

COMMISSIONERS OFFICE

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January, 1999

Dear Reader:

It is with a great deal of pleasure that I present to you Vermont's 1998 Water Quality Assessment [305(b)] Report. The report is required by Congress by Section 305(b) of the Clean Water Act. This abbreviated water quality assessment discusses the first round of the new rotational watershed assessment process. Watersheds included are: White River, Otter Creek, and Lower Lake Champlain. The rotational assessment calls for assessing surface water quality in one-fifth of the state each year, resulting in a complete statewide assessment every five years. This report also includes reassessment results of many lakes throughout the state, plus updates to some programs and other information since the 1996 305(b) Report.

The rotational watershed assessments found that 93%, 77% and 88% of the assessed river and stream miles in the White River, Otter Creek and Lower Lake Champlain watersheds, respectively, fully support the water uses for which they have been classified. For lakes reassessed during the reporting period, 24% of the lake acres fully support all designated uses. This figure includes the fish consumption advisory (which primarily affects lake fish) for child-bearing-age women and children 6 years old and younger.

Common pollutants found in the assessed waterbodies include silt, pathogens and nutrients, which come from eroding stream/lake banks, urban areas and agricultural lands. Additional causes of pollution occurring in certain of the watersheds include thermal modifications, flow modifications, metals, total toxics, algae, and low dissolved oxygen. Sources of these pollutants include atmospheric deposition, natural sources, flow regulation and habitat alterations.

Many of Vermont's lakes and rivers have been cleaned up by construction of approximately 150 municipal and industrial waste water treatment facilities. However, as you can see from the recent assessments above, much work needs to be done to complete the clean-up job - primarily to reduce pollution from non-point, or dispersed, sources. We are indeed fortunate to have many volunteer groups around the state to assist us in this important work. As of last count, there were active watershed or lay monitoring groups on approximately 26 rivers, 70 lakes and 36 Lake Champlain stations. Their work is truly needed and greatly appreciated.

Your comments on the report or other comments or suggestions on ways to improve Vermont's water resources are always welcome. Please write to me or call me at the above phone number.

Sincerely,

Canute E. Dalmasse,
Commissioner

CED:jm
enclosure

STATE OF VERMONT
1998 WATER QUALITY ASSESSMENT
305(B) REPORT

AN ABBREVIATED REPORT, PREPARED IN ACCORDANCE WITH EPA GUIDELINES

Agency of Natural Resources
Department of Environmental Conservation
Water Quality Division
Waterbury, Vermont 05671-0408
January, 1999

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LIST OF ACRONYMS USED IN THIS DOCUMENT

AAP	Acceptable Agricultural Practices
AMP	Acceptable Management Practices
ANCP	Aquatic Nuisance Control Program
ANR	VT Agency of Natural Resources
AOT	VT Agency of Transportation
BASS	Biomonitoring & Aquatic Studies Section
BMP	Best Management Practice
CSO	Combined Sewer Overflow (Sanitary and Storm Sewer Discharges in the Same Pipe)
DAF&M	VT Department of Agriculture, Food & Markets
DEC	VT Department of Environmental Conservation
Department	VT Department of Environmental Conservation
EPA, USEPA	Federal Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
FRAC	Forest Resources Advisory Committee
FS	Fully Supporting Uses as Defined by the Water Quality Standards
NPDES	National Pollution Discharge Elimination System
NOAV	Notice of Alleged Violation
NPS	Nonpoint Source Pollution
NRCS	National Resource & Conservation Service (Formerly SCS)
NWI	National Wetland Inventory
NS	Not Supporting Uses as Defined by the Water Quality Standards
GIS	Geographic Information System
GPS	Geo Positioning System
HHW	Household Hazardous Waste
IBI	Index of Biotic Integrity
O&M	Operation & Maintenance
ORW	Outstanding Resource Water
TMDL	Total Maximum Daily Load
UST	Underground Storage Tank
WBID	Waterbody Identification Number
WBS	Waterbody System
WMZ	Waste Management Zone
WWTF	Waste Water Treatment Facility

FOREWORD

Section 305(b) of the Federal Water Pollution Control Act (Clean Water Act) requires each state to submit a biennial report to the Environmental Protection Agency (EPA), which provides information about the quality of the state's surface and ground waters. This water quality assessment [often called the *305(b) Report, or 305(b) Process*] summarizes Vermont's water quality conditions during the January 1, 1996 through December 31, 1997 reporting period. The 305(b) report also briefly provides the reader with an understanding of the programs designed to assess and reduce or eliminate water quality problems, as well as some special state concerns which have been identified.

For 1998, EPA has given the states three options, or reporting formats, to select from. Vermont has chosen the "preferred" format which includes annual electronic reports, accompanied in even years by an abbreviated narrative 305(b) report of the previous year's rotating assessment of one-fifth of the state. The second option would require, in even years, an electronic report accompanied by an abbreviated narrative report. The third, and "least preferred" option, would be to submit a full 305(b) report in even years, as in the past.

The next full 305(b) report is expected to be produced in 2002. The only information contained in this year's report is that which has changed from the 1996 305(b) report. For a full description of Vermont's water quality and protection programs, the reader is referred to the "State of Vermont 1996 Water Quality Assessment." The 1996 Report may be found on the internet at: <http://www.anr.state.vt.us/dec/waterq/wq305b96/intro.htm>.

The Water Quality Assessment reports whether or not the state's surface water uses as defined by EPA and the State Water Quality Standards are *fully supported, threatened/fully supported, partially supported, or not supported*. Water uses include, but are not limited to, drinking, aquatic life, recreation and agriculture. Determination of use support may be made either from *monitored* information (e.g., water testing) or from *evaluated* information by water resources personnel, fish and wildlife biologists, aquatic biologists, lake association members and other qualified individuals or groups.

River or stream segments and lakes and ponds where one or more uses are not fully supported (i.e. either partially supported or not supported) are considered impaired (*Guidelines for Preparation of the Comprehensive State Water Quality Assessments [305(b) Reports] and Electronic Updates: Supplement, September 1997*). Use support determinations for this report were made using both quantitative (monitored) and qualitative (evaluated) information, including data from sampling, modeling results or best professional judgements.

The 305(b) process has become increasingly important as a means of evaluating and documenting to Congress, Vermont residents and the Vermont General Assembly the progress made in maintaining and restoring the state's water quality and the extent of the remaining problems. EPA's vision for State 305(b) reports is that the "...reports will characterize water

quality and the attainment of water quality standards at various geographic scales." EPA's more detailed vision states that the 305(b) reports will:

- Comprehensively characterize the waters of the States, Tribes, Territories and the Nation, including surface water, ground water and wetlands.
- Use data of known quality from multiple sources to make assessments.
- Indicate progress toward meeting water quality standards and goals.
- Describe causes of polluted waters and where and when waters need special protection.
- Support watershed and environmental policy decision making and resource allocation to address these needs.
- Describe the effects of prevention and restoration programs as well as associated cost and benefits.
- In the long term, describe assessment trends and predict changes.
- Initiate development of a comprehensive inventory of water quality that identifies the location and causes of polluted waters and that helps States, Tribes, Territories direct control programs and implement management decisions.

In order to achieve the vision and long-term goals for the 305(b) process and to coordinate reporting efforts among the States, Territories, Interstate Commissions and Tribes, EPA requested that the following goals be addressed in the 1998 305(b) report.

- *Expand use of biological indicators and reporting*
The Department of Environmental Conservation (the Department, or simply, DEC) has expanded its ambient biological monitoring activities each year since 1985. As mentioned in the 1996 305(b) Report, the Department has compiled biological monitoring data from over 700 sites, representing approximately 1,200 sampling events since 1985.
- *Improve data management and institute annual/biennial electronic reporting.*
The Department has moved away from EPA's Waterbody System (WBS), which was not compatible with existing widely-used data management programs throughout the Department. The Department now uses a Paradox© 4.5 database for 305(b) data management. Paradox© is being used by several sections within DEC, which improves data sharing. Regarding electronic reporting, the Department submitted its first rotating assessment electronic report to EPA in the fall of 1997. Vermont was the first state in the nation to submit waterbody-specific information in this manner.
- *Achieve comprehensive assessment coverage (complete spatial coverage)*
Part III contains detailed information regarding how Vermont plans to achieve comprehensive assessment coverage. A major change in how Vermont assesses its rivers and streams was made in 1997, resulting in much more detailed assessments, and specific follow-up action to monitor suspected problem sites and correct impairments.

- *Increase assessments of drinking water use support*
This remains a goal for the Department. Until sufficient resources are available to specifically perform drinking water use source support assessments, they will be performed as part of the Department's yearly rotational basin assessments.
- *Document and improve assessment quality*
Vermont will strive to develop data description levels for biomonitoring information in the future. For example, the lowest level of information would be that which is evaluated by volunteers and is 5 or more years old. The highest level would be monitored information which is derived from direct biological and habitat measures during key seasons using a regional reference condition approach. This type of description level would give the reader the basis of the underlying information.
- *Increase the use of visuals in presenting information (e.g. GIS maps)*
It is a goal for future assessments to include Geographic Information System (GIS) - produced color basin maps. However, until all of Vermont's waterbodies are located by GIS technology, use support and other water quality information cannot be presented using such technology.
- *Develop a process for reporting by hydrologic unit (georeferencing)*
The Department uses waterbody identification numbers (WBID) for reporting by hydrologic unit. Each waterbody in the state is assigned a waterbody identification number. The WBID consists of the state two-letter abbreviation followed by a two-digit basin number, then a two-digit (river) or five-digit (lake) waterbody number. Waterbodies may consist of several small tributaries, a lake or a portion of the mainstem of a river. For example, WBID #VT08-01 is the mainstem of the Lower Winooski River (Basin 08). WBID #VT05-04L01 is the Northeast Arm of Upper Lake Champlain. There are 555 lake and pond waterbodies and 210 river and stream waterbodies in Vermont.

PART I: EXECUTIVE SUMMARY/OVERVIEW

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Background

Vermont has approximately 7,099 miles of rivers and streams, 300,000 acres of fresh water wetlands and 809 lakes and ponds (those over 5 acres in size or those named on USGS maps) totaling 228,915 acres. The state's waters (not including wetlands) are classified as Class A or Class B, with an overlay Waste Management Zone in Class B waters for public protection below sanitary wastewater discharges. Class A waters are managed for enjoyment of water in its natural condition, as public drinking water supplies (with disinfection when necessary) or as high quality waters which have significant ecological values.

There are approximately 164 miles of Class A rivers and streams and 980 acres of Class A lakes and ponds in Vermont (not including waters above 2,500 feet elevation which are also Class A). In addition, there are 6,935 miles of Class B rivers and streams and 227,935 acres of Class B lakes and ponds. Approximately 313 miles of the Class B rivers and streams and 15 acres of lakes and ponds are Waste Management Zones. The Batten Kill, the West Branch of the Batten Kill, Lower Poultney River, a segment of the Ompompanoosuc River and Pikes Falls on the North Branch of Ball Mountain Brook have been designated as Outstanding Resource Waters.

Overall Description of Vermont's Water Quality

The water quality of all Vermont's rivers and streams and lakes and ponds is considered good. This overall water quality rating has not changed from that which was reported in the 1996 305(b) Report. The federal EPA has requested states to also assess the state's water quality considering the fish consumption advisory for mercury which was issued in June, 1995 and revised in July, 1997. The advisory was issued as the result of fish tissue sampling which showed mercury in the tissue of all fish, particularly in walleye and lake trout, and also PCBs in lake trout¹. (See updated advisory as Appendix A) Therefore, taking the advisory into consideration results in the overall water quality of all the state's waterbodies to be rated as fair to poor.

With regard to Vermont's wetlands, their water quality is believed to be generally good, although Vermont does not have a specific program of assessing wetland water quality. It has been incumbent upon the state's limited resources to insure important wetland functions and values are protected from being lost to development or other destructive practices.

¹Still in effect is the 1989 advisory for PCBs (polychlorinated biphenyls) in Lake Champlain.

Vermont also does not have a specific program to assess ground water quality. The quality of Vermont's ground water is not readily determined from the existing data. Information regarding ground water quality is for finished water from public water systems.

Water Pollution Control Program

Watershed Approach - Vermont is in the process of adopting a watershed approach to surface water quality planning. The draft document, *Watershed Approach to Surface Water Quality Planning*, calls for basin surface water plans to be developed on a periodic basis.

Water Quality Standards - The Water Quality Standards are the foundation of the state's water pollution control and water quality protection efforts. The present Standards were adopted April 2, 1997 and contain a few changes from those that were in use when the 1996 305(b) Report was prepared. One change to the Standards now indirectly includes wetlands as waters of the state, by application of the Standards "...to all 'waters of the United States,' as defined in 40 C.F.R." Another change has to do with the fact that compliance with the Standards is no longer assumed when acceptable management practices (AMPs) are applied to potential agricultural and silvicultural nonpoint sources of pollution. Presently, the Water Quality Standards are undergoing major revisions.

POINT SOURCE CONTROL PROGRAM

Twenty million dollars were spent during the 1996-1997 reporting period on waste water treatment facility (WWTF) upgrades, combined sewer overflow (CSO) corrections and other waste water treatment improvements in 14 towns.

NONPOINT SOURCE CONTROL PROGRAM

Overview - Vermont was one of the first states in the country to have an EPA-approved Nonpoint Source Management Program (March, 1989). In over six years, Vermont has received approximately \$6 million in Section 319 Nonpoint Source (NPS) funds to implement a variety of activities directed at high priority waterbodies. The goal of the NPS management program is to encourage the successful implementation of best management practices (BMPs) by farmers, developers, municipalities, lakeshore residents, landowners and riparian landowners to prevent or reduce the runoff of pollutants.

Some of the activities carried out with Section 319 funding during the last two years included agricultural BMP evaluation and development, and cooperative funding assistance from the Partnership Program for the Better Backroads Program to protect surface waters near town roads.

Section 604(b) Program - Work under the 604(b) Program continued with the awarding of pass through funds to the 12 Regional Planning Commissions to determine the nature, extent and

causes of pollution and develop plans to resolve those problems. Other notable 604(b) work included field evaluation of the water quality of rivers and streams as part of the first and second year's rotational basin assessment, and preparation of the 305(b) Water Quality Assessment Report.

Other Federal Sources - FFY97 EQIP funds (\$1.3 million) were directed as cost sharing assistance to approximately 170 farms for nonpoint source pollution control.

Lake Champlain Management Conference - The Lake Champlain Management Conference, in its October 1996 Plan, has recommended three priorities for action to improve the water quality of Lake Champlain. They are: 1) Reduce phosphorus pollution; 2) Prevent pollution from toxic substances; 3) Manage nuisance nonnative aquatic plants and animals.

Agriculture - Acceptable Agricultural Practices (AAPs) rules became effective June 29, 1995. The AAPs are basic practices that all farm operators are expected to follow without financial assistance to reduce agricultural nonpoint pollutant discharges. Voluntary Best Management Practices (BMPs) were adopted and became effective as rules January 27, 1996. BMPs are site specific practices prescribed to correct a problem on a specific farm. In 1995, the Legislature created a state financial assistance program to help pay for voluntary construction of farm improvements designed to abate NPS waste discharges. The sum of approximately \$350,000 was appropriated by the Legislature for this purpose in 1995 and 1996, and approximately \$500,000 was appropriated in 1997.

Storm Water - Storm Water General Permit Rules were approved and became effective in October 1991. The Stormwater Procedures were officially adopted in December, 1997.

Flow Alteration/Regulation - To protect natural flows in Vermont's rivers and streams, the Agency adopted the "Agency Procedure for Determining Conservation Flows in July, 1993. A rule was adopted in February 1996 to govern water withdrawals for snowmaking.

Cost Benefit Assessment

The total expenditure of state, federal and local funds for all municipal wastewater treatment facilities and appurtances to date has been approximately \$468 million. Annual operation and maintenance costs of these facilities a (using 1994 costs) is approximately \$69 million. These facilities have improved the water quality of 58 rivers and 3 lakes for swimming, fishing, boating and aquatic life. This includes approximately \$20 million in wastewater treatment appurtances constructed during the 1996-1997 reporting period, which have further improved the water quality of 10 rivers and one lake.

The amount of funding expended on nonpoint source control of pollutants is not as easy to calculate due to the many and various state and federal agencies and volunteer watershed groups which deal with NPS pollution. Aside from several federal and state cost sharing programs to

assist with planning and implementation of nonpoint source pollution reduction from agricultural sources, there are two federal programs that deal with NPS pollution control - the 604(b) Pass Through program (planning) and the Section 319 (now a component of the Performance Partnership grant). Expenditures for the two programs amounted to approximately \$460,000 from FY89 through FY97 [604(b)] and approximately \$6 million from 1990 through 1997 (Section 319).

The Upper White River Stream Enhancement Project was undertaken in 1997 by a partnership of state and federal agencies and watershed landowners and citizens. This is an example of the stream bank restoration work going on around the state. The White River Partnership group stabilized 4,525 feet of streambank for enhanced fisheries and riparian habitat.

Special State Concerns and Recommendations

All but two of the special state concerns identified in the 1996 305(b) Report remain as special concerns. Revision of the Water Quality Standards and the need for Comprehensive Water Resources Planning and Protection have been, or are in the process of being resolved. Four new concerns regarding nonpoint pollution have recently emerged:

- Polluting discharges from large farms
- Road runoff to waterbodies
- Lack of statewide vegetated buffer requirements
- Need for wastewater treatment for small communities

Current Surface Water Quality Monitoring Program

Overview - The surface water quality monitoring activities conducted by the Department during 1996-1997 are similar in most respects to those conducted during the 1994-1995 reporting period. They are described in the 1996 305(b) Report and in the document, *Monitoring of the Aquatic Environment*. Both documents are available from the Department. They are also available through the internet. The 305(b) Report can be found at: <http://www.anr.state.vt.us/dec/waterq/wq305b96/intro.htm>. The *Monitoring* document is at: <http://www.anr.state.vt.us/dec/waterq/watermon.htm>. The following are new monitoring/evaluation assessment initiatives begun during the reporting period.

New or Completed Monitoring Projects - Notable additional lake monitoring activities since the last report included the Lake Bioassessment Project and the Assessment of Mercury in Hypolimnetic Sediment of Vermont and New Hampshire Lakes Project. The Lake Carmi Watershed special monitoring project is now complete.

Rotational Watershed Assessment - Vermont's new water quality assessment process began in the spring of 1997. The first three basins assessed in 1997 included: Otter Creek (Basin #3), Lower Lake Champlain Direct (Basin #4) and the White River (Basin #9).

Plan for Achieving Comprehensive Assessments

A draft document entitled *Watershed Approach to Surface Water Quality Planning* (Appendix E) briefly describes several Department activities which would constitute a Plan for Achieving Comprehensive Assessments, if adopted. This would be in addition to special and on-going lake water quality assessments presently being undertaken.

Assessment Methodology

River and stream data was updated and incorporated into the database for this report. Included in the database is information from the first year rotational watershed assessment, along with any water quality information from questionnaires that were provided by district fisheries biologists, watershed association leaders, U.S. Forest Service fisheries biologists, water quality biologists, Natural Resources Conservation Service personnel and local USDA working groups. Information and various files from other divisions, such as Enforcement, Wastewater, Waste (Hazardous and Solid) Management were also used for this report.

Most (81%) of the water quality information for rivers and streams was based on evaluated² information. The remainder of the river and stream information was based on data obtained through monitoring³, primarily from the Ambient Biomonitoring Network. Water quality information for wetlands was not determined because data was not available. With respect to lakes and ponds water quality information, approximately 38% of the assessed inland lakes were evaluated and 62% were monitored. All of Lake Champlain was monitored.

Section 303(d) Waters

The Section 303(d) 1998 List of Waters will be presented under separate cover once the listing process has been completed, including EPA approval of the final submittal. The draft 1998 List was the subject of public meetings in March and September, 1998. The 1998 List of Waters contains two sections. Part A identifies impaired waters which are targeted and scheduled for total maximum daily load (TMDL) development. Part B contains waters which were listed in 1996 and are proposed for 303(d) "de-listing."

²Information obtained from professional opinions and department files. Information not based on water quality sampling.

³Water quality assessment based on biological, chemical or physical analysis.

Rivers and Streams Water Quality Assessment

Including the waters assessed for this report, 79% of Vermont's total assessed miles (5,261 miles assessed) fully support designated water uses, 14% partially support uses, and 7% do not fully support designated uses. Applying the fish advisory to all the state's rivers and streams would result in no rivers and streams fully supporting designated uses, 93% would be partially supporting, and 7% not supporting. This is due to the EPA guidelines, which require waters to be designated as partially supporting if there are any fish consumption advisories for the general public. As stated in the 1996 305(b) Report, nonpoint sources of pollution remain the most widespread cause of water quality impairment affecting rivers and streams.

Assessment of use support in the Otter Creek Basin (936 square miles) indicates that approximately 77% of the assessed miles fully support designated uses. Approximately 14% of the assessed miles partially support designated uses, and approximately 8% do not support uses. Applying the fish consumption advisory to the Otter Creek Basin would result in 92% of the assessed waters partially supporting and 8% not supporting designated uses. The major causes of impairment or threats to water quality in the Otter Creek Basin include siltation, nutrients, pathogens, organic enrichment, metals and suspended solids. Sources of these impairments include streambank erosion, agriculture, natural sources, atmospheric deposition, urban runoff/storm sewers, flow modification and removal of riparian vegetation

Assessment of use support of the Lower Lake Champlain Basin (80 square miles) indicates that approximately 88% of the assessed river miles fully support designated uses, 5% partially support uses, and 7% do not support designated uses. The causes of impairments include nutrients, pathogens and algae as the result of agricultural runoff, decaying aquatic plants and droppings from waterfowl.

Assessment of use support in the White River Basin (710 square miles) indicates that approximately 93% of the river and stream miles fully support designated uses, and approximately 7% partially support or do not support designated uses. Applying the fish consumption advisory to the White River Basin would result in 99% of the river miles being partially supported and 1% being not supported. The major causes of impairment or threats to water quality in the White River Basin include siltation, thermal modifications, nutrients, turbidity and pathogens. Sources of impairments to the White River include streambank destabilization, removal of riparian vegetation and agriculture.

Lakes and Ponds Water Quality Assessment

Assessment of use support of all lakes and ponds throughout Vermont indicates that 52% of assessed lake acres fully support their designated uses, 23% partially support uses and 25% do not support

designated uses. The inclusion of the fish consumption advisory causes 75% of all assessed lakes acres to be partially supporting designated uses and 25% not supporting uses.

For the lakes reassessed during the 1996-1997 reporting period, 24% of the lake acres fully support all designated uses, 35% partially support uses and 41% do not support uses. These support figures include the fish consumption advisory for child-bearing-age women and children 6 years old and younger. They do not include the fish consumption advisory which limits fish consumption in all bodies of water to the general population. If this were applied to the above figures, no lake acres would fully support uses, 59% of the assessed lake acres would partially support uses, and 41% would not support uses.

Metals, total toxics, nutrients, algae, organic enrichment, low dissolved oxygen, flow alteration and siltation are causes of use impairment to Vermont lakes and ponds. Sources of use impairment include atmospheric deposition, natural sources, unspecified nonpoint sources, agriculture, hydromodification and habitat modification.

Wetlands

An analysis of wetland loss between 1990 and 1997 shows that there have been a total of 155 acres of documented wetland loss and 311 acres of documented wetland impairment due to developments. For the projects completed during this seven-year period, the analysis showed that, in descending order, the projects resulting in the greatest wetland loss included: commercial/industrial development (113 acres), agricultural projects (109 acres⁴), pond construction (96 acres), and residential development (63 acres). During the 1990-1997 period, approximately 560 acres of wetlands were saved by encouraging developers to adjust the footprints of their proposed developments to avoid wetlands.

Public Health/Aquatic Life Concerns

There were 4 closures of North Beach in Burlington and 2 closures of Shelburne Bay Beach on Lake Champlain during the reporting period. It is believed that most of the North Beach closures were due to urban runoff from heavy rains. The Shelburne Bay closings were believed to be caused by unknown sources E. coli bacteria.

Fish consumption advisories continue in effect for lake trout, walleye and all other fish due to mercury contamination. The advisory was updated in July, 1997. New changes advise people to not eat any fish, with the exception of brown bullhead from the "Deerfield Chain Lakes." The updated advisory also recommends children age 6 and under and women to limit their consumption of walleye from Lake Carmi and chain pickerel anywhere in Vermont to no more than one meal per month.

⁴This figure includes 100 acres of forested swamp conversion in Brandon.

Ground Water

Approximately 60 percent of Vermont's citizens depend upon ground water for drinking and other uses. The quality of Vermont's ground water is not easily determined due to a lack of data and the resources required to gather and assess the needed data.

The ground water information presented in the 1996 305(b) Report has not changed significantly. It stated that the potential for ground water quality problems may be inferred from the numerous and varied contamination sites that have been identified in the state. Vermont has approximately 1716 sites where hazardous materials have been released into the environment. There are 421 sites where ground water contamination has been detected. Eight of these 1716 sites are designated as National Priority Sites under the federal Superfund Program. It is known that all of these sites represent a wide spectrum of contaminants. However, data is not readily available to link each of the ground water contamination sites to their corresponding hazardous materials site.

PART II: BACKGROUND

PART II: BACKGROUND

Chapter One: Vermont's Surface Water Resources

Vermont has approximately 7,099⁵ miles of rivers and streams, 228,915 acres of lakes, reservoirs and ponds and 300,000 acres of freshwater wetlands. The surface area of lakes, ponds and wetlands represent 826 square miles of water, or 8.5% of the state's total 9,609 square miles. Vermont's border waters include the Connecticut River on the east (border with New Hampshire), Lake Memphremagog on the north (partial border with the Province of Quebec) and the Poultney River and Lake Champlain on the west (border with New York).

There are no coastal waters, estuaries or tidal wetlands in Vermont. However, due to its size (approximately 120 miles long and 12 miles wide at its widest point), Lake Champlain is considered an inland sea by residents of Vermont, New York and Quebec. The Atlantic Ocean and Inland Waterway are accessible from the Lake via the New York Barge Canal to the south and the Richelieu and St. Lawrence Rivers to the north through Canada.

Table II.1.1 - Atlas

State population	562,758 (1990 Census)
State surface area	9,609 square miles
Number of water basins	17
Miles of perennial rivers and streams ⁶	7,099
Border miles of shared rivers/streams (subset) ⁷	262
Number of lakes, reservoirs and ponds (at least 20 acres)	285
Number of lakes, reservoirs and ponds (at least 5 acres but less than 20 acres)	316
Number of significant, lakes, reservoirs and ponds (less than 5 acres)	208
Acres of lakes, reservoirs and ponds ⁸	228,915
Acres of freshwater wetlands ⁹	300,000

⁵ Source: EPA's Total Waters Database. Past 305(b) reports have relied upon Don Webster's 1962 list of Vermont waters; however, many errors and omissions have been discovered in this early listing. Specifically, many streams have been left out or lengths of rivers and streams have been underestimated.

⁶ Includes the Connecticut River

⁷ Connecticut River - 238 miles; Poultney River - 24 miles

⁸ Includes some private waters and some waters less than 5 acres in size. This figure also accounts for a 66 acre reduction which was previously reported for Lake Ninevah.

⁹ Does not include wetlands on agricultural lands which are actively used for agricultural purposes

Total Waters

Until Vermont completes its GIS mapping of waterbodies, the 305(b) Report will use EPA's 1995 estimate of total river and stream miles. Using Clean Water Act 604(b) Pass Through funding, the Regional Planning Commissions (RPC) are gradually digitizing all of Vermont's waterbodies on GIS maps by waterbody ID number. Presently, all but one or two of the RPCs have either completed their waterbody mapping or are planning to do so. When they have all been mapped, then Vermont will be able to determine the total mileage of its rivers and streams.

Maps

Maps showing all the State's waterbodies and surface water use support are not included in this year's Report. However, maps of the three basins which were assessed during the first year of the rotating basin assessment are included.

Chapter Two: Water Pollution Control Program

All the information presented in this chapter is that which has changed from the 1996 305(b) Report.

Watershed Approach

Vermont is developing a watershed approach to surface water quality planning (See the draft paper entitled *Watershed Approach to Surface Water Quality Planning* in Appendix E. This process, when adopted, calls for surface water plans for all major drainage basins or sub-basins on a periodic basis. In addition to the rotational basin assessment reports (see page III-4 for a discussion of the on-going rotational basin assessment process), protection and restoration priority lists for the basin, and statewide management strategies, the watershed approach may also include local watershed management plans with protection and restoration strategies for individual watersheds. These plans may include the following:

- a) petitions for reclassification and outstanding resource water designation;
- b) other surface water use and value protection strategies;
- c) point source effluent limitations, schedules for compliance, and anticipated treatment works for municipal and industrial facilities;
- d) nonpoint source and water quality certification programs and inter-agency agreements to implement BMPs where they are specific to the particular watershed;
- e) pollution source control strategies (TMDLs) where completed. This watershed approach, when adopted, will produce surface water plans for all major drainage basins or sub-basins on a periodic basis.

Water Quality Standards

The Water Quality Standards are the foundation for the state's water pollution control and water quality protection efforts. The Standards provide the specific criteria and policies for the management and protection of Vermont's surface waters. The classification of waters as Class A, Class B or Class B with Waste Management Zone (WMZ) are the management goals to be attained, if not already attained, which are necessary to protect the designated water uses for each class. At this time, the Water Quality Standards are in the process of revision; however, until the time when they have been revised and approved, Vermont will continue to use the existing Water Quality Standards. The existing Water Quality Standards were adopted April 2, 1997, and differ somewhat from the 1994 Standards that were used as a basis for determining water quality support in the 1996 305(b) report. The following paragraphs articulate the changes in the existing Standards from the 1994 Water Quality Standards.

The existing Standards contain significant new wording which now indirectly includes wetlands as waters of the state. The new wording states "These rules shall apply to all 'waters of the United States' as defined in 40 C.F.R."

The existing Standards no longer include Capital Quarry as a Class A emergency water supply for Websterville. The quarry may still be used as an emergency water supply, but is now Class B due to the discharge of excess backwash water into the quarry from the drinking water system. Another change to the Water Quality Standards includes the reclassification of Cold Brook and its tributaries in the Town of Dover as a Class A water.

The water quality standards call for the protection of existing uses and the maintenance of water quality necessary to protect those existing uses. Existing water uses are those uses which have actually occurred on or after November 28, 1975 in or on a waterbody whether or not the uses are included in the standard for classification of the particular waterbody. Determinations of what constitutes an existing water use on a particular waterbody shall be made on a case-by-case basis by the Secretary.

With regard to implementing biocriteria in the Water Quality Standards, the Department has received a 104(b)(3) grant for research and development of biocriteria for Vermont. It is a goal of the Department to ultimately incorporate biocriteria into the Water Quality Standards and be made an integral part of the classification process. Another proposed amendment involves the regulation of stream flows and the inclusion of specific criteria for minimum conservation flows.

Surface Water Classification

All surface waters in Vermont are classified as either Class A or Class B (see Table II.2.1). Class B waters comprise approximately 98% of all waters in the State, and are managed to achieve and maintain a high level of quality that is compatible with values and uses as presented in the table.

Class A Reclassifications

The 1986 "Pristine Streams Act" created the opportunity for any waterbody supporting habitat that is ecologically significant and has water quality that meets at least Class B standards to be reclassified to Class A. A reclassification is a rule making procedure before the Water Resources Board where a public interest determination must be made pursuant to Vermont's Water Pollution Control Statute, 10 V.S.A. § 1253.

Outstanding Resource Waters

Another sub-class, or overlay of both Class A and Class B waters is an Outstanding Resource Water (ORW). ORWs are waters of the State designated by the Water Resources Board as having exceptional natural, recreational, cultural or scenic values. To gain an ORW designation, the petitioners must, in a contested case hearing before the Board, provide evidence and testimony that the waters in question have exceptional natural, cultural, scenic, or recreational values.

Table II.2.1 Summary of Classified Uses and Values (Existing)

Classified Uses & Values	Total Size Classified for Use	
	Rivers (miles)	Lakes (acres)
Class A: <ul style="list-style-type: none"> ● water quality uniformly excellent ● enjoyment of water in its natural condition ● contact recreation when compatible ● public water supply with disinfection ● high quality waters with significant ecological value 	164 approx.(not including all waters above 2500' elevation)	980
Class B: <ul style="list-style-type: none"> ● water consistently exhibits good aesthetic value ● swimming & recreation ● public water supply with filtration & disinfection ● high quality habitat for aquatic biota, fish and wildlife ● irrigation and other agricultural uses 	6,935	227,999
TOTALS	7,099	228,979

Point Source Control Program

Vermont administers a well-planned and comprehensive direct discharge water pollution control program, consisting of planning advances, construction grants and loans, permitting and compliance monitoring. With the construction of the state's last originally identified municipal WWTF and completion of the upgrades from primary to secondary, the

**Table II.2.2 Municipal Pollution Control Project Starts
January 1, 1996 to December 31, 1997**

Community	Description	Est. Project Cost
Algiers Fire District No. 1	Sewer collection and transmission lines	\$1,141,229.
Town of Castleton	Miscellaneous improvements to WWTP	106,339
Town of Castleton	Phosphorus removal and approx. 50% increase in capacity of WWTP	2, 728,112.
Town of Colchester	Sewer line extension to Breezy Acres	1,715,800..
Town of Hartford	Combined sewer overflow improvements on Sykes Avenue	670,000
Village of Johnson	Sewer collection system improvements	746,869.
Town of Lyndon	Combined sewer overflow improvements	440,092.
Town of Middlebury	Access road for new WWTF and treatment facility design	1,325,494.
City of Montpelier	Combined sewer overflow correction - Phase I - Contract 2	1,751,573.
City of Montpelier	Combined sewer overflow correction - Phase I - Contract 3	687,863.
Village of Orleans	Upgrade to tertiary treatment with phosphorus removal	2,020,779
Town of Pawlet	Misc. Improvements to WWTF	25,000.
Town of Randolph	Combined sewer overflow correction	831,722.
City of St. Albans	Installation of digesters and RBC units.	1,150,000.
Town of Stowe	Sewer collection system and an equalization tank at the WWTF	1,093,093.
Village of Swanton	Combined sewer overflow improvements (correction to previous report figure - additive to previous costs)	1,863,937.
Village of Swanton	Sludge removal and reduction of phosphorus	1,818,873.
TOTAL		\$20,116,775.

program has shifted emphasis to refurbishment of existing WWTFs, the completion of phosphorus reduction upgrades, advanced waste treatment, correction of CSOs, control of toxics, pollution prevention activities and facility enlargements and refurbishments.

During the 1996-97 reporting period, construction commenced on CSO corrections, sewer line extensions, wastewater treatment and disposal facilities improvements, phosphorus reductions, system renovations, and WWTF upgrades. These projects are being funded by state, federal and local funds of approximately \$20 million (See Table II.2.2).

Chapter Three: Nonpoint Source (NPS) Control Program

Pollution from nonpoint sources continues to be the major source of water use impairment to Vermont surface and ground water resources. It is estimated that 90% of the miles and acres of the state's impaired waterbodies are caused by nonpoint source pollution.

As one of the first states in the nation to have an EPA-approved NPS Management Program (March 1989), Vermont has been able to effectively target areas, design work plans, compete for and capture funding and implement NPS projects directed at restoring and protecting water uses and values. In the six years of available Section 319 NPS implementation funding, Vermont has received approximately \$6 million to implement a variety of activities.

Specific details regarding NPS program activities are available from the Department. Refer to the 1996 Report for a discussion of these projects and a listing of project titles by funding year, FFY1990 through FFY1995 (Appendix F of that report). See Appendix C in this Report for a listing of Section 319 projects for FFY96 and FFY97. Vermont will continue to pursue and apply Section 319 NPS funding in targeted areas that are likely to result in the successful implementation of Best Management Practices (BMP) and programs

Section 319 Special Projects

The following are two 319 Special Projects selected as examples of the types of projects taking place under this grant program.

Lake Champlain Basin Watersheds National Monitoring Program Project

The Lake Champlain Basin Watersheds National Monitoring Program Project was initiated in May, 1994 by the University of Vermont. The project is currently operated jointly by the Vermont Department of Environmental Conservation and the University of Vermont. The six-year project, located in Franklin County, is using a three-way paired watershed design to evaluate the effectiveness of improved livestock grazing management in (1) reducing sediment, nutrient, and bacteria loads from small agricultural watersheds, and (2) improving stream biological communities. Treatments implemented in the spring, summer and fall of 1997 to reduce the impacts of grazing on streams, include livestock exclusion fencing, protected livestock stream crossings, riparian zone restoration, and bioengineering streambank erosion controls. The project is scheduled to continue through 1999.

The Vermont Better Backroads Program

This special project continued as a partnership between VTDEC and several outside organizations. Section 319 funds were granted to the Vermont Local Roads Program for the production of several publications (*Vermont Better Backroads Pocket Manual*, *Cost Effective Solutions To Protect Water Quality Near Vermont Town Roads*, and *Developing A Highway Access Policy*). A Small Grants Program was initiated during the summer of 1997 and administered by grant through the Northern Vermont Resource Conservation and Development Council. Ten grants were made to eight towns and two lake associations for road erosion control projects such as ditch and bank stabilization, and culvert

replacement. In addition, one of the grants was used by a town to conduct an erosion inventory in town and develop a capital budget plan for correction measures.

Section 604(b)

Use of 604(b) funds by the Department is directed at the inventory, evaluation, strategic planning and management of water resources within the state. Work under the 604(b) program during the reporting period has included the awarding of pass through grants to the 12 regional planning commissions to determine the nature, extent and causes of point and NPS pollution problems and to develop plans to resolve those problems. Appendix D contains an updated inventory of pass through activities by each planning commission. Other 604(b) work included: performance of the first year's rotating basin stream water quality assessment evaluations; preparation of the state water quality assessment [305(b) Report]; data entry of waterbody uses, values and functions, and continuing with the town backroad surface water protection project.

Connecticut River Watershed

The Connecticut River Joint Commission has completed the Connecticut River Corridor Management Plan. The Plan, begun in 1993, consisting of six volumes, was developed by the five River subcommittees. The subcommittees defined the special character of their five reaches, identified the locally significant resources and major issues, and developed a comprehensive set of very practical, results-oriented recommendations aimed at federal and state agencies, as well as local communities. The Joint Commission urges every Connecticut River community in New Hampshire and Vermont to adopt the Plan in their planning process. The Joint Commission will work with state and federal agencies, businesses and non-profit organizations to address river-wide opportunities addressed in the Plan.

Other Federal Sources

Agricultural nonpoint source pollution control efforts in the state continued with financial and technical assistance being provided through several programs within the US Department of Agriculture (USDA). FFY97 EQIP funds (\$1.3 million) were directed as cost sharing assistance to approximately 170 farms.

Lake Champlain Management Conference

The Lake Champlain Management Conference (LCMC), in their October, 1996 publication, "Opportunities for Action," set out three priorities for action to improve the water quality of Lake Champlain. These are described briefly below.

- *1) Reducing Phosphorus Pollution.* Priority sub-basins have been identified through extensive research on phosphorus loadings to the Lake from tributaries. Point and nonpoint source controls are required to reduce phosphorus loading to the tributaries and their watersheds. Missisquoi Bay, St. Albans Bay and the South Lake are the segments which have been found to contain the highest levels of phosphorus. Wastewater treatment and industrial discharges are the main point sources, contributing about 30% of the total phosphorus entering the Lake. Nonpoint sources make up the

remaining 70%. Of this amount, it has been estimated that agricultural uses contribute 66%, silvicultural activities contribute 16% and urban land uses contributes 18% of the total nonpoint source phosphorus loading.

Studies indicated that annual phosphorus loading to the Lake amounted to 496 metric tons, and that it must be reduced by an annual amount of 57 metric tons (relative to the 1995 load), a goal being phased in during the next 20 years, in order to attain in-lake phosphorus reduction. Phosphorus loading from both point and nonpoint sources must be allocated throughout the Basin in a fair, efficient, and cost-effective manner.

- *2) Preventing Pollution from Toxic Substances.* While toxic pollution levels are low compared to more industrialized areas of the Great Lakes, there is still cause for concern. An extensive survey of Lake bottom sediments revealed elevated levels of mercury in many parts of the Lake, and several other toxic substances in specific locations. Three sites in the Lake have the most significant toxic contamination - Cumberland Bay on the New York side, Inner Burlington Harbor and Outer Malletts Bay. Knowing the location of these three sites will allow managers to geographically target toxic reduction and prevention in those areas. Few active sources of toxic substances have been identified; however, the LCMC has adopted a strategy of pollution prevention rather than managing it once it has occurred. It includes such techniques as reducing the use of toxic substances, substituting non-toxic raw materials if available, and modifying manufacturing processes.
- *3) Managing Nuisance Nonnative Aquatic Plants and Animals.* Nonnative aquatic plants and animals that become established in the Lake Champlain Basin can pose serious threats to native fish and wildlife and impede recreational activities. Examples of nonnative species include zebra mussels, Eurasian watermilfoil, water chestnut, flowering rush, purple loosestrife and sea lamprey. Objectives to control nuisance nonnative aquatic species include:
 - 1) documentation of the extent of infestation of nuisance nonnative aquatic species in the Lake Champlain Basin;
 - 2) prevention of the introduction of or slowing the spread of and controlling, where possible and appropriate, nuisance nonnative aquatic species which currently or potentially may cause damage to the social or biological benefits of the Lake Champlain Basin;
 - 3) manage nuisance nonnative aquatic species using current and new technologies;
 - 4) through education, increase public understanding of, and involvement in, spread prevention and control of nuisance nonnative aquatic species.

State Sources

Many nonpoint source planning and management activities funded primarily from state sources were discussed in the 1996 305(b) Report, to which the reader is referred. The following are those state-funded activities which had notable changes during the reporting period.

Agriculture

The Legislature has required the Commissioner of the Department of Agriculture, Food and Markets (DAF&M) to develop by rule, implement and enforce two types of agricultural land use practices (accepted agricultural practices and best management practices) in order to reduce pollutants entering waters of the state.

The AAP Rules, which became effective June 29, 1995, are statewide restrictions designed to reduce agricultural nonpoint pollutant discharges through implementation of improved farming techniques. The AAPs are basic practices that all farm operators are expected to follow without financial assistance as a part of normal operations.

The Vermont DAF&M has developed Best Management Practice (BMP) Rules. BMPs are voluntary and are more restrictive than AAPs and will be site specific practices prescribed to correct a problem on a specific farm. BMPs were adopted and became effective as rules January 27, 1996.

The Vermont General Assembly authorized in 1995 the creation of a state financial assistance program to help agricultural operators in support of their voluntary construction of on-farm improvements designed to abate nonpoint source agricultural waste discharges. Approximately \$350,000 in State General Funds were appropriated for this purpose in 1995 and 1996. Approximately \$500,000 were appropriated in 1997.

Storm Water

Stormwater General Permit Rules have been approved and became effective in October 1991. The Department is responsible for preparing Stormwater General Permits which will be issued according to similar groups of facilities and activities. The Department intends to comply with EPA stormwater requirements using such an approach to the fullest extent possible.

The Stormwater Procedures were officially adopted in December, 1997. Control of collected stormwater runoff flows are required through the Stormwater Procedures when certain size and/or other criteria are met by the proposed development. For example, a stormwater discharge permit is required when the proposed discharge is to a Class A or an Outstanding Resource Water. For further information about the Stormwater Procedures, the reader is referred to the Wastewater Management Division.

Chapter Four: Cost/Benefit Assessment

There have been only a few changes to this chapter since the 1996 305(b) Report (to which the reader is referred). The following paragraphs detail those changes. Quantifying the costs of construction and operation of facilities, such as wastewater treatment facilities, can be done rather routinely; however, quantifying the benefits in either dollars, days of increased public use or miles or acres of enhanced fish habitat as the result of an improved wastewater treatment plant or a stabilized river bank is not an exact science.

Point Sources/CSOs

Vermont has constructed 93 municipal wastewater treatment facilities, 50 industrial pretreatment facilities and 53 industrial wastewater treatment facilities. The total expenditure for the public facilities has been approximately \$468 million of state, federal, and local funds. This figure includes the \$20 million of public wastewater treatment facility improvements made during the last two years. There has been no recent estimate of the total amount spent on capital construction of industrial wastewater treatment facilities. The amount of money spent on operation and maintenance of municipal and industrial WWTFs (approximately \$69 million in 1994) has not been updated since the 1996 305(b) Report.

In general, improved water quality has meant less weed and algae growth, resulting in improved aesthetics and enhanced swimming, fishing and boating uses. Also, it is assumed that less sickness has occurred due to better removal of pathogens. As a result of these public and private expenditures, approximately 58 rivers and 3 lakes have benefitted from improved water quality and enhanced recreational, fishery and aesthetic uses.

During the period January 1, 1996 through December 31, 1997, approximately \$20 million of federal, state and local funds were spent on CSO corrections in five communities, WWTF improvements in six communities, sewer extensions in three communities and phosphorus removal at three WWTFs. These expenditures have resulted in additional improvements to the water quality of 10 rivers and streams and one lake.

To give a total picture, one must also consider the costs and benefits of nonpoint source pollution control practices. A discussion of this effort follows.

Nonpoint Sources

Aside from several federal and state cost sharing programs to assist with pollution reduction from agricultural sources, there are two federal Clean Water Act programs to assist with planning and implementation of nonpoint source pollution reduction. The first is the 604(b) Pass Through Program, awarded to regional planning commissions to assess, map or report on areas of nonpoint pollution. The other federal program is the Section 319 program, which awards grants (on a competitive basis) to water protection groups to be used to repair eroded banks and other areas which cause pollution. Updated total costs of the Section 319 implementation program for the seven years, from FFY 1990 through FFY 1997

were approximately \$6 million. Total costs of the Section 604(b) Pass Through nonpoint source planning projects from FFY1989 through FFY1997 were \$460,000.

Upper White River Stream Enhancement Project

The Upper White River Stream Enhancement Project was undertaken in 1997 by the White River Partnership which is a group consisting of watershed citizens, local officials, non-profit organizations, and state and federal agency personnel. The project involved work at six different sites from May to October 1997 and included streambank stabilization, bufferstrip re-establishment and instream fish habitat activities. The result of the work was a total of 4,525 feet of shoreline being stabilized and/or enhanced for fisheries and riparian habitat. Five of the six project sites involved re-establishment of a 25 foot wide bufferstrip of vegetation. Additional projects have been identified for the 1998 growing season.

Hydroelectric Facilities

No Clean Water Act Section 401 water quality certifications were issued to hydroelectric facilities during the 1996-1997 reporting period. However, the Vermont Water Resources Board dismissed appeals of 5 certifications issued in 1994 and 1995, and denied another certification under appeal.

As a result of the dismissal of the 5 appeals (Deerfield, Pierce Mills, Arnold Falls, Gage, and Passumpsic), improvements anticipated in the 1994-1995 reporting period have been realized at these projects. A total of 22.5 miles of Vermont rivers and approximately 3,600 acres of lakes have been improved now that these cases are settled. The cost of these improvements has not been estimated.

Chapter Five: Special State Concerns and Recommendations

All but two of the special state concerns identified in the 1996 305(b) Report remain as special concerns. *The Need for Revision of the Vermont Water Quality Standards and Water Classification System* and *Comprehensive Water Resources Planning and Protection* have been, or are being addressed.

The remaining concerns from the 1996 Report are:

- Nonpoint Source Pollution
- Management of Lakes and Ponds
- Combined Sewer Overflows
- Wastewater Facilities Operation and Maintenance
- Wetlands Protection
- Zebra Mussels and Other Exotic Species
- Ground Water

Four new concerns regarding nonpoint source pollution have been added during this reporting period, which are discussed below.

1) Polluting Discharges from Large Farms

There is growing concern regarding potential shifts in agricultural production from a large number of smaller farms to increasing numbers of larger farms. The water pollution potential from such large farming operations is equivalent to the waste generated by a small to medium sized city. It is recommended and essential that waste management and pollution prevention efforts are well coordinated.

2) Road Runoff to Waterbodies

Threats and some water quality problems as the result of runoff from local roads, as well as from state highways are widespread. The problems arise from maintenance procedures that are not sensitive to water quality and allow sand and gravel to erode and wash into surface waters.

The Department has developed a small grant program entitled, "Vermont Better Backroads," to assist local road commissioners with better backroad maintenance and planning. The Department is being assisted by many partners, including: the Vermont Local Roads Program at St. Michael's College, Resource Conservation and Development Councils, the Environmental Protection Agency (funding), Regional Planning Commissions, Vermont Lake Association, Vermont Agency of Transportation and many others. The program offers small grants on a competitive basis for following up on local situations where there are no current water quality violations but where road practices threaten adjacent rivers, streams, lakes or wetlands. It is a good program, but only a few towns are able to be helped each year due to limited resources. A larger, more fully funded effort is needed to reach more towns.

3) Lack of Statewide Vegetated Buffer Requirements

Undisturbed vegetation along stream, river and lake shorelines reduces pollutants from reaching surface water. Other than Act 250 and a few local ordinances, there are no state-wide requirements that riparian landowners must maintain a minimum width of vegetation along bodies of water as there are in other states. As a result, many miles/acres of state waters are impaired by sediment, fertilizers, manure, urban runoff and other pollutants which can be reduced or eliminated by properly-maintained vegetated buffers.

It is recommended that the Department make a greater educational effort to inform the public and in particular, municipal planning commissions, about the environmental benefits of riparian vegetation. Also, regional planning commissions, through the use of pass-through funding, might consider sponsoring workshops for town officials and the general public regarding strategies to encourage the maintenance of existing riparian vegetation, as well as promoting the planting of riparian areas lacking vegetative buffers.

4) Need for Wastewater Treatment for Small Communities

There are many small communities in Vermont which have grown, while continuing to rely on individual septic systems to treat and dispose of wastewater. In several of these situations, the traditional means of wastewater disposal is no longer adequate, resulting in concern for human health and environmental impact. Small communities do not always have the technical capability to know where to look or to determine what kind of resources are needed for their particular situation.

Greater technical and financial assistance are needed for Vermont's small communities to protect the state's waters from contamination. Also, an outreach program is necessary to alert small communities to the availability of state and federal resources.

PART III: SURFACE WATER ASSESSMENT

PART III: SURFACE WATER ASSESSMENT

Chapter One: Current Surface Water Monitoring Program

Overview

Surface water quality monitoring undertaken by the Department during the 1996-1997 reporting period continued to support an assortment of water program activities. Long-term monitoring programs are designed to assess trends in water quality, as well as to generate baseline water quality information. The Department also maintains a strong presence on Lake Champlain and conducts a variety of short-term lake and stream-specific monitoring projects. Monitoring data is used to manage and protect Vermont waters in a pro-active manner.

A new surface water rotational watershed assessment (water quality monitoring/evaluation) procedure was initiated during the reporting period. The procedure is discussed in Chapter Three, "Assessment Methodology and Summary Data," and Appendix F. Other surface water quality monitoring activities conducted by the Department during 1996-1997 are similar in most respects to those conducted during the 1994-1995 reporting period. They are described in the 1996 305(b) Report and in the Department's website. The URL for the website is: <http://www.anr.state.vt.us/dec/waterq/watermon.htm>

The following section describes new monitoring projects or changes to surface water monitoring activities since the 1996 305(b) Report (with the exception of the Rotational Watershed Assessment).

Surface Water Quality Monitoring Activities

Volunteer-Collected River and Stream Data

Previous 305(b) reports discussed the fact that citizens groups are involved in stream monitoring, education and restoration projects. Due to greater attention to the state's water quality, it is of utmost importance for citizens to continue to assist in this important work. The Department is most grateful to these dedicated citizens groups, and will continue to provide technical assistance to them as much as possible.

Watershed associations are presently active on approximately 26 rivers in the state, representing all the State's major river basins. The Department has developed a directory listing the various watershed associations and their activities entitled, *Current Programs of Vermont Watershed Associations - June, 1998*.

Lake Bioassessment Project

With special funding from EPA-Region 1, the preliminary phase of the Lake Bioassessment Project has been developed into an operational biological and paleolimnological assessment program. A major goal of the Lake Bioassessment and Paleolimnology Program is the generation of biocriteria for lakes. A regional approach to the definition of lake biological reference conditions was adopted by planning assessments of both Vermont and New Hampshire lakes (the project is managed as a cooperative, bi-state initiative). Application of paleolimnological models to the sediments of selected candidate reference lakes ensures that the underlying biological information used to develop criteria is indeed of reference quality. To date, this project has evaluated a total of 22 reference lakes in both states. With continuing assistance from EPA, an additional 10 lakes are now scheduled for assessment during 1998.

Assessment of Mercury in Hypolimnetic Sediments of Vermont and New Hampshire Lakes

The Department has received funding during this reporting period from EPA-ORD to conduct a 90-lake evaluation of mercury and methylmercury in lake-bed sediments and lake waters. One major goal of this project is to develop a ranking system which identifies lakes that are likely to have elevated mercury burdens in their fish, in the absence of fish tissue data. Results of this study will be used: 1) to direct future fish tissue monitoring efforts; 2) as an additional dataset with which patterns of mercury deposition in lakes across New England and the Adirondacks of New York can be evaluated; and 3) to suggest, where fish tissue data are unavailable, the type of lake in which fish are likely to have elevated mercury for use in future refinements to existing fish consumption advisories.

Lake Carmi Watershed Project

Based on three years of available data and analysis, it was recommended that phosphorus reduction efforts at Lake Carmi should focus primarily on reducing phosphorus loading from watershed sources. Studies showed that internal cycling of phosphorus from the lake's sediments was not the source of the elevated phosphorus.

With support from the Department, a Lake Carmi Watershed Committee was formed with broad representation from the town of Franklin. The Committee has been focusing for the past two years on cooperative nutrient reduction with certain farmers, on shoreland revegetation, landowner education and identification of town road erosion issues.

Silvicultural Impacts Monitoring

As discussed in the 1996 305(b) Report, the Department conducted chemical, physical and biological monitoring in a watershed in the town of Duxbury in central Vermont which underwent intensive timber harvesting. Due to the large size of the logged area (approximately 10,000 acres), there was concern about potential impacts to surface water in the project area. In cooperation with the Department of Forests, Parks and Recreation, this Department conducted water quality monitoring in several streams in the area before, during and after the logging activity (from the spring of 1995 through the fall of 1997).

Final results of the biological monitoring found “moderate impairment” to Dowsville Trib. #11 and Bedrosia Brook. Chemical and physical monitoring found that Dowsville Trib. #2 and sites on Dowsville brook were “out of compliance” with Acceptable Management Practices in 1995. Remediation was implemented. High turbidity was observed in Dowsville Trib. #11 and Telephone Brook resulting from sediment discharges from logging road stream crossings caused by heavy rains. Subsequent evaluation of Dowsville Trib. #11 showed “improved conditions.” Turbidity of Telephone Brook was markedly reduced after three hours due to “.. immediate implementation of corrective actions.”

In general, this study¹⁰ found that “there were remarkably few water quality problems during the three years of this project, particularly given the intense nature of the activity and extreme meteorological events occurring during the project.” This was due mostly to the “professionalism with which those associated with the logging operation performed their jobs.”

Problems were quickly identified and dealt with. In order to continue to protect water quality in the area, it is critical that erosion control structures are properly maintained until the area has completely recovered.

Data Interpretation and Communication

The information from the rotational assessments is incorporated into the Water Quality Assessment database. From the database, reports are generated on river basins for 305(b) annual electronic reporting as well as biennial reports, general information, review and feedback purposes. Feedback is requested from the District fisheries biologists, watershed association leaders, U.S. Forest Service fisheries biologists, NRCS and the local USDA working groups.

Vermont’s 1996 305(b) Report (less appendices) has been placed on the Department’s web site, and is available world-wide. This has not only made the report readily accessible to anyone with internet access, but has also saved paper resources and duplicating costs.

¹⁰ *Water Quality Monitoring and Aquatic Bioassessment Related to Logging Practices in the Dowsville Brook, Shepard Brook and Mill Brook Watersheds.* Vt. Dept. of Environmental Conservation. October, 1998.

Chapter Two: Plan for Achieving Comprehensive Assessments

Vermont's watershed assessment approach to water quality planning as outlined in the draft *Surface Water Quality Planning* document (Appendix E), including the state's rotational watershed assessment procedure (see below), will constitute Vermont's plan for achieving comprehensive assessments.

Chapter Three: Assessment Methodology and Summary Data

Rotational Watershed Assessment

As mentioned earlier in this report, Vermont has moved to a rotational watershed assessment strategy for the purposes of assessing and reporting water quality information. The state has been divided into seventeen major drainage basins that have from four to twenty-two river subbasins and mainstem segments ("waterbodies") within them. The rivers and streams of all seventeen major basins in the state will be assessed at least once every five years. As much as possible, lake assessment work will also follow this rotation schedule. By focusing annual evaluations on selected watersheds each year, more systematic and intensive efforts can be made to collect and evaluate nonpoint and point sources of pollution. Concentrating on a limited number of watersheds provides the opportunity to determine the best characteristics of the river system to use as indicators of improving water quality and aquatic habitat.

For additional information about the rotational watershed assessment, please refer to Appendix F.

Rivers and Streams

This report contains Vermont's first year rotational watershed assessment information. Water quality information from three major river basins begins in Chapter Three. Water quality assessments were made on nearly every waterbody in the three basins. The three basins are: Otter Creek (Basin 3), Lower Lake Champlain (Basin 4), and the White River (Basin 9).

A water quality assessment determination for each of the waterbodies was made based on whether or not water uses were *Fully Supported* (good water quality), *Fully Supported but Threatened* (good water quality but potential sources of pollution exist), *Partially Supported* (fair water quality), or *Not Supported* (poor water quality). Tables III.3.3, III.3.4 and III.3.5 summarize each basin's water quality by showing overall use support for rivers and streams. Each use of the waterbody was considered separately before the use support for the whole waterbody was determined. Overall use support miles and acres in these tables are either monitored (biological or chemical monitoring less than 5 years old) or evaluated (water quality observations by Department personnel, fisheries biologists or other professionals, land use information, predictive modeling among others). The determination process for rivers and streams and lakes and ponds was explained more fully in the 1996 305(b) Report.

As not all states' water quality standards are based on the same uses, EPA requested that the states assess their waters using the categories for which they report nationally if they apply (See Tables III.3.3, III.3.4 and III.3.5). EPA's standard uses are essentially the same as Vermont's "Classified Uses and Values" (see Table II.2.1). Differences between EPA's and Vermont's categories of water uses include "Fish Consumption," "Aesthetics" and "Industrial Water Supply." Vermont does not specifically list "Fish Consumption" in its Standards. However, "Fish Consumption" is indirectly named as a "value," where

the Vermont Water Quality Standards addresses "high quality habitat." EPA does not include "Aesthetics" and "Industrial Water Supply," but these correspond to uses in the Vermont Water Quality Standards.

Lakes and Ponds

A total of 138 different lakes was visited, and some form of assessment information collected during the 1997-1998 field seasons. Forty inland lakes were assessed solely to determine use support status. Of these, 17 were biological assessments, 19 were comprehensive lake assessments (see Appendix B of the 1996 305(b) report), and four were habitat evaluation site visits. Macrophyte and Eurasian watermilfoil surveys were conducted on an additional 17 inland lakes. A total of 38 (and 42) inland lakes was enrolled in the Lay Monitoring Program during the 1996 (and 1997) field seasons. A total of 97 lakes was visited in conjunction with the Spring Phosphorus Program during the 1996 and 1997 field seasons. Many of these lakes and ponds were within the Otter Creek, Lake Champlain (direct), and White River basins. On Lake Champlain, monitoring continued as described in the 1996 305(b) Report on a total of 30 stations and selected shoreline areas. Use support, and causes and sources of impairments for Lake Champlain are not presented in this 305(b) update. In addition to the assessments listed above, existing assessment information for lakes within the selected 1997 rotational watershed basins which were not visited for re-evaluation was nonetheless reviewed and updated as new information became available.

Aquatic Biota/Habitat or Aquatic Life

Aquatic life use assessments were primarily based on fish and macroinvertebrate population data (monitored assessments) or surveys of fisheries biologists and other professionals (evaluated). The Department's Biomonitoring and Aquatic Studies Section conducts bioassessments using community level analysis of either the fish or macroinvertebrate communities. The biological integrity of a site is determined by comparing multiple community biometrics, which measure community structure and function to a statewide database of over 100 reference sites that represent the natural biological potential for a stream type. The reader is referred to the 1996 305(b) Report for a more complete discussion of the biomonitoring assessment work in Vermont.

Fish Consumption Advisory

An updated fish consumption advisory was issued in July, 1997 (See Appendix A). The new advisory includes three changes regarding consumption of the state's fish from that which was reported in the 1996 305(b) Report. The first change advises people to not eat any fish, with the exception of brown bullhead, from five "Deerfield Chain Lakes" in southwestern Vermont. The "Deerfield Chain Lakes" are: Grout Pond, Somerset, Harriman, Sherman and Searsburg Reservoirs.

The second and third changes advise that children age 6 and under and women should limit their consumption of walleyes from Lake Carmi and chain pickerel anywhere in Vermont to no more than one meal per month.

EPA 305(b) Guidance regarding making use support determinations for fish/shellfish consumption requires the states to designate as "Partial Support" those waterbodies where there is a restriction on consumption of fish (number of meals or size of meals consumed per unit of time) in effect for the

general population, such as Vermont's health advisory. The Guidance calls for the states to designate as "Non Support" those waterbodies where health advisories suggest that the general population or a subpopulation should not eat any meals of one or more fish/shellfish species.

Maps

The Department maintains geographic data layers for rivers and streams, lakes and ponds, wetlands and ground water resources. The Department uses the existing Lakes and Ponds data layer, and other relevant data layers, on a PC-ArcView (v3.0, ESRI) platform. This existing Lakes and Ponds data layer contains fields for both lake name and waterbody ID, enabling linkage to the existing assessment data tables using ArcView's data querying functions. Refinements to the Lakes and Ponds GIS layer (described below) will allow users to geographically display use impairment, cause and source information.

In order for such a system to be fully functional, the following steps are necessary:

- 1) The Lakes and Ponds, Rivers and Streams GIS data layers need to be reviewed to ensure that each waterbody in the Lakes and Ponds assessment database is included in the data layer.
- 2) The Lakes and Ponds GIS data layer's data file needs to be reviewed to ensure that each lake has the correct lake name and waterbody ID (WBID). Currently, only 222 waterbodies in the Lakes and Ponds data layer have WBID's associated with them. There are a total of 555 waterbodies in the Lakes and Ponds assessment database. Thus, 333 waterbodies in the Lakes and Ponds data layer need WBID's entered manually.
- 3) Relevant use support, cause, and source information needs to be appended to the Lakes and Ponds GIS data files.
- 4) To provide a broader, national context, it would be useful to create or acquire a data table which places every assessed Vermont lake and pond into its corresponding USGS 14-digit cataloguing unit. This could be accomplished using existing data layers. In addition to these necessary steps, the following is desirable:
- 5) Transfer the existing database to a newer, more modern database system which would allow real-time linking of GIS and assessment data using existing technology.

Steps one through four of this process will require careful execution by an individual with both database and GIS experience. Personnel and resources currently exist within the Department to develop a geo-referenced assessment database by executing steps one through four for the anticipated 2001 305(b) Report. Step five will need to be part of an Agency-wide initiative.

Section 303(d) Waters

Section 303(d) of the Clean Water Act requires States to identify waters that do not or are not expected to meet applicable water quality standards with technology-based controls alone. States are required to establish a priority ranking for these waters, taking into account the pollution severity and designated uses of the waters.

Once the identification and priority ranking of water quality-limited waters are completed, states are to develop total maximum daily loads (TMDLs) at a level necessary to achieve applicable state water quality standards. The public must be involved with the development of the priority ranking and targeting of waters needing TMDL determinations. The public must also be consulted to assist the determination of load allocations to particular sources. States must determine pollution controls to be implemented, a schedule for data collection, establishment of the control measures, assessment for water quality standards attainment and, if needed, additional modeling.

Dating back to the statewide water quality assessments conducted in 1987, the Department has utilized a comparative evaluation procedure for each impaired waterbody. The following five considerations were used to generate the High Priority Targeted Impaired list of waters in 1992, 1994 and 1996:

- the severity of the water quality problem or impairment;
- the degree to which a designated use or uses was impaired;
- the amount of public interest or support in solving the problems associated with that waterbody;
- the controllability of the problem, and
- the public benefit of the use or uses if restored.

Vermont's 1998 List of Waters identifies certain problem waters that are the focus of concerted management actions. The rate and order of targeted waterbodies receiving special management focus will be guided by the availability of financial and personnel resources and by the ability to execute implementation programs in a coordinated fashion. The 1998 List of Waters also identifies previously-listed waters that should be 303(d) "de-listed."

At the time of this Report preparation, the 1998 List of Waters has not been finalized.. The Final List will be submitted to USEPA for approval following a period of public comment. The 1998 List of Waters will be made available following EPA approval under separate cover.

Prologue to the Rivers and Streams and Lakes and Ponds Water Quality Assessments

As indicated in the EPA1998 Guidelines for Submission of 1998 305(b) reports, States that electronically submit assessment databases are not required to prepare and submit summary use support, causes, and sources tables. Vermont submitted its waterbody assessment database in the fall of 1997. However, in order to make this report more meaningful for the reader, those tables are reproduced in this report. Some discussion regarding use support, causes, and sources of impairments for lakes and ponds and rivers and streams on which new assessment information was collected is also included.

Chapter Three: Rivers and Streams Water Quality Assessment

According to EPA, Vermont has 7,099 miles of perennial rivers and streams. Of the 5,261 river and stream miles assessed for the 1996 305(b) Report, approximately 4,138 miles (79%) fully supported designated uses and 1,124 miles did not fully support designated uses. Approximately 936 miles of the 1,124 miles not fully supporting uses are evaluated waters (as opposed to monitored waters).

For rivers and streams, this 305(b) Report contains only updated water quality information for Basins 3, 4 and 9. The assessments for those basins are summarized below. The full assessment reports may be obtained by contacting the Department.

Basin 3. The Otter Creek Basin

General Description¹¹

The Otter Creek watershed encompasses an area of 936 square miles, draining portions of Bennington, Rutland and Addison counties. Otter Creek originates in the Town of Dorset at Emerald Lake and the wetlands south of the lake, and from there, meanders approximately 100 miles northerly through rural and urban areas, finally ending in Lake Champlain at Fort Cassin Point. Otter Creek has ten major tributaries: Mill River, Cold River, East Creek, Clarendon River, Tinmouth Channel, Leicester River, Middlebury River, New Haven River (largest tributary to Otter Creek), Lemon Fair and Dead Creek.

The dominant land cover type in the Otter Creek watershed is forest, covering approximately 60% of the watershed. Agricultural land occupies approximately 23% of the watershed area. Developed land, including residential, commercial, industrial, transportation and utilities covers approximately 6% of the basin. The remaining land area is occupied by wetlands (5.5%) and surface water (5.5%).

¹¹Much of the watershed description is taken from the *Otter Creek Basin Water Quality Management Plan*. April 1975. Vt. Department of Water Resources.

Lakes, Ponds and Wetlands of the Basin

There are 23 lakes and ponds in the Otter Creek watershed, 20 acres or larger in size, including the three largest: Lake Dunmore (985 acres), Chittenden Reservoir (702 acres), and Winona Lake (248 acres).

There are approximately 45,579 acres of National Wetland Inventory (NWI) mapped (Class II) wetlands in the Otter Creek watershed., occurring mostly as a number of large wetland complexes. Some of the larger complexes include Tinmouth Channel wetlands, Brandon Swamp, Long Swamp, Salisbury Swamp, Whiting Swamp, Cornwall Swamp, Dead Creek Marsh, the marsh and swamp at the mouth of Otter Creek and Little Otter/Lewis Creek Marsh. Scanlon Bog in Brandon supports four endangered and threatened plant species.

Dams

According to the Department's dam inventory, there are 93 dams on rivers and streams in the Otter Creek basin. Seventeen dams are for hydroelectric power production and the remaining 76 dams are for fish and wildlife ponds, fire ponds, irrigation, recreation or water supply.

Permitted Discharges

Eight wastewater treatment facilities (Wallingford, Vergennes, Pittsford, Brandon, Middlebury, West Rutland, Rutland City, and Proctor) discharge to waters of the Otter Creek Basin. In addition, ten industries or entities have direct discharge permits in this watershed. There are also a large number of permitted stormwater discharges in the basin - seventy-six (76) in all. Twenty-six (26) of these occur in the East Creek subwatershed in Rutland.

Status of Support of Designated Uses

Overall, 489 of the 627 assessed miles in the Otter Creek Basin, or 78%, are fully supported for all uses based on the information obtained from this assessment process. (For assessment purposes, the total "Full Support" miles includes "Threats" miles as well). There are threats to one or more uses on 135 of the full support miles. One or more uses are partially supported on an additional 83 miles, and 54 miles do not support the uses designated for Class B waters. Partially and non supported miles, as well as threats, are caused by nutrients, pathogens, and siltation or sedimentation from agricultural runoff and streambank erosion. Metals (mercury), primarily from atmospheric deposition also impair the waters of the Otter Creek basin.

The lower reaches of Otter Creek and its tributaries are impaired by organic enrichment due to agricultural impacts which are not fully diluted due to the slow moving and impounded waters. Other causes of impairment waters in the basin include suspended solids, flow alterations, turbidity and thermal modifications. The sources of these pollutants are flow modifications, removal of riparian vegetation, impoundments, land development, road maintenance and runoff. Increased land development and poor gravel road maintenance practices in headwater areas threaten further pollution of the basin's waters.

Table III.3.1 summarizes use support for all assessed Class B rivers and streams designated by the Water Quality Standards for the Otter Creek Basin.

Table III.3.1 Designated Use Support Status
Otter Creek Basin

	Full support (miles)	Threats (miles)	Partial support (miles)	Non-support (miles)	Not assessed (miles)
Overall	354.4	135.0	82.9	54.2	12.0
Aquatic life/habitat	391.2	134.9	63.1	37.3	12.0
Fish consumption	583.8	6.6	27.0	8.6	12.5
Swimming	442.0	83.9	66.4	34.2	12.0
Secondary contact recreation	557.6	40.9	7.4	20.6	12.0
Aesthetics	419.5	117.7	59.0	29.8	12.0
Drinking water supply	432.1	41.5	0.0	6.6	158.3
Agricultural water supply	432.1	43.5	0.0	6.6	158.3

Basin 4. Lower Lake Champlain Basin

General Description

This small, long, narrow, basin (approximately 1 to 4 miles wide at its widest, and 40 miles long) consists primarily of minor tributaries which flow directly to Lower Lake Champlain. The southern portion of the basin is bordered by the Poultney River (included in Basin 2 for reporting purposes). Included in the basin are the western portions of the towns of West Haven, Benson, Orwell, Shoreham, Addison, Panton and Ferrisburg. The primary land use is farming. The basin makes up a major branch of the Atlantic flyway, so is also a feeding ground to migrating birds.

Most of the tributaries are intermittent, or have seasonal flowage. The main perennial streams in the basin are East Creek, Hospital Creek and Wards Creek. East Creek has been dammed in order to provide waterfowl habitat for the East Creek Waterfowl Area. Hospital Creek and Ward Creek are influenced by Lake Champlain, and are slow-flowing and brown-colored. Due to the small, open drainage area and level terrain, most of the other streams in the basin are also slow-flowing, warm and brown-colored.

Lakes, Ponds and Wetlands of the Basin

There are only three ponds in the basin over 20 acres. The largest of these, East Creek Site #1 is 31 acres. The pond is the result of a dam, built to provide waterfowl habitat. Spruce Pond is the second largest at 25 acres. Perch Pond is 24 acres in size and is also the result of a dam.

Wetlands in the basin total approximately 2,950 acres. There are two large wetland complexes in the basin, East Creek Marsh (approx. 1,000 acres) and South Fork Marsh (approx. 1,200 acres).

Dams

In addition to the 21' high dam on East Creek Site #1, and the 5' high dam at Perch Pond, there is also a 10' high dam at East Creek Site #2, constructed to enhance wildlife habitat.

Permitted Discharges

Only one permitted discharge is in Basin 4. This is a treated waste discharge from the town of Orwell. The waste management zone extends from the outfall pipe at the confluence of the North Fork Otter Creek to the South Fork of East Creek, a distance of 2.3 miles.

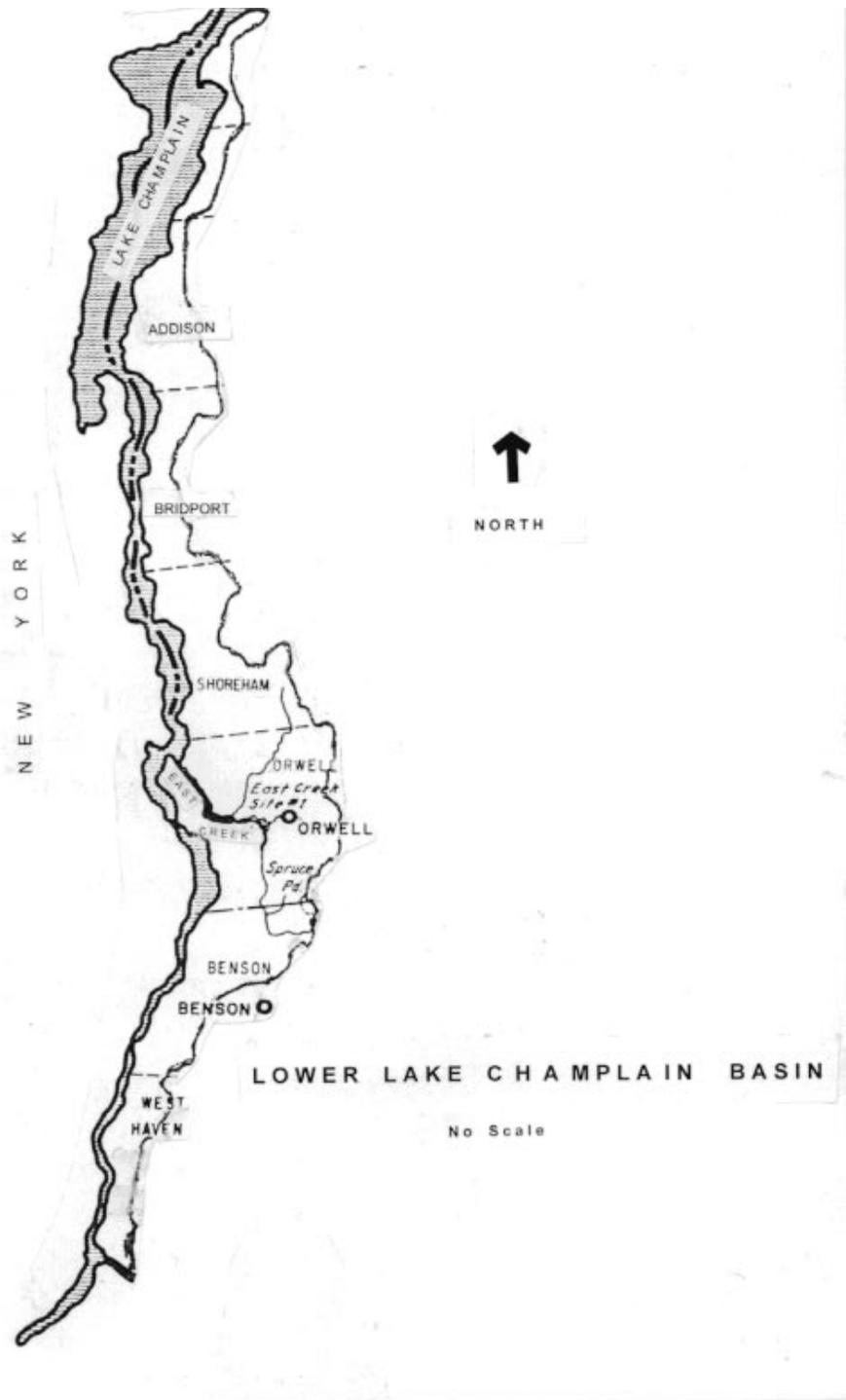
Status of Support of Designated Uses

The assessment (evaluated) of the basin found that 5 miles out of the total of 73 miles do not support swimming due to pathogens, nutrients and algae as the result of runoff from agricultural fields, decaying aquatic plants and droppings from water fowl. Four miles partially support uses, twenty-nine miles are fully supported but threatened by agricultural runoff, and the remainder, or 35 miles fully support the uses for which they have been designated.

Table III.3.2 summarizes use support for all Class B surface waters designated by the Water Quality Standards for the Lower Lake Champlain Basin.

Table III.3.2 Designated Use Support Status
Lower Lake Champlain Basin

Uses	Miles fully supported	Miles with threats	Miles partially supported	Miles not supported
Overall	35.0	29.0	4.0	5.0
Aquatic biota/habitat	73.0	0.0	0.0	0.0
Fish consumption	0.0	0.0	73.0	0.0
Swimming	35.0	29.0	4.0	5.0
Secondary contact recreation	73.0	0.0	0.0	0.0
Drinking water	35.0	29.0	4.0	0.0
Agriculture water supply	35.0	29.0	4.0	5.0



Basin 9. The White River Basin

General Description

The White River Basin encompasses 710 square miles in Vermont draining portions of Addison, Orange, Rutland, Washington, and Windsor Counties. The White River itself is approximately 50 miles long. It originates in the Town of Ripton on the slope of Battell Mountain then flows southerly and easterly before emptying into the Connecticut River at White River Junction in the town of Hartford. Waterbody length totals approximately 457 miles for the watershed, which includes two mainstem segments (VT09-01 and VT09-02) and five subbasins (VT09-03 through VT09-07).

The White River has five major tributaries: the First Branch with a length of 24 miles and drainage area of 103 square miles; the Second Branch with a length of 20 miles and a drainage area of 74 square miles; the Third Branch with a length of 19 miles and a drainage area of 136 square miles; Locust Creek with a length of 11 miles and a drainage area of 26 square miles; and the Tweed River with a length of 10 miles and a drainage area of 51 square miles.

Lakes, Ponds and Wetlands of the Basin

There are eight lakes and ponds greater than 20 acres in the watershed. These include Silver Lake, Lake Mitchell, and Colton, Lamson, McIntosh, Sunset, Rood, North ponds.

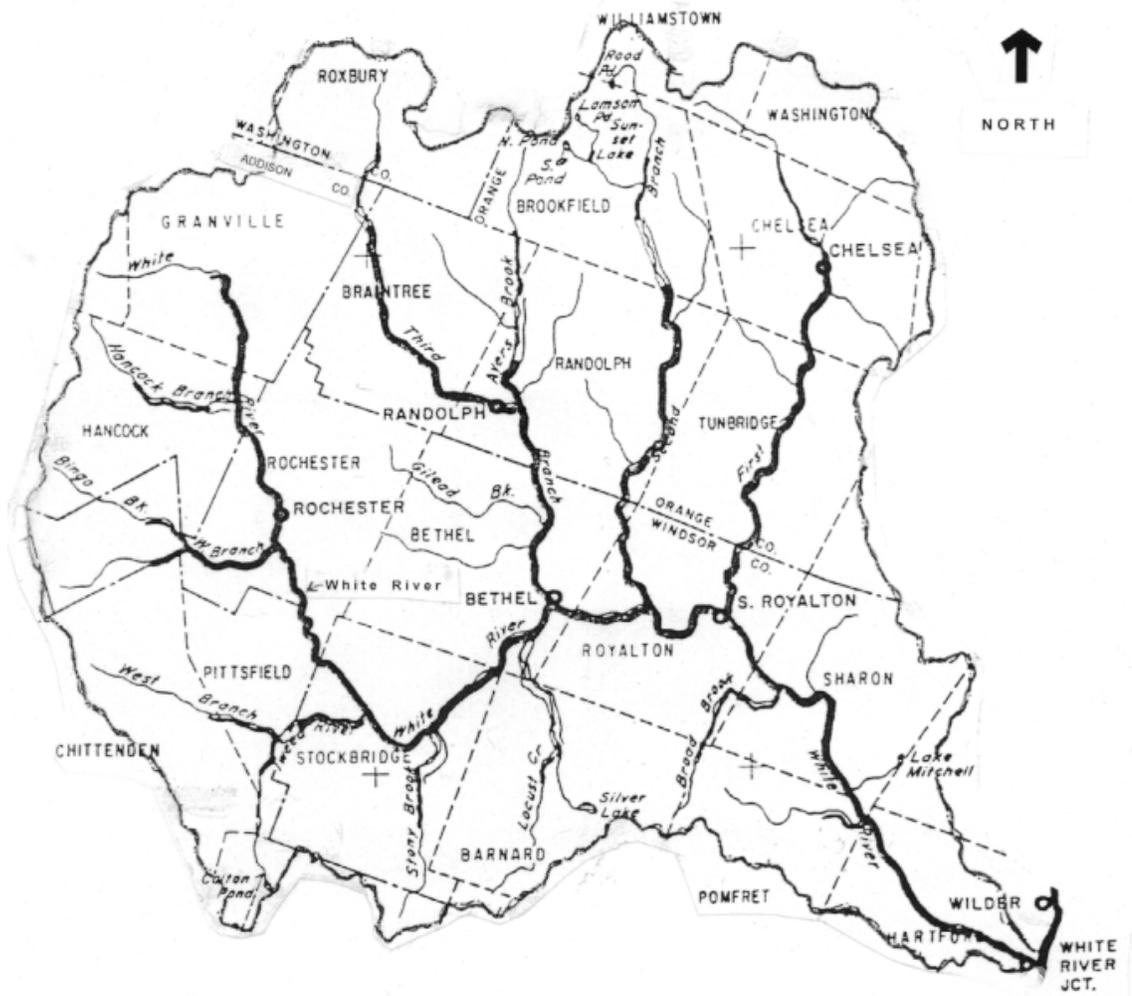
There are approximately 3830 acres of National Wetland Inventory mapped or Class II wetlands in the White River Basin, which is a relatively small area of wetlands for a watershed of this size. Based on project data kept since 1990, approximately 15 acres of wetland (either Class II or III) have been altered or lost.

Dams

There are no dams on the White River main stem. There is one breached mill dam on the Third Branch in Bethel (Bethel Mills), and there are 23 dams on minor tributaries throughout the basin. With the exception of four dams, they are all privately owned, the largest of which is a 25.5' high dam on Mitchell Brook in Sharon. Many of these dams have been breached. The publicly-owned dams provide recreational opportunities for fishing and boating on Rood Pond, Colton Pond and Baker Pond and swimming, boating and fishing on Silver Lake.

Permitted Discharges

Four wastewater treatment facilities (Bethel, Royalton, Chelsea, Randolph) and two fish hatcheries discharge to waters of the White River Basin. There are also twenty-one permitted stormwater discharges in the watershed.



WHITE RIVER BASIN

No Scale

Status of Support of Designated Uses

Assessment of the overall use support of the rivers and streams in the White River Basin indicates that approximately 93% of the assessed miles fully support (including threatened miles which are fully supported), and approximately 7% partially support or do not support designated water uses. Sedimentation, increased water temperature, nutrients, turbidity and pathogens are the major causes of impairment. The sources of these pollutants include streambank de-stabilization, loss of riparian vegetation, and runoff from back roads, developed land and agricultural land.

Table III.3.3 summarizes use support for all Class B surface waters designated by the Water Quality Standards for the White River Basin.

**Table III.3.3 Designated Use Support Status
White River Basin**

Use	Miles fully supported	Miles with threats	Miles partially supported	Miles not supported
Overall	317.1	106.2	31.0	3.0
Aquatic biota/habitat	319.6	103.7	31.0	3.0
Fish consumption	457.3	0	0	0
Swimming	389.9	40.0	27.5	0
Secondary contact recreation	430.3	24.0	0	3.0
Drinking water	436.2	21.1	0	0
Agriculture water supply	436.3	21.0	0	0

Chapter Four. Lakes and Ponds Water Quality Assessment

The tables discussed below are not intended to replace the information presented in the 1996 305(b) Report, but rather to present information from those lakes which were re-assessed during the present reporting period.

Individual Use Support

Table III.4.1 presents overall use support for the 138 lakes reassessed during the reporting period (Appendix B is a listing of those lakes reassessed during this reporting period). Overall, only 4,004 of 16,368 reassessed acres (24%) fully support all designated uses. This is largely the result of newly refined fish consumption advisories. As in 1996, impairments to fish consumption uses result in significant reductions to overall use support. The fish consumption advisory for mercury (and PCBs in Lake Champlain) was significantly refined as a result of data collected during the 1996 field season. Reservoirs in the Deerfield Basin (Harriman, Somerset, Sherman, and Searsburg Reservoirs, and Grout Pond) no longer support fish consumption uses. This refinement in the advisory reduced by 3,877 acres the number of Vermont inland lake acres that previously had partially supported fish consumption.

Table III.4.1. Individual Use Support Summary
Lakes Reassessed During 1996 and 1997.

Use	Acres Fully Supporting Uses	Acres Fully Supporting Uses but Threatened	Acres Partially Supporting Uses	Acres Not Supporting Uses	Acres Not Assessed
Overall	1765	2239	5666	6682	16*
Aesthetics	8805	3399	2171	1872	121
Aquatic life	3785	5701	3865	2992	25
Agricultural Water Supply	20	0	0	0	16348
Drinking Water Supply	175	0	0	0	16193
Fish Consumption	6486	0	3460	6225	197
Filtered Water Supply	14043	50	1321	0	954
Industrial Water Supply	15376	0	0	0	992
Secondary Contact	6637	3230	4579	1872	50
Swimming	9363	3263	1765	1872	105

*) no data were obtainable for two small ponds totaling 16 acres in size.

Approximately 59% of all the reassessed waters fully support aquatic life and secondary contact uses, while nearly 76% of waters fully support swimming and aesthetics uses. Nearly all waters reassessed support filtered water supply and industrial water supply uses.

Of the lake acres in the Otter Creek Basin that were assessed, 2458 acres (71%) did not fully support one or more designated uses. Of the 1024 acres that fully supported all designated uses, 503 acres are threatened. The major cause of partial or non-support on lakes of this basin is flow alteration. Other causes affecting large number of acres are metals (mercury and its effect on fish consumption), nutrients, dissolved oxygen levels and excessive levels of aquatic plants. The major sources of impairment are the manipulation of water level on those lakes with artificial control, atmospheric deposition, unspecified sources of nonpoint pollution and agriculture.

Relative Assessment of Causes, and Relative Assessment of Sources

Table III.4.2 presents an overview of the causes of use impairments, while Table III.4.3 presents an overview of sources, for the 138 lakes reassessed during 1996-1997. Acres of lakes impaired are divided into major and moderate/minor impact. A cause with a major impact means it is considered the most serious problem affecting that acre. A cause rated moderate/minor is a secondary problem affecting that particular acre. If a lake acre is affected by only one cause it was rated as major. The major and moderate/minor figures are added together to derive the total impaired acres for each source.

Metals (for lakes with walleye and Deerfield Basin lakes) and total toxics (for lakes with lake trout) are the causes of fish consumption advisories. Presently, the Department considers that all metals and toxics sources to inland lakes are atmospheric in nature. Thus, the single greatest source of use impairments to lakes reassessed in 1996-1997 is atmospheric deposition. In sum, 8,802 acres are impaired for fish consumption uses due to atmospheric deposition of metals and total toxics. Use impairment information is expected to be continually changing based on the results of additional fish tissue monitoring and the new *Assessment of Mercury in Hypolimnetic Sediments of Vermont and New Hampshire Lakes* project.

Acidification (pH) impairs aquatic life use on 10% of reassessed acres and threatens an additional 19%. Atmospheric deposition and natural sources are the sources of this acidification. The Department is continually revising its estimates of lake and pond aquatic life use impairments based on updated annual monitoring data from the Acid Precipitation Monitoring Program.

Table III.4.2 Total Size of Waters Affected by Various Causes
Lakes Reassessed During 1996-1997

Cause of Use Impairment	High	Moderate / Minor	Threatened
0 Cause unknown	26	789	
500 Metals	3877	4310	
560 Mercury	3793	760	
800 Other inorganics	6	0	
900 Nutrients	2063	873	910
1000 pH	123	1568	3051
1100 Siltation	343	779	589
1200 Organic enrichment - DO	1087	760	70
1400 Thermal modifications		0	160
1500 Flow alteration	2860	457	336
1600 Other habitat alterations		0	84
1700 Pathogens		10	74
1900 Oil and grease		0	6
2200 Noxious aquatic plants - Native	165	215	221
2210 Noxious aquatic plants - Algae	1622	279	611
2400 Total Toxics	174	1856	
2600 Exotic Species	341	72	1279

Significant impairments to aquatic life use are caused by flow alteration, all of which can be attributed to hydromodification. Indeed, 3,317 (20%) of acres reassessed during the reporting period are impaired due to hydromodification and subsequent flow alteration.

The following causes related to eutrophication, nutrients, algae, organic enrichment-DO, and siltation, are all significant causes of use impairments to Vermont lakes, affecting aesthetic, aquatic life, secondary contact, and swimming uses. These cause categories account for use impairments on at least 43% of lake acres reassessed during the reporting period. Major sources of these use impairments include: unspecified nonpoint sources, agriculture, and habitat modification.

Statewide, the acreage of waters with use impairments due to exotic species continues to increase. Currently, the Department actively manages a non-native nuisance aquatic species program for Eurasian watermilfoil (*Myriophyllum spicatum*), water chestnut (*Trapa natans*), zebra mussels (*Dreissena spp.*), and purple loosestrife (*Lythrum salicaria*). More information is available regarding these programs in Appendix B of the 1996 305(b) report.

Presently, 42 inland lakes and Lake Champlain have populations of Eurasian watermilfoil. This represents an increase of three lakes during the reporting period. In addition, water chestnut was found in the northern end of Lake Bomoseen in 1997, only the third inland water to host this species. For the lakes reassessed during the reporting period, approximately 452 acres had uses impaired and 1,263 acres had uses threatened due to the unintentional transport of exotic species from marinas and recreational boating activities to other lakes.

Table III.4.3. Total Size of Waters With Uses Affected
by Various Source Categories for Lakes Reassessed During 1996-1997

Source of Use Impairment	Major	Moderate/	Threatened
100 INDUSTRIAL POINT SOURCES	6	0	11
110 Major Industrial Point Sources		0	160
1000 AGRICULTURE	1789	164	615
1100 Nonirrigated Crop Production	1402	760	446
1400 Pasture Grazing - Riparian and/or Upland	1412	760	565
1800 VT-Animal Holding/Management Area	1402	776	486
2000 SILVICULTURE	33	16	350
2100 Harvesting, Restoration, Residue Management	33	0	331
2200 Forest Management (pump drainage/fertiliz/pestic)		760	
3000 CONSTRUCTION	3	938	630
3200 Land Development	3	932	636
4000 URBAN RUNOFF/STORM SEWERS	5	157	175
4300 Other Urban Runoff		148	15
4500 Highway/Road Bridge Runoff	5	0	
6000 LAND DISPOSAL		10	
6300 Landfills		0	14
6400 Industrial Land Treatment		0	446
6500 Onsite Wastewater Systems (Septic Tanks)		10	34
6700 Septage Disposal		0	446
7000 HYDROMODIFICATION	3211	106	375
7400 Flow Regulation/Modification	3211	106	336
7550 HABITAT MODIFICATION (OTHER THAN HYDROMOD)	132	1031	105
7600 Removal of Riparian Vegetation		85	
7700 Streambank Modification/Destabilization	132	1031	210
7900 MARINAS AND RECREATIONAL BOATING	404	48	1263
7910 In-Water Releases	404	48	1263
8100 ATMOSPHERIC DEPOSITION	4174	5087	927
8200 WASTE STORAGE/TANK LEAKS-ABOVE GROUND		0	6
8300 HIGHWAY MAINTENANCE AND RUNOFF	30	245	687
8600 NATURAL SOURCES	13	2037	3162
9000 SOURCE UNKNOWN	26	789	1
9070 VT-UNSPECIFIED NONPOINT SOURCE	2737	124	

Trophic Conditions and Trends

Table III.4.4 presents information on the trophic status of *all* inland Vermont lakes. During the reporting period, additional monitoring data allowed for the reclassification of one lake (Indian Brook Reservoir, Essex, VT) from eutrophic to mesotrophic. An additional three lakes which previously lacked sufficient data were also classified.

Table III.4.4. Trophic Status of Significant Inland Vermont Lakes

Trophic Status	Number of Lakes	Total Lake Area (ac)
Assessed	544	53,590
Oligotrophic	33	9,817
Mesotrophic	121	25,404
Eutrophic	30	6,205
Hypertrophic	2	473
Dystrophic	16	400
Unknown		12,441
Total	606	54,740

Chapter Five: Estuary and Coastal Information

Vermont is not a coastal state; therefore, estuary and coastal information is not applicable.

Chapter Six: Wetlands Information

Background

Vermont wetlands are significant resources that contribute to the economic, cultural, and physical well being of its residents. Wetlands provide numerous ecological functions and social values, including habitat for fish and wildlife, recreational and educational opportunities, habitat for threatened and endangered species, temporary storage of flood waters, and they aid in the maintenance of water supply and quality. However, these resources have been significantly affected by human land and water use activities.

The following paragraphs are updated from the 1996 305(b) Report. The remainder of the wetlands information in that report has not changed.

The Department provides comment on Act 250 applications that involve wetland issues. The Department also conducts pre-Act 250 determinations to assist potential developers in meeting the requirements of the Act. Staff provide comment and advice to other state agencies and they are called upon as wetland experts wherever testimony is deemed appropriate. The Department reviews projects that involve wetland filling under Section 401 of the Clean Water Act based on compliance with the Vermont Water Quality Standards and other applicable provisions of State law. On January 23, 1996, the Vermont Water Quality Standards included the statement that the Standards shall apply to "all waters of the United States," as defined in 40 C.F.R. §122.2 (1995). This wording, therefore, includes wetlands as being part of "all water..." with respect to having met the goals of the Water Quality Standards.

Extent of Wetland Resources

Recently, the Agency of Natural Resources digitized all the National Wetland Inventory (NWI) maps for the state. A total of 232,000 acres of palustrine wetlands is depicted in the maps. Until a more accurate figure has been determined, Vermont uses the figure of 300,000 acres of wetlands of all types.

Wetland Loss

A recent analysis of all completed projects reviewed by the Department (full information is available) shows that there has been a total of 155 acres of documented wetland loss and 311 acres of documented wetland impairment over the period 1990 through 1997 (Table III.6.1). These figures do not represent all wetland impacts as they are based only on summaries of projects that have been completed for each year. It is likely that many of the projects that have not been completed are larger projects and may represent substantial areas of wetland impacts. Also, it is clear that there are many wetland alterations still occurring that are not reported to the Department and are not included in this database.

Table III.6.1. Areas of Wetland Loss and Impairment - 1990 through 1997¹²

	1990	1991	1992	1993	1994	1995	1996	1997
No. of Completed Projects (Percentage of total projects)	469 (88%)	477 (76%)	553 (87%)	455 (87%)	369 (62%)	321 (58%)	238 (46%)	168 (32%)
Acres of Wetland Loss								
Class One and Two Wetlands	19.4	12.1	11.6	19.1	3.7	5.1	4.7	2.5
Class Three Wetlands	22.6	10.0	8.0	11.6	6.5	6.2	8.5	3.2
Acres of Wetland Impair.								
Class One and Two Wetlands	47.6	40.2	110.7	19.0	24.6	16.8	4.0	1.3
Class Three Wetlands	3.1	7.8	7.2	4.6	10.5	4.0	8.9	0.4

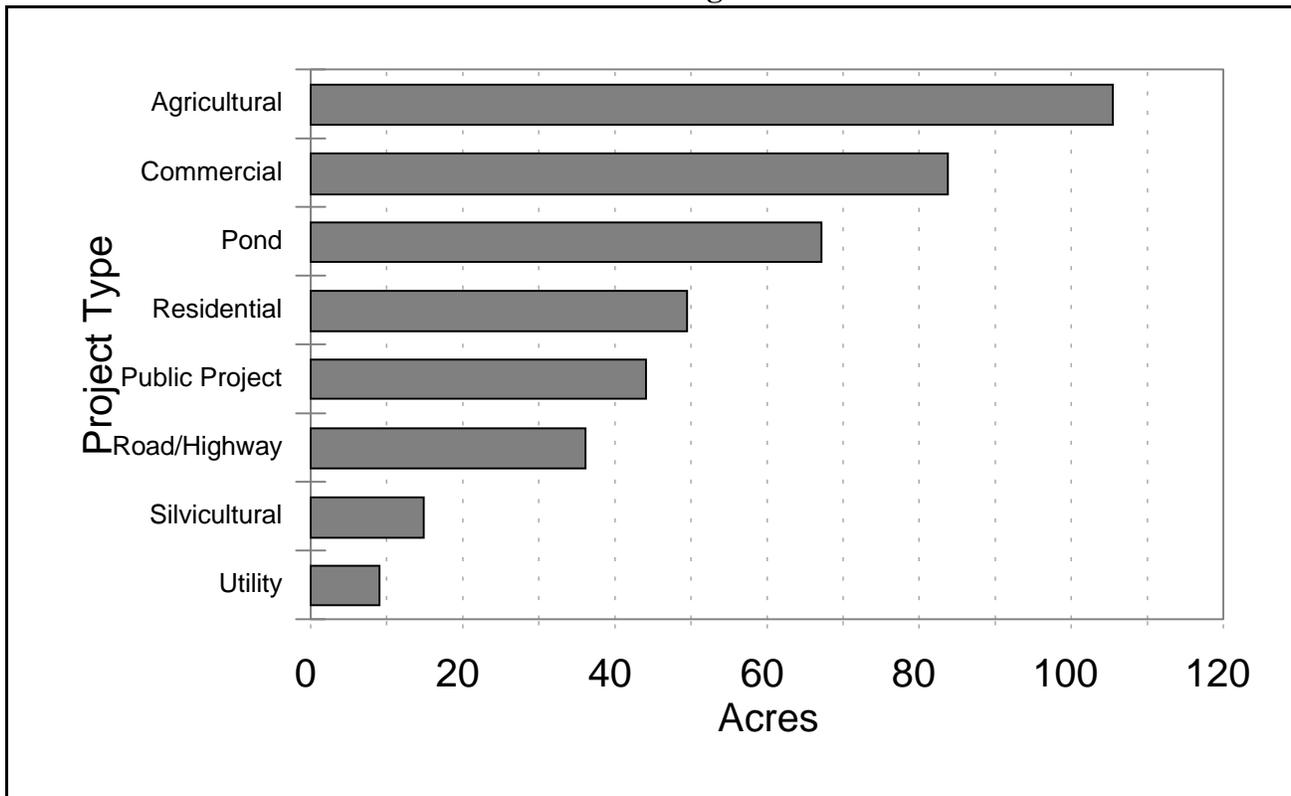
The database analysis also shows that there were approximately 560 acres of wetlands saved during the 1990-1997 period. This was achieved by encouraging developers to move their projects out of wetlands or to reconfigure them so as to have little or no impact on wetlands.

Wetlands Protection Mechanisms

On October 15, 1997, the State of Vermont and the Army Corps of Engineers issued the State General Permit for projects in waters of the United States that occur in Vermont. Under this program, any fill under 3000 square feet, (except in Class Two wetlands, or special wetlands, or wetlands adjacent to international bodies of water, or in the towns of Athens, Brookline, Grafton, Newfane, Putney, Rockingham, or Townshend), do not have to report their fill activity to either the Corps of Engineers or the State of Vermont. Fills between 3000 square feet and one acre are reviewed by an interdisciplinary team. The Vermont Water Quality Standards are the basis for review of projects under Section 401 Water Quality Certification. The Department works closely with the Corps of Engineer's Vermont Field Office staff on many projects.

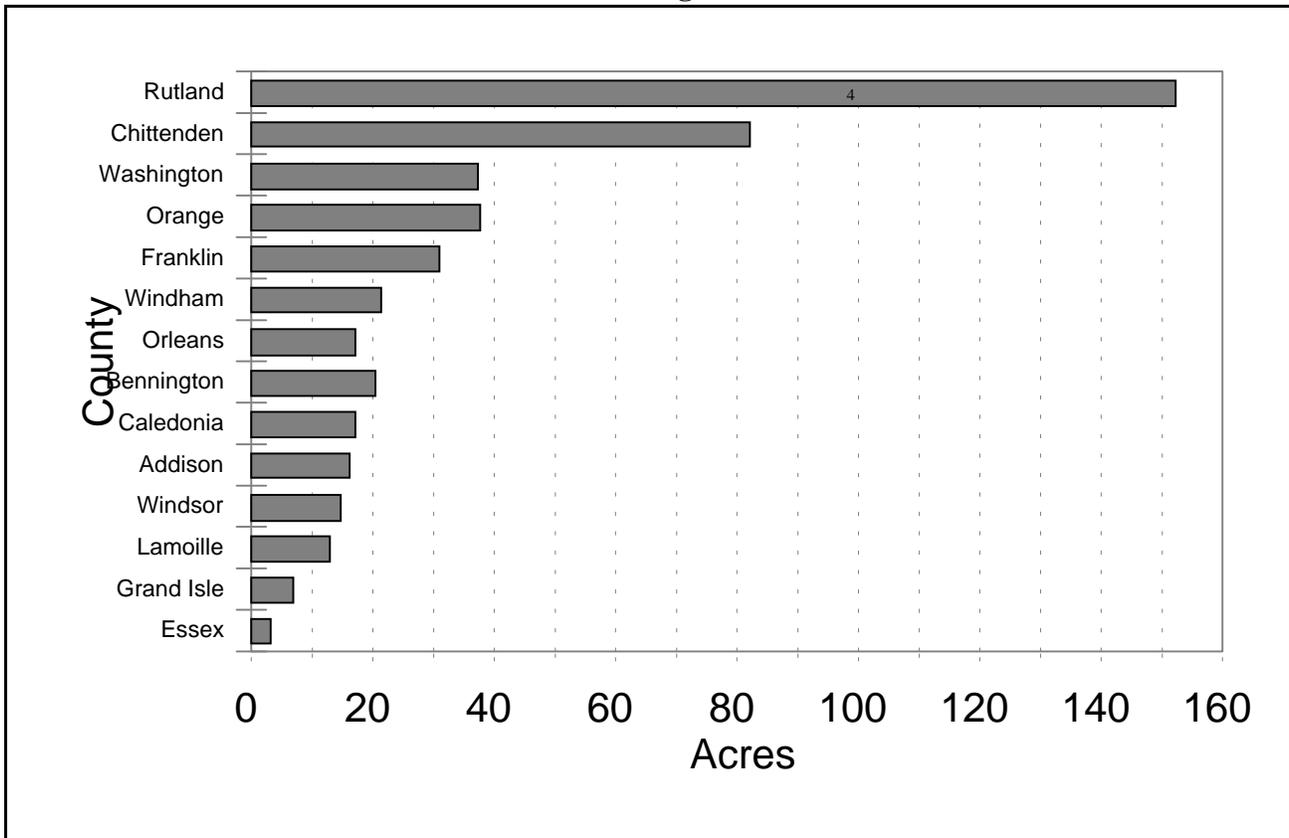
¹² Figures are based on the projects that have been completed. (Source: Wetlands Office Database).

**Table III.6.2. Area of Wetland Loss or Impairment by Project Type
1990 through 1997**



For projects completed during the 1990-1997 period, the Department's database shows that, of the project types, agricultural projects (109 acres) and commercial/industrial development (113 acres) resulted in the greatest area of wetland loss and impairment, followed by ponds (96 acres) and residential development (63 acres) (Table III.6.2). Commercial/industrial development, residential development and road construction generally result in mostly wetland loss with small areas of wetland impairment. The 109 acres of loss and impairment due to agriculture includes 100 acres of forested swamp conversion from one project in Brandon.

**Table III.6.3. Area of Wetland Loss or Impairment by County
1990 through 1997**



Geographically, Rutland County is the area of the state with the highest acreage of wetland alteration, when the 100 acre agricultural conversion is included in the analysis (Table III.6.3). However, Chittenden County remains the area of the state with the largest number of Department site visits and the largest area of wetland loss. Approximately 38 acres of wetland have also been lost or impaired in Washington County over this period.

**Table III.6.4 Area of Wetland Loss or Impairment by Wetland Function
1990 through 1997**

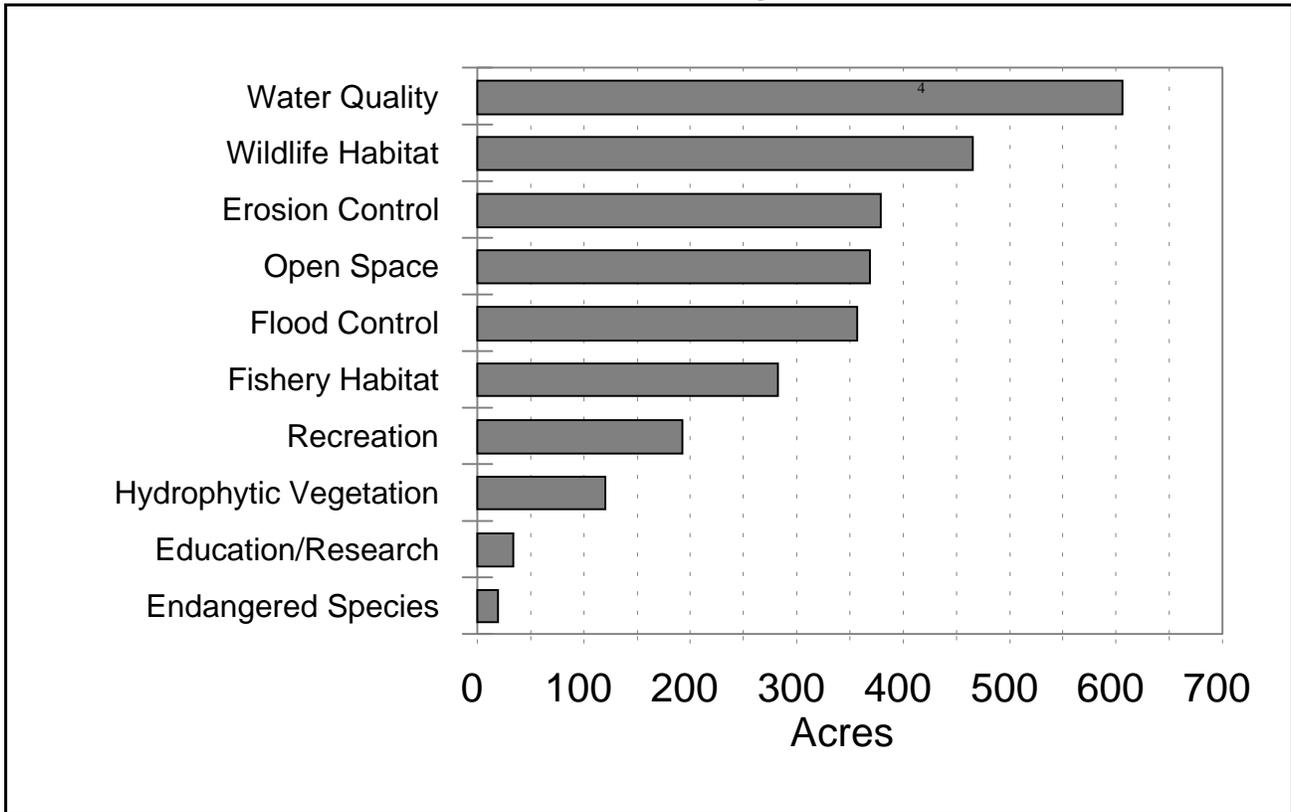


Table III.6.4 shows the area of wetland loss and impairment over the period 1990 to 1997 based on the functions identified to be present in each altered wetland. As a particular wetland where alteration occurred may provide one or many of the ten functions and values listed, the documented area of alteration for that wetland is included in the totals for each function and value provided by that wetland. The surface water quality protection and wildlife habitat functions were the most commonly occurring functions in altered wetlands.

Chapter Seven: Public Health/Aquatic Life Concerns

Size of Water Affected By Toxicants

As stated in the 1996 305(b) Report, and pursuant to Section 304(l) of the Clean Water Act Amendments of 1987, the Department determined that there were no waterbodies in Vermont that were impaired due to the discharge of priority pollutants from point discharges and consequently no point discharges of priority pollutants in Vermont are suspected of causing violations of water quality standards for priority pollutant toxicants. USEPA has reviewed and approved this finding under the provisions of the amended 304(l) regulation of July 24, 1992. Continued point source characterization by the Department and NPDES permittees supports these findings. Cumulative results indicate that, with a few exceptions, toxic substances in point discharges are not likely to be causing significant impairment of surface waters.

Public Health/Aquatic Life Impacts

Fishing Advisory

Fish consumption advisories due to mercury contamination have been instituted by the Department of Health, as well as most of the other New England states since the 1994 305(b) Report. Vermont's Fish Advisory was last updated July 1997, and cautions a segment of the population (women of child-bearing age, particularly pregnant women, women planning to get pregnant and breast feeding mothers, and children age 6 and under) against eating any walleye. However, this segment of the population may eat up to four meals per month of Walleye in Lake Carmi. It also advises this segment of population to eat no more than one meal of Lake Trout, Smallmouth Bass and Chain Pickerel per month and no more than two to three meals of all other fish per month. Exceptions suggest this segment of the population should eat no Lake Trout in Lake Champlain larger than 25 inches, and no meals of any other fish except Brown Bullhead in Grout Pond and Somerset, Harriman, Sherman and Searsburg Reservoirs.

The updated health advisory also alerts all other individuals to eat no more than one meal of Walleye per month in all lakes except Lake Carmi, where there is no Walleye advisory. This segment of the population is advised to eat no more than three meals of Lake Trout, Smallmouth Bass and Chain Pickerel per month in all lakes except Lake Champlain. In Lake Champlain, no more than one meal per month of Lake Trout larger than 25 inches should be eaten. No more than nine meals of all other fish per month should be eaten, except no more than one meal per month of Brown Bullhead in Grout Pond and Somerset, Harriman, Sherman and Searsburg Reservoirs.

Small Community Untreated Waste Discharges

Several small communities throughout the state have been discharging untreated wastes to the state's waters due to the lack of treatment facilities. The discharges constitute threats to public health. Included are the villages of East St. Johnsbury, Shoreham, Cabot, Pownal and Warren. The Department is providing technical assistance to these communities to help them plan for the installation of appropriate sewage treatment facilities.

Sites of Known Sediment Contamination

The reader is referred to page II-10 for a discussion of a survey of Lake Champlain sediments for toxic contaminants.

Restrictions on Bathing Areas

Table III.7.1 summarizes certain Lake Champlain beach closures for 1996 and 1997 due to nontoxics (high E. coli bacteria counts). The North Beach closings were due to heavy rains resulting in urban runoff containing pollutants. There were no North Beach closings in 1997. The completion of corrections to Burlington's combined sewer overflows has resulted in no beach closings from that source.

The Shelburne beach closings were due to suspected faulty septic systems and other sources of bacteria. No source was found for the high bacteria in Ricker Pond. A possible source is beaver activity.

Table III.7.1. Closure of Bathing Areas Due to Nontoxics

<u>Waterbody/Swim Area</u>	<u>Date of Closure</u>
Lake Champlain, North Beach	7/17/96
Lake Champlain, North Beach	7/18/96
Lake Champlain, North Beach	7/24/96
Lake Champlain, North Beach	7/27/96
Lake Champlain, Shelburne Beach	7/18/96
Lake Champlain, Shelburne Beach	7/24/97
Ricker Pond, State beach	7/17/97-7/21/97

Data Source

The state has not performed ambient water source monitoring for drinking water systems served by surface waters. Nor has raw water been sampled from these systems. Finished water as required by the SDWA has been monitored for these water systems. There are approximately 90 public community water systems which use an impoundment, lake, pond, or stream, as a water source. Of these water systems, 52 use surface water as a permanent source. The remaining are used for emergencies. Only two of the permanent surface water sources had any detection of VOCs, one detection occurred in a lake and the other in a stream.

Nitrate can occur naturally and surface water systems are thought to be vulnerable to this type of contamination. As such, surface waters have a more rigorous monitoring schedule with respect to nitrate than do groundwater systems. Surface water systems are required to monitor for nitrate quarterly, unless each sample is below 5.0 mg/l for each quarter, then annual monitoring is required.

Restrictions on Surface Drinking Water Supplies

There were no closures of surface drinking water supplies during the reporting period of 01/01/96 through 12/31/97; however, there were 10 boil water notices issued for the period. The Allen Point Water Supply is under a permanent boil water notice due to system deficiencies, and has been in effect since 09/11/87. Table III.7.2 lists the boil water notices which were issued by the State Health Department.

Table III.7.2. Boil Water Notices, January 1, 1996 through December 31, 1996¹³

<u>Water System Name</u>	<u>Source</u>
Allen Point Water Supply	Lake Champlain
Bristol Water Department	Seth Hill Brook
Gleason Road, Rutland	Tenney Brook
Grand Isle FD #3	Lake Champlain
Greensboro FD #1	Well/Caspian Lake
Newbury Village, Inc.	Emergency Source
North Hero State Park	Lake Champlain
Pownal Tannery Res.	Unnamed Brook
Pownal Water Company, Pownal	Unnamed Brook
Rutland City Water District	Mendon Brook

¹³Source: Jean Nicolai, VT DEC, Water Supply Division

PART IV: GROUND WATER ASSESSMENT

Overview

The Ground water assessment information has not changed significantly since the 1996 305(b) Report. The following paragraphs, appearing in that report, are included here to give the reader a basic overview of the Groundwater program.

Ground water is a critical resource for the rural State of Vermont, as approximately 60 percent of Vermont's citizens depend upon ground water for drinking and other uses. In rural communities, ground water dependence on both public and private drinking water sources is nearly 100 percent.

Vermont's hydrogeologic settings have not been rigorously assessed or mapped. In part, this is due to the lack of resources needed to gather and assess the data. This also can be said of ground water quality monitoring which has not been performed with any regularity. Nor has monitoring of raw water at public ground water sources been performed. Routine monitoring of ground water has only included finished water at public sources. This monitoring information has been collected to meet the regulatory requirements of the Safe Drinking Water Act.

The potential for ground water quality problems may be inferred from the numerous and varied contamination sites that have been identified in the state. Vermont has approximately 1716 sites where hazardous materials have been released into the environment. There are 421 sites where ground water contamination has been detected. Eight of these 1716 sites are designated as National Priority Sites under the federal Superfund Program. It is known that all of these sites represent a wide spectrum of contaminants. However, data is not readily available to link each contaminant to its corresponding site. Nor is data available to indicate the type of hydrogeologic setting in which they occur. It is known that petroleum is a major contaminant and is apt to be present at many sites. In addition to petroleum, septage is another recognized ubiquitous contaminant. Due to the state's rural setting, homes and industries outside municipal services areas lack access to sewers. Therefore, septic systems are now and probably will remain a significant potential nonpoint source of contamination. Solid waste disposal is also frequently identified as a source of ground water contamination. An estimated 300 active and nonactive landfills exist throughout Vermont.

APPENDIX A

FISH CONSUMPTION ADVISORY - JULY 3, 1997

-----**Health Alert**-----

Vermont Department of Health
Vermont Fish Advisory Chart - July 1997

Due to mercury contamination, the Vermont Department of Health has issued this health advisory warning to people to limit consumption of fish caught in Vermont waters. Scientific studies have linked mercury with developmental problems, and kidney and nervous system damage.

	Women of childbearing age - particularly pregnant women, women planning to get pregnant, and breastfeeding mothers - and children age 6 and under.	All other individuals
Walleye	No meals	No more than 1 meal per month
Lake Trout, Smallmouth Bass, Chain Pickerel	No more than 1 meal per month	No more than 3 meals per month
Brown Bullhead, Pumpkinseed	No Advisory	No Advisory
All Other Fish	No more than 2-3 meal per month	No more than 9 meals per month
Exceptions:		
Lake trout in Lake Champlain* (larger than 25 inches)	0 meals (includes all children under age 15)	No more than 1 meal/month
All fish except brown bullhead in these Deerfield Chain lakes (Grout pond, and Somerset, Harriman, Sherman, and Searsburg reservoirs).	0 meals	No more than 1 meal/month

*Still in effect is the 1989 advisory for Lake Champlain which recommends that adults limit consumption of lake trout larger than 25 inches to one meal per month and that women of childbearing age and children under age 15 eat no lake trout over 25 inches in length because of PCB's (polychlorinated biphenyls).

For more information, call
1-800-439-8550
The Vermont Department of Health
Toxicology and Risk Assessment Program

APPENDIX B

SUPPORT STATUS OF LAKES AND PONDS REASSESSED 1996-1997

Appendix B - Support Status of Lakes and Ponds Reassessed 1996-1997

Lake Name	Town	Lake Area	Acres Fully Supporting Uses	Acres Threatened	Acres Partially Supporting Uses	Acres Not Supporting Uses
ABBEY	Ripton	3		3		
ANSEL	Bethel	2	2			
ARROWHEAD MOUNTAIN	Milton	760				760
BALDWIN	Starksboro	9			9	
BALL MOUNTAIN	Jamaica	85			85	
BEAN (SUT)	Sutton	30		30		
BEAVER (MEN)	Mendon	6		6		
BEAVER (PROCT)	Proctor	9	9			
BEAVER MEADOWS	Chittenden	3	3			
BECK	Newark	6		6		
BIG MUD	Mount Tabor	15			15	
BLACK (HUB)	Hubbardton	20	14	4	2	
BULLHEAD (BENSON)	Benson	7	7			
BURR (PITT)	Pittsford	20	20			
CARMI	Franklin	1402				1402
CASPIAN	Greensboro	789			789	
CEDAR	Monkton	123	73	25	11	14
CHAMPAGNE	Randolph	3		3		
CHARLESTON	Charleston	40				40
CHIPMAN	Tinmouth	79		79		
CHITTENDEN	Chittenden	702			702	
CLYDE	Derby	186				186
COLES	Walden	125	120	5		
COLTON	Sherburne	27		27		
COOKS (SHREWS)	Shrewsbury	12	12			
CRESCENT	Sharon	20	20			
DANBY	Danby	56		56		
DANYOW	Ferrisburgh	192	154	38		
DOW	Middlebury	11		11		
DUNKLEE	Rutland	3				3
DUNMORE	Salisbury	985			985	
EAST LONG	Woodbury	188			188	
ECHO (HUB)	Hubbardton	54	35	11	8	
EDDY	Rutland	10	10			
ELBOW;	Mendon	8		8		
ELFIN	Wallingford	16			16	
ELLIGO	Greensboro	174			174	
EMERALD	Dorset	28	28			
EWELL	Peacham	51	0	25	26	
FAIRFIELD	Fairfield	446		446		
FERN	Leicester	69	55	14		
FIFIELD	Wallingford	6		6		
GILMORE	Bristol	6			6	
GRIFFITH	Peru	18			18	
GROUT	Stratton	84				84
HALF MOON	Hubbardton	23		23		
HALLOCK;	Starksboro	15		15		
HANCOCK MT;	Rochester	14	14			
HARRIMAN (WHITING)	Whitingham	2040				2040
HARVEYS	Barnet	351			351	
HIGH (SUD)	Sudbury	20	20			
HOLDENS	Brookfield	10		10		

INDIAN BROOK (ESSEX)	Essex	50	28	22	
INMAN	Fair Haven	85	68	17	
JACKSONVILLE	Whitingham	20		20	
JOHNSON (ORWELL)	Orwell	20	20		
JOHNSON (SHREWS)	Shrewsbury	12			12
KENNY	Newfane	26			26
KEYSER;	Chelsea	7	7		
KINGS	Rochester	4	4		
LAKE-OF-THE-CLOUDS	Cambridge	1			1
LAKOTA	Barnard	20		20	
LAMOILLE	Morristown	148			148
LAMSON	Brookfield	24		24	
LEFFERTS	Chittenden	55	55		
LILY (LON)	Londonderry	21	21		
LITTLE ELMORE	Elmore	24		24	
LITTLE MUD (MT. TAB)	Mount Tabor	7			7
LITTLE ROCK	Wallingford	18		18	
LONG (GREENS)	Greensboro	100	100		
LONG (WEST)	Westmore	90			90
LONG HOLE	Mount Tabor	18			18
LYFORD	Walden	33	33		
MANSFIELD	Stowe	35		35	
MARSHFIELD	Marshfield	69		69	
MAY	Barton	116	93	23	
MCCONNELL	Brighton	87		87	
MCINTOSH	Royalton	23		23	
MILL (BENSON)	Benson	39		39	
MITCHELL	Sharon	28	28		
MOREY	Fairlee	547	410	100	37
MUD (BENSON)	Benson	8		8	
MUD (BRAIN)	Braintree	10	10		
MUD (GRANBY)	Granby	55	55		
MUD (LEICESTER)	Leicester	23		23	
MUD (MORGAN - N)	Morgan	35		35	
MUD (THET)	Thetford	20	20		
MUDD	Hubbardton	20		20	
MUDDY (RUTLAND)	Rutland	10		10	
NINEVAH	Mount Holly	171		171	
NORTH (BRISTOL)	Bristol	6			6
NORTH (BROOK)	Brookfield	24		24	
NORTH (CHIT)	Chittenden	3			3
NOYES	Groton	39	29	8	2
OLD MARSH	Fair Haven	131		131	
OLYMPUS POOL	Proctor	3		3	
OSMORE	Peacham	48		48	
PATCH	Rutland	20			20
PERCH (BENSON)	Benson	24		24	
PICKLES	Brookfield	17	17		
PLEIAD	Hancock	6	6		
RANDOLPH - N;	Randolph	10		10	
RICHVILLE	Shoreham	129			77
ROCKY	Rutland	8	8		
ROOD	Williamstown	23		23	
ROYALTON HILL;	Royalton	11		11	
RUTLAND CITY	Rutland	13		13	
SEARSBURG	Searsburg	25			25
SHERMAN	Whitingham	160			160

SILVER (BAR)	Barnard	84			84	
SILVER (LEICESTER)	Leicester	101			101	
SKYLIGHT	Ripton	2			2	
SMITH (PITT)	Pittsford	6			6	
SOMERSET	Somerset	1568				1568
SOUTH (BROOK)	Brookfield	16	16			
SOUTH (CHIT)	Chittenden	10	10			
SOUTH (EDEN)	Eden	103			103	
SPRING (SHREWS)	Shrewsbury	66	41	25		
SPRUCE (ORWELL)	Orwell	25	24	1		
SPRUCE (WILM)	Wilmington	12	12			
ST. CATHERINE	Wells	883			883	
STANNARD	Stannard	25	25			
STAPLES	Williamstown	15		15		
STAR	Mount Holly	63			58	5
SUGAR HILL	Goshen	63				63
SUGAR HOLLOW	Pittsford	21		21		
SUNSET (BROOK)	Brookfield	25			25	
TWIN - E	Athens	3	3			
TWIN - W	Athens	1	1			
VERGENNES WATERSHED	Bristol	15		3		12
WALKER (HUB)	Hubbardton	13		13		
WALKER (NEWARK)	Newark	3	2		1	
WALLACE	Canaan	532			532	
WALLINGFORD	Wallingford	87		87		
WHEELER (BRUN)	Brunswick	66		66		
WINONA	Bristol	248				248
WOLCOTT	Wolcott	74		74		
ZACK WOODS	Hyde Park	23	23			

APPENDIX C

SECTION 319 NONPOINT SOURCE IMPLEMENTATION PROGRAM

State of Vermont
Section 319 Nonpoint Source Implementation Program
Federal FY1990

Project name & proponent

Wetlands enforcement - DEC	\$ 118,403	
Domestic discharge enforcement - DEC	53,666	
Act 250 erosion control enforcement - DEC	57,740	
Ground water NPS abatement - DEC	46,095	
FY90 grand total	\$ 275,904	(\$ 467,313)

Federal FY1991

Project name & proponent

Wetlands NPS control - DEC	\$ 59,582	
Lake protection - DEC	9,562	
Revision of NPS Assessment & Management Program & Lake Memphremagog - DEC	36,791	
BMP development & evaluation - DEC	3,299	
Flow restoration at hydro sites - DEC	49,820	
a) total base	\$ 159,054	

Lake Iroquois watershed demonstration NPS control - DEC	\$ 75,793	
Act 250 erosion control in targeted watersheds - DEC	32,076	
Agricultural milkhouse waste treatment BMP demonstration - DAF&M	39,836	
Targeted watersheds domestic discharge enforcement - DEC	42,027	
New England Interstate NPS pollution coordination - NEIWPC	21,000*	
b) total competitive	\$ 210,732	

FY91 grand total	\$ 369,786	(\$616,310)
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* Vermont's share = \$3,500

Cumulative Section 319 funding (FY90 & 91) total	\$ 645,690	(\$1,083,623)
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Figures in parenthesis represent 319 plus required 40% non-federal match.

**State of Vermont
Section 319 Nonpoint Source Implementation Program
Federal FY1992**

Project name & proponent

Wetlands NPS control - DEC	\$ 58,218
Flow restoration - DEC	44,182
Lake protection - DEC	13,717
BMP development & evaluation - DEC	23,321
Section 319 program administration - DEC	27,019
Shoreland management conference - DEC	7,103
a) total base	\$ 173,560

Geographic information system support for drinking & groundwater programs - DEC & DAF&M	\$ 34,712
b) total ground water	\$ 34,712

Act 250 erosion control in targeted watersheds implementation - DEC	\$ 41,599
Agricultural milkhouse waste treatment BMP demonstration - DAF&M	24,000
Logger education on AMPs within targeted impaired watersheds - DFP&R	6,000
Targeted watersheds domestic discharge enforcement implementation - DEC	51,013
Crop management service - WNRCD	30,000
Year #1 agricultural watersheds BMP <u>implementation</u> - UVM & DEC	22,582
Snow disposal techniques - WNRCD	10,000
Streambank stabilization - DEC/MMRW	3,000
c) total competitive	\$ 188,194

Year #1 agricultural watersheds BMP effectiveness <u>monitoring</u> - UVM	\$ 105,554
d) total NPS monitoring "set-aside"	\$ 105,554

FY92 grand total	\$ 502,020	(\$ 836,699)
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Cumulative Section 319 funding (FY90 - FY92) total	\$1,147,710	(\$1,920,322)

Figures in parenthesis represent 319 plus 40% non-federal match amount.

State of Vermont
 Section 319 Nonpoint Source Implementation Program
Federal FY1993

Project name & proponent

Wetlands NPS control - DEC	\$ 56,674
Flow restoration - DEC	42,472
Lake protection - DEC	4,684
BMP development & evaluation - DEC	16,155
Section 319 program administration & NEAT - DEC	54,914
a) total base	\$ 174,899

Geographic information system support for drinking & ground water programs - DEC & DAF&M	\$ 36,800
b) total ground water	\$ 36,800

Act 250 erosion control in targeted watersheds implementation - DEC	\$ 43,000
Targeted watersheds domestic discharge enforcement implementation - DEC	42,461
Assessment priority ground waters & implementation of protection/control measures - DEC	70,000
NPS Pollution Interstate Coord. - NEIWPC	21,000*
Year #2 agricultural watersheds BMP <u>implementation</u> - UVM	16,039
c) total competitive	\$ 192,500

Year #2 agricultural watersheds BMP effectiveness <u>monitoring</u> - UVM	\$ 75,000
d) total NPS monitoring set-aside	\$ 75,000

Integrated Crop Management Service - FNRC & NRCC	\$ 62,400
e) total pollution prevention	\$ 62,400

FY93 grand total **\$ 541,599** **(\$ 902,578)**

* Vermont's share = \$3,500

Cumulative Section 319 funding (FY90 - FY93) total **\$1,689,309** **(\$2,822,900)**

Figures in parenthesis represent 319 plus required 40% non-federal match.

**State of Vermont
Section 319 Nonpoint Source Implementation Program
Federal FY1994**

**** all projects 12 months unless noted ****

Project name & proponent

Wetlands NPS control - DEC	\$ 88,850	
Flow Restoration - DEC	41,120	
Lake Watershed Protection Program - DEC	19,338	
BMP development & evaluation - DEC	9,636	
Section 319 Program Administration - DEC	57,237	
Agricultural BMP Rule Promulgation - DAF&M	12,670	
a) total statewide implementation	\$ 228,851	
Source locations - DEC		\$ 18,603
Private well locations - DEC		56,154
GIS Support for Drinking & Ground Water Programs - DAF&M		39,000
b) total ground water		\$ 113,757
Act 250 Erosion Control in Targeted Watersheds Implementation- DEC		\$ 38,154
VT Backroads Watershed Management & Water Quality Project - DEC		42,819
Impaired Stream Habitat NPS Treatment Project - DEC (24 mo)		75,000
Targeted Watersheds Domestic Discharge Enforcement Implementation - DEC		43,889
Educating Loggers to Apply AMP & Wetlands Protection Techniques within Targeted Impaired Watersheds in VT - DFP&R (24 mo)		15,000
Winooski Integrated Crop Management Service - WNRCD (17 mo)		30,000
BMP Demonstration Watershed Project - DAF&M		24,300
c) total watershed-based implementation		\$ 269,162
Youth Watershed Resource Restoration Project - DFP&R		\$ 54,559
Batten Kill Water Resources Restoration Project - BNRCD (4 mo)		12,841
d) total watershed resource restoration		\$ 67,400
Agricultural NPS Demonstration in Watersheds of Lake Memphremagog -		
	- OCNRCD (36 mo)	\$260,100
Urban Runoff NPS Control - Burlington City		66,738
e) total "special" projects		\$ 326,838

FY94 grand total **\$1,006,008 (\$1,676,681)**

Cumulative Section 319 funding (FY90 - FY94) total **\$2,695,317 (\$4,499,581)**

Figures in parenthesis represent 319 plus 40% non-federal match.

**State of Vermont
Section 319 Nonpoint Source Implementation Program
Federal FY1995**

**** all projects 12 months unless noted ****

<u>Project name & proponent</u>	
Wetlands NPS control - DEC/WQ	\$ 94,516
Training of Crop Mgmt Specialist & Expansion of ICM Services Statewide - CVCMA (15 mo)	48,200
VT Backroads Watershed Management & Water Quality Project - DEC/WQ	44,104
Flow Restoration - DEC/WQ	42,354
Section 319 Program Administration - DEC/WQ	39,660
Lake Watershed Protection Program - DEC/WQ	27,254
Technical Assistance for AAP Implementation - NRCC	27,000
BMP Loan & Grant Coordinator - DAF&M	17,392
a) total statewide implementation	\$ 340,480
Source Protection Plans - DEC/WS	\$ 89,131
GIS Support for Drinking & Ground Water Programs - DAF&M	43,500
Regional Offices GIS - DEC/WS	33,912
b) total ground water	\$ 166,543
NMP/project YR 3 <u>implementation</u> - UVM/SNR	\$ 67,472
Targeted Watersheds Domestic Discharge Enforcement Implementation - DEC/ENF	45,206
Act 250 Erosion Control in Targeted Watersheds Implementation - DEC/WQ	39,299
Integrated Crop Management Service - FNRC	15,000
Project Administration* in Lake Memphremagog - ONRCD (24 mo)	10,000
c) total watershed-based implementation	\$ 176,977
Section 319 "Partnership" - DEC/WQ & CRJC	\$ 65,000
Colchester Pond Water Restoration Project - WVPD (4 mo)	12,000
d) total watershed resource restoration	\$ 77,000
SubTotal (a - d) FY95 319 "Target"	\$761,000
NMP/project YR 3 <u>NPS monitoring</u> - UVM/SNR	\$ 80,000
New Regional NPS Coordination - NEIWPC	21,000**
e) total above target	\$ 101,000

FY95 grand total **\$ 862,000 (\$1,436,666)**

* Refer to FY94 Section 319 project work plan.
** Vermont's share = \$3,500.

Cumulative Section 319 funding (FY90 - FY95) total **\$3,557,371 (\$5,936,247)**

Figures in parenthesis represent 319 plus 40% non-federal match.

State of Vermont
Section 319 Nonpoint Source Implementation Program
Federal FY1996

** all projects 12 months unless noted **

<u>Project name & proponent</u>		
Wetlands NPS control - DEC/WQ	\$ 106,118	
Flow Restoration - DEC/WQ	71,450	
Section 319 Program Administration - DEC/WQ	63,806	
Lake Watershed Protection Program - DEC/WQ	31,791	
Technical & educational Assistance for Implementation of VT's Agricultural NPS Program - NRCC/DAF&M	124,071	
BMP Grant Coordinator - DAF&M	<u>18,240</u>	
subtotal	\$ 415,476	
Groundwater Data Utilization & Public Awareness - DAF&M		\$ 44,000
Targeted Watersheds Domestic Discharge Enforcement Implementation - DEC/ENF		44,520
Act 250 Erosion Control in Targeted Watersheds Implementation - DEC/WQ		40,704
NMP/project YR 4 <u>implementation</u> - UVM/SNR		<u>15,000</u>
subtotal		\$ 144,224
Comprehensive river w/shed assessment - DEC/WQ	\$ 22,064	
Stream habitat/nps treatment (II) - DEC/WQ	29,573	
Lord's Creek model restoration - Lake Memphremagog Watershed Assoc	20,000	
Write/rewrite EPRs - DEC/WW	27,455	
Consumer toxics use reduction education - DEC/EA	8,474	
Special waste management assessment - DEC/EA	47,321	
Comprehensive planning & permit coordination - DEC/EA	6,413	
Completion of statewide land cover database - VCGI	<u>40,000</u>	
subtotal	\$ 201,300	
FY96 319 "Target"	\$ 761,000	
NMP/project YR 4 <u>NPS monitoring</u> - UVM/SNR	\$ 80,000	
New Regional NPS Coordination - NEIWPCC	<u>21,000</u>	
Total others separate from "Target"	\$ 101,000	
FY96 grand total	\$ 862,000	(\$1,436,667)

Cumulative Section 319 funding (FY90 - FY96) total	\$4,419,371	(\$7,372,914)

Figures in parenthesis represent 319 plus required 40% non-federal match.

State of Vermont
Section 319 Nonpoint Source Implementation Program
(a part of Vermont's Performance Partnership Grant Agreement)

Federal FY1997

<u>Project name & proponent</u>	<u>Approx. federal dollars</u>
Part One. DEC base programs.	
Wetlands NPS Control	\$ 113,222
Flow Restoration	75,759
Section 319/NPS Program Administration	68,281
Lake Watershed Protection	34,412
Domestic Discharge Enforcement	24,444
Act 250 Erosion Control	47,482
Rotational Watershed Assessment	24,948
Habitat/NPS Treatment	<u>31,232</u>
subtotal	\$ 419,780 (57% of 319 target allocation)
 Part Two. DAF&M base programs.	
Technical Assistance for AAP Implementation	\$ 119,000
BMP Grant Coordinator	23,336
Groundwater NPS Program	<u>43,400</u>
subtotal	\$ 185,736 (25% of 319 target allocation)
 Part Three. NPS Program "Enhancements"	
Stormwater Evaluation, FMR	\$ 5,000
Elizabeth Mine Hydrologic Assessment, White River NRCD	12,000
New Haven River Streambank Restoration, NHRAA	2,000
Local Roads Pass-thru, DEC/WQ	15,000
Youth Watershed Restoration, YCC	22,000
West Branch Streambank Restoration, Town of Stowe	27,500
Winooski River Streambank Stabilization, Town of Colchester	45,000
Urban Watershed Management NPS Implementation Fund, DEC/WQ	<u>6,300</u>
subtotal	\$ 134,800 (18% of 319 target allocation)
 Part Four. NPS Monitoring	
National Monitoring Project (UVM, NEI, DEC)	\$ 75,000
 Original FY97 "Target" Grand Total	 \$ 815,316
 Part Five. Interstate Coordination	
New England Regional NPS Coordination, NEIWPC	\$ 28,286
 Revised Final FY97 319 Grand Total	 \$ 843,602 (\$1,406,003)

Cumulative Section 319 funding (FY90 - FY97) total	\$5,262,973 (\$8,778,917)

Figures in parenthesis represent 319 plus required 40% non-federal match.

State of Vermont
Section 319 Nonpoint Source Implementation Program
(a part of Vermont's Performance Partnership Grant Agreement)

Federal FY1998

<u>Project name & proponent</u>	<u>Approx. FFY98 319 dollars</u>
Part A.1. Traditional VT DEC base programs	
Wetlands NPS Control	\$118,883
Flow Restoration	79,547
Section 319/NPS Program Administration	71,695
Lake Watershed Protection	36,133
Domestic Discharge Enforcement	25,666
Act 250 Erosion Control	49,856
Rotational Watershed Assessment	26,195
Habitat/NPS Treatment	<u>32,794</u>
Subtotal	\$ 440,769
 Part A.2. Enhancements to DEC base programs	
Urban expenses & local implementation fund	\$ 9,575
Local Roads Small Grant Fund (to No.VT RC&D)	20,000
Watershed geomorphology training course	<u>5,000</u>
Subtotal	\$ 34,575
Part A Total	\$ 475,344
 Part B. Pass-thru to VT DAF&M base programs	
BMP cost share coordination	
Agricultural NPS technical assistance	
Ground & drinking water protection	
Part B Total	\$ 186,000
 Part C. NPS Program Pass-thru	
Addison County RPC - alternative on-site	\$ 7,450
Bennington County District - Batten Kill	5,550
VT Youth Conservation Corps - restoration	35,000
Rutland NRCD - backroads assessment	10,000
WVPD - riparian demonstration site	35,000
White River NRCD - Elizabeth mine	2,575
Part C Total	\$ 95,575
 Part D. NPS National Monitoring Project	
University of Vermont, SNR	\$ 60,368
New England Interstate Water Pollution Control Commission	21,000
DEC lab	18,732
Part D Total	\$ 100,100
Vermont "Target" Amount (Parts A - D)	\$ 857,019
Part E. NEIWPC Interstate Coordination	\$ 28,451
Final Vermont FY98 319 Grand Total (Parts A - E)	\$ 885,470

APPENDIX D

205(j) / 604(b) PASS THROUGH PROJECTS INVENTORY - FFY89-FFY98

604(b)
Pass Through Projects Inventory
FFY89 - FFY98

(all projects completed unless noted with completion date)

Addison County Regional Planning Commission

Phase II of a two-phased project to develop priorities for Little Otter Creek watershed water quality improvement.

Phase I of a two-phased project whose purpose is to develop priorities for Little Otter Creek watershed water quality improvement by reducing phosphorus transport from agricultural and other land uses to Lake Champlain.

Map on-site septic system info for four towns and support On-Site Sewage Committee proposed legislation.

Report on satellite imagery land cover conditions for certain watershed, conduct additional mapping of conditions in Lewis Creek watershed, continue coordination with USDA, sponsor on-site regional meeting.

Assist New Haven River lay monitoring, continue agricultural NPS mapping efforts in certain watersheds, develop capability to utilize LANDSAT TM technology.

Locations of watershed boundaries for seven drainages, of approved (USDA/SCS) agricultural runoff control systems, watershed pollutant loading reductions (incomplete).

Land use/land cover for watersheds of Lake Dunmore and Fern Lake.

Prepare local planning guides for flood plains, wetlands and special/natural areas.

Land use/land cover for Wellhead Protection Areas throughout the region.

Mapped zoning district boundaries within WHPAs of the region.

Evaluation of potential for development within each WHPA of region.

Assist with Lake Champlain Committee's "Planning Manual & Checklist."

Inventory source, number served and the extent of service areas for community and municipal drinking water systems of the region.

Bennington County Regional Commission

Map ground water source protection areas, overlaid with E911 data for all towns in the region (12/31/98).

Update water resources element of the regional plan, survey conservation commissions to identify conditions which either impact or improve water quality, develop study design and scope of work to prepare comprehensive basin/watershed management plan for region and host a meeting on the proposed on-site sewage rules/regulations. (11/30/97).

Locate flood hazard areas (i.e. FEMA lines) for Rupert; integrate flood hazard info with wetlands-related info; enhance town-wide water resources planning efforts.

Characterize existing and projected water consumption and use in region, produce greater awareness of management strategies for source supplies.

Collect data for existing water consumption and use for Bennington County.

Location of flood hazard areas (i.e. FEMA lines) for Dorset.

Location/extent of wetlands in Dorset from NWI maps.

Flood hazard area (ie FEMA lines) for Bennington, overlay with NWI wetlands.

Location of flood hazard areas (ie FEMA lines) for Sunderland & Arlington.

Location of flood hazard areas (ie FEMA lines) for Manchester.

Location/extent of surface water classifications in region. Location/extent of six use restricted waterbodies of the region.

Location/extent watershed boundaries for 14 lakes & ponds in the region greater than 20 acres.

Location/extent of WHPAs in region, attribute information for WHPAs.

Highlight NWI information for region.

Develop a VT Hoosic River Watershed Ground Water Protection Strategy.

Central VT Regional Planning Commission

Develop a series of planning maps for each town , showing information developed in previous water quality and surface water inventories.

Enter onto the regional GIS the location of all cascades, waterfalls, gorges and whitewater sections in the Region, assist the Dept. with a regional public meeting regarding the status of the on-site sewage reform legislation.

Develop (for remainder of region) digitally referenced surface waters by Waterbody ID and calculate Waterbody sizes; augment existing surface water data by adding certain attribute info.

Develop (for Duxbury, Northfield & Roxbury) digitally referenced surface waters and attributes, sponsor on-site regional public meeting.

Develop (for Fayston & Warren) digitally referenced surface waters and attributes.

Land use/land cover within WHPAs and watersheds of public surface water supplies throughout region.

Land use/land cover for Town of Woodbury at 1:5000 scale.

Land use/land cover for watersheds of at least 5 lakes and ponds in Woodbury, spatial analysis of 5 watersheds.

Sponsored WNRCD to develop soil erosion control handbook for construction equipment operators.

Location/extent of watershed boundaries for lakes/ponds in region greater than 5 acres.

Sponsored DEC to enter NWI Wetland areas by county.

Mapped land use and zoning districts within WHPAs of Calais and Plainfield.

Mapped land use/land cover within WHPAs of region and watersheds of public water supplies.

Mapped extent of existing and planned service areas.

Location and attributes of waterfalls, cascades and gorges and whitewater segments within Calais and Plainfield.

Chittenden County Regional Planning Commission

Continue work on automation of municipal drinking water distribution and sewage collection and treatment systems using ARC/INFO GIS for the Town of Milton (06/22/98).

Complete work on automation of municipal sewage collection and treatment systems using ARC/INFO GIS for the towns of Williston and Essex (06/22/98).

Develop digitally-referenced rivers and streams in Chittenden County by Waterbody ID and calculate Waterbody sizes.

Map all drinking water distribution lines greater than 2" for at least one Chittenden County town.

Digitize approximate location and extent of surface water for region, certain attributes, sponsor on-site regional public meeting.

Outfall location associated with each municipal and industrial wastewater treatment facility in region, assist DEC with spatial analysis of urban/suburban conditions in LaPlatte River watershed for Nonpoint source phosphorus TMDL project.

Watershed boundaries for major surface watersheds (50 in number) within region.

Land use/land cover, parcels (where available) and zoning district boundaries within WHPAs in Charlotte, Colchester and Jericho.

Location/extent of land use, parcels and zoning district boundaries within WHPAs of Hinesburg, Richmond and Underhill, well attribute information (incomplete).

Analysis of potential for development within WHPAs of Hinesburg and Richmond.

Assist with Lake Champlain Committee's "Planning Manual & Checklist."

Lamoille County Planning Commission

Provide a streambank and land use inventory along Wild Branch River in Wolcott and Craftsbury; provide Wolcott with recommendations for areas of building restrictions due to past flood damage; provide Wolcott with a septic system suitability analysis in Wild Branch watershed; continue collecting water resource policies for next update to regional Plan.

Provide a septic system suitability analysis for the West Branch River watershed in Stowe; to continue to collect relevant water resource data for the next update of the regional plan, and assist with public outreach regarding any recent on-site sewage reform rule change.

Spatially locate all boundaries of the Green River watershed and overlay the watershed with septic system suitability information and previously-acquired land use/land cover information; complete the update of the Regional Plan to include water resource policies and priorities, and assist the Dept. with public outreach regarding the status of on-site sewage reform.

Prepare town maps depicting the area and extent of each septic system suitability class for the region. Map the boundaries of the Gihon watershed and locate the extent of septic system suitability soils information and land use/land cover.

Begin update of Regional Plan to include water resource policies and priorities.

Update regional soils information (septic system suitability), illustrate North Branch watershed land use/cover with septic system suitability, sponsor on-site regional public meeting.

Spatially referenced locations and characteristics of sites where hazardous materials (active/inactive landfills, state/local active salt storage sites, state "registered" non-petroleum haz. waste sites & underground storage tanks, on-site sewage disposal systems greater than 6500 gpd) may be used, stored or generated.

Design, develop and deliver certain portions of an education and information program regarding water source protection planning.

Location and extent of distribution and/or collection lines for municipal drinking water, municipal stormwater and municipal sanitary wastewater throughout the region.

Location and extent of surface water classified as Class C.

Location/extent of land use within WHPAs of region, well attribute information.

Mapped zoning district boundaries and extent of existing and planned service area within WHPAs of the region.

Location/extent and attributes of waterfalls, cascades and gorges of the region, evaluate the potential for loss of these features.

Mapped location and attributes of whitewater segments in region. Inventory (for regional plan development) locations of boating access points, use restricted waters, locations of federal*, state* and municipally* owned property along/adjacent to surface water, locations of hydroelectric* and hydro-related facilities*, locations of targeted waters, trophic status and watershed area for lakes/ponds over 20 acres and locations of nutrient sensitive lakes/ponds* and extent of watershed area; (*) denotes to be GIS compatible

Northeastern VT Development Association

Develop (for certain NVDA towns in the Barton, Memphremagog, Coaticook and Clyde River basins, digitally-referenced surface waters and augment existing surface water data by adding certain attribute information (12/28/98).

Develop for certain NVDA towns in the Missisquoi, Black and Barton River basins, digitally-referenced surface waters by Waterbody ID and calculate Waterbody sizes; augment existing surface water data by adding certain attribute info; assist with public information re the on-site sewage reform.

Spatially reference location/extent of large clear-cutting operations in four towns, review certain programmatic aspects of VT AMPs, sponsor 2 on-site regional public meetings.

For the Passumpsic River basin, inventory locations of unique natural areas, locations of existing and potential public access points to surface waters and evaluate the adequacy of existing municipally-based mechanisms for protecting these resources.

Location/extent of distribution and/or collection lines for municipal drinking water, municipal stormwater and municipal sanitary wastewater for Newport City, Canaan, Danville and St. Johnsbury.

Develop model shoreland ordinance for use in N.E.Kingdom. Prepare/distribute undeveloped shorelines report.

Location/extent and characteristics (zoning, size and use of undeveloped sections, parcels) of undeveloped shoreline areas of lakes/ponds of the region larger than 10 acres, assess adequacy of present municipal shoreline ordinances, develop criteria and prioritize lakes in region in need of protection.

Assist with digitization of features associated with CT River Inventory Project.

Assist with mapping and characterization of features associated with CT River Inventory Project.

Mapped land use, zoning districts and extent of service area within the Wellhead Protection Areas of Brighton, Concord, Greensboro and Sutton.

Watershed boundaries for 88 lakes/ponds in region greater than 20 acres, land uses and zoning districts within watersheds of lakes/ponds in at least 4 municipalities.

Highlight NWI maps information for 12 municipalities.

Northwest Regional Planning Commission

Mapping of surface waters and waterbodies in the existing 1:5000 Northern Forest Lands surface water coverages for Franklin County and the remainder of Franklin County, and attribute the waterbodies with DEC-designated WBIDs, and generate a tabular summary of water course lengths by VT WBID and stream names (3/22/99).

Mapping of surface waters and waterbodies in Grand Isle County, Lake Champlain direct drainage and Franklin County, and attribute the waterbodies with DEC-designated WBIDs, and generate a tabular summary of water course lengths by VT WBID and stream names. (3/22/99)

Conduct a GIS-based land use inventory and analysis of the Missisquoi River watershed and its major sub-basins, and assist the Dept. in sponsoring a regional public forum regarding the status of the on-site sewage reform.

Inventory and digitize on GIS maps, streambank erosion along the Missisquoi River within the Region.

Develop, review & present to public basic regional water resource policies for regional plan, spatially reference certain DEC-WQ information, sponsor on-site regional public meeting.

Map and characterize Lake Carmi watershed land use.

Map and characterize undeveloped shoreline areas of St. Albans Bay & Missisquoi Bay.

Prepare/distribute local strategies for ground water protection handbook.

Location/extent of land use and zoning districts within WHPAs of the region.

Develop/expand regionally based matrix which identifies regionally significant water resources and specific abatement measures for land use scenarios.

Assist with Lake Champlain Committee's "Planning Manual & Checklist."

Mapped extent of existing and planned service area within WHPAs of the region.

Rutland Regional Commission

Update existing water resources information in the Rutland region, develop a waterbody map of the region, attributed with DEC-designated WBIDs, and supply the town of Brandon with a cdrom containing the waterbody information for the town of Brandon. (2/24/99)

Study the bedrock influence on water quality and yield for certain public community water systems in the Region and share this information with owners of the systems; assist the Dept. with a public forum regarding the status of the on-site sewage reform.

Map current and proposed land uses (and their areas) within groundwater source protection areas and share info with towns and DEC.

Investigate use of GPS technology in locating private wells and surface water sources in part of region, sponsor on-site regional public meeting.

Develop regional water resource policies for regional plan, present spatially based water resource information using the GIS.

Attribute information associated with 67 community water systems of the region.

Identify and display, for each waterbody in region greater than 20 acres in size (35 waterbodies) the configuration and extent of surface water located within 100' and 200' of shore, identify waterbodies in region under use restrictions enacted by VT Water Resources Board.

Location and attributes of privately owned domestic wells in Brandon and Wallingford.

Location/extent of land use and zoning district boundaries within the WHPAs of Brandon and Wallingford.

Assist with Lake Champlain Committee's "Planning Manual & Checklist."

Location/extent of watershed boundaries for lakes/ponds in region greater than 5 acres.

Southern Windsor County Regional Commission

Complete the first phase of work for the development of a regional water quality plan by preparing regional GIS maps depicting updated surface water uses and values and certain land uses and practices; making recommendations for segments in need of further assessment, and holding a regional public meeting to obtain feedback on surface water uses and threats (12/06/99).

Assist with hosting a Project "WET" workshop and spatially analyze potential impacts of land use activities in the Mill Brook watershed on water quality and water uses.

Assess the potential impact of agricultural activities on nonpoint source pollution in the Mill Brook watershed, and assist the Dept. with public outreach regarding the status of the on-site sewage reform.

Continue developing the Regional Watershed Protection Program and assist local groups involved with water quality protection in the SWC region.

Assist Ascutney Local River Subcommittee in the review of health & sewage ordinances and town plans in 3 towns, increase town involvement associated with Regional Watershed Protection Program, sponsor on-site regional public meeting.

Location and extent of potential pollution sites and current uses of waterbodies in region using GIS.

Land use/land cover and parcel conditions along the CT River, evaluate river protection criteria against land use and parcels, characterize location, type and owner of domestic point sources to CT River.

Initiate phase I of III regarding a Regional Watershed Protection Program.

Forums for local officials regarding the implementation of tools/techniques for surface water quality protection.

Assist with digitization of features associated with CT River Inventory Project.

Assist with mapping and characterization of features associated with CT River Inventory Project.

Location/extent of surface waters and WHPAs in region.

Location/extent of waterfalls, cascades and gorges and whitewater segments in the region, attribute information.

Mapped surface water classifications in region.

Surface water monitoring project on several rivers in region with River Watch & CT River Watershed Council.

Two Rivers-Ottauquechee Regional Commission

Update the water resources element of the Regional Plan, survey town planning and conservation commissions to identify conditions which either impact or improve water quality, and develop a study design and scope of work to prepare a comprehensive basin/watershed management plan for the Ottauquechee River watershed.

Update the Windsor County surface water GIS data sets and assist the Dept with public outreach regarding the status of the on-site sewage reform.

Edit and code surface waters in 16 towns to current VCGI attribute standards, label surface waters with their appropriate VT Waterbody ID number and calculate the length of riverine surface waters by WBID number.

Spatially reference land use/cover conditions in 3 towns, document potential NPSs pollution, sponsor on-site regional public meeting.

Coding of surface waters (VCGI protocol) in towns of region located in Windsor County.

Location of major surface waters and tributaries in Windsor County portion of region (includes 10 towns), location and extent of potential Nonpoint pollution sources (defined as an inventory of land use) immediately adjacent (within 150 feet of shore) to major surface waters and tributaries entered above.

Location, extent and characteristics of land use, zoning district boundaries and parcels found in upper White River towns (Granville & Hancock), identify riparian conservation strategies, complete phase III report.

Assist with digitization of features associated with CT River Inventory Project.

Assist with mapping and characterization of features associated with CT River Inventory Project.

Land use/land cover within WHPAs for the region.

Annotate each surface water segment in region.

Verify and enter all point source locations in region.

Location & attributes of waterfalls, cascades, gorges & whitewater segments of the region.

Location and attributes of hydroelectric and hydro-related facilities of the region.

Highlight information on NWI maps for 3 municipalities.

Upper Valley - Lake Sunapee Council

Collect and evaluate information re the status of water supply protection in certain towns and identify each community's needs relative to water supply protection (12/31/98).

Draft an updated and expanded water resources component for the Hartland Town Plan.

Identify, map and enter onto GIS land use/land cover of parcels adjacent to Ottauquechee, White, Ompompanoosuc and West Branch of the Ompompanoosuc Rivers in the region.

Summarize/compare water quality protection features contained in zoning ordinances and subdivision regulations of 10 towns, sponsor on-site regional public meeting.
Identify, map and enter onto GIS land use/land cover of parcels adjacent to CT River in region.
Update/revise maps and data files associated with inventory of formal and informal public access points found on the Ottauquechee, White and Ompompanoosuc Rivers.
Coordinate the CT River Inventory Project - a project which will map and enter many natural resource items found in the 29 VT towns adjacent to the CT River.
Assist with administration of CT River Inventory Project.
Location/extent and characterize public access points to major waterways of region (other than CT River).
Promote bi-state (NH & VT) conference on CT River.

Windham Regional Commission

Assist with rotational watershed assessment by building a regional watershed planning process and by continuing the work of assessing nonpoint source pollution areas on tributaries of the West River (06/30/98).
Initiate a water quality improvement project for the West River Basin, in cooperation with the Bonnyvale Environmental Education Center, and assist the Dept with public outreach regarding the status of the on-site sewage reform.
Continue working with On-Site Sewage Committee to develop plan of action and assist with dissemination of info from Committee to towns in Windham region.
Develop a protected lands map for six Connecticut River towns in the Region, identifying gaps of important resource land protection, including riparian lands.
Summarize/compare water quality protection features contained in bylaws and ordinances of 6 towns, assist with Deerfield River hydro relicensing public participation, sponsor on-site regional public meeting.
Determine condition of individual sewage disposal systems in Dummerston, Newfane and Putney, enhance administration and enforcement of sewage ordinances in region.
Inventory and evaluate local and state septic system control programs, conduct septic system workshops, continue attending Deerfield River Compact meetings.
Assist DEC-WQ with Deerfield River comprehensive river planning, design local implementation strategies, regional plan review.
Assist with digitization of features associated with CT River Inventory Project.
Assist with mapping and characterization of features associated with CT River Inventory Project.
Draft and present to the public policies and action program recommendations regarding recreational greenways adjacent to major rivers/streams in region.
Evaluate Jamaica Town Plan & Regulations with respect to NPS pollution, draft suggested amendments.
Conduct Upper West River Basin "water forums."

In 1989 a cooperative pass through effort involved the **Otter Creek Natural Resources Conservation District** and the VT ANR/GIS. The order in which data were entered onto a geographic information system [for Addison County]....was as follows:

1. surface water classifications
2. public water supply wells
3. aquifer protection areas
4. important water related features - waterfalls, gorges, cascades, whitewater segments
5. wetlands
6. warm and cold water fishery waters
7. important regional swimming areas
8. public surface water supplies
9. electric generating sites

**VT Pass Through Program - funding levels by federal fiscal year
Section 604(b) of the Clean Water Act**

<u>Year</u>	<u>100,000.</u> 89
90	80,000.
91	80,707.
92	40,000.
93	40,000.
94	40,000.
95	40,000.
96	40,000.
97	40,000.
<u>98</u>	<u>40,000.</u>
total	\$540,707.

APPENDIX E

DRAFT WATERSHED APPROACH TO SURFACE WATER PLANNING

Vermont Department of Environmental Conservation
Watershed Approach to
Surface Water Quality Planning

Draft - August 12, 1998

Background

It is the policy of the State of Vermont that waters are managed to protect, maintain and improve water quality. The national policy, and goal of the Clean Water Act, is to restore and maintain the chemical, physical, and biological integrity of the nation's surface waters. Both state and federal law require water quality planning as one of the means to carry out these policies.

This document describes the overall Vermont water quality planning program and constitutes an addendum to the 1995 Continuing Planning Process. It is the goal of this revised process to promote truly effective surface water protection and restoration based on partnerships between the state and local watershed teams.

Vermont's first surface water quality plans, completed for all 17 major river basins, focused primarily on the management of domestic and industrial waste and were a prerequisite for receiving federal funding to construct waste water treatment facilities. Recently, the Department produced river plans in selected watersheds to inventory water uses relevant to hydroelectric dam licensing. At the present time, most pollutants which can be controlled at specific points of pollution have been abated or are on a schedule for abatement. Diffuse discharges of pollutants and human-caused physical alterations continue to impair the use and enjoyment and ecological health of our waters. Considerable planning and implementation of control measures are necessary to reduce these complex and widespread sources of pollutants.

While significant progress has been made in the past two decades in the restoration of our waters, the non-point source pollution problem is much larger and more widespread than the discharges of municipal sewage and industrial wastes. Addressing the problem requires involvement of the broad range of people who use and plan the use of land. Vermont must take a new collaborative approach to focus state water quality planning and management in watersheds where local people, landowners, and municipalities are actively seeking solutions to water resource protection and restoration issues. This approach will address the cumulative effects of pollution and the complex natural, social, and economic factors involved in implementing effective corrective actions.

New Collaborative Watershed Planning Process

As part of a collaborative watershed planning process, the Department will promote and support partnerships to work on water quality planning within watersheds to propose surface water management goals and restore waters to achieve such goals. Partnerships may consist of landowners, towns, regional planning commissions, watershed associations, conservation districts, businesses, agencies of state and federal government, and others interested in water quality management. Partnerships will build consensus and commitment, and identify the needs at the local and state level to protect watersheds or control existing sources of pollution. Planning will generally be multi-year efforts. The Department will identify and support these partnerships through the formation of "Watershed Teams" which will shape the content of plans and seek financial and technical support for remedial activities.

The following outline presents the four components of the Department's watershed planning process. Watershed planning will be conducted pursuant to section 303(e) of the Clean Water Act and it will be guided and supported by statewide water quality assessments and waterbody priority listings.

Components of Vermont's Surface Water Quality Planning Program

The following are components of Vermont's surface water planning program. The Department will seek public participation to complete basin assessments, priority lists, and management strategies which are compiled into Surface Water Management Plans. These Plans, also referred to as Basin Plans, satisfy the requirements of federal law, Sections 208 and 303e of the Clean Water Act, and state law, 10 V.S.A. Section 1253d. Each component consists of a statewide data/information base from which the Department is able to generate up-to-date water quality management plans called for in 40 CFR Section 130.5(b)(4).

① Basin Assessment

- Product:** Basin assessment reports result from water quality monitoring and evaluation and contain:
- surface water bodies where pollutants are violating State Water Quality Standards;
 - surface water bodies where designated uses are impaired or threatened;
 - discharges and activities requiring permits and water quality certifications; and
 - current surface water classifications and inventories of high quality waters and existing surface water uses and values, such as waterfalls, cascades, swimming holes, fishing, and undeveloped shore lands.
- Frequency:** Updates the assessment data base for 1/5 of the state's waters in 3-4 of the 17 major basins each year.
- Participants:** VT DEC (lead), Department of Fish and Wildlife, Natural Resource Conservation Service, Vermont Department of Agriculture, Regional Planning Commissions, Watershed Associations, Natural Resource Conservation Districts, other interested parties
- Time line:** Basin assessment period begins in early July and ends the following year in late August (1 year and 2 months).
- Public process:** Prior to the assessment year, the general public is notified of the assessment process, its purpose, and how to provide input. Upon request, individuals and organizations are provided with existing basin assessment(s). Those wishing to provide new data and information on specific water bodies are provided data sampling and reporting guidance to enhance the quality and timeliness of public input. Public involvement in the basin assessment process assists the Department in the identification of waterbody priorities for surface water protection and restoration described below.

② Waterbody Priority Lists for Surface Water Protection and Restoration

- Product:** Lists of priority waterbodies that are impaired (40 CFR §130.7(b)(1)), threatened, in need of further information or assessment, or that have been identified as needing reclassification by major drainage basin include:
- a **protection priority list** including those waters where existing or designated uses are threatened or in need of protection and for which schedules and lead agencies have been identified to complete protection strategies [reclassification petitions and ORW designations, where necessary]
 - b a **restoration priority list** including those waters where pollutants are violating numerical water quality criteria and impairing designated uses and for which schedules and lead agencies have been identified to complete assessments and pollution source control strategies [Total Maximum Daily Load (TMDL) determinations, where necessary](40 CFR §130.7(b)(4) and §130.6(c)(5)); and
- Frequency:** The TMDL list is updated every two years. Other statewide priority lists are updated periodically.
- Participants:** VT DEC (lead), Department of Fish and Wildlife, Natural Resource Conservation Service, Vermont Department of Agriculture, Regional Planning Commissions, Watershed Associations, Natural Resource Conservation Districts, other interested parties.
- Time line:** The TMDL list is due to EPA by April every even-numbered year.
- Public process:** Draft priority list prepared and made available every 2 years at public meetings or upon request, with opportunity for input and comment.

③ Statewide Management Strategy

The Department will prepare a Statewide Management Strategy describing the current water quality standards and the regulatory and non-regulatory programs, activities, and best management practices used by the Department and Watershed Teams to protect and restore surface waters in each of the major drainage basins. The Management Strategy Report contains general information that is applicable to surface waters statewide, including:

- a) Water Quality Standards, recent revisions to the Standards, and current Department rules, policies and procedures for implementing the Standards;
- b) current nonpoint source and water quality certification programs and best management practices (BMPs) to treat stormwater, residual wastes, and pollution related to agriculture, silviculture, mining, and construction, including inter-agency agreements to implement BMPs (40 CFR §130.6(c)(4,7)); and
- c) technical assistance programs provided by the Department related to surface water planning and protection including town plan and zoning regulation assistance.

The Report will be periodically updated through a public review process as statewide strategies are adopted or revised. The schedule for preparing individual basin plans is presently under discussion between the Department and the Water Resources Board and depends in part on the availability of resources.

④ Individual Watershed Management Strategies

Periodically, the Department will compile a surface water management plan for all major drainage basins or sub-basins. These plans include the basin assessment report, the protection and restoration priority lists for the basin, and the statewide management strategies that apply to all basins. Local watershed management plans may be developed with protection and restoration strategies for individual watersheds (refer to diagram of plan development process, page 6). These local watershed plans may include:

- a) petitions for reclassification and ORW designation including those made by Watershed Teams, and waterbody reclassifications where they have been completed;
- b) other surface water use and value protection strategies where completed;
- c) point source effluent limitations, schedules for compliance, and anticipated treatment works for municipal and industrial facilities (40 CFR §130.6(c)(2,3));
- d) nonpoint source and water quality certification programs and inter-agency agreements to implement BMPs where they are specific to the particular watershed (40 CFR §130.6(c)(4,7)); and
- e) pollution source control strategies (TMDLs) where completed (40 CFR §130.6(c)(1)).

The Department will seek to establish Watershed Teams to complete surface water protection or restoration strategies. The work of these teams will arise in part from the restoration and protection priority lists. Watershed Teams may seek to protect surface water uses and values by proposing surface water management goals and carrying out protection strategies. Watershed Teams may also seek to restore surface water uses and values by developing pollution source control strategies implemented through permits, enforcement, and best management practices. Watershed Teams may consist of local and regional organizations, interested individuals, and state and federal agencies. The composition of each Team may change as its work shifts from strategy development to implementation.

Watershed Teams - Protection Function

- Product:** A surface water protection strategy will be developed which documents the surface water uses and values of concern; identifies the environmental, social, and economic importance of the surface uses and values within the watershed and within the state; explains the actions necessary to protect or enhance those uses and values; and spells out the resources and timetables for implementing protection and enhancement strategies. Examples of protection strategies may include petitions to the Water Resources Board for surface water reclassification or Outstanding Resource Water designation; conservation plans for protecting recreational access through easements or public ownership; and education and outreach programs to promote BMP implementation.
- Frequency:** Based on the staff and resources available to support Watershed Teams.
- Geographic Scope:** Variable; not necessarily as large as the geographic scope of one of the 17 major river basins. Size of the waterbody is dependent on the public's interest in proposing watershed management goals.
- Participants:** Leadership - Local organization or regional planning commission. Team May Include - DEC, Department of Fish and Wildlife; Vermont Department of Agriculture; Regional Planning Commission; municipalities; watershed associations; conservation districts; landowners; other interested parties. Established by - DEC Commissioner in collaboration with other organizations and agencies.
- Time line:** Depending on the watershed size and the type of protection mechanisms sought, a management planning effort may take one year or several years.
- Staff Resources:** Each Team may require one or more part-time support staff, including: DEC water quality planner - time commitment identified in annual work plan and Water Quality Division budget; and local organization coordinator or regional planner.
- Support Materials and Services** - Costs associated with travel, public meetings, publications, and mapping services. Costs provided for in DEC Water Quality Division, local organization, or regional planning commission budgets or by contract with local organization or regional planning commission.
- Public process:** Public forums are conducted throughout the protection strategy development process. In watersheds where Teams are working on reclassification and ORW petitions to the Water Resources Board, workshops are provided to explain the reclassification and ORW designation processes. (Reclassification planning is contingent upon the Water Resources Board establishing Water Quality Standards which contain classifications and the narrative and numeric standards which clearly distinguish between and support individual classification goals.)

Watershed Teams - Restoration Function

- Product:** A pollution source control strategy or TMDL will be developed which documents the pollutant of concern; identifies the pollutant sources within the watershed; explains the pollution source reductions necessary to meet Standards and protect designated uses and values; documents the management practices necessary to remediate the pollutant; and spells out the resources and timetables for implementing management practices. Watershed Teams will focus on specific pollutants, such as: nutrients, organic substances, pathogens, toxic substances, sediments, and hydrological modifications (40 CFR §130.6(c)(1,6)).
- Frequency:** Based on the staff and resources available to support Watershed Teams.
- Geographic Scope:** The size of the watershed for which pollution source controls are developed is dependent on the type of pollutant and the location at which the cumulative effects of the pollutant cause a violation of Standards.
- Participants:** Leadership - Representative of agency or organization responsible for providing technical assistance, management, and/or implementation of pollution source controls¹⁴. Depends on initial and ongoing identification of pollution sources. Team may be co-led. Team May Include - DEC; Vermont Department of Agriculture; municipalities; Regional Planning Commission; watershed associations; Natural Resource Conservation Service; conservation districts; landowners; other interested parties. Established by - DEC Commissioner in collaboration with other organizations and agencies.
- Time line:** The work of a Watershed Team may take one year or several years depending on the pollutant type, need for detailed assessment, complexity of sources, watershed size, who holds the authority for BMP implementation, and the type and amount of funding available.
- Staff Resources:** Each Watershed Team may require one or more part-time support staff, including: State and Federal agency planner(s) - time commitment identified in annual work plans and budgets¹; and local organization coordinator or municipal planner.
- Support Materials and Services** - Costs associated with travel, public meetings, publications, mapping services, data collection and processing. Costs provided for in DEC Water Quality Division, local organization, or regional planning commission budgets or by contract with local organization or regional planning commission.
- Public process:** Watershed Teams may be comprised of individuals and organizations that were initially involved in the identification of the pollutant and the prioritization of the waterbody. The composition and leadership of Teams may shift over time to those individuals who have the authority to implement the best management practices needed.

¹⁴ A memorandum of agreement between the DEC and other local, state or federal agencies or organizations will precede the establishment of a watershed team that is led or staffed by another organization.

Diagram of Surface Water Management Plan Development Process

Statewide Basin Planning

① **Basin Assessment**
maintained in statewide
database

Basin Assessment Report
for each of the 17 major
drainage basins, updated
every 5 years

② **Waterbody Priority Lists**
maintained in statewide
database

**Statewide Waterbody
Priority List** compiled under
the 17 major drainage basins,
updated every 2 years

③ **Statewide Management
Strategy**
maintained in statewide
report

Management Strategy Report
containing strategies that
apply statewide to waters in
all 17 major drainage basins,
updated periodically

Surface Water Management Plan
for a major drainage basin or
sub-basin containing the most
current:

1. Basin Assessment Report
2. Priority Listed Waterbodies
3. State Management Strategy

Local Basin Plan Component

④ **Watershed Team**
established to address
priority surface water use
protection

**Individual Watershed
Management Strategy Report**
including reclassification
petitions to the Water
Resources Board, if
appropriate

④ **Watershed Team**
established to address
priority surface water use
restoration

**Individual Watershed
Management Strategy Report**
including TMDLs, if
appropriate

Surface Water Management Plan
for a major drainage basin or
sub-basin containing the most
current:

1. Basin Assessment Report
2. Priority Listed Waterbodies
3. State Management Strategy
4. **Individual Watershed
Management Strategies
including petitions
for reclassification,
TMDLs where they have
been completed, and
remediation.**

APPENDIX F

VERMONT ROTATIONAL WATERSHED ASSESSMENT

Vermont Rotational Watershed Assessment

Background:

The Vermont Department of Environmental Conservation Water Quality Division has conducted statewide water quality evaluations every two years from 1980 to 1996 for the purpose of reporting the conditions of the nation's waters to Congress as required by the Clean Water Act, section 305(b). In 1988, the Department conducted a comprehensive nonpoint source pollution water quality assessment that greatly enhanced the base of water quality information we maintain. Since 1988, the biennial updates had been restricted to gathering information from a limited number of sources due to staff and time constraints. Information sources not fully used since 1988 include volunteer monitoring and watershed groups, educational institutions, other state and federal agencies, local and regional planning commissions. The water quality assessment information has been used for the state's Clean Water Strategy, which determines nonpoint source pollution abatement priorities. It has also provided information to the general public on the water quality conditions of the state.

For the purposes of assessing and reporting water quality information, the state has been divided into seventeen major drainage basins that have from four to twenty-two river sub-basins or mainstem segments ("waterbodies") within them. (The Water Quality Division has a map that shows the seventeen major basins and the "waterbodies" (the sub-basins or river segments) within the major basins). The seventeen major basins drain to either Lake Champlain, the Connecticut River, Lake Memphremagog, or the Hudson River.

In order to more comprehensively and thoroughly assess the State's water and to take advantage of the untapped sources of information, the Vt DEC Water Quality Division has designed a rotational watershed assessment process such that the rivers and streams of all seventeen major basins in the state are evaluated once every five years. As much as possible, lake assessment work would also follow this rotation schedule. By focusing evaluations on selected watersheds each year, more systematic and intensive efforts can be made to collect and evaluate nonpoint and point sources of pollution. A focus on a limited number of watersheds will also provide the opportunity to determine the best characteristics of the river system to use as indicators of improving water quality and aquatic habitat; potentially reveal water quality trends; involve the general public; and provide interagency coordination.

The schedule for the basins' assessment is shown on page 5 and the criteria used to determine which basins would be assessed in each of the five years of the cycle included:

- Basins from more than one of the four major drainage areas of the state (Lake Champlain, Connecticut River, Lake Memphremagog, Hudson River) be represented each year with special attention paid to having at least one Lake Champlain basin and at least one Connecticut River basin in most years;
- The sum of the basins' areas evaluated for any given year be roughly equivalent;
- The order of evaluation in the next five years reflects known projects where an assessment is needed or where projects or major assessments are being done (examples of projects needing assessment include hydropower relicensing, basin planning with respect to point and nonpoint phosphorus reduction, and municipal wastewater facility upgrades or enlargements); and
- The order of evaluation considers watershed planning taking place in adjacent states and Canada.

A footnote to the assessment schedule: if important water quality information is known about waters in a basin scheduled for later in the rotation, we will add that information to the database at the time it is known.

I. The Assessment

The assessment itself involves identifying, compiling, analyzing and evaluating all water quality data and information as well as point and nonpoint source pollution impacts on designated uses specific to the basins being assessed in any given year. The specific tasks include:

- a) Identify and compile all impacts or potential impacts from discharges in significant non-compliance (Waste Water Management Division)
- b) Identify and compile all impacts or potential impacts from Solid Waste Section files
- c) Identify and compile all impacts or potential impacts from the Hazardous Waste Section files
- d) Identify and compile all impacts that were dealt with through the Enforcement Division
- e) Interview district fisheries biologists and incorporate all impacts and threats identified
- f) Solicit information from the NRCS staff (their direct experience or data gathered through their surveys and public meetings) and incorporate
- g) Solicit information from the Regional Planning Commission on any watershed projects they have conducted or facilitated
- h) Interpret and compile all Riverwatch and other lay groups' data
- i) Interpret and compile all macroinvertebrate and fish sampling data
- j) Interview and compile information from the Water Quality Division hydrologists
- k) Gather and incorporate data generated by federal agencies such as the U.S.G.S. Water Resources Division and the U.S. Forest Service
- l) Gather and incorporate any appropriate data generated by universities and colleges
- m) Interview informed river users (Trout Unlimited +) and incorporate comments
- n) Do aerial photograph buffer analysis on mainstems and main tributaries in each basin
- o) Conduct as much field assessment of streams and riparian zones as possible to identify obvious nonpoint source pollution, threats, and stream, stream corridor and watershed characteristics.

II. Data and Information Review

Assessment committee

Following incorporation of the assessment information into the database (which has involved evaluating the impacts of multiple causes and sources of pollution and making use support judgements as well as noting where we have limited or no information to make those decisions), an assessment committee will meet to review the results of that year's assessment. The committee will determine whether there are areas of the basins that need more directed study either short term or over the next four years and what kind of information is necessary. The committee will also review the problems that have been identified and suggest appropriate follow-up actions.

III. Information Exchange Process

● First tier reporting (EPA, violations, public health concerns)

If the annual assessment reveals new information that involves potential water quality violations of any kind or involves threats to public health, the appropriate information (waterbody, location of problem, source of problem, source of information) will be reported to:

- 1) Other DEC Divisions (Enforcement, Wastewater Management, Facilities Engineering)
- 2) Department of Health (public health threats or impacts)
- 3) Department of Agriculture if any of the impacts are a result of agricultural activities
- 4) Department of Forests, Parks, and Recreation if any of the impacts are a result of poor logging practices

● Second tier reporting (information verification/feedback)

Once all the new information generated during the assessment process is incorporated, draft basin or watershed reports will be written and sent out to:

- 1) ANR District fisheries biologists
- 2) Watershed association leaders
- 3) U.S. Forest Service fisheries biologists
- 4) NRCS and the local USDA working groups
- 5) the appropriate Regional Planning Commission(s)

Feedback on the draft reports will be solicited from these people and changes incorporated if appropriate. These reports will include all the information contained in the database for each given waterbody: basic waterbody information, use support status, causes and sources, comments.

● Third tier reporting (information sharing)

In addition to report production and information exchange among the individuals and groups listed above, and if time allows, cover letters and reports will go to municipal commissions and officials. The letter will draw attention to the steps that the towns can take locally to protect or improve water quality and aquatic habitat based on the report information.

IV. Basin Planning

The information generated for, and contained in, each basin assessment report will be an early piece of the basin planning process. The assessment results and conclusions will be combined with the waterbodies identified on priority lists and statewide management strategies to develop a basin plan. The work of watershed teams to do more detailed, more specific assessments, propose re-classifications, or outline protection or restoration activities will be incorporated with the three components listed above to have a more refined basin plan. A good assessment base, however, is critical for a useful basin plan.

Figure 1

Five Year Watershed Rotation

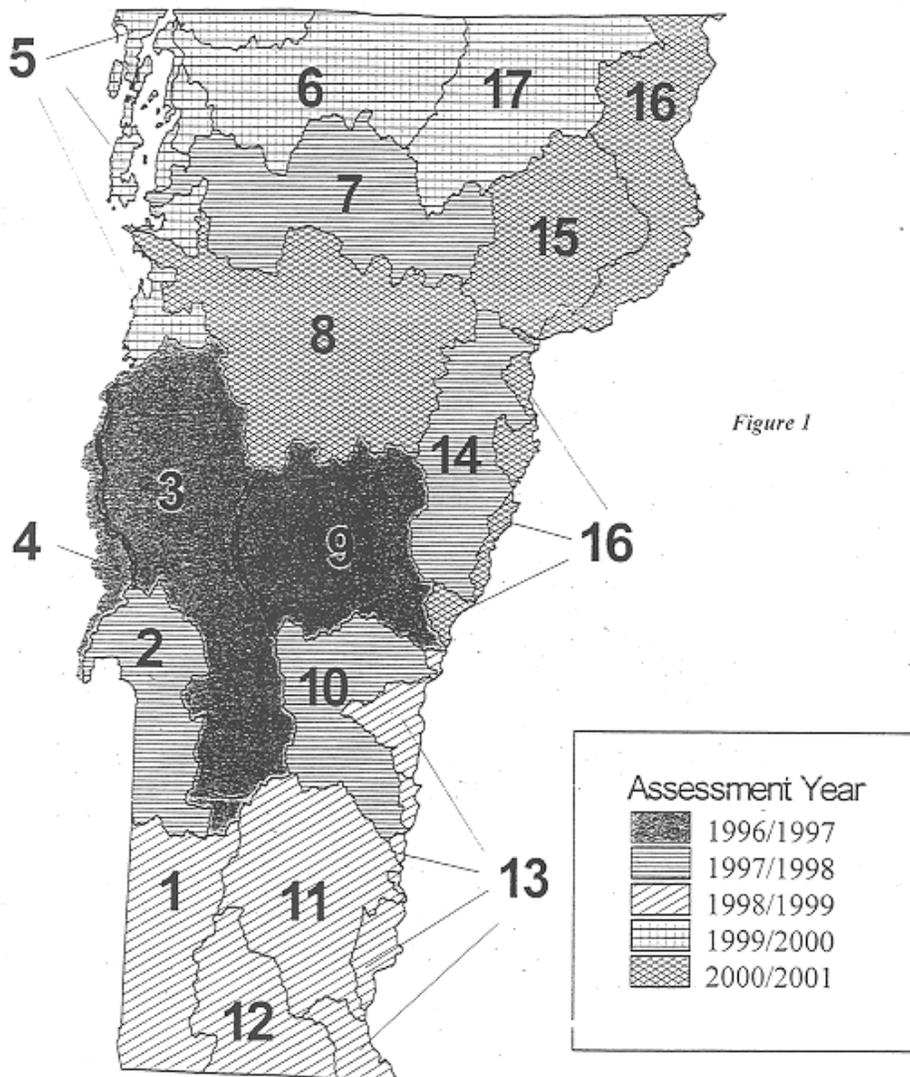


Figure 1

Five Year Watershed Rotation Plan

First year:
(July 1996 -
August 1997)

Basin 3 - Otter Creek
Basin 4 - Lower Lake Champlain
Basin 9 - White River

Total square miles - 1843

Second year:
(July 1997 -
August 1998)

Basin 2 - Poultney, Mettawee Rivers
Basin 7 - Lamoille River
Basin 10 - Ottauquechee, Black Rivers
Basin 14 - Ompompanoosuc, Waits, Wells Rivers

Total square miles - 1901

Third year:
(July 1998 -
August 1999)

Basin 1 - Battenkill, Walloomsuc, Hoosic Rivers
Basin 11 - West, Williams Rivers
Basin 12 - Deerfield River
Basin 13 - Lower Connecticut River

Total square miles - 1709

Fourth year:
(July 1999 -
August 2000)

Basin 5 - Upper Lake Champlain
Basin 6 - Missisquoi River
Basin 17 - Black, Barton, Clyde Rivers

Total square miles - 1842

Fifth year:
(July 2000 -
August 2001)

Basin 8 - Winooski River
Basin 15 - Passumpsic River
Basin 16 - Upper Connecticut River

Total square miles - 1951