from manure storage facilities. USEPA. **Online at:** http://www.epa.gov/seahome/manure.html

- ***Animal Waste Management Software***. - A tool for estimating waste production and storage requirements.
  Online at: http://www.wcc.nrcs.usda.gov/awm/awm.html

6.2.8. Beaches, Boats and Marinas

Recreational water uses can contribute to pathogens loads. Bathing beaches, marinas, and areas frequented by boats may be impacted by pathogen sources specific to these areas, including (MADEP, 2005):

- Swimmers at beaches;
- Sewage and graywater from boats; and
- Marina facilities.

A description of each of these types of sources is provided below. Municipal officials, harbor masters, boards of health, departments of public works, marina operators, and citizens are largely responsible for managing these pathogen sources.

Bathing Beaches

Swimmers may contribute to pathogen impairment at swimming areas. Control of pathogen contamination at recreational beaches is particularly important since large numbers of people are regularly in contact with the water at beaches. When swimmers enter the water, residual fecal matter may be washed from the body and contaminate the water with pathogens. In addition, small children in diapers may contribute to contamination of recreational waters. Swimmers are likely to be significant pathogen sources when the number of swimmers is high and the flushing action of waves, tides, or river flow is low (MADEP, 2005).

The NHDES Designated Public Beach Inspection Program monitors and samples Designated Public Beaches throughout the state from mid-June through Labor Day. About 170 public bathing beaches on lakes, rivers, and impoundments are inspected on a monthly basis, while about 15 coastal and estuarine beaches are inspected on a weekly or bi-weekly basis during the swim season (NHDES, 2003c). NHDES has adopted criteria recommended by the EPA for bacteria in surface waters (USEPA, 1986). The state instantaneous, and geometric mean standards for freshwater beaches are 88 and 47 counts/100 mL respectively for *E. coli*, while the instantaneous, and geometric mean standards for coastal waters are 104 and 35 counts/100 mL for Enterococci. Statistically, as the level of indicator bacteria increases, the potential for the public to contract a water-borne disease increases. Designated Public Beaches that exceed the state standards for bacteria levels are notified within 24 hours and advisories are issued to the public. The beaches are immediately re-sampled until bacteria levels fall below the standards. Once standards are met, the advisories are removed (NHDES, 2003c).

Boats

Boats have the potential to discharge pathogens in sewage from installed toilets and graywater (includes drainage from sinks, showers, and laundry). Sewage and graywater discharged from boats can contain pathogens (including bacteria, viruses, and protozoans), nutrients, and chemical products. These constituents can directly harm aquatic life or degrade water quality (MADEP, 2005). In 1957, the New Hampshire Legislature enacted a law to require treatment devices on marine toilets (NHDES, 2006d). The law was amended in 1967 to prohibit any sewage discharge from boats (currently RSA 487:2, Marine Toilets and Disposal of Sewage from Boats).

With regards to discharge of boat sewage (which includes graywater), New Hampshire has established “No Discharge Areas” (NDAs) where the discharge of all boat sewage, whether treated or untreated, is prohibited (RSA 487:2). NDAs include all inland and coastal waters within three miles of the New Hampshire shoreline and the Isles of Shoals. Tidal and estuarine waters, including all bays and rivers to the tidal dams, are also incorporated in this designation. In waters that are not designated as No Discharge, federal law allows for overboard discharge of boat sewage that is first treated by an on-board marine sanitation device (MSD) but prohibits the discharge of untreated boat sewage. This waste must be contained in a holding tank to be later removed at a pumpout or dump station. Pumpout stations service boats with fixed toilets while dump stations are for portable toilets. New Hampshire's coastal waters are currently serviced by five stationary pumpout stations located at marinas and one mobile pumpout boat that can travel to where the service is required (NHDES, 2006e). There are also numerous pumpout and dump stations available on the some of the largest lakes in the state, including Lake Winnipesaukee, Lake Winnisquam, Squam Lake and Lake Sunapee.

Boat sewage discharges are highly concentrated with bacteria and nutrients that can contribute to unhealthy water for shellfish, other fauna and flora, and unsafe conditions for swimming and other recreation activities. Even properly operating vessels are most likely to contribute significantly to pathogen impairment in situations where large numbers congregate in enclosed environments with low flushing rates. Many marinas and popular anchorages are located in such environments (MADEP, 2005).

Graywater from boats is also a source of bacteria pollution. Graywater includes wastewater from sinks, showers, and laundry. Graywater can contain low levels of pathogens, detergents, soap, and food wastes. These components can contribute to reduced oxygen levels in small bays and coves by enriching algae growth and bacterial breakdown of wastes, both of which use up oxygen (MADEP, 2005). Graywater discharge is prohibited in all inland NH waterbodies (currently RSA 487:3, Marine Toilets and Disposal of Sewage from Boats).

NHDES conducts boat inspections for freshwater vessels with onboard wastewater containment facilities (NHDES, 2006d). Random inspections of occupied boats are conducted at marinas or at private docks, at the convenience of the owner or boat operator. The typical inspection takes about 20 minutes with minimal disruption to boater activity. Once on board, the inspector checks all onboard facilities that are designed to receive or hold sewage or graywater, including sinks, showers, holding tanks, valves, and plumbing. Starting at the various receiving fixtures, the plumbing is traced to the final onboard holding tank(s).

If found in compliance with state law, the boat is identified with a DES decal. If the boat is not in compliance, the corrective measures are outlined and a schedule is agreed upon for re-inspection. The law currently provides for an administrative fine up to $2,000 for each offense and loss of boat registration if a problem is not remedied within 48 hours of citation (NHDES, 2006d).

Marinas

In addition to discharges from boats, there are a number of other potential pathogen sources in marinas. Pathogens from shore side restrooms, uncontrolled pet waste, and fecal matter from wildlife attracted to fish cleaning waste can contaminate waters near marinas. Shore side sanitary facilities should be functioning properly to protect public health and the environment. Waste from pets, especially dogs, is a major source of complaints from barefoot boaters and, depending on the frequency that pets are walked in these areas, may substantially affect pathogen levels in nearby beaches (MADEP, 2005).

Best Management Practices– Beaches, Boats and Marinas

The following BMPs are intended to reduce pathogen pollution from beaches, boats, and marinas.

Bathing Beaches

- Shower facilities should be made available and bathers should be encouraged to shower prior to swimming;
- Parents, guardians and childcare providers should be encouraged to check and change children's diapers when they are dirty; and
- Local health agencies may provide visitor education programs and present information on sanitary practices using notices posted at beach/park entrances, flyers given to individuals, and signs asking visitors to use rest rooms and collect and dispose of pet waste.

Boats

- Distribute information on the proper operation and maintenance of MSDs; and
- Target outreach to marina owners, boat dealers and their consumers regarding the State and EPA requirements for the No Discharge Area; and
- Encourage marina owners to provide clean and safe onshore restrooms and pumpout facilities.

Marinas

The following BMPs for marinas were excerpted from *"Best Management Practices for New Hampshire's Marinas: Guideline for Environmentally Proactive Marinas"* (NHDES, 2001).

Boat Washing-

- Boat washing huts must have a roof and an impermeable floor sloped to a central floor drain. The drain can discharge to a NHDES registered holding tank or a sewer line. Permission is required from the local wastewater treatment plant prior to discharge.
- Outdoor wash facilities should be located on a permeable surface such as grass or gravel.
- Outdoor wash facilities can be located on pavement if a trench is in place to filter out sediments and other harmful constituents from wash water or a water bar is installed to prevent discharge to surface water. Marinas must obtain a groundwater discharge registration for this option.

Sewage and Grey Water-

- Provide an appropriate pump out station that is accessible to staff and customers.
- Do not allow waste to drain into receiving waters.
- Properly maintain the pump out station system for optimal performance.
- Provide educated staff to assist in boat pump outs.
- Charge an appropriate fee boat pump out services.
- Educate boat owners about the no discharge policy in New Hampshire's inland waters.
- Include a section in boater contracts that explains that grey water discharge is illegal and punishable by federal law.
- Disable grey water systems upon sale of boats bound for New Hampshire inland waters, to prevent illegal discharges. Boat companies or marinas provide this service on fresh waters.
- Question boat owners about their existing grey water systems.

Stormwater-

- Pave only areas that are absolutely necessary.
- Consider alternatives to asphalt for parking lots and vessel storage areas such as dirt, gravel or permeable pavement.
- Install infiltration trenches. Trenches installed at the leading edge of a boat ramp catch pollutants in an oil absorbent barrier or crushed stone before discharge.
- Install water bars. Water bars are essentially speed bumps for water. They divert water away from ramp areas and redirect to an infiltration area.
- Install vegetative buffers between surface waters and upland areas.
- Grassy or constructed wetlands allow pollutants to first be filtered out of water before discharging to the water body.
- Protect storm drains with filters or oil-grit separators. Stencil words (such as "Drains to Lake") on storm drains to alert customers and visitors that storm drains lead directly to water bodies without treatment. Contact the municipal public works department before stenciling any drain.

Resources – Beaches, Boats and Marinas

Best Management Practices for New Hampshire Marinas - The information provided in this document is intended to give basic idea of the rules, regulations, and management options that must be considered by service facility owners and managers in order to be in compliance with applicable state and federal regulations.
Online at: http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/nhdes-wd-01-12.pdf

New Hampshire's Clean Vessel Act Program **-** The NH Clean Vessel Act Program works to secure a healthy aquatic environment by preventing improper sewage disposal by recreational boats. Many recreational activities are sustained by our water resources and improper sewage disposal could threaten this use.
Online at: http://des.nh.gov/organization/divisions/water/wmb/cva/index.htm

A Boaters Guide to Sewage Pumpout Discharge Regulations and Pumpout Stations – A NHDES environmental fact sheet for boat owners.
Online at: http://des.nh.gov/organization/commissioner/pip/factsheets/wmb/documents/wmb-18.pdf

NHDES Beach Inspection Program - The Public Beach Inspection Program tests the waters at swimming beaches across New Hampshire during the swimming season. The website provides information on beach closures, regulations, and other information.
Online at: http://des.nh.gov/organization/divisions/water/wmb/beaches/index.htm

New Hampshire Handbook of Boating Laws and Responsibilities - This handbook is published by Boat Ed, the official provider of New Hampshire's boating safety course.
Online at: http://www.boat-ed.com/nh/handbook/waters.htm

7. FUNDING AND COMMUNITY RESOURCES

Funding assistance for bacteria mitigation and other watershed management projects is available from various government and private sources. This section provides an overview and contact information for financial assistance programs offered by the state of New Hampshire. Information presented here is subject to change, so please contact the appropriate agency to learn more about the programs.

Non-Point Source Pollution

Section 319 Watershed Assistance Grants

Watershed Assistance Grants are available to address non-point source problems in high quality waters. Applicants must implement watershed-based plans with quantifiable water quality goals that make reasonable progress toward maintaining or improving high quality waters as specified in the watershed-based plan.

Eligible applicants: Statewide. Eligible applicants include non-profits, government units, conservation districts, regional planning commissions, and watershed organizations.

Online at: http://des.nh.gov/organization/divisions/water/wmb/was/categories/grants.htm#warg

Contact: NHDES Watershed Assistance section, 29 Hazen Drive, Concord, NH 03301. (603) 271-2457

Section 319 Watershed Restoration Grants

Watershed Restoration Grants are available to assist in restoration of waterbodies that have been impaired by non-point source pollution. Projects must implement a watershed-based plan that identifies and quantifies the sources of pollution that caused the impairment, the load reduction required for the water to meet water quality standards, and the best management practices needed to achieve the required load reduction.

Eligible applicants: Statewide. Eligible applicants include non-profits, government units, conservation districts, regional planning commissions, and watershed organizations.

Online at: http://des.nh.gov/organization/divisions/water/wmb/was/categories/grants.htm#warg

Contact: NHDES Watershed Assistance section, 29 Hazen Drive, Concord, NH 03301. (603) 271-2457

Small Outreach and Education Grant for Non-point Source Pollution

This program provides small grants of $200 to $2,000 for outreach and education projects relating to non-point source pollution (NPS) issues that target appropriate audiences with diverse NPS water quality related messages. These small grants are available year round on an ongoing basis, which allows applicants to move forward with outreach and education projects without having to wait for annual application deadlines. The NHDES Watershed Assistance section administers the grant program using $20,000 each year from the US Environmental Protection Agency under section 319 of the CWA.

Eligible applicants: Municipalities, regional planning commissions, non-profit organizations, county conservation districts, state agencies, watershed associations, community groups, non-profit educators and schools, water suppliers.
Online at: http://des.nh.gov/organization/divisions/water/wmb/was/categories/grants.htm#soeg
Contact: NHDES Watershed Assistance section, PO Box 95, Concord, NH 03302. (603) 271-7889

Regional Planning

Regional Environmental Planning Program Grants
The Regional Environmental Planning Program (REPP) provides $25,000 in state general funds per year to each of the nine regional planning commissions for a total of $225,000 per year. The grant money supports projects that address environmental quality through local and regional land use planning and land use regulations.
Eligible applicants: The nine regional planning commissions.
Online at: http://des.nh.gov/organization/divisions/water/wmb/was/categories/grants.htm#wqp
Contact: NHDES Watershed Assistance section, 29 Hazen Drive, Concord, NH 03301. (603) 271-2457

Water Quality Planning 604(b) Grants
These grants are available to Regional Planning Commissions and/or the Connecticut River Joint Commissions for water quality planning purposes. Funding priority is given to projects developing and implementing lake management/shoreland protection plans, river corridor/river watershed plans, designated river nominations or comprehensive lake inventories. A total award amount of $80,000 is usually available every two years.
Eligible applicants: The nine regional planning commissions and/or the Connecticut River Joint Commissions.
Online at: http://des.nh.gov/organization/divisions/water/wmb/was/categories/grants.htm#wqp
Contact: NHDES Watershed Management Bureau, 29 Hazen Drive, Concord, NH 03301. (603) 271-2457

Municipal Planning

Clean Water State Revolving Load Fund (CWSRF)
Since 1989 the New Hampshire Department of Environmental Services (DES) has provided millions of dollars in low interest loans to towns and cities for sewer and wastewater treatment projects. With the advent of stimulus funds in 2009, the program has broadened eligibility to include non-point source projects and private, non-profit entities.
Eligible applicants: Municipalities and private, non-profit entities. .
Online at: http://des.nh.gov/organization/commissioner/pip/factsheets/wwt/documents/web-6.pdf

Contact: NHDES, Water Division, Wastewater Engineering Bureau, 29 Hazen Drive, Concord, NH 03301. (603) 271-3448.

Community Technical Assistance Program

The Piscataqua Region Estuaries Partnership (PREP) Community Technical Assistance Program provides assistance to communities on a wide range of regulatory and non-regulatory approaches to natural resources protection. The PREP Management Plan identifies many priorities that involve implementing actions at a community level. In order to implement those actions and to assist communities, the PREP will hire Technical Assistance Providers ("TAPs") to work with communities on natural resource topics of mutual interest to the community and the PREP. TAPs are organizations and firms with expertise in natural resource protection issues and activities. Communities interested in receiving customized assistance from qualified professionals should submit an application to the PREP. The program is intended to be simple for communities to participate: the PREP pays for the assistance and manages the contract agreement with the TAPs.

Eligible applicants: All NH communities.

Online at: http://www.nhep.unh.edu/programs/ctap.htm

Contact: Piscataqua Region Estuaries Partnership, University of New Hampshire Nesmith Hall 131 Main St, Durham, NH 03794

Community Development Block Grants (CDBG) for Public Facilities

Title 1 of the Housing and Community Development Act of 1974 authorized the Community Development Block Grant (CDBG) program. The program is sponsored by the US Department of Housing and Urban Development (HUD) and the New Hampshire program is administered through the Community Development Finance Authority (CDFA). Public Facilities grants include water and sewer system improvements.

Eligible applicants: Municipalities.

Online at: http://www.nhcdfa.org/web/cdbg/cdbg_grants.html

Contact: New Hampshire CDFA, 14 Dixon Ave., Suite 102, Concord, NH 03301. (603) 226-2170

Agriculture

Agricultural Nutrient Management Grants

Small agricultural nutrient management grants are available from the NH Department of Agriculture, Markets, and Food (DAMF) to assist agricultural land and livestock owners with efforts to minimize adverse effects to state waterbodies from agricultural nutrients. The majority of the funding is used for on-farm projects that assist livestock and agricultural land operations and related organizations with implementing Best Management Practices and other such measures, which help to prevent or mitigate water pollution. Funding may also be utilized by organizations for educational projects. Up to $2,500 per project per year is available from funding provided by DAMF and DES's Drinking Non-point Source Program (NHDAMF, 2005).

Eligible applicants: Agricultural operators and organizations.

Online at: http://des.nh.gov/organization/divisions/water/dwgb/dwspp/agricultural_grants.htm

Contact: NHDAMF, Bureau of Markets, PO Box 2042, Concord NH 03302 (603) 271-2753

Resource Protection and Restoration

Local Source Water Protection Grants

Since 1997, DES has made small grants to water suppliers, municipalities, and other local organizations for the purpose of protecting drinking water sources. Protection projects funded through this program have included delineation of wellhead protection areas, inventorying potential contamination sources, development of local protection ordinances, performing land surveys as a precursor to land acquisitions, groundwater reclassification, shoreline surveys, drinking water education and outreach activities, and controlling access to sources.

Eligible applicants: Statewide. Water suppliers, municipalities, regional planning commissions, county conservation districts, and non-profit organizations are welcome to apply. Applicants must have endorsement of a public water supplier.

Online at: http://des.nh.gov/organization/divisions/water/dwgb/dwspp/lswp_grants.htm

Contact: NHDES Source Water Protection Program, 29 Hazen Drive, Concord, NH 03301 (603) 271-7017

Additional Resources

The U.S. Environmental Protection Agency (EPA) recognizes that committed watershed organizations and state and local governments need adequate resources to achieve the goals of the Clean Water Act and improve our nation's water quality. To this end, the EPA has created the following web site to provide tools, databases, and information about sources of funding to practitioners and funders that serve to protect watersheds:

Online at: http://www.epa.gov/owow/funding.html

8. Watershed-Specific Bacteria Data Summaries and Reduction Estimates

Appendices A through O include bacteria data for the 379 bacteria impaired segments in New Hampshire's surface waters. The data is organized by watershed with each appendix representing one of 15 HUC 8 watersheds in the State as shown below.

Appendix A: Lower Androscoggin River Watershed
Appendix B: Saco River Watershed
Appendix C: Salmon Falls-Piscataqua River Watershed
Appendix D: Pemigewasset River Watershed
Appendix E: Winnipesaukee River Watershed
Appendix F: Contoocook River Watershed
Appendix G: Nashua River Watershed
Appendix H: Merrimack River Watershed
Appendix I: Upper Connecticut River Watershed
Appendix J: Connecticut River Watershed from John River to Waits River
Appendix K: Connecticut River Watershed from Waits River to White River
Appendix L: Connecticut River Watershed from White River to Bellows Falls
Appendix M: Connecticut River Watershed from Bellows Falls to Vernon Dam
Appendix N: Connecticut River-Ashuelot River Watershed from Vernon to Millers River
Appendix O: Coastal Impaired Segments

Each watershed-specific appendix contains:

1. A description of the HUC 8 watershed (size, location, and major features).
2. A watershed map, showing the locations of the impaired segments within the HUC 8 watershed.
3. A land cover map, showing land cover types within the HUC 8 watershed.
4. Data tables with recent (within 10 years) bacteria data for each impaired segment (when available) and reductions needed to meet water quality standards.

8.1 Wet/Dry Weather Analysis Methodology

A "wet" or "dry" weather analysis was conducted to assign a wet or dry-weather status to each bacteria sampling data point. This analysis enables investigators to evaluate whether or not bacteria violations occur during wet or dry weather conditions. This weather status characterization can support identification and prioritization of bacteria pollutant sources for mitigation. The wet/dry analysis was conducted according to the method described below:

National Weather Service and Federal Aviation Administration weather data were obtained from the NOAA National Climatic Data Center through the NOAA National Data Centers (NNDC) "Climate Data Online" website (http://cdo.ncdc.noaa.gov/CDO/cdo). Weather data of interest included both hourly precipitation and geographical information. One additional NH DES weather station (Green St., Laconia, NH) was also used.

Weather stations were matched to AU's using GIS software. If an AU's HUC 12 watershed was within 5 miles of a weather station, it was matched to that weather station. Weather stations at high altitudes (e.g., Mt. Washington) were excluded. If two or more weather stations met the criteria, then the one closest to the AUID was chosen.

The following rule was used to indicate wet weather: >0.1" in the past 24 hours; or >0.25" in the past 48 hours; or >2.0" in the past 96 hours. Using Excel, this rule was applied to all weather data, so that a "wet," "dry," or "no data" designation was created for all hourly periods in the study. If data were missing for any portion of the previous 96 hours, and if not enough precipitation had occurred to indicate wet weather, a "no data" designation was applied. Only if all data were present, and prior precipitation was insufficient, did a "dry" designation result.

Using Excel, each single sample bacteria result's date and time was rounded to the nearest hour and compared to the wet / dry / no data designation for that hour for the matched weather station.

8.2 Estimated Load Reduction Calculation Methodology

TMDL reductions necessary to meet water quality standards were calculated for a rough estimation of pollution abatement action needed. The estimate of percent (%) reduction needed is calculated based on the difference between measured ambient bacteria data and the water quality criteria for bacteria. In a few cases, where segments were listed based on the presence of known sources rather than monitoring data, percent reductions were calculated based on presumed concentrations associated with the known sources. For each segment in Table 8-1, the basis for the calculation of the percent reduction (along with available monitoring data) is explained in the applicable appendix report.

For segments impaired by *E. coli* or enterococci, the necessary % reduction was calculated based on both single sample and geometric mean water quality standards; for segments impaired by fecal coliform, the estimated % reduction was based on water quality standards for 90th percentile and geometric mean fecal coliform data. The following process was used to estimate the % reduction necessary to achieve the water quality standard in each impaired segment:

1. ***For E. coli and enterococci impaired segments:*** Select highest concentration level of single sample indicator bacteria among all current samples (both dry and wet conditions) taken within an impaired segment. For the highest concentration of bacteria for the impaired segment, calculate the % reduction in bacteria levels needed to meet the appropriate single sample water quality criteria.
2. ***For fecal coliform impaired segments:*** Select highest 90^{th} percentile value, calculated from all current samples (both dry and wet conditions) within an impaired segment. For the highest 90^{th} percentile value, calculate the % reduction in bacteria levels needed to meet the appropriate 90^{th} percentile water quality criteria.
3. ***For all impaired segments:*** Select highest geometric mean value, calculated from all current samples (both dry and wet conditions) within an impaired segment. For the highest geometric mean value, calculate the % reduction in bacteria levels needed to meet the appropriate geometric mean water quality criteria.

For example, if the highest single sample value from a Class B impaired tidal segment is 1,000 enterococci/100mL, the % reduction needed to meet the single sample criterion is [(1000 – 104)/1000] x 100 = 89.6% reduction).

While both single sample and geometric mean percent reductions are presented, it is recommended that the reductions needed to attain the geometric mean be used (when available) for implementation planning purposes in most cases. Bacteria sampling results can be highly variable and the geometric mean helps to reduce undue influence of any one data point.

Table 8-1: Summary of Estimated Percent Reductions for Bacteria Impaired Segments.

Watershed	Waterbody Name	Assessment Unit #	Primary Town	Impairment	% Reduction to meet TMDL	
					Single Sample	Geometric Mean
Lower Androscoggin River	MOOSE BROOK - TOWN POOL-RAVINE BEACH	NHIMP400020101-01-02	RANDOLPH	Escherichia coli	78%	complies
	MOOSE BROOK - MOOSE BROOK STATE PARK BEACH	NHIMP400020101-02-02	GORHAM	Escherichia coli	60%	31%
	PEABODY RIVER - LIBBY TOWN POOL	NHLAK400020102-01	GORHAM	Escherichia coli	58%	complies
Saco River	DAN HOLE RIVER - MILL POND TOWN BEACH	NHIMP600020702-01-02	OSSIPEE	Escherichia coli	57%	complies
	ECHO LAKE - STATE PARK BEACH	NHLAK600020302-01-02	CONWAY	Escherichia coli	37%	complies
	MOORES POND SKI AND BEACH	NHLAK600020604-03-02	TAMWORTH	Escherichia coli	78%	complies
	WHITE LAKE - STATE PARK BEACH	NHLAK600020605-02-02	TAMWORTH	Escherichia coli	23%	complies
	SILVER LAKE - MONUMENT BEACH	NHLAK600020801-06-02	MADISON	Escherichia coli	78%	15%
	SILVER LAKE - FOOT OF THE LAKE BEACH	NHLAK600020801-06-03	MADISON	Escherichia coli	56%	complies
	SILVER LAKE - NICHOLS BEACH	NHLAK600020801-06-04	MADISON	Escherichia coli	23%	complies
	WILDCAT BROOK	NHRIV600020104-03	JACKSON	Escherichia coli	73%	54%
	ELLIS RIVER	NHRIV600020105-07	BARTLETT	Escherichia coli	6%	41%
	SWIFT RIVER	NHRIV600020203-07	CONWAY	Escherichia coli	60%	58%
	EAST BRANCH SACO RIVER	NHRIV600020301-01	JACKSON	Escherichia coli	complies	26%
	EAST BRANCH SACO RIVER	NHRIV600020301-04	BARTLETT	Escherichia coli	82%	58%
	SACO RIVER - FIRST BRIDGE REC AREA BEACH	NHRIV600020302-02-02	CONWAY	Escherichia coli	78%	32%
	SACO RIVER	NHRIV600020304-01-01	CONWAY	Escherichia coli	59%	21%
	SACO RIVER - DAVIS PARK REC AREA BEACH	NHRIV600020304-01-02	CONWAY	Escherichia coli	56%	complies
	SACO RIVER - SMITH EASTON REC AREA BEACH	NHRIV600020304-10-02	CONWAY	Escherichia coli	20%	complies
	SACO RIVER	NHRIV600020305-02	CONWAY	Escherichia coli	22%	complies
	DAN HOLE RIVER	NHRIV600020702-02	OSSIPEE	Escherichia coli	51%	6%
Salmon Falls - Piscataqua Rivers	SALMON FALLS RIVER	NHEST600030406-01	DOVER	Enterococcus	93%	71%
	COCHECO RIVER	NHEST600030608-01	DOVER	Enterococcus	96%	82%
	LAMPREY RIVER	NHEST600030709-01	NEWMARKET	Enterococcus	83%	59%
	SQUAMSCOTT RIVER	NHEST600030806-01	STRATHAM	Enterococcus	89%	84%
	OYSTER RIVER	NHEST600030902-01-03	DURHAM	Enterococcus	84%	50%
	BELLAMY RIVER SOUTH[1]	NHEST600030903-01-02	DOVER	Enterococcus	86%	22%
	GREAT BAY PROHIB SZ1	NHEST600030904-02	NEWMARKET	Enterococcus	69%	52%
	PICKERING BROOK[1]	NHEST600030904-04-03	NEWINGTON	Enterococcus	98%	63%
	GREAT BAY - COND APPR[1]	NHEST600030904-04-05	NEWINGTON	Enterococcus	68%	complies
	ADAMS POINT SOUTH - COND APP[1]	NHEST600030904-04-06	DURHAM	Enterococcus	89%	complies
	ADAMS POINT MOORING FIELD SZ	NHEST600030904-06-10	NEWINGTON	Enterococcus	89%	complies
	U LITTLE BAY (SOUTH)[1]	NHEST600030904-06-12	NEWINGTON	Enterococcus	89%	complies
	U LITTLE BAY (NORTH)[1]	NHEST600030904-06-16	NEWINGTON	Enterococcus	89%	28%
	DOVER WWTF SZ-NH	NHEST600031001-01-02	DOVER	Enterococcus	84%	66%
	LOWER PISCATAQUA RIVER - SOUTH	NHEST600031001-02-02	PORTSMOUTH	Enterococcus	74%	complies
	LOWER SAGAMORE CREEK	NHEST600031001-04	PORTSMOUTH	Enterococcus	98%	no data
	SOUTH MILL POND	NHEST600031001-09	PORTSMOUTH	Enterococcus	83%	28%
	NORTH MILL POND	NHEST600031001-10	PORTSMOUTH	Enterococcus	96%	95%
	WITCH CREEK[1]	NHEST600031002-01-01	RYE	Enterococcus	35%	complies
	BERRYS BROOK[1]	NHEST600031002-01-02	RYE	Enterococcus	42%	no data
	SEABROOK HARBOR BEACH	NHEST600031004-09-05	SEABROOK	Enterococcus	73%	complies
	HAMPTON RIVER MARINA SZ	NHEST600031004-09-08	HAMPTON	Enterococcus	57%	no data

1 also listed for Fecal Coliform impairment

Watershed	Waterbody Name	Assessment Unit #	Primary Town	Impairment	% Reduction to meet TMDL	
					90th Percentile	Geometric Mean
Salmon Falls - Piscataqua Rivers	BELLAMY RIVER NORTH	NHEST600030903-01-01	DOVER	Fecal Coliform	83%	55%
	BELLAMY RIVER SOUTH[2]	NHEST600030903-01-02	DOVER	Fecal Coliform	80.5%	55.6%
	CROMMENT CREEK	NHEST600030904-04-02	DURHAM	Fecal Coliform	67.3%	4.4%
	PICKERING BROOK[2]	NHEST600030904-04-03	NEWINGTON	Fecal Coliform	94%	68%
	FABYAN POINT	NHEST600030904-04-04	NEWINGTON	Fecal Coliform	67.2%	complies
	GREAT BAY - COND APPR[2]	NHEST600030904-04-05	NEWINGTON	Fecal Coliform	79.9%	24.1%
	ADAMS POINT SOUTH - COND APP[2]	NHEST600030904-04-06	DURHAM	Fecal Coliform	46%	complies
	ADAMS POINT TRIB	NHEST600030904-06-11	DURHAM	Fecal Coliform	98%	61%
	U LITTLE BAY (SOUTH)[2]	NHEST600030904-06-12	NEWINGTON	Fecal Coliform	51.7%	complies
	LOWER LITTLE BAY	NHEST600030904-06-13	NEWINGTON	Fecal Coliform	53%	4%
	LOWER LITTLE BAY GENERAL SULLIVAN BRIDGE	NHEST600030904-06-15	NEWINGTON	Fecal Coliform	47.4%	complies
	U LITTLE BAY (NORTH)[2]	NHEST600030904-06-16	NEWINGTON	Fecal Coliform	47.4%	complies
	OYSTER RIVER MOUTH	NHEST600030904-06-17	DURHAM	Fecal Coliform	68%	10.6%
	WITCH CREEK[2]	NHEST600031002-01-01	RYE	Fecal Coliform	57.4%	25.3%
	BERRYS BROOK[2]	NHEST600031002-01-02	RYE	Fecal Coliform	90.8%	72.4%
	TAYLOR RIVER	NHEST600031003-02	HAMPTON FALLS	Fecal Coliform	69%	26%
	TAYLOR RIVER	NHEST600031003-03	HAMPTON	Fecal Coliform	35.5%	complies
	HAMPTON FALLS RIVER	NHEST600031004-01-03	HAMPTON	Fecal Coliform	36.3%	complies
	TAYLOR RIVER (LOWER)	NHEST600031004-02-02	HAMPTON	Fecal Coliform	1%	complies

Watershed	Waterbody Name	Assessment Unit #	Primary Town	Impairment	% Reduction to meet TMDL	
					Single Sample	Geometric Mean
Salmon Falls - Piscataqua Rivers	SALMON FALLS RIVER - BAXTER MILL DAM POND	NHIMP600030405-04	ROCHESTER	Escherichia coli	97%	83%
	SALMON FALLS RIVER - LOWER GREAT FALLS DAM	NHIMP600030406-02	SOMERSWORTH	Escherichia coli	92%	no data
	SALMON FALLS RIVER - SOUTH BERWICK DAM	NHIMP600030406-04	ROLLINSFORD	Escherichia coli	complies	20%
	COCHECO RIVER - CITY DAM 1	NHIMP600030603-01	ROCHESTER	Escherichia coli	12%	9%
	COCHECO RIVER - GONIC DAM POND	NHIMP600030607-02	ROCHESTER	Escherichia coli	28%	45%
	COCHECO RIVER - WATSON-WALDRON DAM POND	NHIMP600030608-02	DOVER	Escherichia coli	complies	11%
	COCHECO RIVER - CENTRAL AVE DAM	NHIMP600030608-04	DOVER	Escherichia coli	62%	34%
	EXETER RIVER - EXETER RIVER DAM I	NHIMP600030805-04	EXETER	Escherichia coli	79%	84%
	UNKNOWN RIVER - WINNICUT RIVER DAM POND	NHIMP600030901-02	GREENLAND	Escherichia coli	74%	38%
	OYSTER RIVER	NHIMP600030902-04	DURHAM	Escherichia coli	88%	61%
	BEARDS CREEK	NHIMP600030902-06	DURHAM	Escherichia coli	80%	83%
	BELLAMY RIVER - SAWYERS MILL DAM POND	NHIMP600030903-02	DOVER	Escherichia coli	80%	20%
	LOVELL POND - TOWN BEACH	NHLAK600030401-01-02	WAKEFIELD	Escherichia coli	78%	46%
	MILTON POND - MILTON POND REC AREA BEACH	NHLAK600030404-01-03	MILTON	Escherichia coli	76%	no data
	SUNRISE LAKE - TOWN BEACH	NHLAK600030601-05-02	MIDDLETON	Escherichia coli	69%	complies
	BOW LAKE - TOWN BEACH	NHLAK600030604-01-02	STRAFFORD	Escherichia coli	56%	complies
	FRESH CREEK POND	NHLAK600030608-01	DOVER	Escherichia coli	38%	26%
	PAWTUCKAWAY LAKE - PAWTUCKAWAY SP BEACH	NHLAK600030704-02-02	NOTTINGHAM	Escherichia coli	99%	51%
	PAWTUCKAWAY LAKE - TOWN BEACH	NHLAK600030704-02-03	NOTTINGHAM	Escherichia coli	60%	complies
	LUCAS POND - TOWN BEACH	NHLAK600030705-02-02	NORTHWOOD	Escherichia coli	54%	complies

2 also listed for Enterococcus impairment

Watershed	Waterbody Name	Assessment Unit #	Primary Town	Impairment	% Reduction to meet TMDL	
					Single Sample	Geometric Mean
Salmon Falls - Piscataqua Rivers	PIKE BROOK	NHRIV600030401-02	BROOKFIELD	Escherichia coli	32%	52%
	BRANCH RIVER	NHRIV600030401-08	WAKEFIELD	Escherichia coli	26%	45%
	SALMON FALLS RIVER	NHRIV600030405-14	SOMERSWORTH	Escherichia coli	complies	11%
	SALMON FALLS RIVER	NHRIV600030406-03	SOMERSWORTH	Escherichia coli	97%	complies
	COCHECO RIVER	NHRIV600030601-02	NEW DURHAM	Escherichia coli	80%	77%
	DAMES BROOK	NHRIV600030601-07	MILTON	Escherichia coli	25%	20%
	COCHECO RIVER	NHRIV600030601-09	FARMINGTON	Escherichia coli	6%	42%
	AXE HANDLE BROOK - HOWARD BROOK	NHRIV600030602-03	ROCHESTER	Escherichia coli	complies	20%
	COCHECO RIVER	NHRIV600030603-01	FARMINGTON	Escherichia coli	80%	61%
	POKAMOONSHINE BROOK	NHRIV600030603-02	FARMINGTON	Escherichia coli	10%	35%
	COCHECO RIVER	NHRIV600030603-06	ROCHESTER	Escherichia coli	64%	57%
	COCHECO RIVER	NHRIV600030603-08	ROCHESTER	Escherichia coli	79%	75%
	WILLOW BROOK	NHRIV600030603-10	ROCHESTER	Escherichia coli	78%	81%
	ISINGLASS RIVER	NHRIV600030605-16	BARRINGTON	Escherichia coli	80%	complies
	ISINGLASS RIVER	NHRIV600030607-01	BARRINGTON	Escherichia coli	77%	complies
	BLACKWATER BROOK-CLARK BROOK	NHRIV600030608-02	DOVER	Escherichia coli	44%	72%
	COCHECO RIVER	NHRIV600030608-03	DOVER	Escherichia coli	17%	30%
	REYNERS BROOK	NHRIV600030608-04	DOVER	Escherichia coli	79%	78%
	COCHECO RIVER	NHRIV600030608-05	DOVER	Escherichia coli	complies	44%
	INDIAN BROOK	NHRIV600030608-06	DOVER	Escherichia coli	50%	65%
	FRESH CREEK - TWOMBLY BROOK	NHRIV600030608-08	ROLLINSFORD	Escherichia coli	85%	18%
	ROLLINS BROOK	NHRIV600030608-10	ROLLINSFORD	Escherichia coli	69%	70%
	FRESH CREEK	NHRIV600030608-11	ROLLINSFORD	Escherichia coli	61%	81%
	BERRY BROOK	NHRIV600030608-15	DOVER	Escherichia coli	80%	52%
	JACKSON BROOK	NHRIV600030608-16	DOVER	Escherichia coli	59%	76%
	LAMPREY RIVER - CARROLL LAKE BEACH	NHRIV600030703-07-02	RAYMOND	Escherichia coli	79%	67%
	LAMPREY RIVER	NHRIV600030703-15	EPPING	Escherichia coli	87%	69%
	LAMPREY RIVER	NHRIV600030703-18	EPPING	Escherichia coli	complies	<1%
	NORTH RIVER	NHRIV600030706-02	NOTTINGHAM	Escherichia coli	55%	23%
	LITTLE RIVER	NHRIV600030707-07	LEE	Escherichia coli	complies	59%
	LAMPREY RIVER	NHRIV600030709-07	LEE	Escherichia coli	12%	15%
	EXETER RIVER	NHRIV600030802-03	SANDOWN	Escherichia coli	82%	57%
	TOWLE BROOK - TO PANDOLPIN DAM	NHRIV600030802-10	CHESTER	Escherichia coli	71%	71%
	EXETER RIVER	NHRIV600030803-01	FREMONT	Escherichia coli	20%	21%
	EXETER RIVER	NHRIV600030805-02	EXETER	Escherichia coli	10%	57%
	GREAT BROOK-BRICKYARD BROOK-HOBBS BROOK-YORK BROOK	NHRIV600030805-04	KENSINGTON	Escherichia coli	80%	32%
	NORRIS BROOK	NHRIV600030806-01	EXETER	Escherichia coli	94%	66%
	WHEELWRIGHT CREEK - PARKMAN BROOK	NHRIV600030806-04	STRATHAM	Escherichia coli	80%	41%
	UNNAMED BROOK - TO SQUAMSCOTT RIVER	NHRIV600030806-09	NEWFIELDS	Escherichia coli	28%	31%
	TRIB TO SQUAMSCOTT RIVER - STUART DAIRY FARM	NHRIV600030806-14	STRATHAM	Escherichia coli	99%	no data
	WINNICUT RIVER-BARTON BROOK-MARSH BROOK-THOMPSON BROOK	NHRIV600030901-02	GREENLAND	Escherichia coli	83%	no data

Watershed	Waterbody Name	Assessment Unit #	Primary Town	Impairment	% Reduction to meet TMDL	
					Single Sample	Geometric Mean
Salmon Falls - Piscataqua Rivers	HAINES BROOK	NHRIV600030901-03	GREENLAND	Escherichia coli	80%	62%
	OYSTER RIVER - CALDWELL BROOK	NHRIV600030902-02	BARRINGTON	Escherichia coli	92%	84%
	OYSTER RIVER	NHRIV600030902-03	LEE	Escherichia coli	92%	94%
	OYSTER RIVER - CHELSEY BROOK	NHRIV600030902-04	LEE	Escherichia coli	92%	91%
	OYSTER RIVER	NHRIV600030902-05	DURHAM	Escherichia coli	73%	complies
	LONGMARSH BROOK - BEAUDETTE BROOK	NHRIV600030902-06	DURHAM	Escherichia coli	67%	no data
	HAMEL BROOK	NHRIV600030902-08	DURHAM	Escherichia coli	80%	81%
	COLLEGE BROOK	NHRIV600030902-09	DURHAM	Escherichia coli	81%	79%
	RESERVOIR BROOK	NHRIV600030902-10	DURHAM	Escherichia coli	82%	86%
	JOHNSON CREEK - GERRISH BROOK	NHRIV600030902-13	MADBURY	Escherichia coli	55%	73%
	BELLAMY RIVER	NHRIV600030903-07	BARRINGTON	Escherichia coli	92%	82%
	BELLAMY RIVER - KELLY BROOK - KNOX MARSH BROOK	NHRIV600030903-08	MADBURY	Escherichia coli	92%	75%
	BELLAMY RIVER	NHRIV600030903-09	DOVER	Escherichia coli	78%	54%
	VARNEY BROOK - CANNEY BROOK	NHRIV600030903-11	DOVER	Escherichia coli	96%	no data
	GARRISON BROOK	NHRIV600030903-13	DOVER	Escherichia coli	91%	complies
	PICKERING BROOK	NHRIV600030904-06	PORTSMOUTH	Escherichia coli	80%	59%
	SHAW BROOK	NHRIV600030904-13	GREENLAND	Escherichia coli	87%	85%
	UNNAMED BROOK	NHRIV600030904-21	GREENLAND	Escherichia coli	98%	68%
	SAGAMORE CREEK	NHRIV600031001-03	PORTSMOUTH	Escherichia coli	80%	50%
	LOWER HODGSON BROOK	NHRIV600031001-04	PORTSMOUTH	Escherichia coli	98%	90%
	UPPER HODGSON BROOK	NHRIV600031001-05	PORTSMOUTH	Escherichia coli	80%	81%
	PAULS BROOK - PEASE AIR FORCE BASE	NHRIV600031001-07	PORTSMOUTH	Escherichia coli	49%	54%
	BORTHWICK AVE TRIBUTARY	NHRIV600031001-09	PORTSMOUTH	Escherichia coli	76%	72%
	NEWFILEDS DITCH	NHRIV600031001-10	PORTSMOUTH	Escherichia coli	80%	86%
	BERRY'S BROOK	NHRIV600031002-01	RYE	Escherichia coli	96%	80%
	UNNAMED BROOKS - TO ATLANTIC OCEAN AT CONCORD POINT	NHRIV600031002-03	RYE	Escherichia coli	80%	complies
	CAIN'S BROOK	NHRIV600031004-10	SEABROOK	Escherichia coli	90%	93%
	CAIN'S BROOK	NHRIV600031004-12	SEABROOK	Escherichia coli	88%	77%
Pemigewasset River	SNOWS BROOK - CORCORAN POND TOWN BEACH	NHIMP700010401-01-02	WATERVILLE VALLEY	Escherichia coli	70%	complies
	STINSON LAKE - CAMP HAPPY T RANCH BEACH	NHLAK700010306-01-02	RUMNEY	Escherichia coli	56%	15%
	LITTLE SQUAM LAKE - TOWN BEACH	NHLAK700010502-01-02	ASHLAND	Escherichia coli	73%	complies
	NEWFOUND LAKE - WELLINGTON STATE PARK BEACH	NHLAK700010603-02-05	BRISTOL	Escherichia coli	68%	complies
	NEWFOUND LAKE - CAMP WI-CO-SU-TA BEACH	NHLAK700010603-02-13	HEBRON	Escherichia coli	95%	complies
	HERMIT LAKE - TOWN BEACH	NHLAK700010802-03-02	SANBORNTON	Escherichia coli	78%	complies
	WEBSTER LAKE - GRIFFIN TOWN BEACH	NHLAK700010804-02-02	FRANKLIN	Escherichia coli	89%	complies
	WEBSTER LAKE - LEGACE TOWN BEACH	NHLAK700010804-02-03	FRANKLIN	Escherichia coli	73%	complies
	BAKER RIVER	NHRIV700010303-09-01	WENTWORTH	Escherichia coli	complies	34%
	BAKER RIVER	NHRIV700010303-12	WENTWORTH	Escherichia coli	69%	15%
	BAKER RIVER	NHRIV700010305-11	RUMNEY	Escherichia coli	60%	55%
	BAKER RIVER	NHRIV700010307-11	PLYMOUTH	Escherichia coli	68%	68%
	BOG BROOK	NHRIV700010602-09	ALEXANDRIA	Escherichia coli	complies	34%
	SALMON BROOK - EMERSON BROOK	NHRIV700010802-07	SANBORNTON	Escherichia coli	48%	70%
	WEEKS BROOK	NHRIV700010803-07	SANBORNTON	Escherichia coli	17%	36%
	SUCKER BROOK - UNNAMED BROOKS	NHRIV700010804-05	ANDOVER	Escherichia coli	82%	1%
	UNNAMED BROOK - TO SUCKER BROOK	NHRIV700010804-07	ANDOVER	Escherichia coli	97%	44%

Watershed	Waterbody Name	Assessment Unit #	Primary Town	Impairment	% Reduction to meet TMDL	
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Winnipesaukee River	LAKE WENTWORTH - ALBEE BEACH	NHLAK700020101-05-02	WOLFEBORO	Escherichia coli	56%	complies
	LAKE WENTWORTH - WENTWORTH STATE PARK BEACH	NHLAK700020101-05-03	WOLFEBORO	Escherichia coli	78%	complies
	MIRROR LAKE - MIRROR LAKE BEACH	NHLAK700020106-02-02	TUFTONBORO	Escherichia coli	41%	no data
	LAKE WINNIPESAUKEE - MELVIN VILLAGE LAKE TOWN PIER BEACH	NHLAK700020110-02-04	TUFTONBORO	Escherichia coli	78%	complies
	LAKE WINNIPESAUKEE - PUBLIC BEACH	NHLAK700020110-02-07	TUFTONBORO	Escherichia coli	67%	complies
	LAKE WINNIPESAUKEE - BREWSTER BEACH	NHLAK700020110-02-09	WOLFEBORO	Escherichia coli	78%	complies
	LAKE WINNIPESAUKEE - ALTON BAY TOWN BEACH	NHLAK700020110-02-10	ALTON	Escherichia coli	56%	no data
	LAKE WINNIPESAUKEE - PUBLIC DOCK TOWN BEACH	NHLAK700020110-02-11	ALTON	Escherichia coli	62%	complies
	LAKE WINNIPESAUKEE - ELACOYA STATE PARK BEACH	NHLAK700020110-02-12	GILFORD	Escherichia coli	78%	complies
	LAKE WINNIPESAUKEE - GILFORD TOWN BEACH	NHLAK700020110-02-13	GILFORD	Escherichia coli	77%	complies
	LAKE WINNIPESAUKEE - ENDICOTT PARK WEIRS BEACH	NHLAK700020110-02-14	LACONIA	Escherichia coli	98%	42%
	LAKE WINNIPESAUKEE - STATES LANDING TOWN BEACH	NHLAK700020110-02-17	MOULTONBOROUGH	Escherichia coli	84%	complies
	HUNKINS POND	NHLAK700020201-02	SANBORNTON	Escherichia coli	80%	no data
	LAKE WINNISQUAM - BARTLETTS BEACH	NHLAK700020201-05-03	LACONIA	Escherichia coli	78%	no data
	LAKE WINNISQUAM - BELMONT TOWN BEACH	NHLAK700020201-05-04	BELMONT	Escherichia coli	56%	complies
	LAKE WINNISQUAM - AHERN STATE PARK	NHLAK700020201-05-05	LACONIA	Escherichia coli	99%	complies
	OPECHEE BAY - OPECHEE POINT BEACH	NHLAK700020201-06-03	LACONIA	Escherichia coli	56%	complies
	OPECHEE BAY - OPECHEE PARK COVE BEACH	NHLAK700020201-06-04	LACONIA	Escherichia coli	78%	no data
	NORTH INLET TO RUST POND	NHRIV700020101-22	WOLFEBORO	Escherichia coli	80%	no data
	SHANNON BROOK	NHRIV700020103-12	MOULTONBOROUGH	Escherichia coli	28%	complies
	UNNAMED BROOK - TO WINONA LAKE	NHRIV700020108-01	ASHLAND	Escherichia coli	80%	80%
	UNNAMED BROOK - GOVERNORS PARK STREAM	NHRIV700020201-20	LACONIA	Escherichia coli	98%	94%
	WINNIPESAUKEE RIVER	NHRIV700020203-16	NORTHFIELD	Escherichia coli	41%	complies
Contoocook River	ELM BROOK - ELM BROOK STATE PARK BEACH	NHIMP700030503-01-02	HOPKINTON	Escherichia coli	27%	complies
	CONTOOCOOK LAKE - TOWN BEACH	NHLAK700030101-03-02	JAFFREY	Escherichia coli	12%	complies
	ZEPHYR LAKE - TOWN BEACH	NHLAK700030105-01-02	GREENFIELD	Escherichia coli	56%	complies
	OTTER LAKE - GREENFIELD SP PICNIC BEACH	NHLAK700030105-02-03	GREENFIELD	Escherichia coli	78%	48%
	OTTER LAKE - GREENFIELD SP MIDDLE BEACH	NHLAK700030105-02-04	GREENFIELD	Escherichia coli	76%	complies
	NORWAY POND - TOWN BEACH	NHLAK700030107-02-02	HANCOCK	Escherichia coli	72%	complies
	JACKMAN RESERVOIR - MANAHAN PARK TOWN BEACH	NHLAK700030202-03-02	HILLSBOROUGH	Escherichia coli	72%	complies
	PLEASANT LAKE - ELKINS BEACH	NHLAK700030402-02-02	NEW LONDON	Escherichia coli	78%	complies
	TANNERY POND - BEACH	NHLAK700030402-03-02	WILMOT	Escherichia coli	78%	14%
	UNNAMED TRIBUTARY - TO CONTOOCOOK LAKE	NHRIV700030101-05	JAFFREY	Escherichia coli	77%	28%
	CONTOOCOOK RIVER - US OF JAFFERY WWTF TO 3000 FT DS OF WWTF	NHRIV700030101-16	JAFFREY	Escherichia coli	no data	1%
	CONTOOCOOK RIVER - NORTH VILLAGE DAM TO US OF PETERBOROUGH WWTF	NHRIV700030104-17	PETERBOROUGH	Escherichia coli	<1%	45%
	CONTOOCOOK RIVER - OTTER BK TO POWDER MILL POND	NHRIV700030106-08	PETERBOROUGH	Escherichia coli	59%	complies
	MOOSE BROOK	NHRIV700030107-07	HANCOCK	Escherichia coli	80%	no data
	UNNAMED BROOK - TO ISLAND POND	NHRIV700030204-04	WASHINGTON	Escherichia coli	23%	5%
	BEARDS BROOK - TOWN BEACH	NHRIV700030204-15-02	HILLSBOROUGH	Escherichia coli	78%	54%
Nashua River	NASHUA RIVER - JACKSON PLANT DAM POND	NHIMP700040402-05	NASHUA	Escherichia coli	92%	no data
	MELENDY POND - TOWN BEACH	NHLAK700040401-01-02	BROOKLINE	Escherichia coli	78%	complies
	LAKE POTANIPO - TOWN BEACH	NHLAK700040401-02-02	BROOKLINE	Escherichia coli	78%	complies
	POTANIPO POND - CAMP TEVYA BEACH	NHLAK700040401-02-03	BROOKLINE	Escherichia coli	36%	no data
	NASHUA RIVER	NHRIV700040402-08	NASHUA	Escherichia coli	94%	complies
	NASHUA RIVER	NHRIV700040402-09	NASHUA	Escherichia coli	92%	no data

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Merrimack River	MERRIMACK RIVER - GARVINS FALLS	NHIMP700060302-07	CONCORD	Escherichia coli	88%	25%
	BERRY POND BROOK - TOWN BEACH	NHIMP700060501-03-02	PITTSFIELD	Escherichia coli	78%	complies
	MERRIMACK RIVER - AMOSKEAG DAM	NHIMP700060802-04	MANCHESTER	Escherichia coli	83%	complies
	SOUHEGAN RIVER	NHIMP700060902-01	GREENVILLE	Escherichia coli	80%	no data
	SOUHEGAN RIVER - PINE VALLEY MILL	NHIMP700060904-08	WILTON	Escherichia coli	49%	72%
	SOUHEGAN RIVER - MCLANE DAM	NHIMP700060906-08	MILFORD	Escherichia coli	86%	78%
	SONDOGARDY POND - GLINES PARK BEACH	NHLAK700060101-02-02	NORTHFIELD	Escherichia coli	50%	complies
	CRYSTAL LAKE-TOWN BEACH	NHLAK700060401-02-02	GILMANTON	Escherichia coli	81%	complies
	UPPER SUNCOOK LAKE - CAMP FATIMA BEACH	NHLAK700060402-10-03	BARNSTEAD	Escherichia coli	56%	complies
	JENNESS POND	NHLAK700060502-06	NORTHWOOD	Escherichia coli	98%	complies
	NORTHWOOD LAKE	NHLAK700060502-08-01	NORTHWOOD	Escherichia coli	90%	complies
	NORTHWOOD LAKE - TOWN BEACH	NHLAK700060502-08-02	NORTHWOOD	Escherichia coli	83%	50%
	CATAMOUNT POND - BEAR BROOK STATE PARK BEACH	NHLAK700060503-02-02	ALLENSTOWN	Escherichia coli	78%	34%
	WEARE RESERVOIR - CHASE PARK TOWN BEACH	NHLAK700060601-05-02	WEARE	Escherichia coli	56%	complies
	EVERETT LAKE - CLOUGH STATE PARK BEACH	NHLAK700060602-01-02	WEARE	Escherichia coli	56%	complies
	GLEN LAKE - PUBLIC (STATE OWNED) BEACH	NHLAK700060607-01-02	GOFFSTOWN	Escherichia coli	8%	no data
	NAMASKE LAKE	NHLAK700060607-02	GOFFSTOWN	Escherichia coli	83%	complies
	CRYSTAL LAKE-TOWN BEACH	NHLAK700060703-02-02	MANCHESTER	Escherichia coli	56%	no data
	BABOOSIC LAKE	NHLAK700060905-01-01	AMHERST	Escherichia coli	95%	no data
	BABOOSIC LAKE - TOWN BEACH	NHLAK700060905-01-02	AMHERST	Escherichia coli	70%	27%
	SILVER LAKE - STATE PARK BEACH	NHLAK700061001-02-02	HOLLIS	Escherichia coli	90%	complies
	NATICOOK LAKE - WASSERMAN PARK BEACH	NHLAK700061002-04-02	MERRIMACK	Escherichia coli	78%	complies
	ISLAND POND - CHASE'S GROVE	NHLAK700061101-01-02	DERRY	Escherichia coli	52%	complies
	WASH POND - TOWN BEACH	NHLAK700061101-03-02	HAMPSTEAD	Escherichia coli	71%	no data
	SUNSET LAKE - SUNSET PARK BEACH	NHLAK700061101-03-03	HAMPSTEAD	Escherichia coli	54%	complies
	CAPTAIN POND - CAPTAIN'S BEACH	NHLAK700061102-03-02	SALEM	Escherichia coli	complies	1%
	CAPTAIN POND - CAMP OTTER SWIM AREA BEACH	NHLAK700061102-03-03	SALEM	Escherichia coli	51%	no data
	BEAVER LAKE - GALLIEN'S BEACH	NHLAK700061203-02-02	DERRY	Escherichia coli	78%	55%
	HOODS POND - TOWN BEACH	NHLAK700061203-03-02	DERRY	Escherichia coli	94%	69%
	RAINBOW LAKE - KAREN-GENA BEACH	NHLAK700061203-05-02	DERRY	Escherichia coli	78%	47%
	ROBINSON POND	NHLAK700061203-06-01	HUDSON	Escherichia coli	57%	3%
	ROBINSON POND - TOWN BEACH	NHLAK700061203-06-02	HUDSON	Escherichia coli	95%	76%
	LONG POND - TOWN BEACH	NHLAK700061205-02-02	PELHAM	Escherichia coli	78%	26%
	COUNTRY POND - LONE TREE SCOUT RESV. BEACH	NHLAK700061403-03-03	KINGSTON	Escherichia coli	37%	complies
	GREAT POND - KINGSTON STATE PARK BEACH	NHLAK700061403-06-02	KINGSTON	Escherichia coli	56%	no data
	GREAT POND - CAMP BLUE TRIANGLE BEACH	NHLAK700061403-06-03	KINGSTON	Escherichia coli	56%	19%

Watershed	Waterbody Name	Assessment Unit #	Primary Town	Impairment	% Reduction to meet TMDL	
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Merrimack River	MERRIMACK RIVER	NHRIV700060101-12	FRANKLIN	Escherichia coli	47%	complies
	TANNERY BROOK - COLD BROOK	NHRIV700060102-07	BOSCAWEN	Escherichia coli	51%	52%
	GUES MEADOW BROOK	NHRIV700060201-09	CANTERBURY	Escherichia coli	75%	51%
	GUES MEADOW BROOK	NHRIV700060201-10	LOUDON	Escherichia coli	15%	49%
	SHAKER BRANCH	NHRIV700060202-09	LOUDON	Escherichia coli	80%	37%
	TURKEY RIVER - BOW BROOK	NHRIV700060301-13	CONCORD	Escherichia coli	80%	59%
	MERRIMACK RIVER	NHRIV700060302-24	CONCORD	Escherichia coli	59%	complies
	MERRIMACK RIVER - GARVINS FALLS BYPASS	NHRIV700060302-25-01	CONCORD	Escherichia coli	8%	complies
	PISCATAQUOG RIVER - CENTER BROOK	NHRIV700060602-06	WEARE	Escherichia coli	28%	54%
	PISCATAQUOG RIVER	NHRIV700060603-07	NEW BOSTON	Escherichia coli	complies	37%
	SOUTH BRANCH PISCATAQUOG RIVER	NHRIV700060606-05	NEW BOSTON	Escherichia coli	74%	29%
	HARRY BROOK	NHRIV700060607-15	GOFFSTOWN	Escherichia coli	complies	13%
	CATAMOUNT BROOK	NHRIV700060607-20	GOFFSTOWN	Escherichia coli	86%	no data
	COHAS BROOK - LONG POND BROOK	NHRIV700060703-05	MANCHESTER	Escherichia coli	63%	53%
	UNNAMED BROOK - FROM PINE ISLAND POND TO MERRIMACK RIVER	NHRIV700060703-09	MANCHESTER	Escherichia coli	99%	33%
	MERRIMACK RIVER	NHRIV700060802-14-02	HOOKSETT	Escherichia coli	98%	39%
	PATTEN BROOK	NHRIV700060803-12	BEDFORD	Escherichia coli	80%	85%
	MERRIMACK RIVER	NHRIV700060803-14-02	MANCHESTER	Escherichia coli	94%	36%
	MERRIMACK RIVER	NHRIV700060804-11	MERRIMACK	Escherichia coli	87%	complies
	SOUHEGAN RIVER - FURNACE BROOK	NHRIV700060901-09	NEW IPSWICH	Escherichia coli	89%	49%
	SOUHEGAN RIVER - TUCKER BROOK	NHRIV700060902-05	WILTON	Escherichia coli	49%	41%
	SOUHEGAN RIVER	NHRIV700060902-13	WILTON	Escherichia coli	35%	complies
	STONY BROOK - TOWN BEACH (GOSS PARK)	NHRIV700060903-16-02	WILTON	Escherichia coli	78%	19%
	PURGATORY BROOK	NHRIV700060904-07	MILFORD	Escherichia coli	55%	36%
	SOUHEGAN RIVER - STONY BROOK	NHRIV700060904-13	WILTON	Escherichia coli	69%	48%
	SOUHEGAN RIVER	NHRIV700060904-14	MILFORD	Escherichia coli	75%	67%
	RIDDLE BROOK	NHRIV700060905-18	BEDFORD	Escherichia coli	35%	54%
	BEAVER BROOK	NHRIV700060906-01	MONT VERNON	Escherichia coli	complies	19%
	GREAT BROOK - OX BROOK	NHRIV700060906-12	MILFORD	Escherichia coli	complies	39%
	SOUHEGAN RIVER	NHRIV700060906-13	MILFORD	Escherichia coli	86%	50%
	SOUHEGAN RIVER	NHRIV700060906-16	AMHERST	Escherichia coli	86%	67%
	SOUHEGAN RIVER	NHRIV700060906-18	MERRIMACK	Escherichia coli	80%	34%
	SOUHEGAN RIVER	NHRIV700060906-25	MERRIMACK	Escherichia coli	complies	3%
	WITCHES BROOK	NHRIV700061001-02	HOLLIS	Escherichia coli	87%	78%
	PENNICHUCK BROOK - WITCHES BROOK	NHRIV700061001-07	MERRIMACK	Escherichia coli	45%	68%
	MERRIMACK RIVER	NHRIV700061002-13	MERRIMACK	Escherichia coli	54%	complies
	MERRIMACK RIVER	NHRIV700061002-14	NASHUA	Escherichia coli	72%	25%
	SALMON BROOK - HASSELLS BROOK - OLD MAIDS BROOK - HALE	NHRIV700061201-05	NASHUA	Escherichia coli	92%	no data
	SALMON BROOK	NHRIV700061201-07	NASHUA	Escherichia coli	96%	90%
	BEAVER BROOK	NHRIV700061203-09	DERRY	Escherichia coli	complies	29%
	BEAVER BROOK	NHRIV700061203-22	PELHAM	Escherichia coli	63%	21%
	LAUNCH BROOK	NHRIV700061203-26	HUDSON	Escherichia coli	75%	50%
	BEAVER BROOK - TONYS BROOK	NHRIV700061205-01	PELHAM	Escherichia coli	50%	66%
	MERRIMACK RIVER	NHRIV700061206-24	NASHUA	Escherichia coli	96%	35%
	KELLY BROOK - SEAVER BROOK	NHRIV700061401-04	PLAISTOW	Escherichia coli	80%	59%

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Upper Connecticut River	CONNECTICUT RIVER - CANAAN HYDRO	NHIMP801010305-01	STEWARTSTOWN	Escherichia coli	76%	3%
	BISHOP BROOK - POND BROOK	NHRIV801010301-02	CLARKSVILLE	Escherichia coli	complies	3%
	HALLS STREAM	NHRIV801010303-02	PITTSBURG	Escherichia coli	75%	61%
	CONNECTICUT RIVER	NHRIV801010305-01	STEWARTSTOWN	Escherichia coli	72%	4%
	SIMMS STREAM - EAST BRANCH SIMMS STREAM	NHRIV801010403-01	COLUMBIA	Escherichia coli	66%	9%
	CONNECTICUT RIVER	NHRIV801010404-02	COLUMBIA	Escherichia coli	76%	51%
	CONNECTICUT RIVER	NHRIV801010405-03	COLUMBIA	Escherichia coli	57%	37%
	CONNECTICUT RIVER	NHRIV801010603-05	STRATFORD	Escherichia coli	complies	15%
	BURNSIDE BROOK	NHRIV801010805-04	NORTHUMBERLAND	Escherichia coli	49%	23%
	OTTER BROOK - CALEB BROOK - BONE BROOK	NHRIV801010805-05	LANCASTER	Escherichia coli	8%	50%
	OTTER BROOK	NHRIV801010805-06	LANCASTER	Escherichia coli	80%	79%
	WAUMBEK INN BROOK - TOWN BEACH	NHRIV801010806-03-02	JEFFERSON	Escherichia coli	70%	complies
	ISRAEL RIVER	NHRIV801010806-06	JEFFERSON	Escherichia coli	44%	complies
	ISRAEL RIVER	NHRIV801010806-09	LANCASTER	Escherichia coli	80%	54%
	CONNECTICUT RIVER	NHRIV801010902-02	NORTHUMBERLAND	Escherichia coli	complies	5%
	CONNECTICUT RIVER	NHRIV801010903-02	LANCASTER	Escherichia coli	complies	2%
Connecticut River - Johns River to Waits River	BURNS POND - PUBLIC BEACH	NHLAK801030101-01-02	WHITEFIELD	Escherichia coli	78%	44%
	FOREST LAKE - FOREST LAKE STATE PARK	NHLAK801030101-02-02	DALTON	Escherichia coli	56%	31%
	ECHO LAKE - FRANCONIA STATE PARK BEACH	NHLAK801030302-01-02	FRANCONIA	Escherichia coli	83%	complies
	TUTTLE BROOK - TWIN MTN REC AREA BEACH	NHRIV801030402-07-02	CARROLL	Escherichia coli	54%	complies
	AMMONOOSUC RIVER	NHRIV801030403-11	LITTLETON	Escherichia coli	33%	complies
	OLIVERIAN BROOK - MORRIS BROOK	NHRIV801030701-05	HAVERHILL	Escherichia coli	80%	84%
	CLARK BROOK	NHRIV801030703-02	HAVERHILL	Escherichia coli	65%	70%
Connecticut River - Waits River to White River	LAKE TARLETON	NHLAK801040201-03	PIERMONT	Escherichia coli	80%	complies
	POST POND - CHASE TOWN BEACH	NHLAK801040203-01-02	LYME	Escherichia coli	78%	complies
	BEAN BROOK-TOWN BEACH	NHRIV801040205-02-02	PIERMONT	Escherichia coli	78%	60%
Connecticut River - White River to Bellows Falls	SUGAR RIVER	NHIMP801060406-08	CLAREMONT	Escherichia coli	17%	33%
	CANAAN STREET LAKE - TOWN BEACH	NHLAK801060101-01-02	CANAAN	Escherichia coli	78%	<1%
	KOLEMOOK LAKE - TOWN BEACH	NHLAK801060401-08-02	SPRINGFIELD	Escherichia coli	56%	complies
	LITTLE SUNAPEE LAKE - BUCKLIN TOWN BEACH	NHLAK801060402-04-02	NEW LONDON	Escherichia coli	48%	complies
	SUNAPEE LAKE - GEORGES MILL TOWN BEACH	NHLAK801060402-05-02	SUNAPEE	Escherichia coli	46%	no data
	SUNAPEE LAKE - DEWEY (TOWN) BEACH	NHLAK801060402-05-03	SUNAPEE	Escherichia coli	78%	complies
	SUNAPEE LAKE - BLODGETT'S LANDING BEACH	NHLAK801060402-05-04	NEWBURY	Escherichia coli	78%	13%
	SUNAPEE LAKE - SUNAPEE STATE PARK BEACH	NHLAK801060402-05-05	NEWBURY	Escherichia coli	78%	complies
	OTTER POND - MORGAN BEACH	NHLAK801060402-12-02	NEW LONDON	Escherichia coli	54%	complies
	RAND POND - PUBLIC WAY BEACH	NHLAK801060403-04-02	GOSHEN	Escherichia coli	56%	complies
	MASCOMA RIVER	NHRIV801060105-05	CANAAN	Escherichia coli	68%	30%
	LOVEJOY BROOK - SCALES BROOK	NHRIV801060105-08	HANOVER	Escherichia coli	69%	25%
	HARDY HILL BROOK	NHRIV801060106-03	LEBANON	Escherichia coli	92%	72%
	BLODGETT BROOK	NHRIV801060106-04	LEBANON	Escherichia coli	92%	56%
	BLODGETT BROOK	NHRIV801060106-05	LEBANON	Escherichia coli	92%	85%
	SOUTH BRANCH SUGAR RIVER - GUNNISON BROOK	NHRIV801060403-12	GOSHEN	Escherichia coli	69%	47%
	NORTH BRANCH SUGAR RIVER - PERKINS BROOK	NHRIV801060404-11	CROYDON	Escherichia coli	71%	25%
	SUGAR RIVER	NHRIV801060405-10	SUNAPEE	Escherichia coli	59%	22%
	SUGAR RIVER	NHRIV801060405-25	NEWPORT	Escherichia coli	70%	55%
	SUGAR RIVER	NHRIV801060405-27	NEWPORT	Escherichia coli	complies	9%
	SUGAR RIVER	NHRIV801060406-30	CLAREMONT	Escherichia coli	64%	4%
	SUGAR RIVER	NHRIV801060407-09-02	CLAREMONT	Escherichia coli	complies	27%
	SUGAR RIVER	NHRIV801060407-16	CLAREMONT	Escherichia coli	29%	29%
	CHASE BROOK	NHRIV801060701-05	UNITY	Escherichia coli	80%	6%

Watershed	Waterbody Name	Assessment Unit #	Primary Town	Impairment	% Reduction to meet TMDL	
					Single Sample	Geometric Mean
Connecticut River - Bellows Falls to Vernon Dam	COLD RIVER - VILAS POOL BEACH	NHIMP801070202-01-02	ALSTEAD	Escherichia coli	78%	3%
	COLD RIVER - UNDERWOOD BROOK	NHRIV801070201-08	ACWORTH	Escherichia coli	73%	complies
	COLD RIVER - BOWERS BROOK	NHRIV801070202-04	ACWORTH	Escherichia coli	80%	50%
	CRANE BROOK	NHRIV801070202-09	ACWORTH	Escherichia coli	98%	complies
	COLD RIVER - WARREN BROOK	NHRIV801070203-04	ALSTEAD	Escherichia coli	80%	40%
	COLD RIVER	NHRIV801070203-09	LANGDON	Escherichia coli	84%	complies
	PARTRIDGE BROOK	NHRIV801070503-02	CHESTERFIELD	Escherichia coli	80%	complies
	PARTRIDGE BROOK	NHRIV801070503-03	WESTMORELAND	Escherichia coli	80%	69%
Connecticut River - Ashuelot River-Vernon Dam to Millers River	ASHUELOT RIVER - HOMESTEAD WOOLEN MILL DAM	NHIMP802010401-01	SWANZEY	Escherichia coli	62%	23%
	MILLEN POND - TOWN BEACH	NHLAK802010101-06-02	WASHINGTON	Escherichia coli	73%	complies
	SURRY MOUNTAIN RESERVOIR - REC AREA BEACH	NHLAK802010104-02-02	SURRY	Escherichia coli	86%	complies
	OTTER BROOK - OTTER BROOK PK BEACH	NHLAK802010201-06-02	KEENE	Escherichia coli	87%	complies
	RUSSEL RESERVOIR - CHESHAM BEACH	NHLAK802010202-07-02	HARRISVILLE	Escherichia coli	78%	complies
	SWANZEY LAKE - RICHARDSON PARK TOWN BEACH	NHLAK802010302-01-02	SWANZEY	Escherichia coli	67%	complies
	ASHUELOT RIVER	NHRIV802010101-08	WASHINGTON	Escherichia coli	72%	complies
	UNNAMED BROOK - TO SAND POND	NHRIV802010101-19	MARLOW	Escherichia coli	96%	57%
	UNNAMED BROOK - TO SAND POND	NHRIV802010101-20	MARLOW	Escherichia coli	80%	no data
	ASHUELOT RIVER	NHRIV802010103-22	GILSUM	Escherichia coli	68%	35%
	ROBBINS BROOK	NHRIV802010202-16	MARLBOROUGH	Escherichia coli	80%	complies
	ASHUELOT RIVER - ASHUELOT RIVER DAM POND TO OTTER BR	NHRIV802010301-09	KEENE	Escherichia coli	62%	56%
	SOUTH BRANCH ASHUELOT RIVER - QUARRY BROOK	NHRIV802010303-11	TROY	Escherichia coli	36%	54%
	SOUTH BRANCH ASHUELOT RIVER	NHRIV802010303-12	TROY	Escherichia coli	80%	58%
	SOUTH BRANCH ASHUELOT RIVER	NHRIV802010303-18	TROY	Escherichia coli	80%	58%
	SOUTH BRANCH ASHUELOT RIVER	NHRIV802010303-20	MARLBOROUGH	Escherichia coli	79%	43%
	SOUTH BRANCH ASHUELOT RIVER	NHRIV802010303-23	SWANZEY	Escherichia coli	complies	26%
	ASHUELOT RIVER - SOUTH BRANCH TO HOMESTEAD DAM	NHRIV802010401-15	SWANZEY	Escherichia coli	80%	62%
	MIREY BROOK - BLACK BROOK	NHRIV802010402-06	WINCHESTER	Escherichia coli	80%	65%
	ASHUELOT RIVER - 300FT US OF WINCHESTER WWTF TO 3000FT DS OF	NHRIV802010403-07	WINCHESTER	Escherichia coli	47%	41%
	ASHUELOT RIVER - 300FT US OF HINSDALE WWTF TO CONNECTICUT R	NHRIV802010403-20	HINSDALE	Escherichia coli	80%	72%
Coastal Impaired Segments	ATLANTIC OCEAN - NEW CASTLE BEACH	NHOCN000000000-02-02	NEW CASTLE	Enterococcus	86%	complies
	ATLANTIC OCEAN - PIRATES COVE BEACH	NHOCN000000000-02-04	RYE	Enterococcus	78%	complies
	ATLANTIC OCEAN - CABLE BEACH	NHOCN000000000-02-05	RYE	Enterococcus	39%	complies
	ATLANTIC OCEAN - SAWYER BEACH[1]	NHOCN000000000-02-06	RYE	Enterococcus	35%	no data
	ATLANTIC OCEAN - JENNESS BEACH	NHOCN000000000-02-07	RYE	Enterococcus	72%	complies
	ATLANTIC OCEAN - STATE BEACH[1]	NHOCN000000000-02-09	NORTH HAMPTON	Enterococcus	86%	complies
	ATLANTIC OCEAN - HAMPTON BEACH STATE PARK BEACH	NHOCN000000000-02-10	HAMPTON	Enterococcus	75%	complies
	ATLANTIC OCEAN - SEABROOK TOWN BEACH	NHOCN000000000-02-11	SEABROOK	Enterococcus	91%	complies
	BASS BROOK BEACH OUTFALL AREA[1]	NHOCN000000000-03-01	RYE	Enterococcus	26%	no data
	ATLANTIC OCEAN - BASS BEACH[1]	NHOCN000000000-03-02	RYE	Enterococcus	50%	complies
	ATLANTIC OCEAN - CHAPEL BROOK[1]	NHOCN000000000-04	OCEAN	Enterococcus	95%	60%
	ATLANTIC OCEAN - LITTLE RIVER[1]	NHOCN000000000-06	OCEAN	Enterococcus	92%	81%
	ATLANTIC OCEAN - PARSONS CREEK[1]	NHOCN000000000-07	OCEAN	Enterococcus	89%	71%

Watershed	Waterbody Name	Assessment Unit #	Primary Town	Impairment	% Reduction to meet TMDL	
					90th Percentile	Geometric Mean
Coastal Impaired Segments	ATLANTIC OCEAN - SAWYER BEACH[2]	NHOCN000000000-02-06	RYE	Fecal Coliform	90%	40%
	ATLANTIC OCEAN - STATE BEACH[2]	NHOCN000000000-02-09	NORTH HAMPTON	Fecal Coliform	90%	65%
	BASS BROOK BEACH OUTFALL AREA[2]	NHOCN000000000-03-01	RYE	Fecal Coliform	92%	no data
	ATLANTIC OCEAN - BASS BEACH[2]	NHOCN000000000-03-02	RYE	Fecal Coliform	93%	78%
	ATLANTIC OCEAN - CHAPEL BROOK[2]	NHOCN000000000-04	OCEAN	Fecal Coliform	78%	11%
	ATLANTIC OCEAN - EEL POND	NHOCN000000000-05	OCEAN	Fecal Coliform	90%	40%
	ATLANTIC OCEAN - LITTLE RIVER[2]	NHOCN000000000-06	OCEAN	Fecal Coliform	90%	65%
	ATLANTIC OCEAN - PARSONS CREEK[2]	NHOCN000000000-07	OCEAN	Fecal Coliform	90%	60%

1 also listed for Fecal Coliform impairment

2 also listed for Enterococcus impairment

9. EXAMPLES OF IMPLEMENTATION PLANS TO REMOVE BACTERIA IMPAIRMENT

Two pilot implementation planning projects have been conducted concurrently with development of this New Hampshire Statewide TMDL for Bacteria Impaired Waters. Each project provides an implementation plan for restoring one of the bacteria impaired segments documented in this report. These projects are designed to serve as examples of next steps for restoring impaired waters and may be readily adapted by stakeholders to support development of restoration plans for other impaired segments. The full implementation plan reports are appended as follows:

- Appendix Q: Furnace Brook Watershed-Based Restoration Plan
- Appendix R: Greenville IDDE Investigation Report

A brief summary of each pilot project is provided below.

9.1 Furnace Brook Watershed-Based Restoration Plan

Furnace Brook is a small stream situated in New Ipswich and flowing into the Souhegan River in southern New Hampshire. Furnace Brook has been adversely impacted in several important ways, including by elevated levels of potentially harmful bacteria. A watershed-based restoration plan has been developed for Furnace Brook.

The overall goal of the project is to develop a watershed management plan to remove excess bacteria and other pollutants and to restore the Brook. The approach has included working collaboratively with stakeholders, conducting as much local assessment as possible, and identifying practical, locally-supported mitigation actions to restore Furnace Brook. Specifically, the project consists of the following tasks:

1. Coordinate closely with local stakeholders in all phases of the project;
2. Obtain and review available reports, data, and knowledge related to Furnace Brook;
3. Design and conduct a field investigation, including water sampling;
4. Conduct pollutant source identification surveys and analyses;
5. Estimate bacteria source loading and reductions associated with mitigative actions
6. Prioritize potential pollutant sources to mitigate in coordination with stakeholders; and
7. Develop preliminary mitigation measures for high priority sources.

The Furnace Brook watershed-based restoration plan report describes each of the tasks above and provides recommended next step actions to restore Furnace Brook.

9.2 Greenville IDDE Investigation Report

Greenville is a small, southern New Hampshire town with a downtown area featuring historic mill buildings situated along the Souhegan River. Like many downtown areas, Greenville has a storm drain network that routes stormwater runoff from streets and rooftops through a set of pipes and into an adjacent river. Routine monitoring conducted by the NHDES found elevated levels of indicator bacteria in two of Greenville's storm drain outfalls. A storm drain study was conducted to identify and support removal of bacteria sources from the storm drain network.

The approach applied in conducting this investigation was to begin at the storm drain outfall, where the presence of excess bacteria was known to exist, and to work upgradient in the system to identify and isolate source(s) of bacteria. A set of investigative tools was applied to help narrow in on—and ultimately pinpoint—these unseen sources of water quality pollution. These tools included:

- Storm drain network reconnaissance and mapping;
- Bracket sampling; bacteria sampling to bracket bacteria source locations;
- Optical brightener surveys;
- Television surveys; and
- Dye studies.

The Greenville Illicit Discharge Detection and Elimination report provides a summary of each of these investigative activities and recommended next steps to support removal of bacteria.

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