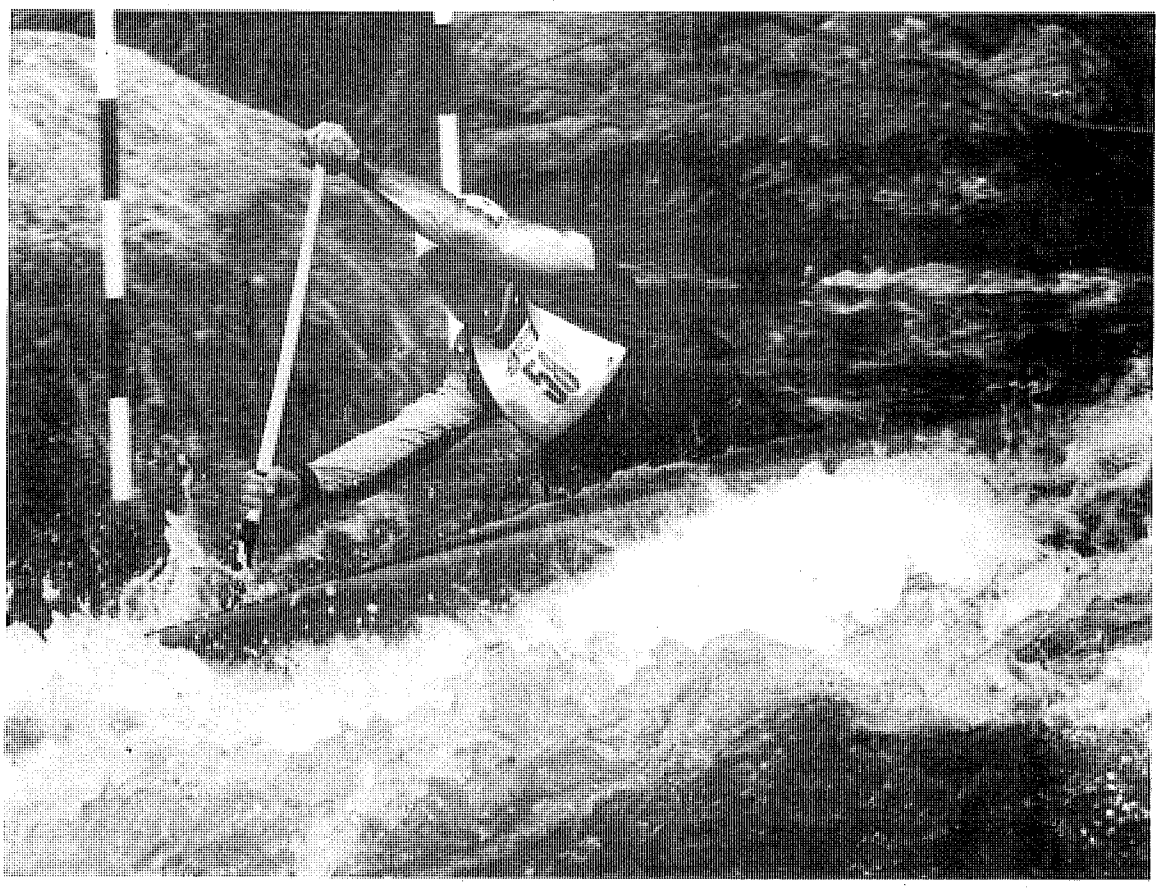
STATE OF VERMONT

1988 WATER QUALITY ASSESSMENT

305(b) REPORT



White Water Racing on the Roaring West River in Jamaica. – Photo Credit: Vermont Travel Division

AGENCY OF NATURAL RESOURCES

DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

WATER QUALITY DIVISION
WATERBURY, VERMONT

STATE OF VERMONT

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Agency of Natural Resources
Department of Environmental Conservation
Water Quality Division
Waterbury, Vermont 05676
April, 1988
Revised, July, 1988

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8. APPENDICES

* Not included in this document

\+ Detailed waterbody information is included in a separate appendix.

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FOREWORD

The 1988 Vermont Water Quality Assessment represents a new approach to water quality evaluation mandated by Congress in the 1987 amendments to the Federal Water Pollution Control Act. The manpower used to gather information increased from approximately one quarter man year in 1986 to over two man years in 1988. The Department reviewed water quality reports, sent questionnaires, and interviewed hundreds of citizens, biologists, engineers, chemists and others with knowledge about water quality conditions. Much of the information was compiled and organized with the new EPA-designed Waterbody computer system.

Because the Department took a much harder look at Vermont's water quality in 1988, we cannot directly compare the results with the data in previous assessments. Following full public review, the 1988 data will represent a new baseline reference point against which to gauge future water quality improvement.

The water quality conditions identified by this new method were rated against both the more general goals of the federal Water Pollution Control Act and separately against the stringent Vermont Water Quality Standards. The assessment resulted in the following conclusions:

1. The State of Vermont has continued its strong long-standing tradition of abating pollution from municipal discharges.

The water quality of many additional miles of rivers has improved during the past two years.

2. A new awareness has emerged of the role of pollution from nonpoint sources (generally, discharges other than those from pipes). Nonpoint sources are now recognized as serious widespread water pollutants which compromise uses specified by the Vermont Water Quality Standards.
3. Further assessment is needed to determine the magnitude of certain pollution impacts.

Specific conclusions contained in this assessment include the following. Eighty-eight percent of Vermont river and stream miles and 78 percent of its lake acreage fully support the uses defined by the demanding criteria of the Vermont Water Quality Standards.

With respect to the general Federal Water Pollution Control Act goals of attaining fishable and swimmable water quality, 93 percent of 5,160 river and stream miles meet the swimmable goal and 97 percent meet the fishable goal. The less intensive assessment in 1986, had revealed that 94 percent of the river and stream miles met the federal swimmable goal and 99 percent met the fishable goal. With respect to lakes, the 1988 assessment indicated that 99 percent out of 227,121 lake acres assessed meet the federal fishable goal and 99.6 percent meet the swimmable goal. This differs very slightly from the 1986 report that 99.9

percent of Vermont lakes met both the federal swimmable and fishable goals.

It is hoped that the information from this assessment will enable the public and the state to better decide which future efforts and expenditures for water pollution control will produce the greatest public benefit.

1. Summary

Overall Description of Vermont Water Quality.

The water quality of Vermont rivers and streams, lakes and ponds is generally excellent. There has been continued progress in Vermont's tradition of cleaning up or eliminating point source discharges, particularly from municipal wastewater treatment plants. Vermont is proud to be among the few states in the nation to be completing construction of all required municipal wastewater treatment facilities.

Four statewide assessments completed in 1988 greatly increased the information base for this report. These include assessments of point and nonpoint source pollution for (1) rivers and streams, (2) lakes and ponds, (3) ground water, and (4) toxics. Over 350 professionals and individuals, including many members of the general public, provided information on many surface waters for which little data was previously available. As a consequence of these surveys, the Department is preparing new management plans and strategies for the control of all sources of pollution.

The Vermont General Assembly has taken several initiatives since 1986. New legislation provides greater protection for Vermont's surface and groundwater quality through laws such as the Comprehensive State Rivers Policy Act, the Pristine Streams Act, the Wetlands Protection Act, and the Groundwater Protection Act.

Of the 5,160[1] miles of rivers and streams in Vermont, 4,534

[1] Including Connecticut River miles

miles, or 88%, fully support the uses for which they are designated by the stringent state[1] water quality standards. Of the 229,146 acres of lakes and ponds in Vermont, 227,121 acres could be assessed for this report and 177,915 acres, or 78%, fully support uses designated by the Vermont Water Quality Standards. Federal guidance for the preparation of this report calls for an estimate of waters whose uses are threatened by various sources of pollution. Some degree of threat is estimated to exist for 908 river miles or 20% of those which fully support their uses at the present time. A higher level of threat (86%) was attributed to the uses of 153,319 acres of lakes which presently fully support their uses. The largest part of this threat to lake use is associated with Lake Champlain where toxic substances have been found in the tissue of a species of fish.

The great majority of Vermont waters meet the general Federal Clean Water Act Goal of '100% fishable and swimmable' (see p. 10 for definitions). Ninety-seven percent or 4,989 miles of river and stream are fishable, and 93% or 4,786 miles are swimmable. Of the 375 miles designated as not swimmable, 243 miles are Class C waters located downstream of sewage treatment plants. This classification does not contemplate swimming as a designated use.

Eighty-nine percent of the state's lakes and ponds acres were assessed for swimming. Ninety-nine percent of the acres assessed meet the swimmable goal. Most of the 838 acres that do

[1] See Table 1, page 4, for an explanation of state designated uses.

not meet the swimmable goal are accounted for by Burlington Bay of Lake Champlain which is impaired by sewage treatment plant discharges and combined sewer overflows. These are expected to be corrected within the next two years. Ninety-eight percent of the lakes and ponds acreage was assessed for fishing. Ninety-nine percent of the acres assessed are considered fishable under the federal standards. Certain acreage (2,578 acres) is counted as not fishable primarily due to eutrophication and organic enrichment, natural physical constraints, habitat alterations or acidic conditions.

Major Factors Affecting Use Support.

Nonpoint sources are the most widespread sources of water pollution. The four most common nonpoint types of water quality impairments in rivers are: siltation/turbidity, habitat alterations, nutrient enrichment, and flow alterations. Other common problems are thermal modifications and pathogens. The highest-ranked sources of these impairments are agricultural runoff, hydromodifications below hydropower dams, and erosion from construction sites.

Point source discharges were responsible for repeated beach closures on Lake Champlain. Public beaches in the Burlington area were closed frequently during the summer of 1987 due primarily to combined sewer overflows which are now being corrected.

On other lakes, most of the water quality impairments are caused by nonpoint sources and excessive plant growth. Very few

lakes receive point source discharges. The major impairments are nuisance aquatic plants such as Eurasian milfoil and algae, nutrient enrichment from nonpoint sources, pathogens, and siltation/turbidity. Threats to lake water quality include erosion from development, acid precipitation, and, in the case of Lake Champlain, a preliminary indication of the contamination of fish tissue by toxic substances. Lake Champlain is the ultimate receiving water for point and nonpoint source discharges from nearly half of the state's land area, and is the highest priority for development of a watershed management program.

The spread of Eurasian milfoil probably poses the greatest threat to boating and swimming on Vermont lakes. Seven percent of lakes that are 20 acres or larger are infested with milfoil, including the three largest lakes, Lake Champlain, Lake Memphremagog, and Lake Bomoseen. One hundred and seven lakes in Vermont are also threatened by acid precipitation, and of these, six lakes already have high acidity.

Ground Water

Ground water contamination in Vermont is comparatively minor when compared with more populous, industrial states. Due to its temperate climate and few consumptive uses Vermont is generally considered a water-rich state. However, from time to time, well interference problems do occur in more developed areas, although there is no evidence of ground water mining (withdrawal exceeds recharge). The state's reliance on ground water to supply more than half of its drinking water needs is expected to continue

since there is no evidence of widespread water degradation or depletion.

The major sources of ground water contamination are: 1) petroleum pollution from leaking underground storage tanks and accidental spills; 2) leachate from landfills; 3) leachate from on-site sewage systems; 4) salt and salted sand; and 5) agricultural practices. Current efforts to manage ground water quality include coordinating various state agencies that participate in ground water management programs, carrying out the objectives of the 1988 Ground Water Management Work Plan, and developing rules to implement 10 V.S.A., Chapter 48.

The proposed ground water rules include phase one of a comprehensive statewide strategy. Other rule making activities are underway in the solid waste, hazardous waste, on-site sewage disposal and residuals (sludge and septage) management programs. Ongoing ground water protection efforts are actively underway in the underground storage tank program, and through contamination site cleanups under the Resource Conservation and Recovery Act and the state's contingency fund as well as the waste management programs listed above.

Point Source Discharges.

As of December, 1987, there were 89 public wastewater treatment plants, 43 industrial pretreatment facilities and 54 industries with NPDES[1] permits in the state. These plants have improved the quality of approximately 55 rivers and streams and

1. National Pollution Discharge Elimination System.

three lakes. A total of $200,000,000 of state, federal and local funds have been spent to cover the capital construction costs of the municipal treatment facilities.

Vermont is concluding construction of required municipal wastewater treatment plants. Two towns still require construction of their first plants (Troy and Jeffersonville) and five towns require an upgrade from primary to secondary treatment (Windsor, St. Johnsbury, Hartford-Wilder, Fair Haven, and Bellows Falls). Construction of these projects will begin in 1988, and they should be operational by 1990. Seven plants require construction of phosphorus removal facilities (Shelburne FD #1, Burlington City [three plants], Hinesburg, Colchester FD #1, and Swanton). These will also be in operation by 1990. The remaining wastewater treatment plant work planned involves separation or treatment of combined sewer overflows, the enlargement of existing treatment plants to accommodate growth, and the incorporation of advanced waste treatment and toxics removal measures.

Substantial progress has been made in regulating industrial discharges and their impacts on the receiving waters as well as on the municipal treatment plants which receive industrial discharges. The majority of industrial discharges in Vermont employ Best Practicable Treatment technology. Work remains to be done with the cheese industry in the area of waste whey disposal.

Toxics.

Vermont has a toxics control strategy and has begun a toxics

monitoring program. A preliminary survey of toxics-related pollution in 1988 showed that there are six sites with surface water quality impairment due to the discharge of toxic substances. Two are state-classified hazardous waste sites, one is a landfill, two sites involve tailings from inactive copper mines and one is an on-site failed sewage disposal system. Industrial waste deposit sites and landfills may threaten other surface and groundwater. Further sampling and assessment are needed. Thirty wastewater treatment facilities were identified as having chlorine concentrations in the discharge which exceed the ambient criteria for the protection of the aquatic community. Chlorine is used as a disinfectant but is also harmful to aquatic life. A state chlorine reduction policy for wastewater treatment plants has been developed and is in the third year of implementation.

A fish consumption advisory was issued in August of 1987 for all of Lake Champlain due to the detection of elevated levels of PCB's in lake trout. There has been one known fishkill in Vermont due to toxics which occurred in May of 1987 on the Hoosic River. The source was thought to be a large release of acids from an industrial facility in Massachusetts.

Wetlands

A 1987 national inventory indicates that there are approximately 220,000 acres of wetlands in Vermont, which represent 3.7% of the state's land area. A recent study showed that roughly 94 acres of wetlands were lost during the 17 month

period from January 1, 1986, to May 1, 1987. Sixty-six percent of this loss was due to road construction. Light industrial and residential development were the second and third ranked causes of loss. An estimated 67 acres of wetlands are lost annually in Vermont.

Vermont wetlands receive protection from Army Corps of Engineers federal permitting programs, Act 250, and state water quality programs. Wetlands will be protected by state standards under legislation passed in 1986 aimed at preserving significant wetlands. Rules are now being developed and should be adopted by the Water Resources Board in the coming year.

Water Quality Control Programs.

There are many control programs that monitor and regulate water quality in Vermont, including some new initiatives. Point source discharges are controlled and abated through planning, construction grants, permitting, compliance, and enforcement programs. The state has developed a toxic control strategy incorporating increased state assessment as well as self-monitoring by dischargers. Most potentially toxic discharges do not discharge directly to streams but are pretreated prior to introduction into a municipal wastewater treatment facility.

Lakes and ponds management and protection is achieved through a) monitoring and surveillance programs including an extremely successful lay monitoring program; b) educational efforts such as conferences and publications on weed control and eutrophication; and c) regulatory programs.

A Nonpoint Source Task Force was formed in 1987 and has begun to assess current standards and programs for controlling nonpoint source pollution. The Task Force is reviewing the need for stricter standards for construction erosion, ski trail construction, upland stormwater discharges, highway construction and stream and lakeshore development.

Vermont has a variety of water quality monitoring programs. There are eight lake programs that monitor spring phosphorus, aquatic weeds, fecal coliform bacteria, other water quality parameters, and biotic changes due to acid deposition. In 1987 the state began an Ecoregion study to develop an Index of Biotic Integrity. The Ambient Biomonitoring program, Acid Precipitation Monitoring Network, and Fish Flesh Contaminant Monitoring Program involve monitoring of rivers, lakes, and precipitation. Assimilative capacity studies and special monitoring studies are performed for specific rivers and lakes as needed.

Special State Concerns and Recommendations

Several areas of special state concern and recommendations were identified in this report:

1. Nonpoint sources of pollution are now the most widespread water pollution problems remaining in Vermont. Several future needs were identified, including a reversal of the trend of dwindling Federal funds for cost sharing agricultural nonpoint runoff control; a format for cumulative impact review; more personnel to monitor compliance with water quality standards; and improved flow regimes flow below hydroelectric plants.

2. Special concerns relating to lake management and protection include the need for a state technical assistance program available to lake associations or municipalities; development of regulations to protect shorelands; consistent federal funding for the Clean Lakes Program including funding to conduct lake water quality assessments; increased effort for the control of Eurasian milfoil; and creation of a Water Quality Division information and education program.
3. Combined sewer overflows (CSO) are an ongoing problem at many of the state's larger communities, as inadequately treated wastewater overflows to the state's waters. The state construction grants program has added CSO correction projects to its priority list.
4. The Federal Construction Grants Program will end in 1990, and Vermont is planning a transition from a grant program to a revolving loan program, between 1988 and 1994. Highest priority is being given to construction of two initial wastewater treatment facilities and upgrade of five others from primary to secondary.
5. The Financial Management Assistance Program for wastewater treatment facilities needs to be consistently funded.
6. Upland streams are extremely vulnerable both to nonpoint sources and to the effects of increasing stormwater runoff. The protection of these areas is a matter of concern. A cumulative impact review process, more Act 250 compliance monitoring personnel for erosion, and legislative rules to

regulate alterations of upland stream hydrology are seen as actions to better protect these sensitive areas.

7. Follow-up sampling is underway to determine the extent of PCB contamination in lake trout and other fish species in Lake Champlain. The results of analysis will be available this summer and follow-up action will be identified in concert with New York under a memorandum of agreement.

8. A statewide interagency strategy must be completed to coordinate ground water protection efforts. Federal and state funding must be allocated for the collection and evaluation of data, ideally using a Geographic Information System. The statutory basis and rules are needed to control potential ground water contamination by junkyards and highway deicing compounds.

9. Each river basin or river corridor should have a detailed plan for its management which will be tied to workable strategies for implementation.

10. In 1987, the Vermont General Assembly authorized the designation of certain high importance waters for special protection. Outstanding resource waters, including lakes, rivers, important aquifers, shoreland and wetlands must now be identified, designated and given special attention and protection.

11. In 1988 a memorandum of agreement will be entered into with the state of New York for the study and protection of Lake Champlain. This will receive special attention by the Department in coming years.

Vermont

1988 Water Quality Assessment

(305(b) Report)

2. BACKGROUND

2.a. Atlas

State population	548,000 (as of 7/1/87)
State surface area	9,609 sq. mi.
Number of water basins	17
Total of stream miles*	5,160+
Number of border miles (subset)+	262++
Number of lakes/reservoirs/ponds (less than 20 acres, but greater than 5)	315
Number of lakes/reservoirs/ponds (greater than 20 acres)	289
Acres of lakes/reservoirs/ponds	229,146+++
Acres of freshwater wetlands	220,000 (approx.)

Names of border rivers:
- Connecticut River
- Poultney River

Names of border lakes:
- Lake Champlain
- Lake Memphremagog
- Wallace Pond

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*From Donald Webster's "Drainage Areas of Vermont Streams" - 1962
+Includes the Connecticut River
++ Connecticut River - 238 mi.; Poultney River - 24 mi.
+++Includes private waters and some waters less than 5 acres in size (public only=227,010 A.)

2.b. Water Classification

All surface waters in Vermont are classified as either A, B or C (see Table 1). Class A waters are managed for public drinking water supply, for high quality water that has significant ecological value, for uniform excellent character and, when compatible, may be suitable for enjoyment in its natural condition. Class C waters are designated zones below sewage treatment facilities where drinking water and contact recreation are not considered appropriate uses due to the threat to public health from pathogens. All other waters are classified as B, and have as management goals good aesthetic values, contact and non-contact recreation, public water supply with disinfection and filtration, irrigation and other agricultural uses.

The water quality classifications establish water quality goals for each body of water in the state. These water quality goals are expressed in terms of those "beneficial values and uses" which are to be protected. It is important to note that the classification assigned to any specific body of water does not necessarily represent a description of the existing condition or quality of the waters. Classifications establish water quality goals to be attained where the actual water quality is lower than the standard, or the minimum standard to be maintained where actual water quality is higher.

Classifications are established by the Vermont Water Resources Board. The Board on its own motion or in response to a petition from a state agency, a municipality or from thirty or more persons in interest, will review an established classification to determine if it is contrary to the public

interest and, if so, what classification is appropriate. In deciding how to classify any given body of water, the Board must determine which classification is in the public interest.

The Secretary of the Agency of Natural Resources is responsible for management of the State's waters to achieve and maintain the classified uses of the waters. The primary program which governs water quality is the discharge permit program. The Secretary evaluates applications for discharge permits to determine whether or not the proposed discharge will comply with the Water Quality Standards.

Table 1.

SUMMARY OF CLASSIFIED USES

Classified Uses	Total Size Classified for Use: Rivers (miles)	Lakes (acres)
Class A: • water quality uniformly excellent • contact recreation when compatible • public water supply with disinfection • high quality waters with significant ecological value	152 approx. (not including all waters recently classified "A" above 2,500' elevation)	868
Class B: • water quality consistently exhibits good aesthetic value • swimming and recreation • public water supply with filtration and disinfection • high quality habitat for aquatic biota, fish and wildlife • irrigation and other agricultural uses	4,697	228,277
Class C: • minimal contact recreation and other uses where water ingestion is not probable • irrigation of crops not consumed without cooking • habitat suitable for aquatic biota, fish and wildlife • compatible industrial uses	311+	1
TOTALS	5,160 Miles	229,146 Acres*

*Includes 172,800 acres of the Vermont portion of Lake Champlain.
+Includes Connecticut River Class C zones.

3. SURFACE WATER QUALITY

3.a. Status

3.a.1. - Methodology

Information on water quality was gathered from written reports and interviews with water quality professionals and the public. The computer software system used to manage water quality information was the Environmental Protection Agency's Waterbody System (WBS). Waterbody-specific information was provided for assessed waters of the state using WBS coding forms as the format for questionnaires.

Over 350 people were contacted including biologists, water resource investigators, chemists, soil scientists, permit specialists, foresters, and laypeople with water-oriented interests or experiences, such as members of Trout Unlimited, local fish and game clubs, boating clubs, lay monitoring groups and other similar environmental organizations.

Information from the 1987 State Nonpoint Source Assessment, the State Toxics Assessment, the State Ground Water Assessment, and the State Clean Lakes Assessment was used. Also, information was utilized from the recently completed "Vermont Hydropower Problem Mitigation Study", as well as data from the following on-going and special monitoring programs and studies:

- Acid Precipitation Monitoring Program
- Ambient Biomonitoring Network Program (ABN)
- Assimilative Capacity Studies (ASCAP)
- Compliance Monitoring
- Hydroelectric Monitoring
- Spring Phosphorus Monitoring Program*

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* See Appendix 3: the Lake Water Quality Assessment for a full description of these programs and studies.

- Lay Monitoring Program*
- Aquatic Plant Survey Program*
- Cooperative Bacteriological Sampling Program*
- Eurasian Milfoil Control Program*
- Toxicity Testing
- Lake Diagnostic Studies*
- Lake Modeling Studies*
- Lake Planning and Management Studies*
- River Basin Water Quality Management Plans

Finally, data from special studies was used, such as PL83-566 plans and progress reports furnished by the Soil Conservation Service, various records from the Permits and Compliance Division, Hazardous Waste Division files, Rural Clean Water Program (RCWP) plans and annual reports, Resource Conservation and Development (RC & D) plans, River Watch Network reports, State 208 Water Quality Management Plans, State 303(e) Basin Plans and information contained in the America's Clean Waters report developed by the Association of State and Interstate Water Pollution Control Administrators (1984).

The 17 river basins of the state were further divided into subbasins called "waterbodies". Information on each waterbody was entered into the computerized "Waterbody System" software developed by EPA. For location of waterbodies, see map between page 13 and page 14.

Water quality assessments for each waterbody were made on the basis of the state surface water classification system and the designated uses assigned to each class (Class A, B or C. See Table 1). If the water quality of a section of stream, river, lake or pond was such that one or more designated uses were not possible, the mileage or acreage of that section was considered to be "Not Supported". If one or more designated uses were only partially impaired, the section was defined as "Partially

Supported". If all designated uses were possible but a threat to water quality clearly existed, the section was assessed as "Threatened".

EPA's "Criteria for Designated Use Support Classification" (see Appendix 5) was used as a guideline for determining use support status. For a detailed description of individual assessed lake and pond waterbodies, refer to Appendices B and D of the Lake Water Quality Assessment Report. Rivers and lakes use support status is summarized in Tables 2 and 3, respectively.

3.a.2 Water Quality Summary

Waterbodies were identified and delineated (refer to Section 3.b of this report) across the State. A total of 210 river and stream waterbodies were designated. Table 2 below summarizes the degree of use support for Vermont's river and stream waterbodies.

Table 2.

DESIGNATED USE SUPPORT STATUS

FOR VERMONT RIVERS & STREAMS

Degree of Use Support	Assessment Type: Evaluated	Monitored	Total Assessed
Size Fully Supporting	3,115.1 mi.	510.7 mi.	3,625.8 mi.
Size Fully Supporting/ Threatened	693.8 mi.	214.0 mi.	907.8 mi.
Size Partially Supporting	286.2 mi.	93.0 mi.	379.2 mi.
Size Not Supporting	200.7 mi.	48.4 mi.	249.1 mi.
TOTALS	4,295.8 mi.	866.1 mi.	5,161.9 mi.

Approximately 630 miles of the State's 5,160 miles of rivers and streams (or 12%) were found to not fully support designated uses and 4,534 miles (or 88%) fully supported designated uses. It should be noted that approximately 490 miles of the 630 miles not fully supporting designated uses (or 77%) were based on evaluated rather than monitored information. Similarly, of the 5,160 total miles assessed for this report, 4,295 miles (or 83%) were evaluated. Only 17% of the total river and stream mileage assessed was based on information obtained through monitoring.

Monitored waters are waterbodies for which the assessment is based on current (no more than five years old) site-specific monitoring data. Evaluated waters are waterbodies for which the assessment is based on information other than current site-specific monitoring data, such as land use data, presence of sources, surveys of fisheries biologists, citizen complaints, and predictive modeling using estimated input variables.

The high percentage of evaluated miles not fully supporting designated uses may stem from the perceptions of those Vermonters contacted during the assessment process. Generally, residents of the state hold high standards for environmental quality and are sensitive to changes in natural resources. As a result, these values may have been translated into statements concerning the condition of certain waterbodies. Clearly, those miles evaluated as 'not supporting' should be targeted for more detailed assessment and possible monitoring strategies.

A total of 518 lake and pond waterbodies were assessed, which included 472 waterbodies greater than five acres in size and 46 waterbodies less than five acres found on U.S. Geological

Survey topographic maps. The number of monitored and evaluated waterbodies was 250 and 268, respectively. The summary of designated use support status of Vermont's lake and pond waterbodies is shown on Table 3.

Table 3.

DESIGNATED USE SUPPORT STATUS

FOR VERMONT LAKES AND PONDS

Degree of Use Support	Assessment Type: Evaluated	Monitored	Total Assessed
Size Fully Supporting	3,611 a.	20,985 a.	24,596 a.
Size Fully Supporting/ Threatened**	2,067 a.	151,252 a.	153,319 a.
Size Partially Supporting	895 a.	36,818 a.	37,713 a.
Size Not Supporting	106 a.	11,387 a.	11,493 a.
TOTALS	6,679a.	220,442 a.	227,121 a.
Not Assessed	---	---	2,025 a.

* a. = acres
** Threatened acres are assumed to be currently fully supporting uses.

Approximately 49,206 lake and pond acres were found to not fully support designated uses, which represents 22% of the assessed acreage. An additional 153,319 acres (or 67% of assessed area) had threats to designated uses. The remaining 24,596 acres (11%) fully support designated uses. The 2,025 acres not assessed comprise less than 1% of the lake and pond acreage in the state. Acreage not assessed involves 201 lakes and ponds.

For acres assessed as fully supporting but threatened, 140,125 acres of the 153,319 state-wide threatened acres (or 91%) are found in Lake Champlain. These acres are listed as threatened due to the recent fish consumption advisory released by the Vermont Health Department.

The Clean Water Act (CWA) requires states to assess the degree to which the goal of totally fishable and swimmable waters has been achieved. Attainment of CWA goals is considered as a separate criterion from the degree of support to state-designated uses. Vermont's achievements with respect to these federal goals for rivers and streams and for lakes and ponds are presented in Tables 4 and 5, respectively.

The federal fishable goal is defined as "providing a level of water quality consistent with the goal of protection and propagation of a balanced population of shellfish, fish and wildlife". Waters not achieving the fishable goal are those that have been the subject of fishing advisories, consumption bans or have unsuitable fish habitat. Meeting the swimmable goal is defined as "providing a level of water quality that allows for recreational activities in and on the water". Waters of the state not meeting this goal were presumed to have a health-related risk (e.g. bacteria) rather than an aesthetic problem (e.g. weeds or turbidity).

Table 4.

ATTAINMENT OF CLEAN WATER ACT GOALS

RIVERS & STREAMS

Goal Attainment	Fishable Goal (miles)	Swimmable Goal (miles)
Size Meeting	4,989.6	4,786.6
Size Not Meeting	172.3	132.3
Size Not Attainable	0.0	243.0

Approximately 97% of Vermont's river and stream mileage "allows for the propagation and protection of a balanced population of shellfish, fish and wildlife". The primary reasons for the miles not meeting the fishable goal are low or diverted flows caused by hydroelectric facilities and possible chlorine toxicity below certain municipal point source discharges during low flow periods.

Approximately 93% of Vermont's river and stream mileage "allows for recreational activities in and on the water". The 243 miles designated as not able to attain the swimmable goal (or 5% of the total state mileage) are Class C waters and are located below municipal point source discharges where water contact is not recommended due to potential health risks. The remaining 132 miles (or 2%) not meeting the swimmable goal are largely the result of pathogens from nonpoint sources of pollution.

Table 5.

ATTAINMENT OF CLEAN WATER ACT GOALS

FOR VERMONT LAKES AND PONDS

Goal Attainment	Fishable Goal (acres)	Swimmable Goal (acres)
Size Meeting	222,772	202,808*
Size Not Meeting	2,274	838
Size Not Attainable	304	1.49**
Size Not Assessed	3,796	25,498.51

* Includes Lake Champlain acreage as "Swimmable Supported" (exclusive of the 464 acres Not Supported) Actually, many acres of Lake Champlain are not sampled for fecal coliform bacteria concentration.

** Includes the four Class C zones in lakes.

Fishable goal attainment status for lakes and ponds was based largely upon information obtained by Vermont fisheries managers and game wardens. Approximately 97% of Vermont's lake and pond acreage meets the fishable CWA goal. The 304 acres (less than 1%) assessed as not able to attain the fishable goal are primarily affected by physical limitations and acidic conditions. Acres assessed as not fishable (less than 1%) were affected by such factors as dissolved oxygen deficits, aquatic weeds or significant water level variations. The remaining 3,796 acres were not assessed (or 2%) due to a lack of information.

The CWA swimmable goal is known to have been attained in approximately 89% of Vermont's lakes and ponds acreage. Eleven (11) percent of the lake and pond acreage has not been assessed due to the lack of fecal coliform data. The 838 acres (less than 1%) assessed as not swimmable were primarily located in

Burlington Bay of Lake Champlain. Burlington Bay is affected by point source and combined sewer overflow problems which cause fecal coliform violations and repeated beach closings. The one acre assessed as not able to attain the swimmable goal is the total of four "Class C" zones found in Vermont lakes where swimming is not recommended due to the presence of a municipal point source discharge.

3.b. Map

The fold out map between pages 14 and 15 shows the location of the waterbodies throughout the state. It indicates there are three types of waterbodies: main stems, watershed basins, and lakes and ponds over 20 acres. Exclusive of lakes and ponds, but including Lakes Champlain and Memphremagog, there are 223 waterbodies in the state of Vermont. Not shown on the map are 354 lake and pond waterbodies. It was necessary to delineate waterbodies in order to use EPA's Waterbody System and River Reach System to computerize the water quality information. In future 305(b) reports, maps will be used to show the locations of waterbodies which do not support their uses.

3.c. Causes of Nonsupport of Designated Uses

Tables 6 and 7 present the total miles of rivers and streams and acres of lakes and ponds affected by each category[1] of cause assessed for this report. Table 8 presents total miles of rivers and streams affected by each category[1] of source. A cause is a condition of impairment of the water quality; a source is the

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1. These categories have been established by the U.S. Environmental Protection Agency.

Table 6.

TOTAL SIZE OF WATERS NOT FULLY SUPPORTING USES AFFECTED BY VARIOUS CAUSE CATEGORIES

Rivers and Streams (Miles)

Cause Categories	Major Impact	Moderate/Minor Impact
Priority Organics	5.9	13.5
Non-Priority Organics	1.0	0.3
Metals	10.0	16.6
Ammonia	10.0	7.0
Chlorine	0.3	37.7
Other Inorganics	0	8.7
Nutrients	205.0	121.6
pH	16.0	3.1
Siltation/Turbidity	341.7	122.1
Organic Enrichment/DO	132.4	255.7
Thermal Modification	116.3	358.4
Flow Alteration	168.1	89.1
Other Habitat Alterations	241.4	123.9
Pathogens	64.2	174.4
Oil and Grease	0	6.6
Taste & Odor	15.5	19.4
Suspended Solids	0	0.7
Noxious Aquatic Plants	17.8	26.2
Salinity	0	0
Radiation	0	0

PLEASE NOTE: These miles will not add up to total Not Supported or Partially Supported Miles as more than one cause was sometimes cited for a particular impact.

Table 7.

TOTAL SIZE OF WATERS NOT FULLY SUPPORTING USES

AFFECTED BY VARIOUS CAUSE CATEGORIES *

Lakes and Ponds (Acres)

Cause Categories	Major Impact	Moderate/Minor Impact
Other Inorganics		6
Nutrients	2,953	9,089
pH	44	69
Siltation/Turbidity	1,102	16,184
Organic Enrichment/D.O.	684	13,878
Thermal Modifications		7
Flow Alteration	1,887	4,173
Other Habitat Alterations		27
Pathogens	741	131
Noxious Aquatic Plants	7,205	9,291

* Includes Lake Champlain

PLEASE NOTE: These acreages will not add up to total Not Supported or Partially Supported Acres as more than one cause was sometimes cited for a particular impact.

Table 8.

SOURCE SUMMARY REPORT FOR VERMONT

TOTAL RIVER MILES NOT FULLY SUPPORTING USES AFFECTED
BY VARIOUS SOURCE CATEGORIES

Source Categories	Major Impact	Moderate/Minor Impact
Point Source		
Industrial	16.5	3.4
Municipal	86.5	68.0
Combined Sewer Outflow	0	17.7
Storm Sewers	0	0
Total	103.0	89.1
Non-Point Source		
Agriculture		
Agriculture-General	19.5	0
Non-Irrigated Crop Production	230.2	79.4
Pasture Land	145.5	153.8
Aquaculture	11.0	0
Animal Holding Areas	104.3	147.9
Total	510.5	381.1
Silviculture		
Harvesting, Restoration	9.5	19.7
Road Construction	13.1	4.0
Total	22.6	23.7
Construction		
Construction-General	37.0	0
Highway, Road, Bridge	0	14.5
Land Development	104.5	24.0
Total	141.5	38.5
Urban Runoff		
Storm Sewers	0	4.7
Surface Runoff	54.8	67.3
Total	54.8	72.0
Resource Extraction		
Surface Mining	26.4	21.0
Mill Tailings	6.9	0
Mine Tailings	9.0	0
Total	42.3	21.0
Land Disposal		
Sludge	0	1.3
Wastewater	7.1	9.5
Landfills	0.2	20.5
Industrial Land Treatment	24.0	52.2
On-Site Wastewater Systems	0.2	90.1
Hazardous Waste	0	5.5
Total	31.5	179.1
Hydromodification		
Channelization	3.0	17.0
Flow Regulation	209.1	16.7
Removal of Riparian Vegetation	55.9	139.9
Streambank Modification	58.0	106.1
Total	326.0	279.7
Other		
Atmospheric Deposition	0	8.0
Waste Storage & Tank Leaks	0	9.6
Highway Maintenance & Runoff	19.2	85.1
Spills	0	2.2
In-Place Contaminants	40.3	5.6
Natural	80.5	116.6
Recreational Activity	23.0	0
Upstream Impoundment	140.2	60.1
Salt Storage Sites	0	3.5
Total	303.2	290.7

origin of the cause of impairment. The sources are subdivided into point and nonpoint, and a nonpoint source is defined as any pollutant that is not discharged directly from the end of a pipe.

Miles of rivers and streams and acres of lakes and ponds impaired are further divided into those with major impact and moderate/minor impact. These magnitudes were determined based on the extent to which each cause and source impairs the designated uses of the water. For example, a source with major impact will make one or more designated uses impossible or inadvisable, whereas a moderate or minor impact may only partially impair a designated use.

A stretch of river or stream or a portion of a lake may be affected by more than one cause or source, and so the same mileage or acreage may be tallied in several places in each table. For this reason, the two columns on each table should not be summed, because the total would overestimate the total number of miles or acres affected by all causes and sources in Vermont. Subtotals are provided in Table 8, Sources, so that general categories of sources (i.e. agriculture, silviculture, construction, etc.) can be easily compared to the causes in Table 6.

3.c.1. Relative Assessment of Causes

The four largest causes of major impact to river and stream water quality, indicated by total miles affected, are siltation and turbidity, other habitat alterations*, nutrients, and flow

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* Other habitat alterations: Impairments (other than siltation/turbidity, thermal modifications and flow alterations) of the suitability of a stream or river for aquatic life, such as dewatering, removal of streambank vegetation, changes in water chemistry, and channel widening or alterations.

alteration (Table 6). Siltation, habitat alterations, and nutrients are not source specific and result from several kinds of point and nonpoint sources. Flow alterations primarily result from hydropower facilities which regulate flows.

Thermal modification, organic enrichment/low dissolved oxygen, and pathogens are the three largest causes of moderate and minor impact. The first two are the results of several sources such as low flows below hydropower dams, removal of riparian vegetation, runoff from agricultural operations and sewage effluent from point and nonpoint sources. Nutrients, siltation, and habitat alterations are the next closely ranked sources.

The major causes of use impairments on lakes in Vermont are summarized in Table 7. More than one-third of the impaired lake acres are impacted by noxious aquatic plants, including Eurasian milfoil (Myriophyllum spicatum), other rooted macrophytes and blue-green algae. Nutrients that contribute to some noxious plant growth are another major cause of use impairments.

Siltation and turbidity impair more acreage than any other causes, but relatively little of the impact is high. Major examples of this impact are turbid waters in southern Lake Champlain, Missisquoi Bay, off the mouth of Otter Creek and deposits of sediment in deltas off the mouths of inlet streams on numerous lakes. Most (92 percent) of the acres affected by organic enrichment and low dissolved oxygen concentrations are in Malletts Bay in Lake Champlain. The District Fisheries Manager for Malletts Bay indicated that the Bay's coldwater fisheries are partially impaired due to low dissolved oxygen concentrations in

the cool hypolimnetic waters during the summer. Flow alteration, specifically the fluctuation of water levels for power generation, impacts the fisheries of several large Vermont reservoirs. Most of the acres impaired by pathogens are in Lake Champlain, where point source discharges and combined sewer overflows are responsible for periodic discharges of untreated sewage. Other causes of use impairments to lakes in Vermont include low pH, inorganics, habitat alterations other than flow, and thermal modifications.

3.c.2. Relative Assessment of Sources

Agriculture is the greatest source of nonpoint pollution, with 510.5 total river miles having major impact (Table 8). Within the agriculture category, non-irrigated crop production and pasture land are the largest contributors. Soil erosion, manure and fertilizer runoff, as well as livestock in the streams and rivers, are the primary concerns. Animal holding and management areas, which include manure containment areas, were frequently cited as a source of problems. Impairments due to agricultural sources may be severe, such as a fish kill and bacterial contamination resulting from a manure pit failure, or may be episodic and temporary such as high turbidity after rainstorms, or may be chronic and persistent, such as siltation of a stream channel due to soil erosion.

Hydromodification ranks second among sources with major impact. Flow regulation below hydropower facilities (low and fluctuating flows and dewatering of channels) is the principal source in this category, and generally impairs more uses at once than do other sources. Siltation and streambank erosion from

water releases and temperature increases during low flows are secondary impairments associated with flow regulation. The impairment is particularly important because it is affecting the state's major streams, ones which receive the most use.

A number of diverse sources have been grouped in the 'Other' category, which ranks third for major impact. The largest contributor is upstream impoundments which are mainly storage reservoirs for hydropower plants. Water quality impairments may result when:

1. the reservoir has a deep, stratified layer of low dissolved oxygen and water drawn from the bottom is released downstream; or
2. silt builds up in the reservoir and is discharged downstream, creating high turbidity and siltation in the river; or
3. the warm upper layer of the reservoir is discharged downstream and mixes with cooler river water.

Natural streambank erosion is the next highest contributor in the 'Other' category. This source may overlap with other sources, because cultural land uses may also destabilize banks or otherwise make shorelines more prone to natural erosion events such as floods.

Fourth in the major impact category of sources is erosion from construction, particularly land development, which includes land clearing, grading, excavation and filling. Soil erosion, turbidity and siltation result from construction sites which are not properly stabilized with temporary and permanent soil erosion

controls, and streambank and channel alterations may occur as well.

Sources of moderate impact are similar to those for major impact with the exception of land disposal, which ranks high. Failed on-site septic systems, industrial settling lagoons and buried waste pits, and landfills are the problem sources in this category, creating water quality impairments such as pathogens, organic enrichment, turbidity and siltation and toxic compounds.

Additional assessment work is needed to better identify the nonpoint pollution sources to Vermont lakes; however, it is expected that the relative assessment of pollution sources to rivers and streams on a statewide basis should be generally consistent for lakes. Past experience has shown that reliable information regarding the significant sources of pollution in lakes can only be obtained through watershed monitoring programs, unless gross sources are obvious. Diagnostic studies conducted on three lakes in Vermont all concluded that the major source of pollution on the lakes was something other than what professionals had believed it to be from personal evaluations made prior to monitoring programs. Refer to the Lake Water Quality Assessment for a table on sources of pollution in lakes and a more detailed table of causes.

3.d. Public Health/Aquatic Life Concerns

3.d.1 Toxics-related concerns

Vermont does not have a toxics monitoring program at the present time. Therefore a table showing the extent of surface waters monitored for toxics and the portions of rivers or lakes with elevated levels of toxics is not included. Toxics-related pollution from point and nonpoint sources, however, is of concern to the state and sites that impair or threaten to impair waters of the state have been inventoried as part of a recently completed toxics assessment (see Appendix 4).

The results of this assessment have revealed a total of five sites with surface water quality impairments due to the nonpoint discharge of toxic substances (Ai list in Table 9). Two are state-classified hazardous waste sites, two sites involve tailings from inactive copper mines and one is an on-site failed sewage disposal system. Thirty wastewater treatment facilities were identified as having excessive chlorine concentrations in the discharge and are included on the (A)(ii) list for purposes of the toxic assessment.

Vermont is required by Section 304(l) of the 1987 CWA Amendments to identify waters that meet various criteria concerning priority pollutants. For the purpose of this assessment, chlorine, ammonia and whole effluent toxicity were included for consideration with the 126 priority pollutants. Three lists are required under 304(l) and these have been designated the "mini" list, the "long" list and the "short" list.

The lists are defined as follows:

304(l)(A)(i) - "the mini" list - listing of waters for which a State does not expect to achieve water quality standards of the section 307(a) toxics after technology-based requirements have been met, due to either point or nonpoint sources of pollution.

304(l)(A)(ii) - the "long" list - comprehensive list of waters impacted by point or nonpoint source discharges of toxic, conventional and non-conventional pollutants.

304(l)(B) - the "short" list - list of waters for which a state does not expect "applicable water quality standards" to be achieved after technology-based requirements have been met due entirely or substantially to point source discharges of section 307(a) toxics.

The assessment was conducted by reviewing data from information sources which generate documentation of direct or indirect sources of toxic pollutants to surface waters. The presence of impairment was determined by one of several means:

1. Levels of toxic pollutants measured in surface waters or fish tissue which exceeded criteria levels. Sediment contamination by toxics was also considered in assessing impairment.
2. Biological monitoring of surface waters which showed impairment of community structure due to toxics.
3. Desk-top modeling which determined that toxicity would be present under certain conditions.

The contents of the (A)(i) and (A)(ii) lists can be found in Appendix 4. Table 9 summarizes the geographical information contained on these lists. As Vermont has no waters on the (B) list, that list is not included in the appendix.

Table 9.

TOXICS RELATED CONCERNS IN VERMONT

304(l) List	No. of sites	No. of waterbodies involved	No. of sites in Winooski R. Basin	No. of sites in Lake Champlain Drainage
(A)(i)	5	5	2	3
(A)(ii)	35	31	8	18
B	0	0	0	0

3.d.1.(A). Relative levels of toxics in fish/shellfish.

The effect of toxics on aquatic life, specifically fish tissue contamination, is being studied. Most of this work is focused on levels of PCBs in lake trout in Lake Champlain. Both New York and Vermont have recorded tissue concentrations in excess of the EPA action level of 2 ppm. An extensive (one-time) synoptic survey is planned for spring, 1988 and will include analysis of metals, pesticides and PCBs. The study will attempt to identify the extent of the problem in terms of area as well as numbers of species affected. The work is being conducted jointly by the Vermont Departments of Environmental Conservation, Fish and Wildlife, and Health.

3.d.1.(B). General trends in toxics contamination.

A University of Vermont study of toxic chemicals in the Lake Champlain basin* has identified sources of pollutants, but the amount of such substances coming from these sources is unknown.

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* The study is under the direction of Dr. Alan McIntosh, director of the Vermont Water Resources Research Center.

One source of priority pollutants located on the Lake's shore is the Pine Street Barge Canal in Burlington (a Superfund site - see below). Another source of toxic pollutants is urban runoff, such as from the combined sewer overflows in Burlington and other communities along the Lake.

3.d.1.(C). Other Toxics Concerns

(1). Fishing Advisories and Bans Currently in Effect

A fishing advisory for all of Lake Champlain (174,175 acres) went into effect in August, 1987 based on elevated levels of PCB's found in lake trout in the main lake. Individuals over 15 years old were advised to eat no more than one meal or 1/2 pound of lake trout per month. Children under 15, pregnant women, and women planning to bear children were advised to avoid consuming lake trout.

A ban on fishing, swimming and all other water contact for the Pine Street Barge Canal (1400 feet long) in Burlington went into effect May 21, 1981. PCB's and polycyclic aromatic hydrocarbons were found in significant concentrations in sediments, although no contamination was detected in the water column. The site is on the U.S. EPA Superfund Cleanup list.

(2). Fish kills/Abnormalities Due to Toxics -

In the last two years there has been one fish kill in Vermont due to toxics. This occurred in May, 1987 on the Hoosic River in Bennington County and spanned the entire seven mile length of the river in Vermont. The suspected cause was acids allegedly dumped by an industry located in Massachusetts.

(3). Sediment Contamination -

Sediment contamination due to toxics in Vermont (Table 10) has been found in seven sites. Five of those sites are found within the Lake Champlain drainage; two of the five sites can be found on the lake's shoreline. Estimates of the area affected for most of the sites are not provided due to a lack of monitoring data.

Table 10.

SEDIMENT CONTAMINATION DUE TO TOXICS

Waterbody #	Waterbody Name	Est. area Affected	Pollutants	Sources
01-03	Walloomsac River	*	Lead, Zinc, Nickel, Mercury, Trichloroe-thene, Tetrachlore-thene	Burgess Brothers landfill. Discontinued landfill for Union Carbide process waste.
03-03	Otter Creek	*	Atrazine, Alachlor, Metolachor	Old Fox/Lawes Ag. Services-wetland adjacent to site contaminated with herbicides from poor handling practices; pollutants degrading
03-05 & 03-14	Otter Creek, East Creek	*	PCBs	C. Vt. Public Service Corp. On site storage, service and recycling of electrical capacitors and transformers containing PCB-laden oils
05-10	Burlington Direct	*	methylene chloride, xylene 2-butane, PAHs, Phthalate Esters	C. Vt. Railway Option Property-site formerly used for oil storage, scrap metal and railroad yard; elevated levels of volatile and semi-volatile organics found in sediments

Table 10. (Cont.)
SEDIMENT CONTAMINATION DUE TO TOXICS

Waterbody #	Waterbody Name	Est. area Affected	Pollutants	Sources
05-10	Burlington Direct	11AC	PAHs PCBs	Burlington Gas-coal tar disposal area from coal gasification plant; Superfund site; Maltex Pond area cleaned up in 1985
08-16	Stevens Branch	*	PAHs dibenzofuran, selenium, arsenic	Barre Coal Tar site-remediation measures underway and include storage tank and surface sludge removal, micro-organism system
13-04	Connecticut River-Vernon	*	PAHs Phthalate Esters	Brattleboro Gas Works-coal tar from gasification plant disposed of in River from 1869 to 1949; environmental impact slight if site remains undisturbed

* No information available

(4). Closure of surface drinking water supplies due to toxics

There were no surface water supplies reported to be closed due to toxics during the period January 1, 1966 - December 31, 1987.

3.d.2. Non-toxics concerns

1. CLOSURES OF BATHING AREAS DUE TO NON-TOXICS

Table 11 summarizes the beach closures for 1986-1987 due to non-toxics. The information was gathered primarily from the Department of Health records and newspaper ("Burlington Free Press") reports. All the closures occurred at beaches on bays of Lake Champlain, and all but three were the result of combined sewer overflows (CSO) caused by heavy rains. Further discussion of the Burlington CSO problem may be found in other sections of this report.

Table 11.

CLOSURES OF BATHING AREAS DUE TO NON-TOXICS

Waterbody/Station	Date/Length of Closure	Pollutants	Sources
Lake Champlain/ St. Albans Bay	7/20/87 - 8/2/87	High Fecal Coliform	Raw sewage from broken sewer line
Lake Champlain/ North Beach	7/21/87 - 7/25/87	High Fecal Coliform	CSO's
Lake Champlain/ Mobil Beach	7/21/87 - 8/3/87	High Fecal Coliform	CSO's
Lake Champlain/ Leddy Park	7/22/87 - 7/25/87	High Fecal Coliform	CSO's
Lake Champlain/ Oakledge Park	7/22/87	High Fecal Coliform	CSO's
Lake Champlain/ Red Rocks Beach	8/6/87 - 8/7/87	Unknown	Accidental Discharge
Lake Champlain/ North Beach	8/6/87	Unknown	CSO's
Lake Champlain/ North Beach	8/21/87 - 8/24/87	High Fecal Coliform	CSO's
Lake Champlain/ Leddy Park	8/23/87 - 8/24/87	High Fecal Coliform	CSO's
Lake Champlain/ Malletts Bay Bay Side Town Beach	9/19/87- 9/20/87	High Fecal Coliform	Unknown

2. INCIDENTS OF WATERBORNE DISEASE -

The Vermont Department of Public Health maintains public records of reportable diseases by county. There are three types of water-borne pathogens that are reported in Vermont, namely Campylobacter, Giardia and Shigella. There were no documented cases of illnesses caused by these pathogens and attributable to contaminated water sources during the last two years.

3. CLOSURE OF SURFACE DRINKING WATER SUPPLIES

There were no closures of surface drinking water supplies due to non-toxics in 1986 and 1987. There were, however, 'Boil Water' orders issued to at least two towns. The Town of Readsboro was required to boil its water due to the fact that it has no facility for filtering and disinfecting its water supply, which is taken from the stream outlet of Howe Pond.

Residents of Brattleboro (10,000 people) were advised to boil their water for one month (September, 1987) due to high turbidity which reduced the effectiveness of chlorine added to the Pleasant Valley Reservoir (140 million gallons at full capacity). The source of the turbidity was not discovered, but an improperly run logging operation was suspected. Water tests also indicated the presence of Giardia.

3.e. Lake Information

The Vermont Lake Water Quality Assessment (refer to Appendix 3) includes all of the information required by Section 314 of the federal Clean Water Act as amended.

(A) Identification, Trophic Condition and Trends.

Table 12 provides a summary of significant Vermont lakes, classified according to trophic condition. (See Appendix 3 for a list of all significant lakes classified as to trophic condition).

Table 12.

TROPHIC INVENTORY OF VERMONT LAKES

Trophic Status	Acres	# Lakes
Eutrophic	37,239*	28+
Mesotrophic	163,643**	72++
Oligotrophic	9,044	19
Dystrophic	287	11
Unknown	18,933	589

* Includes 32,142 acres of Lake Champlain
** Includes 142,033 acres of Lake Champlain
\+ Includes 6 sections of Lake Champlain
++ Includes 5 sections of Lake Champlain

(B) Lakes With Impaired Uses

See Appendix 3 for a list and description of those lakes for which uses are known to be impaired, including those lakes which are known not to meet applicable water quality standards or which require implementation of control programs to maintain compliance with applicable standards.

(C) Lakes Impaired by Acid Deposition

Also refer to Appendix 3 for those lakes which have been identified as having water quality deterioration as a result of high acidity.

(D) General Assessment of Status and Trends

There are 379 lakes in Vermont that presently meet Water Quality Standards and fully support designated uses. Overall, there are presently 177,915 lake acres fully supporting their designated uses in Vermont, which represents 78% of the lake acreage in the state. It is alarming, however, that 86% of these acres are threatened by imminent pollution sources.

Rapid growth is a major threat to Vermont lakes (see Appendix 3.C.), primarily because the regulatory mechanisms are not yet in place to control growth and to prevent lake water quality degradation. Point source discharges are regulated so as not to cause an undue adverse impact on the state's waters. Once these discharges are established, however, new unregulated nonpoint sources can result in significant water quality degradation over time. Lakes receiving point source discharges must therefore be particularly protected from the cumulative impacts of unregulated nonpoint sources in their watersheds through the establishment of in-lake eutrophication standards and watershed management programs. Lake Champlain, which ultimately receives point source discharges from nearly half of the state's land area, is the highest priority for this procedure.

At present, large-scale development in Vermont is regulated by Vermont's Land Use and Development Control Law (Act 250). Smaller land subdivision and development on existing lots receive only limited review under the Department of Environmental Conservation's Environmental Protection Regulations or local

municipal zoning ordinances. The review of new development under any of these authorities very rarely takes into consideration existing development in a lake watershed and the overall cumulative impact of all nonpoint sources of pollution to the lake. There are presently 76 Vermont lakes located in towns that have been identified as "rapid growth" towns according to a Growth Areas Research Project conducted by the Vermont Law School's Environmental Law Center. These lakes are most likely undergoing a tremendous increase in development pressure in their watersheds. A technical assistance program is needed to assist regional and local planners in the development of comprehensive watershed protection programs for these threatened lakes.

On a more general statewide scale, lakeshore property has undergone a dramatic increase in value and demand in recent years, resulting in increased shoreland development. Vermont has no statewide shoreland zoning laws, and much of the shoreland development currently taking place receives little or no review. Education and technical assistance is urgently needed to encourage the development and implementation of effective shoreland protection measures at the state, regional, local and property owner levels.

Eurasian milfoil is perhaps the greatest present threat to the recreational use of Vermont lakes. Seven percent of Vermont lakes twenty acres or greater in size are currently infested with this nuisance weed, including the state's three largest lakes - Lake Champlain, Lake Memphremagog, and Lake Bomoseen. Another thirty-seven percent of these lakes (107) are

situated within ten miles of a lake that is already infested, making them particularly vulnerable to the introduction of Eurasian milfoil by boaters or wildlife. There are uncounted numerous smaller lakes less than twenty acres in size also in close proximity to infested lakes. The Vermont Eurasian Milfoil Control Program has made control of the between-lake spread of Eurasian milfoil a top priority. However, the Milfoil Watchers Program and statewide educational efforts must be expanded if significant progress is to be made in this area. In addition, effective ways to eliminate small new infestations must be found to supplement the control program.

There are twenty lakes in Vermont with average spring total phosphorus concentrations of 15-20 ug/l as P (See Appendix 3-Table II). Most of these lakes are not presently experiencing nuisance algae blooms. However, phosphorus concentrations in the 15-20 ug/l range approach the threshold concentration when periodic nuisance blooms can be expected to occur. It is imperative that the nutrient sources to these lakes be identified and controlled and watershed protection plans be implemented before algae problems arise and lake uses become impaired.

There are 107 lakes in Vermont considered to be threatened by acid precipitation. Of these, six lakes are already impacted by high acidity. Lake-of-the-Clouds in Cambridge, Vermont consistently exhibits a pH of less than 4.5. Vermont has no program or plans to mitigate the effects of high acidity in these lakes or to control toxics mobilized by this acidity. The recommended course of action on these lakes, as it is for all lakes requiring management, restoration or protection in Vermont

is to control the source of the problem or threat first, then treat any resulting in-lake problems if necessary.

A study conducted for the Vermont Department of Environmental Conservation's Air Pollution Control Division concluded that 99.9 percent of the pollutants responsible for wet sulfate deposition in Vermont originates from out of state sources. Vermont therefore encourages the implementation of federal emission standards to reduce the discharge of pollutants responsible for acid precipitation. Vermont intends to pursue all available legal and political avenues to reach this end. The state's Acid Precipitation Program continues to provide extensive lake and precipitation data from Vermont to support these efforts.

Toxic contamination is not considered to be a widespread problem in Vermont lakes. However, limited fish tissue sampling has raised some concern that PCB and other toxic substances may be threatening a portion or all of Lake Champlain's fishery. A special Fish Tissue Monitoring Program has been initiated in Vermont to assess the existence and/or extent of toxic contamination in fish tissue in Lake Champlain. If necessary, a management plan will be prepared to address any problems that are discovered through the monitoring program.

The five basic threats outlined above - rapid growth, Eurasian milfoil, threshold in-lake nutrient levels, acid precipitation, and toxic contamination in Lake Champlain - represent the major threats to Vermont's lakes that exist today.

3.f Nonpoint Source Information

A Nonpoint Pollution Source (NPS) Assessment (see separate Appendix) was done in Vermont, as required by Section 319(a) of the Clean Water Act as amended. Much of the information in this report with regard to water quality of surface waters was taken from that assessment.

Table 13 is a list of those river and stream waterbodies that, without additional action to control nonpoint sources of pollution, cannot reasonably be expected to attain or maintain standards. All lakes and ponds assessed as not fully supporting designated uses or with threats to use support cannot be expected to attain or maintain State Water Quality Standards without nonpoint source controls. A list of these lakes is included in Appendix 3. Please refer to Appendices 2 and 3 for those categories and subcategories of nonpoint sources or, where appropriate, particular nonpoint sources which add significant pollution to each type of surface waterbody, listed in amounts which contribute to not meeting water quality standards.

Table 13.

WATERBODIES WHICH CANNOT ATTAIN OR MAINTAIN
WATER QUALITY STANDARDS WITHOUT NPS CONTROL

04/07/88 WATERBODY TABULATION REPORT PAGE 1

WATERBODY ID #	WATERBODY NAME	DATE
VT01-02	Hoosic River	8801
VT01-03	Walloomsac River	8801
VT01-04	Batten Kill Main Stem	8801
VT01-07	Minor Tribs - Direct to N.Y.	8801
VT02-01	Poultney Main Stem and Tribs	8801
VT02-02	Hubbardton River	8801
VT02-03	Castleton River	8801
VT02-04	Upper Poultney Watershed	8801
VT02-05	Mettawee Watershed	8801
VT03-01	Lower Otter Creek	8801
VT03-04	Minor Tribs - Mid Main Stem Otter Ck.	8801
VT03-05	Upper Main Stem Otter Ck.	8801
VT03-06	Minor Tribs - Upper Main Stem Otter Ck.	8801
VT03-08	Lewis Creek	8801
VT03-09	Dead Creek	8801
VT03-10	Lemon Fair River	8801
VT03-11	New Haven River	8801
VT03-14	East Creek	8801
VT03-15	Clarendon River	8801
VT03-18	Upper Otter Creek Watershed	8801
VT04-03	East Creek	8801
VT05-01	Rock River	8801
VT05-07	St. Albans Bay Drainage	8801
VT05-08	Lower Northeast Arm Direct	8801
VT05-09	Malletts Bay Drainage	8801
VT05-10	Burlington Direct Land Drainage	8801
VT05-11	Shelburne Bay Direct Drainage	8801
VT06-01	Lower Missisquoi River	8801
VT06-02	Mid Missisquoi River	8801
VT06-03	Minor Tribs - Lower Missisquoi River	8801
VT06-05	Black Creek	8801
VT06-06	Tyler Branch	8801
VT06-07	Trout River	8801
VT06-08	Upper Missisquoi	8801
VT07-01	Lower Lamoille	8801
VT07-02	Lower Mid-Lamoille	8801
VT07-04	Upper Mid-Lamoille	8801
VT07-07	Upper Lamoille River	8801
VT07-08	Minor Tribs - Upper Lamoille	8801
VT07-15	Gihon River	8801
VT07-21	Lower Headwaters Lamoille River	8801
VT08-01	Lower Winooski River	8801
VT08-02	Minor Tribs - Lower Winooski	8801
VT08-03	Lower Mid-Winooski	8801
VT08-05	Upper Mid-Winooski	8801
VT08-07	Upper Winooski River	8801
VT08-08	Minor Tribs - Upper Winooski	8801
VT08-09	Winooski Headwaters	8801
VT08-11	Lower Little River	8801
VT08-12	Upper Little River	8801

Table 13. (con't)

WATERBODY ID #	WATERBODY NAME	DATE
VT08-13	North Branch - Winooski River	8801
VT08-15	Jail Branch - Winooski River	8801
VT08-16	Stevens Branch - Winooski River	8801
VT08-17	Dog River	8801
VT08-20	Upper Mad River	8801
VT09-04	First Branch - White River	8801
VT09-05	Second Branch - White River	8801
VT09-06	Third Branch - White River	8801
VT10-01	Lower Ottauquechee River	8801
VT10-05	Upper Ottauquechee River	8801
VT10-06	Minor Tribs - Upper Ottauquechee	8801
VT10-07	Kedron Brook	8801
VT10-11	Lower Black River	8801
VT10-13	Mid-Black River	8801
VT10-16	North Branch - Black River	8801
VT11-01	Lower Williams River	8801
VT11-03	Middle Branch - Williams River	8801
VT11-05	Lower Saxtons River	8801
VT11-15	Ball Mtn Brook	8801
VT11-16	Winhall River	8801
VT11-18	Minor Tribs - Upper West	8801
VT12-01	Lower Deerfield River	8801
VT12-03	Upper Deerfield River	8801
VT12-05	North Branch Deerfield	8801
VT13-12	Sacketts Brook	8801
VT14-02	Western Ompompanoosuc River	8801
VT14-03	Ompompanoosuc River	8801
VT14-04	Lower Waits River	8801
VT15-01	Passumpsic Main Stem	8801
VT15-02	Joe's Brook	8801
VT15-04	Sleepers River	8801
VT15-05	Upper Minor Tribs - Passumpsic River	8801
VT15-08	East Branch Passumpsic	8801
VT15-09	Moose River	8801
VT16-04	Moore Impoundment	8801
VT16-05	Comerford Impoundment	8801
VT16-08	Canaan Direct Tribs	8801
VT16-10	East Branch - Nulhegan	8801
VT16-11	Nulhegan River	8801
VT16-14	Maidstone-Guildhall Direct Drainage	8801
VT17-01	Lake Memphremagog Direct	8801
VT17-02	Tomifobia River	8801
VT17-03	Coaticook River	8801
VT17-04	Lower Clyde River	8801
VT17-05	Upper Clyde River	8801
VT17-09	Lower Black River	8801

3.g. Estuary Information

As Vermont is not a coastal state, there are no estuaries.

3.h. Waterbody-Specific Information

Federal guidelines require that water quality information specific to each waterbody be included in this report. Due to the large number of river and stream waterbodies (210), many assessed lake and pond waterbodies (518), and the large volume of information which accompanies each waterbody report, this material has been prepared and placed in a separate appendix. Tables 14 and 15 summarize the degree of designated use support and CWA goal status for rivers and streams and lakes and ponds, respectively by the seventeen drainage basins in Vermont.

Table 14. WATER QUALITY INFORMATION BY BASIN.
VERMONT RIVER AND STREAMS (MILES)

BASIN NUMBER	USE SUPPORT STATUS (2)				CWA GOAL STATUS				
					fishable		swimmable		
	NOT SUPPORTED	PARTIAL SUPPORT	THREATENED	FULLY SUPPORT	MEETING	NOT (1) MEETING	MEETING	NOT (1) MEETING	NOT (1) ATTAINABLE
1	7.0	2.1	32.3	210.8	252.2	0	240.8	0	11.4
2	8.0	35.6	19.5	117.1	169.9	10.3	156.9	12.0	11.3
3	37.1	46.1	119.2	280.6	460.1	22.9	432.4	26.1	24.5
4	0	4.0	0	26.6	30.6	0	28.3	0	2.3
5	10.5	33.0	34.1	60.2	126.8	11.0	116.9	9.0	11.9
6	10.2	17.6	63.3	234.8	310.7	15.2	299.9	13.6	12.4
7	21.6	71.4	42.8	263.8	375.8	23.8	391.5	0	8.1
8	79.4	53.0	76.7	367.2	539.4	36.9	442.1	47.4	86.8
9	0	25.1	64.6	367.6	457.1	0.2	449.7	0	7.6
10	7.5	27.7	54.7	158.6	239.7	8.8	232.5	0	16.0
11	1.0	20.3	94.9	225.8	339.9	2.1	336.0	2.0	4.0
12	15.3	8.5	32.5	86.9	127.8	15.4	126.5	13.3	3.4
13*	1.3	0	91.1	170.2	262.1	0.5	253.1	0	9.5
14	4.0	5.1	18.5	226.7	250.2	4.1	252.4	0	1.9
15	10.5	17.0	27.4	285.2	335.9	4.2	321.8	2.1	16.2
16*	21.6	1.0	121.6	291.0	428.4	6.8	426.2	2.0	7.0
17	10.0	13.2	12.1	254.5	279.7	10.1	276.3	4.8	8.7
TOTALS	245.0	380.7	905.3	3,627.6	4,986.3	172.3	4,783.3	132.3	243.0

* includes mileage from Connecticut River main stem
(1) not meeting = correctable water quality problem
not attainable = non-correctable water quality problem
not attainable + not meeting = total miles not meeting CWA fishable or swimmable goals
(2) refer to Appendix 5 for definitions

Table 15. WATER QUALITY INFORMATION BY BASIN.
VERMONT LAKES AND PONDS (ACRES)

BASIN NUMBER	USE SUPPORT STATUS (2)				CWA GOAL STATUS					
					Fishable			Swimmable		
	NOT SUPPORTED	PARTIAL SUPPORT	THREATENED	FULLY SUPPORT	MEETING	NOT (1) MEETING	NOT (1) ATTAINABLE	MEETING	NOT (1) MEETING	NOT (1) ATTAINABLE
0*	6,015	28,235	139,925	0	173,204	970	0	173,708	464	0.9
1	61	151	167	38	253	-	11	99	-	0
2	771	1,974	1,420	1,092	5,089	-	10	4,415	-	0.1
3	330	905	666	1,911	3,559	33	-	1,188	-	0
4	15	0	24	31	55	15	0	24	-	0
5	524	1,152	323	477	2,327	61	-	1,291	374	0
6	479	-	215	66	652	4	-	535	-	0
7	782	267	423	2,410	3,347	408	18	739	-	0
8	536	229	1,316	1,941	3,165	485	71	632	-	0
9	-	26	237	78	253	-	14	84	-	0
10	215	411	935	215	1,373	215	67	457	-	0
11	-	290	530	135	878	30	9	102	-	0
12	1,640	2,387	583	71	4,609	16	27	223	-	0.4
13	-	25	158	142	221	25	-	-	-	0
14	-	383	790	863	1,933	-	51	1,229	-	0
15	20	123	349	896	1,335	7	15	743	-	0
16	5	149	2,039	1,172	3,254	5	6	2,246	-	0
17	100	1,006	3,219	13,058	17,265	-	5	15,093	-	0
TOTALS	11,493	37,713	153,319	24,596	222,772	2,274	304	202,808	838	1.4

* represents Lake Champlain
- represents portions of unassessed lake or pond acreages
(1) not meeting = correctable water quality problem
not attainable = non-correctable water quality problem
not attainable + not meeting = total acres not meeting CWA fishable or swimmable goals
(2) refer to Appendix 5 for definitions

4. GROUND WATER QUALITY

4.a. Overview

Ground water contamination within Vermont is comparatively minor when considering more populous, industrial states. In addition, due to its humid climate, it is a water-rich state with few consumptive uses. However, from time to time, well interference problems do occur in more developed areas, although there is no evidence of ground water mining (pumping faster than it is able to be recharged). The state's reliance on ground water to supply more than half of its drinking water needs is expected to continue since there is no evidence of widespread water degradation or depletion (see Table 16).

A number of ground water quality problems do exist, but are specific to certain known activities. The more predominant types of contamination include petrochemical, leachate from landfills and old dumps, salt and salted sand, and accidental spills. Fundamental data on these activities are currently being collected. In conjunction with this effort, a computer program has been written to provide ready access to this information. The computerized data base is expected to be functional during 1988, provided that staffing is available. Concurrently, the State Ground Water Section is investigating the potential for an interagency coordinated data base.

Data collection is being conducted within the lead agencies which are responsible for certain aspects of ground water contamination. Of all state agencies, the bulk of the ground water responsibilities lie with the Department of Agriculture,

Department of Environmental Conservation, Department of Health and the Agency of Transportation. Information at the Department of Agriculture has yet to be gathered, hence, data presented on agricultural problems in Tables 17 and 18 do not represent the true magnitude of the problem.

The lack of a comprehensive history of ground water problems highlights two important factors in Vermont's ground water management programs. The first factor is the dispersion of ground water protection efforts among a number of Agencies, and the second is the lack of a comprehensive ground water data management system. The former is the focus of active interagency negotiations and the second is being addressed as one program element in the 1988 coordinated ground water management work plan.

A recent study of nitrate levels in ground water adjacent to six residential subdivisions with on-site sewage disposal systems indicates that, despite modern design criteria for on-site systems, elevated levels of nitrate are present. Preliminary analysis of the data indicates that the relationship between density of on-site systems and nitrate levels in the groundwater cannot be determined with existing data.

The report is being redrafted as an executive summary report with conclusions and recommendations. Further internal review is anticipated prior to public release.

Table 16.

POPULATION RELIANCE ON GROUND WATER FOR DRINKING WATER FOR YEAR 1980*

	Public Water Systems	Domestic Wells	Total
Percent of Population Relying on Ground Water for Drinking Water	22%	32%	54%
Number of People Relying on Ground Water for Drinking Water	113,000	162,000	275,000

* Data from National Water Summary - Vermont, U.S.G.S. Water-Supply Paper 2275, 1984

4.b. Ground Water Quality

4.b.1 Major sources of contamination

Of all the contamination problems documented within the state, petroleum-related pollution occurs most often. This type of contamination normally occurs in the form of a leaking underground storage tank or an accidental spill. Leaky underground storage tanks are presently regulated by the state, and requirements may call for double wall containment or rigorous monitoring schedules. In addition, a task force responds to accidental spills which might otherwise go unabated.

Landfills are the second most common source of groundwater contamination. The category of 'landfill' includes sanitary waste sites, old town dumps, stump dumps, granite waste and other solid waste disposal sites. There are 273 landfills in Vermont. Since none of the leachate-producing landfills has a liner or

treatment facilities, they are all suspected of contributing leachate to groundwater.

On-site sewage systems, the third most prevalent source of groundwater contamination, are a common method of disposal since Vermont is a rural state. As indicated by the draft domestic nitrate density study, high levels of nitrate may be common at disposal sites throughout the state. An elaborate monitoring network would be required to verify the impact of all on-site systems statewide. It is expected that the amount of ground water contamination is significant due to the sheer numbers of active on-site sewage disposal systems.

The fourth and fifth most prevalent sources of contamination are expected to be salt, salted sand, and agricultural practices. Information suggests that elevated sodium and chloride concentrations continue to impact ground water due to the storage and spreading of salt for road deicing purposes. Approximately 40 wells have been replaced due to high levels of sodium and chloride. It has been estimated that 500 wells may be impacted due to salt because of the proximity to roads or storage facilities.

Currently, a case study that is being conducted by the State Department of Agriculture has identified seven water sources contaminated with herbicides. Approximately 100 water sources have been sampled and tested to date. The State Department of Environmental Conservation continues to cooperate with both of the state agencies mentioned above to discourage ground water contamination.

The U.S. Environmental Protection Agency has provided the format for Table 17, which has been completed utilizing the Department of Environmental Conservation's ground water data. The data illustrate the types of contamination problems within the state. Table 17 ranks the problems according to their abundance. Contamination categories not marked with an 'X' are not found in Vermont.

Table 17.

MAJOR SOURCES OF GROUND WATER CONTAMINATION

Source	Identified Problems in Vermont	Relative Priority
Septic tanks	X	3
Municipal Landfills	X	2
On-site industrial landfills (excluding pits, lagoons, surface impoundments)	X	
Other landfills	X	
Surface impoundments (excluding oil and gas brine pits)	X	
Oil and gas brine pits		
Underground storage tanks	X	1
Injection Well (including Class V)	X	
Abandoned hazardous waste sites	X	
Regulated hazardous waste sites	X	
Salt Water intrusion		
Land application/ treatment	X	
Agricultural activities	X	4
Road salting	X	5
Other (specify)		

Table 18 provides a summation of the number of contamination incidences from the late 1940's through 1987. Documentation covers the entire spectrum from merely suspected contamination to fully documented cases of contamination which have been verified by water quality analysis. In addition, there is a large variation in the risk involved since cases range from spills of non-threatening material to large hazardous waste spills. The range in magnitude of most contamination incidences generally tends to be minor to moderate. Large ground water pollution problems are rare.

Table 18.

GROUND WATER CONTAMINATION INCIDENCES

Contamination Incident	Number of Incidences
Petrochemicals	154
Solid Waste (landfills, dumps)	13
Liquid Waste to Land Surface or Subsurface	12
Industrial Lagoon	3
Agricultural Wastes	1
Salt/Salted Sand	39

Only one case of salt and/or salted sand contamination was inventoried. It is known however, that the State Agency of Transportation has information on approximately thirty-nine contamination incidences. It is also suspected by the Department that there are several additional unreported contamination incidences arising from municipal salt storage or application practices.

4.b.2. Contaminating substances

Of the contaminating substances routinely tested for, those checked on Table 19 are most prevalent. The categories listed were provided by the U.S. Environmental Protection Agency and data from the State Department of Environmental Conservation files was used. Agencies in addition to the Department of Environmental Conservation that may be involved in monitoring and sampling for these contaminants are the Department of Health, Agency of Transportation, and the Department of Agriculture.

Table 19

SUBSTANCES CONTAMINATING GROUNDWATER

Organic chemicals:		Metals	X
Volatile	X		
Synthetic	X	Radioactive material*	X
Inorganic chemicals:		Pesticides	X
Nitrates	X		
Fluorides	___	Other agricultural chemicals	X
Arsenic	___		
Brine/salinity	X	Petroleum products	X
Other	___		
		Other (specify)	___

* Naturally occurring Radon

5. SPECIAL STATE CONCERNS

Please refer to Section 7 (page 103), Special State Concerns and Recommendations for further discussion.

6. WATER POLLUTION CONTROL PROGRAM

Vermont administers a well-planned and comprehensive water pollution control program, consisting of planning, construction grants, permitting, compliance and monitoring. With the construction of the State's last original sewage treatment plants, the remaining upgrades from primary to secondary, and phosphorus removal, the program is shifting emphasis to advanced waste treatment, correction of combined sewer overflows (CSOs) and enlargement of sewage treatment plants.

Based on 1985 self monitoring data, 92% of all biological oxygen demand (BOD) data points for secondary treatment plants were below 30 mg/l. Similarly, 50% of all total suspended solids data was below 30 mg/l. Ninety percent of all total coliform data points for secondary plants were below the 500 total coliform/100ml limit. These data show the high degree of success in Vermont treatment plants but also define a substantial need for improvement.

6.a Point source control program

Municipal Facilities

Vermont is concluding construction of required municipal pollution control treatment plants. At this writing, there are two municipalities which require original sewage treatment plants (Troy and Jeffersonville), and five which require an upgrade from primary to secondary (Windsor, St. Johnsbury, Hartford-Wilder,

Fair Haven and Bellows Falls). Planning and financing for these projects have been concluded and construction will begin during the winter or spring of 1988, with the last plants to be in operation by 1990 (See Tables 20 and 21). Seven Vermont plants

Table 20.

SUMMARY OF MUNICIPAL WASTE TREATMENT

FACILITIES AS OF JANUARY 1988

Number of municipalities served by primary treatment	5
Number of municipalities served by secondary treatment	80
Number of municipalities served by off-stream disposal	4
Number of municipalities served by no treatment	2
Total number of municipalities served by central sewage collection and treatment	89
Number of major[1] treatment facilities	21
Number of minor[2] treatment facilities	68
Number of facilities with phosphorus removal capability on-line or under construction	12

Table 21.

MUNICIPAL WASTEWATER FACILITY CONSTRUCTION STARTS

January 1, 1986 - January 1, 1988

Project	Type	Cost
Bethel	New Secondary	$2,995,000
Proctor	Primary Upgrade	$4,200,000
Shelburne F.D. #1	Primary Upgrade	$ 780,000
S. Burlington, Bartlett Bay	Primary Upgrade	$ 580,000

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[1] Major treatment facilities are those that treat one million or more gpd and any other plants the State believes have significant problems.

[2] Minor treatment facilities are those that treat less than one million gpd.

require the addition of phosphorus removal facilities (Shelburne FD #1, Burlington City [3 plants], Hinesburg, Colchester FD #1, and Swanton). These will also be under construction within the next year and be operational by 1990. Ten of these fourteen treatment plants are located in the Lake Champlain drainage basins.

The remaining pollution control work in Vermont includes the separation or treatment of combined sewer overflows, the enlargement of existing treatment plants as population growth requires, and the incorporation of advanced waste treatment measures as needed to accommodate population growth or toxics removal. Planning is in progress for these projects.

In anticipation of losing federal water pollution control grant money, Vermont enacted enabling legislation for a revolving loan fund in 1987. The fund is anticipated to be operational during 1988. The forms of and relative proportion of grants and loans is currently under study. The foremost alternative being considered is for the state to provide a 25% grant and a 50% zero-interest loan for all CSO work tributary to lakes, with all other projects receiving zero or low-interest loans from the revolving loan fund. The 1988 legislature is expected to resolve this issue.

Vermont is in the process of amending the project priority system, which is used to rate and rank all projects seeking financial assistance through the grant program or through the state revolving loan program. The priority system is expected to be adopted by April, 1988 in preparation for the start of the revolving loan fund.

As of December, 1987, there were 89 public wastewater treatment plants, 43 industrial pretreatment plants and 54 industries with NPDES permits in Vermont. These plants have improved the quality of approximately 55 rivers and streams and three lakes. A total of $200 million of state, federal and local funds have been spent to cover the capital construction of these facilities.

Industrial Facilities

Substantial progress has been made by Vermont in cataloging industrial discharges and their impact on receiving water quality and on municipal treatment facility operations which receive industrial discharges. The majority of industrial discharges in Vermont presently employ Best Practicable Treatment Technology.

Pretreatment permit issuance continues to receive significant manpower commitment on the part of the Department due to the large potential and actual effect of industrial wastes on Vermont's relatively small municipal facilities. The major problem category is the cheese industry.

Permit Compliance/Enforcement

Sampling by the Compliance Monitoring Unit serves to verify effluent data submitted by municipal and nonmunicipal dischargers. Permittees are considered major or minor dischargers based on volume and type of effluent. Major municipalities are those who discharge more than one million gallons per day, and minor municipalities are those that discharge less. For nonmunicipal dischargers, Vermont uses EPA's rating system for designating major discharges.

Table 22.

NPDES* EFFLUENT LIMIT VIOLATIONS OVERVIEW

July 1, 1986 - June 30, 1987

	Numbers of Permits with Monitoring Requirements	Numbers of Permittees in SNC** With Effluent Limits
Municipal		
Major	30	6 (20%)
PL 92-500 Minor	27	0
Industrial		
Major	7	1 (14%)

*National Pollution Discharge Elimination System
**Significant Noncompliance

Table 23.

SIGNIFICANT NONCOMPLIANCE

EFFLUENT LIMIT VIOLATIONS ONLY

July 1, 1986 - June 30, 1987

	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Status 9/30/87
Major Municipal					
Bellows Falls	X				Compliance
Bennington	X				Compliance
Burlington River	X				Compliance
Colchester FD #1				X	Noncompliance
St. Albans	X	X	X	X	Compliance
Windsor Main	X	X	X		Compliance
Minor Municipal					
None					
Major Industrial					
Boise Missisquoi			X		Compliance

Operation, Maintenance and Training

Wastewater facilities must be properly operated and maintained by competent persons to maintain effluent quality. The Operations and Management Section provides a range of programs to improve compliance including:

1. Visits and detailed inspections, including compliance record review and recommendations to correct violations.
2. Compliance sampling of selected plants.
3. Technical assistance to define violations, corrections and plant improvements.
4. Certification of operators.
5. On-site and classroom training in process control and laboratory procedure. Classroom training includes both industrial and domestic operators.
6. Review of proposed facilities to assure effluent limits can be met.
7. Operations and Maintenance manual review.
8. Financial management assistance to help municipalities firmly establish proper financial procedures.

This program is well received and thirteen municipalities have accepted all recommendations including increased budgets and rates.

This program needs to be securely funded and the person performing the work needs to be converted from contractor to permanent employee.

Toxic Control Program

The State has developed a Toxic Discharge Control Strategy utilizing a progressively stringent three-tiered, data-development process to identify and quantify all toxic point discharges in Vermont.

Tier I of the data-generation process will serve as an initial screening of all existing discharges to waters of the State to identify those which are potentially toxic.

Tier II data generation will establish the presence or absence of toxicity and provide at least a preliminary assessment of the magnitude of the threat that the presence of toxicity poses to the biota of the receiving water.

Tier III data generation will be undertaken by the discharger to refine any uncertainty associated with the development of regulatory criteria. The refinement process will involve either increasing the intensity of toxic testing and expanding the chronic and definitive data base to include more test organism species, or reducing toxicity in the discharge through the implementation of a toxicity reduction evaluation.

Tier I of the strategy has been completed. With one exception, no data generation (Tiers II and III) has occurred. Pownal Tannery effluent was tested (Whole Effluent Toxicity Test) in August, 1987. The presence of toxicity was determined. Operations at the plant have subsequently ceased (bankruptcy) and negotiations are currently underway to close out the site permanently.

6.b. Lakes and Ponds Program

A full description of Vermont's Lakes and Ponds Program can

be found in the 1988 Lake Water Quality Assessment (Appendix 3).

(A) Protection

Lakes currently without water quality problems should be protected to prevent problems from developing in the future. Lakes with problems should also be protected to prevent further degradation. Vermont's Lake Protection Program promotes lake protection on a general scale in three basic ways - through monitoring and surveillance, through education, and through regulation.

1. The monitoring and surveillance programs are very important for lake protection. The Department of Environmental Conservation must be kept aware of any changes in the water quality of a lake. The early detection of a water quality problem often leads to a simpler, less expensive and more effective solution. By the time a problem becomes visible to lake users, corrective measures are often expensive and may not even be feasible. Although Vermont's monitoring programs are fairly extensive for a small state, the 1987 lake assessment data showed that only 35 percent of Vermont lakes were actually monitored from 1983-1987. These lakes reflect 96 percent of the total acreage of Vermont lakes, indicating the emphasis placed on monitoring larger lakes, particularly Lake Champlain, when funding is limited. However, the smaller Vermont lakes are an important resource worthy of protection, and monitoring and surveillance programs should include these lakes as well.

2. Education plays a critical role in lake protection. Public awareness and cooperation can result in the widespread implementation of lake protection measures that are difficult or impossible to achieve through any other means. Examples of educational efforts are the two Lake Protection Conferences held in Vermont in 1982; a movie on Lake Eutrophication and a slide/tape show on Lake Protection that are available to the public; a slide show on Eurasian milfoil that is currently being developed; numerous brochures which are available on topics ranging from septic system maintenance to Eurasian milfoil control; periodic newsletters distributed by the Lay Monitoring Program and the Eurasian Milfoil Control Program; newspaper articles and radio and television spots that have appeared statewide every summer; metal signs placed at all lake access areas warning boaters to control the spread of aquatic plants; and the Department of Environmental Conservation staff preparation of exhibits and talks for many public meetings each year. However, despite these efforts, a large number of citizens continue to make uninformed decisions that threaten the water quality of Vermont lakes. Educational programs must be continued and expanded to reach more people involved with lake management in Vermont. This is particularly true in the area of shoreland management, where no comprehensive statewide program presently exists. Education and technical assistance is urgently needed to encourage the development and implementation of effective shoreland protection

measures at the state, regional, local, and individual level.

3. Vermont has several regulatory programs that provide protection to lakes. The underlying basis to most of these programs is the Vermont Water Quality Standards, which generally prohibit activities that will result in an undue adverse impact on the quality of the state's waters. Permits are required under Title 10 V.S.A., Chapter 47 to discharge waste, either directly or indirectly, into Vermont's lakes. Permits are also required under Title 29 V.S.A., Chapter 11, for encroachments into public lakes. The introduction of chemicals to waters of the state to control nuisance aquatic conditions requires a permit under Title 10 V.S.A., Chapter 37, as does the control of nuisance aquatic plant growth by powered mechanical devices or bottom barrier materials. Legislation currently under consideration in the Vermont legislature would make the transport of Eurasian milfoil to or from lakes illegal. Other statewide regulatory measures that protect lakes either directly or indirectly include Vermont's Land Use and Development Control Law, the Department of Environmental Conservation's Environmental Protection Regulations, and a ban on the sale of phosphorus-containing detergents in Vermont. The Department of Environmental Conservation is currently developing Indirect Discharge Regulations, Groundwater Protection Regulations, Wetland Regulations, and other rules and procedures that will provide additional protection to lakes.

The Water Resources Board also has jurisdiction over lake water levels and surface use under Title 10 V.S.A., Chapter 37 and Chapter 49.

Shoreland zoning can be a very valuable lake protection technique. Since zoning laws in Vermont are adopted and enforced at the local level, the state's role is an educational one. Many towns do not realize the value of shoreland zoning and are unfamiliar with the options available to them. A technical assistance program to aid towns in developing shoreland zoning legislation specific to their lakes and needs would be a major step toward lake protection in Vermont.

Although considerable statutory and regulatory controls exist in Vermont to protect lake water quality, many of these controls are inadequate to address the accelerating development and pollution pressures now facing Vermont's lakes. Proposed changes to Vermont's statutes are currently being prepared for future legislative consideration to afford special protection to Vermont's lakes and shoreland.

The lake protection programs described above all approach lake protection from a general, statewide perspective. The need for lake protection programs specific to priority lakes is not currently being met in Vermont. In order to meet this need, additional lake assessment data must first be obtained, a lake protection classification system must be developed, and Vermont lakes must be prioritized for lake protection measures. Significant progress

will only be possible if additional funding is forthcoming for lake assessment and classification activities. Once priority lakes have been identified, a technical assistance program will be needed to assist regional and local planners in the development of comprehensive watershed protection programs for threatened lakes.

Due to its large size and tremendous recreational value, Lake Champlain has already been identified as a high priority for lake protection measures. The state environmental agencies in New York and Vermont are presently developing a Cooperative Lake Agreement that will provide guidance for management and protection programs on Lake Champlain in the future. It is hoped that interstate cooperation and a renewed emphasis on the issues affecting the water quality of Lake Champlain will result in a comprehensive watershed management plan for Vermont's largest lake.

B) Management or Restoration Activities

When a lake is identified as having a water quality problem, there are two possible courses of action. Either a feasibility study is initiated to gather information and determine what management or restoration measures would be appropriate, or management or restoration activities may immediately be recommended if a study is not warranted. Management activities generally must be repeated yearly to be effective. Weed harvesting and bottom screening materials are examples of management techniques. Restoration activities are aimed at eliminating

the cause of a lake's problem in order to achieve long-term benefits. Such activities may involve both watershed and in-lake work.

Lake management or restoration projects are often large-scale and expensive. There are several funding sources for these activities in Vermont.

1. The Lake Champlain Aquatic Nuisance Control Program is a management effort encompassing the harvesting of water chestnut in South Lake Champlain and Eurasian milfoil in St. Albans Bay. Funding for this program is provided on a cost-sharing basis by the U.S. Army Corps of Engineers and the State of Vermont, respectively.

2. The State Department of Environmental Conservation administers an Aquatic Nuisance Control Program that provides matching grant funds for both management and restoration activities. Funds may be granted to municipalities or agencies of the State for new aquatic nuisance control projects or to operate and maintain existing projects. Most projects to date have involved weed harvesting operations.

3. The U.S. Environmental Protection Agency's Clean Lakes Program currently provides federal funding at a match level for lake restoration projects, but does not fund lake management activities. At the present time, it is the Department of Environmental Conservation's (DEC) position that one-half the nonfederal funds for a lake restoration project must be locally supplied. Lakes eligible for

federal funding must first undergo a complete diagnostic/feasibility study. Harvey's Lake and Lake Iroquois are eligible for Clean Lakes restoration funds. A lake restoration project has already been implemented on Lake Morey.

4. The Soil Conservation Service has been instrumental in lake restoration activities on several Vermont lakes through the implementation of best management practices on agricultural land in the lake watersheds. The Department of Environmental Conservation works closely with the Soil Conservation Service to determine priority watersheds and to provide any necessary water quality data. The watersheds of Lake Parker, Lake Carmi Lake Memphremagog and Lake Champlain have all substantially benefited from Soil Conservation Service work in recent years.

(C) Mitigation of High Lake Acidity

Vermont has no program of mitigation for high lake acidity. The State believes that getting to the source of the problem rather than treating causes/symptoms is the most appropriate action. To this end, Vermont encourages that federal emission standards be implemented to reduce or eliminate atmospheric deposition of sulfates and nitrates. Vermont continues its high quality acid precipitation monitoring program in order to provide hard data for EPA to assist them in their emission regulation activities.

6.c. Nonpoint Source Control Program

6.c.1. Description of Process to Identify Best Management Practices

The process to identify best management practices (BMP) has been conducted in conjunction with the Nonpoint Source Task Force, chaired by Mollie Beattie, Commissioner of the State Department of Forests, Parks, and Recreation. This Task Force was established by the Secretary of the State Agency of Natural Resources in part to secure public participation in the nonpoint source control planning process. The Task Force consists of 20 representatives from a broad range of organizations including the Vermont Department of Agriculture, the Natural Resources Conservation Districts, Soil Conservation Service, municipal government, Agency of Natural Resources, private consultants, the Vermont Ski Areas Association, the Natural Resources Conservation Council, the Home Builders Association of Northern Vermont, Vermont Association of Planning and Development Agencies, and others listed in Appendix 1.

The Task Force adopted the following mission statement: "To prepare by August 4, 1988 portions of a four-year management program for nonpoint source pollution in Vermont as required by the 1987 Amendments to the Federal Clean Water Act; specifically, (1) to identify or develop best management practices for controlling each of these sources of nonpoint pollution; (2) to identify most appropriate means of implementing the best management practices; (3) to estimate the relative significance

of various sources of nonpoint pollution in Vermont such as agriculture, silviculture, construction, urban runoff, and water course modification; and (4) to solicit public comment on these conclusions".

The group recognized that before nonpoint sources of pollution could be controlled it would be necessary to determine (1) that the rules, statutes, policies, and guidelines contained in standards (best management practices or BMP's) are technically adequate to control significant nonpoint sources of pollution; and (2) that programs are adequate to implement the technical standards at a level which will bring about a resolution of the problems.

With the aid of the Department of Environmental Conservation, the Task Force examined the technical standards for all major sources of pollutants identified in the assessment. Of the 12 major sources of nonpoint pollution identified in Vermont, including agricultural operations, hydropower facilities, and construction sites, seven have been recognized by the Task Force (as of this writing) as having water pollution control standards which are either inadequate or which need further study for technical adequacy. The technical adequacy review is a time consuming and ongoing task. Where there are two standards, the Task Force will recommend the BMP's which should be favored as the "state standard" for a specified source. Although the Task Force is also concerning itself with emerging problems, first priority is being given to assuring that appropriate standards exist for the most serious nonpoint sources as well as sources

requiring further assessment which are believed to lead to serious impacts.

In addition to Task Force review of technical standards, Best Management Practices are routinely evaluated by the Agency of Natural Resources (ANR). The Agency is continually upgrading its own rules and policies and urging other federal and state agencies to do the same with their own standards.

Examples of Best Management Practices which have received recent attention are:

Best Management Practices	Responsible Agency/Department
Agricultural Acceptable Management Practices	VT Department of Agriculture
Acceptable Management Practices for Silviculture	VT Department of Forests, Parks, & Recreation
Policy on Gold Dredging	VT Agency of Natural Resources
Rules & Standards for Septic Systems	VT Agency of Natural Resources
Procedures for Bridge Cleaning	VT Agency of Transportation
Standards for Groundwater Protection	VT Department of Environmental Conservation
Standards for Ski Trail Erosion Control	VT Department of Forests, Parks, & Recreation
Policies for Controlling Spread of Nuisance Aquatic Plants	VT Department of Environmental Conservation

The process for identifying best management practices was also incorporated into the nonpoint source assessment process to gain broader public input. Over 350 individuals and organizations were contacted regarding specific nonpoint sources that they may have observed. Each was asked his or her opinion of specific best management methods and programs that they felt were appropriate to resolve local problems.

A complete description of the suggested programs and practices is found in the comments section of each waterbody surveyed (see Appendix 2).

Public review of best management practices will continue over the next year. The Task Force recently took the initiative to have the relevant portions of the state- wide assessment distributed to Regional Planning Agencies and district offices of the Agency of Natural Resources, and to make the report available to a wide range of knowledgeable individuals and organizations for their comments. The Task Force will solicit comments on the completeness and accuracy of the assessment and recommendations for best management practices and remedial actions.

6.c.2. Control Programs

Programs for controlling nonpoint sources (NPS) of pollution continue to evolve and have included initiatives at local, state, and federal levels. A state strategy for identifying and reducing NPS problems was designed as early as February, 1975. A second strategy was developed in 1980 which shifted from planning to the implementation of plans. NPS control programs that have been developed and are being implemented across Vermont are presented below by source category.

Agriculture

Federal programs for controlling agricultural NPS pollution in Vermont require landowners to voluntarily "cooperate" with one of fourteen Natural Resources Conservation Districts throughout Vermont in order to become eligible for federal financial and technical assistance from the U.S. Department of Agriculture's

Agricultural Stabilization and Conservation Service and the Soil Conservation Service. Federal programs in Vermont to control agricultural NPS's include the Watershed Protection and Flood Prevention Program (PL 83-566), the Resource Conservation and Development Program (RC&D), the Rural Clean Water Program (RCWP), and the Agricultural Conservation Program (ACP). Other, more recent programs that are associated with the Food Security Act of 1985 (Swampbuster, Sodbuster, and Conservation Compliance provisions) attempt to disqualify agricultural landowners from USDA financial assistance when it can be shown that crop production occurs on converted wetland or on grassland or forest land with highly erodible soils.

The first watershed protection ("land treatment only") PL 83-566 project in the nation was the LaPlatte River Project in Vermont. Since the project's inception, five watersheds have been authorized and three watersheds have undergone preauthorization planning. The 208 Planning Process identified nine additional watersheds that require agricultural NPS control measures and federal assistance.

The RC&D Program remains active in many communities throughout the state and includes two project areas - the Northern Vermont RC&D and the George D. Aiken RC&D. The RC&D Program in Vermont, however, does not include Chittenden and Washington counties. Vermont RC&D Measure Plans have included streambank protection, habitat evaluation, agricultural land preservation and treatment.

The single RCWP Project in Vermont is located in the St. Albans Bay drainage area and includes land treatment measures primarily in the form of agricultural waste management systems and soil conservation from cropland. This project, along with the LaPlatte River PL 83-566 project, has a comprehensive surface water quality monitoring program to evaluate changes in water quality associated with the implementation of agricultural Best Management Practices (BMP's).

The ACP Program is another program which can provide financial assistance to control agricultural NPS pollution. Approximately sixty-eight (68) percent of Vermont's FY '87 funding was spent on water quality related measures.

State of Vermont programs for controlling agricultural NPS's of pollution are based on the promulgation of two statutes, namely Title 10 Vermont Statutes Annotated (V.S.A.) Chapter 41 (Regulation of Streamflow) and Chapter 47 (Water Pollution Control). In accordance with these regulations, the State Department of Agriculture has developed a draft list of Accepted Agricultural Practices (AAP) to encourage agricultural landowners to adopt improved management techniques while avoiding capital outlays. The draft list of rules attempts to define practices that are acceptable with respect to minimizing NPS pollutant loading.

Accompanying these programs are a variety of policies, plans, and publications that serve to manage, control, or reduce agricultural sources of pollution. These include the "Guide for Managing Animal Manure and Preventing Water Pollution", "Animal

Waste Management: Accomplishments and Needs", "The Manure Primer", and the "State Water Quality Plan for Controlling Agricultural Pollution".

Silviculture

State regulations for addressing NPS pollution from silvicultural activities are included in the Acceptable Management Practices (AMP) for Maintaining Water Quality on Logging Jobs in Vermont. Drafted and adopted in response to amendments to the State Water Quality Statutes and based on guidelines that had been developed under the 208 Planning Program, the AMP's require the implementation of twenty-four (24) specific practices during and after logging activities.

Associated with these rules and their specified practices are two publications, the "State Water Quality Plan for Controlling Silvicultural Nonpoint Source Pollution" and the "Guidelines for Controlling Soil Erosion and Water Pollution on Logging Jobs in Vermont".

Construction

The main state program for controlling NPS pollution originating from construction sites is the State Land Use and Development Control Law (Act 250), 10 V.S.A., Chapter 151. Act 250 is administered through nine District Environmental Commission offices. Development proposals must include plans and measures for controlling soil erosion. Act 250 review encompasses development proposals ranging from residential, commercial, or industrial uses to road construction.

On the local level, communities that have adopted planning and zoning regulations or site plan reviews may have requirements for soil erosion control and other NPS pollution control.

Publications that have been designed to provide technical assistance in reducing NPS pollution from construction sites and roadways include the "Handbook for Soil Erosion and Sediment Control on Construction Sites", the Vermont Agency of Transportation "Erosion Control Specifications and Details", the "Back Road Maintenance and Erosion Control Guidelines", the "Vermont Back Road Erosion Control Handbook", and the "State Water Quality Plan for Controlling Erosion from Back Roads".

Urban Runoff

State programs for controlling NPS pollution from urban runoff can be found within Act 250 District review procedures and under the permitting program for stormwater dischargers (10 V.S.A., Chapter 47). Draft stormwater procedures have been designed to encourage the use of treatment by overland flows and to control post-development peak flows by reducing velocities. A sewer separation policy exists for reducing combined sewer overflows.

Resource Extraction and Development

The National Pollution Discharge Elimination System (NPDES) is a federal program administered by Vermont for reducing pollution discharges including those from mining operations. Discharges from settling lagoons and other mining activities must not violate applicable federal or state water quality laws.

New mining activities are regulated through the state's Act 250 process. Reclamation and stabilization plans are required.

Stream bed alteration and stream flow regulation (10 V.S.A. Chapter 41) are also regulated by state programs.

Land Disposal

Vermont completed the "Vermont Septage and Sludge Management Plan" in February, 1987. This comprehensive planning document outlines issues of current and future sludge disposal and makes recommendations for legislative and administrative actions which are necessary for an enforceable sludge management program. Additionally, as part of the 208 Planning Process, Vermont developed a State Water Quality Plan for Septage Management.

Existing regulations and guidelines do not, however, cover all sludge disposal practices. Currently, Vermont has no regulation in effect for dealing with septage, composting or land application. Although there is a draft guideline in place ("Guidelines for the Treatment and Utilization or Disposal of Sewage Sludge" - Draft, October, 1984), it has not been finalized. Vermont plans, as required by 10 V.S.A., Chapter 159, to develop the necessary and appropriate regulations for all land disposal practices, conduct routine inspections of disposal sites, and update the inventory of sludge generators and haulers.

State programs for controlling NPS pollution from wastewater and on-site septic systems have been established according to design capacity of the disposal system. Soil- based disposal systems larger than 6,500 gallons per day are presently controlled under an Interim Administrative Procedures process

while proposed Indirect Discharge Regulations are being drafted. Smaller systems are controlled under the State Environmental Protection Rules (10 V.S.A. Chapter 47). The state exercises some other controls over wastewater disposal system installation through the State Land Use and Development Control Law (Act 250) and through State Subdivision Regulations. A State Water Quality Strategy for On-Site Wastewater Disposal Management was designed during the 208 Planning Process.

Municipalities may regulate domestic wastewater disposal systems through local health or zoning ordinances. A local health ordinance requires approval by the Vermont Board of Health and must conform to State Health Department standards. A health ordinance for controlling wastewater disposal systems does not require a vote at Town Meeting, unlike a zoning ordinance.

For communities that have adopted a health ordinance, the Vermont Association of Conservation Districts On-Site Sewage Program may provide technical expertise for system design and installation. Towns may choose to join the nonprofit program where On-Site Specialists are available to perform site evaluations, review system designs, and supervise system installations. At present, 105 towns out of the 246 towns and villages in Vermont are involved with the On-Site Program, representing a 75% increase in participation since 1980.

Programs for controlling NPS pollution from landfills have been available since 1978 and were strengthened by the 1987 Solid Waste Bill. The bill's five key components seek to develop a sustainable, environmentally sound, and economically beneficial

solid waste management program with state technical and financial assistance. The program requires all new and existing landfills to be state certified and to install liners. New landfills must collect and treat landfill leachate. Existing Vermont landfills will undergo state review by July 1, 1990. In addition, all commercial solid waste haulers must be licensed and specify the type of waste transported and the area served.

NPS pollution originating from hazardous waste is controlled by various federal laws and state programs. Applicable federal laws and programs are the Comprehensive Environmental Release Compensation and Liability Act, commonly known as Superfund; the Resource Conservation and Recovery Act; and the Toxic Substances Control Act.

State programs for controlling NPS hazardous waste are governed by the Hazardous Waste Management Regulations, which were adopted in July, 1980. The regulations require state certification for the storage, transport, treatment, or disposal of defined hazardous materials and are accompanied by technical standards for hazardous waste facilities. Generators producing more than 100 kg per month, transporters, and facilities for disposal of hazardous waste are required to submit manifests and reports of their activities. An environmental monitoring program is required for each hazardous waste storage, treatment, or disposal facility.

Hydromodification

The Federal Power Act (FPA) of 1920 and its subsequent amendments require the Federal Energy Regulatory Commission

(FERC) to license (or exempt from licensing) and regulate hydroelectric projects on navigable waterways, and those projects not located on navigable waterways but constructed or requiring additional construction after 1935 and affecting interstate commerce interests.

The FPA pre-empts any state regulations that would otherwise apply to these projects. State regulations that are also pre-empted are the State Land Use and Development Control Law (Act 250), the fish passage statute (10 V.S.A., Chapter 3, Section 4607), and stream alteration permits (10 V.S.A., Chapter 41 and Chapter 43, and 30 V.S.A., Chapter 248).

In addition to FERC licensing requirements, Section 401 of the Federal Clean Water Act of 1972 and its subsequent amendments require an applicant for a federal license or permit to obtain a state certification that any discharge which may originate from the facility will not violate State Water Quality Standards. The State 401 Certificates are issued with specific conditions regulating activities during project construction and operation and may include minimum flow releases in order to maintain standards. Based on aquatic base flow requirement that have been developed by the U.S. Fish and Wildlife Service, Vermont has utilized a Fisheries Flow Needs Assessment to determine appropriate minimum in-stream flows below hydroelectric facilities. Although the State of Vermont has the authority to regulate hydroelectric projects under the 401 process, some deficiencies exist. If the State determines that the

artificial regulation of stream flow threatens the public interest or welfare or an emergency exists, the state may call the owner(s) of the dam to conference and negotiate or require modification of stream flow.

Other Sources

State programs for controlling NPS pollution originating from riparian zones are found within the development review process of Act 250 and in the lists of Accepted Agricultural or Management Practices developed by the State Departments of Agriculture and Forests, Parks, and Recreation. A Streambank Management Policy is available to State Agency of Natural Resources personnel in permitting or design processes. The "Vermont Streambank Conservation Manual" has been published to assist in the preservation and enhancement of streambank values.

Vermont has the lowest national generation rate of atmospheric deposition, yet is heavily impacted by mid-western emissions and has no control programs beyond those associated with car emissions and sulfate and nitrate emission controls to reduce the effects of atmospheric deposition or 'acid rain'. There are, however, several acidic precipitation monitoring programs and studies that are concerned with problem assessment and trend evaluation.

Programs for controlling 'natural' nonpoint pollution sources are offered through the two Resource Conservation and Development (RC&D) areas, the U.S. Army Corps of Engineers (COE), and the National Flood Insurance Program. Army COE can provide beach, streambank, and shoreline erosion protection measures

under their Continuing Authorities Program where an identified and measurable threat to public works or services exists.

The National Flood Insurance Program for the state is administered by the Agency of Natural Resources to assist communities in securing flood insurance protection. Critical components of the program with respect to NPS pollution are the structural and nonstructural measures of prohibiting or managing development in the identified 100-year floodplain.

Programs to control pollution from recreational activities exist and are administered by various federal or state agencies. Recreational activities in Vermont occurring on public lands may be controlled by the U.S. Forest Service, the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, the State Agency of Natural Resources, the Vermont Green Mountain Club, and the Appalachian Mountain Club. For example, on state-owned land leased for ski area development and use, the Department of Forests, Parks, and Recreation has developed regulations regarding long-range development plans and annual construction and maintenance plans. New recreational projects that utilize federal funds are required to conduct an environmental assessment. Recreational development proposals on privately owned lands are reviewed under Vermont's Land Use and Development Control Law (Act 250) which considers plans for the implementation of erosion control measures.

Winter road conditions require the application of deicing salts in order to maintain safe conditions for travel. State programs for controlling NPS pollution from salt storage or

application are the responsibility of the State Agencies of Transportation (AOT) and Natural Resources. Standards for control have been developed, which must be annually reviewed, that integrate a tri-level program for maintenance - i.e., road type, climate and temperature, and application rates. In addition, all AOT salt storage areas must be covered and rest on impervious surfaces.

6.d Ground Water Protection

The ground water protection program has made many significant accomplishments during the past two years. Many of these are the result of passage of Title 10 Vermont Statutes Annotated, Chapter 48 (setting up a classification system) while others are continuations and completions of ongoing activities.

A major accomplishment during the period was completion of the Groundwater Protection Rule and Strategy. Presently, this is in draft form undergoing review by various State agencies and by the EPA. It requires final approval by the Water Resources Board and by a committee of the state legislature.

The document, as the first of two phases, is an update of the 1982 strategy and includes rules to implement the new 10 V.S.A. Chapter 48 which creates a classification system for aquifers in the state. The Strategy provides a comprehensive framework for ground water management and meets the major requirements for continued Section 106 funding.

The second phase will include an Executive Order creating an inter-departmental oversight committee to assist in the formation of a comprehensive ground water strategy. This second phase will

result in a more detailed document than the present draft Rule and Strategy with greater emphasis on interagency coordination and a program integrating the statutory responsibilities of these agencies.

As a result of the new legislation, the ground water management section of the Department has begun mapping Class I and II aquifers. A draft report to the Vermont General Assembly has been compiled which introduces proposed Class I areas, those areas which have no exposure to activities that may pose a risk to current or potential use as a public water supply. From a review of 400 potential Class I public water supplies, nine systems have been proposed for Class I status. If adopted by the General Assembly, they will be afforded the most stringent protection from potential contamination.

A draft report on the results of the nitrate study, initiated during FY '86, has also been produced. This report, in two phases, includes a literature review of the occurrences and effects of elevated nitrate levels in ground water (phase I) and field analysis (phase II) of approximately 35 wells. The results of the study will be important to implementation of the ground water strategy in that they will be used to guide recommendations on septic system densities surrounding wells.

Other ongoing activities which contribute to the strength of the ground water management program are Act 250 reviews, Class II aquifer mapping and well driller licensing. Act 250 reviews, unique to Vermont, allow the ground water staff to comment on the potential impact to ground water from any proposed development.

The ground water management section coordinates reviews with the State Health Department by flagging projects for its consideration. This is one example of interagency coordination which is very important to implementation of the ground water strategy.

Coordination is institutionalized in Vermont in the Ground Water Coordinating Committee which includes representation from Vermont Agencies of Natural Resources, Agriculture, Transportation, Health and others. This group has reviewed and commented on the proposed Rule and Strategy. The primary problem has been that coordination with other agencies is a responsibility of the Secretary of the Agency of Natural Resources but not a role which has reciprocal responsibility in other agencies. Thus, their commitment to the Committee may be less. This lack of commitment has been felt periodically in work with the Departments of Agriculture and Health.

6.e Wetlands Protection Program

Background

Vermont wetlands are significant resources that contribute to the economic, cultural and physical well-being of its residents. Wetlands provide food and fiber for consumption, habitat for fish and wildlife, recreational opportunities and aid in the maintenance of water supply and quality. However, these resources have been significantly affected by human land and water use activities and many acres of wetland habitat are lost each year in Vermont.

The Department responds and comments at Act 250 and Act 404 (Federal Clean Water Act) hearings that involve wetland issues.

Table 24

VERMONT WETLAND ACREAGE BY TYPE

(Based on the U.S. Fish and Wildlife Services National Wetland Inventory)

Wetland Type	Acreage
Palustrine Forested Wetland	
PF01 (Broad-leaved Deciduous)	58,608
PF02 (Needle-leaved Deciduous)	2,773
PF04 (Needle-leaved Evergreen)	53,543
PF05 (Dead)*	5,162
Total PFO	120,086
Palustrine Scrub-Shrub Wetland	
PSS1 (Broad-leaved Deciduous)	60,843
PSS3 (Broad-leaved Evergreen)	2,539
PSS4 (Needle-leaved Evergreen)	716
PSS5 (Dead)*	174
Total PSS	64,272
Palustrine Emergent Wetland	24,681
Palustrine Aquatic Bed	701
Palustrine Open Water	8,890
Lacustrine Littoral Open Water**	598
Lacustrine Aquatic Bed	220
Lacustrine Emergent Wetland	22
Riverine Emergent Wetland	174

* Typically the result of beaver activity
** Excluding the littoral zone of Lake Champlain (23,403 acres)

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 are called upon as wetland experts wherever testimony is deemed appropriate. The Department is also responsible for drafting rules regarding wetland protection in Vermont, for developing educational information used in a wide variety of settings including public forums and schools, and for distributing the National Wetlands Inventory (NWI) maps. Once the rules and regulations accompanying the Vermont Wetlands Act are reviewed and adopted by the Vermont Water Resources Board, the Department will administer the Act's regulations.

The 1987 preliminary report of the National Wetlands Inventory (NWI) found a total of approximately 220,000 acres of wetlands in Vermont. This total represents 3.7% of the state's land area. The NWI survey is a nationwide effort to provide information regarding the different wetland types and their respective acreages in each state. The NWI survey classifies wetlands using the system developed for the United States Fish and Wildlife Service. The Service's classification system groups wetlands according to ecologically similar characteristics. It divides wetlands and deepwater habitats into five ecological systems: (1) marine, (2) estuarine, (3) riverine, (4) lacustrine, and (5) palustrine. Only riverine, lacustrine, and palustrine wetlands occur in Vermont as the other two are associated with the marine environment.

Seventy-eight percent of the state's wetlands (or about 120,000 acres) are forested wetlands, with nearly equal amounts of broad-leaved deciduous and needle-leaved evergreen types. Scrub-shrub wetlands represent less than a third of the state's wetlands, with about 64,000 acres. Emergent wetlands (marshes and wet meadows) make up about 11% of the state's wetlands or nearly 25,000 acres.

The counties with the highest acreages are Essex 33,569; Addison 31,639; Franklin 26,317; Orleans 20,962; and Chittenden County with 16,492 acres of wetlands.

The counties with the lowest wetland acreages are Windsor 5,189; Orange 6,655; Washington 7,115; and Lamoille County with 8,017 acres of wetland habitat.

Wetland Loss

A recent analysis of wetland impact in Vermont focused on 50 projects which resulted in the loss of wetland acreage. Using data reported by the wetlands office of the Division of Water Resources, Table 25 indicates wetland losses by activity and type for the period January 1, 1986 through May 1, 1987. Mitigation gains have been incorporated into these figures.

The data presented above suggest that road construction continues to be a major factor in wetland loss. Highway and secondary roads accounted for nearly two-thirds of the reported wetland loss. This data only represents the wetland loss which is either required by law to be reported (in some cases a permit

Table 25.

VERMONT WETLAND LOSS ACCORDING TO WETLAND TYPE AND ACTIVITY TYPE, JANUARY 1, 1986 THROUGH MAY 1, 1987

Wetland Type	Loss (acres)	Wetland Loss Activity	% of Total
Palustrine Emergent	45.9 (49%)*	Road	66
		Light Industrial	16
		Residential	9
Palustrine Scrub-shrub	28.6 (30%)	Miscellaneous	7
		Campgrounds	1
Palustrine Forested	19.5 (21%)		
Total	94.0		

* The numbers in parentheses are percentages of the total loss by wetland type.

is required), or is discovered through different means. Only one case of wetland loss due to agricultural activities is included in this set of data. For the most part, agricultural and silvicultural activities in wetlands are not reported or quantified.

The 94 acres of lost wetlands recorded during this 17 month period probably represent only a portion of the actual loss in the state. On an annual basis, about 67 acres of wetland have been documented to be lost in Vermont.

Wetlands Protection Mechanisms

The U.S. Army Corps of Engineers has federal jurisdiction over wetlands through Section 404 of the Clean Waters Act and through Section 10 of the River and Harbors Act. Section 10

regulates the dredging and filling of navigable waters. Section 404 has jurisdiction over a greater number of wetlands than does Section 10, but it only regulates the discharge of dredge and fill materials into wetlands. Many activities do not require a permit under Section 404. Normal farming and silvicultural practices, including forest road construction as well as temporary roads, are exempted activities. Many small wetlands (areas where surface water bodies and associated wetlands are smaller than 10 acres), isolated wetlands, and those associated with small streams (with an annual flow less than 5 cubic feet per second) have only recently and then only partially fallen under the jurisdiction of Section 404.

The U.S. Environmental Protection Agency (EPA) and Fish and Wildlife Service also participate in the implementation of Section 404 of the Clean Water Act. These agencies review permits and provide comments and recommendations on whether permits should be issued by the Corps. EPA has the authority to veto any application or overrule any disposal site designated on a permit reviewed by the Corps if it finds project impacts to be unacceptable.

In 1986 Vermont's legislature passed a wetlands act which provides the basis for a broad measure of protection to many of the state's wetlands. The Act designates a minimum of 11 functions by which a wetland can be judged "significant". Significant wetlands will be given protection, and restrictions on activities which could potentially degrade the function or value of these wetlands will be enacted. The Act also encourages

local and regional planning commissions to consider wetlands in the planning process.

Vermont's Land Use and Development Control Law (Act 250) requires a permit for every major land development and subdivision in Vermont. The law provides for broad review of the environmental impact of those developments and subdivisions subject to its jurisdiction. There are ten criteria for granting a permit in Act 250, several of which could afford protection to important wetlands. The criteria include: water pollution, waste disposal, flood plains, shorelines, soil erosion, aesthetics, natural areas and wildlife habitat. Where a project falls within the jurisdiction of Act 250, the District Commissions and Environmental Board have the authority to protect important wetland values.

Many projects fall outside of the jurisdiction of Act 250. Most agricultural and forestry-related activities are not regulated under the Act. Furthermore, small-scale industrial, commercial, and residential projects are not addressed through the Act 250 process.

The wetlands office operates an informal wetland mitigation program. The program consists mostly of providing advice to prospective developers in order to minimize the impacts of their activities upon the wetland resource. Where wetland loss is inevitable, the wetlands office encourages the enhancement and/or creation of existing or new wetlands. These efforts reduce the loss of wetlands to a considerable degree in Vermont.

The Management of Lakes and Ponds (29 V.S.A., Chapter 11)

statute manages lakes and ponds and their shorelines, and recognizes these resources as a public trust to be managed for the public good. The jurisdictional boundary for the purposes of this law is: "waters and lands underlying the water below the mean water level". This definition includes some wetland areas, but most wetlands adjacent to lakes and ponds lie above the mean water level. Such factors as water quality, fish and wildlife habitat, aquatic and shoreline vegetation and recreational uses of the areas are criteria which are considered when permits for development are reviewed. This law does afford some measure of protection for wetlands associated with streams and ponds. Isolated wetlands are not covered under this law.

The Stream Alteration law (10 V.S.A., Chapter 41, Subchapter 2) mandates a permit for activities which would change, alter or modify the course, current, or cross-section of any watercourse having a drainage area greater than 10 square miles by movement, fill or excavation of 10 cubic yards or more of material. This law can prohibit the alteration of stream banks with riverine wetlands if it is found that such activity would significantly damage fish or wildlife, the rights of riparian owners, or if it would adversely affect the public safety by creating flood hazards. This law is limited to wetlands within the area confined by the stream banks.

Wetland loss in Vermont is a priority issue. In light of the increased understanding of the many benefits that society derives from wetlands, the filling and draining activities which occur in wetlands must be regulated. In addition, significant

wetlands must be acquired for the benefit of future generations.

Vermont residents support a strong wetland protection program. Wetland acquisition is considered a desirable component of Vermont's efforts to protect the resource. Vermonters make extensive use of wetlands, and their activities are generally more nonconsumptive than consumptive. Any acquisition program implemented by the State will consider these various uses, and acquisition requests will reflect the broad range of interests and benefits which the public recognizes. The State is currently compiling a "master list" of wetlands to be acquired. This will be a working list, continually updated to reflect the changing priorities which enter into acquisition considerations.

6.f. Benefit/Cost Assessment

Consideration of the benefit/cost relationship of any project must begin with acknowledgement of the minimum environmental requirements imposed by law or rule. Those requirements establish a benchmark of performance above which benefit/cost decisions can influence project details or concept but below which benefit/cost considerations have no effect. For example the Clean Water Act requires that all municipalities achieve secondary treatment standards by July 1, 1988. Benefit/cost considerations may influence how that goal is achieved but never establish a foundation for not achieving secondary treatment. The exercise of benefit/cost analysis will continue to be focused in the facilities planning process, where alternative means of carrying out the project are defined and evaluated for technical feasibility relative to life-cycle cost and environmental impact.

Vermont will continue to encourage and require project planning that results in selection of the most cost effective, technically feasible, and environmentally sound projects.

In the case of CSO correction there are generally two alternatives, separation of sewers into storm and sanitary sewers or treatment of the first flush of combined overflow, either at the point of overflow or at the municipal treatment plant which has been enlarged to handle the extra hydraulic load. The benefits and costs associated with a particular selection are site specific and must be calculated individually for each project and outfall point.

In the case of advanced waste treatment there are several alternative courses of action available to a municipality to restrict effluent pollutant loads. Some of these include traditional advanced wastewater treatment processes of chemical coagulation, filtration, nitrification, or the greatly advanced treatment technologies of reverse osmosis or ion exchange. In addition to these, spray irrigation of all or a part of the effluent volume may be appropriate. The equivalent removal of pollutants from another source, such as the reduction of nonpoint source phosphorous entering the same waterbody, may prove equally effective.

As previously mentioned (Section 6.a.), 89 public waste treatment facilities and approximately 50 industrial pretreatment facilities have been constructed in Vermont. The total expenditure for the public facilities has been approximately $200,000,000 of state, federal and local funds. There has been

no estimate for the amount of money spent on industrial treatment facilities. In general, improved water quality has meant less weed and algae growth, resulting in improved swimming, recreational, and aesthetic uses. Also, it is assumed that less sickness has occurred due to better removal of pathogens. It is difficult to quantify the benefits, but as a result of these public and private expenditures, approximately 56 rivers and three lakes have benefitted from improved water quality and enhanced recreational, fishery and aesthetic uses.

An interesting study was recently done in Burlington which illustrates the benefit (not quantified, unfortunately) of the expenditure of $3 million for the relocation of a sewage treatment plant outfall pipe. The study was done by a University of Vermont graduate student to determine where to best locate the Burlington main sewage outfall pipe after the plant is upgraded for phosphorus removal. The present outfall pipe (to Lake Champlain) is located inside a breakwater in Burlington Bay. During the past summer, prevailing summer winds blew the effluent to North Beach and Leddy Park, the city's main recreation beaches, resulting in their closure during the warmest period of the summer (see Section 3.d.2.). The study showed that moving the pipe outside the breakwater would reduce the risk of pollution by 75 percent. Moving the outfall would also result in far less risk to the city's drinking water quality, which is drawn from the lake north of the outfall pipe and the city beaches. The benefits from spending $3 million to move the outfall pipe are difficult to quantify since they involve

recreation and health benefits; however, one may assume that these types of benefits far outweigh their costs.

As another example, St. Albans Bay Park visitors have recently begun to use the park again for swimming after a period of about 10 years. Swimming was not desirable due to poor water quality in the bay, mainly caused by discharges from the St. Albans City sewage treatment plant and agricultural land runoff. The plant was upgraded in 1987 at a cost of $12 million and approximately $1.7 million has been spent on agricultural Best Management Practices. The water quality improvement benefits considered were increased property values, improved recreational experiences, and cost-savings resulting from reduced water quality maintenance activities. A study by the Agricultural Research Service revealed the benefits of reducing phosphorus loads from point and nonpoint sources exceeded the costs by a ratio of 1.3 to 1. However, neither the point source nor the nonpoint source control measures individually would have a benefit-cost ratio greater than 1.0 since improvements to water quality in the Bay required both programs.

6.g. Surface Water Monitoring Program

The Department of Environmental Conservation has a coordinated approach to water quality monitoring. The monitoring resources are balanced between assimilative capacity studies, lakes and ponds water quality programs, biomonitoring at 45 fixed stations, compliance monitoring of NPDES facilities and pretreatment facilities, monitoring activities at existing and proposed hydropower sites and special monitoring in support of river basin planning efforts.

The Department performs monitoring activities to support the lakes and ponds management program, including the following:

A. Collection of spring phosphorus data on nearly 75 lakes.

B. Summer chlorophyll-a and Secchi disc data for 60 lakes and 28 stations on Lake Champlain, and phosphorus data on many of these.

C. Aquatic macrophyte surveys on selected lakes and Lake Champlain shorelines. Since 1982, detailed plant surveys have been conducted on 90 lakes and 15 major areas of Lake Champlain.

D. Shoreline fecal coliform bacteria sampling on selected lakes by volunteer monitors. This program was initiated in 1987 with eight lakes participating. An expanded program is planned for 1988.

E. Surveys and searches of lakes infested with or threatened by Eurasian milfoil to document the spread of this nuisance plant species.

F. Seasonal water quality data for selected chemical constituents in acid sensitive lakes.

G. Fish population studies in acid sensitive lakes and streams.

H. Precipitation monitoring in conjunction with acid sensitive lake and stream studies.

6.g.1. History of the Water Monitoring Program

During the mid-1970's, Vermont embarked on water quality monitoring programs that were designed to bring the State into compliance with the Federal Water Pollution Control Act of 1972 (PL 92-500). The passage of this Act and the state's subsequent

movement to comply created the foundation for many of Vermont's current monitoring efforts. The Act has undergone several amendments, and monitoring emphasis has shifted somewhat from direct discharges and conventional pollutants to hazardous and toxic waste and nonpoint discharges. However, the monitoring goal of providing timely and reliable data for assessing environmental impacts and making management decisions remains an integral component of the state's water program. The state's monitoring programs have strived for compliance with Federal monitoring requirements but are tailored to Vermont's specific needs and available resources. The state's present water monitoring activities represent a mix of short-term intensive and long-term trend monitoring at a level deemed appropriate to achieve the state's water quality goals.

Initially, the state did trend monitoring, utilizing a primary monitoring network, but due to incompatibility with state objectives, it was suspended. Efforts were then directed toward short-term, intensive surveys like assimilative capacity studies. Also, short-term diagnostic lake studies were initiated for Harvey's Lake, Lake Morey, and Lake Iroquois.

In 1980, the Department began monitoring the water chemistry and biology of selected lakes and ponds as well as the pH of rain and snowfall to evaluate the aquatic impacts of acid deposition throughout Vermont via an Acid Precipitation Monitoring Network and Long-Term Lake Monitoring Program. The lake program, now in its eighth year, is recognized by EPA as one of the longest running programs of seasonal lake monitoring in the nation.

Also, in the early 80's, an ambient biomonitoring program (ABN) was begun in order to analyze the aquatic macroinvertebrate fauna in a network of fixed stations. Beginning in 1985, fish populations were sampled at selected ABN sites in order to provide a more complete understanding of how the total aquatic community may be altered by watershed disturbances.

In 1986 the Department began developing a modification of the Index of Biotic Integrity to evaluate the health of stream fish communities. Individual metrics, which comprise the index, are presently being analyzed with respect to Vermont's ecoregions.

Also in 1986, the Department initiated a program designed to generate information on fish flesh contamination as an indicator of water quality. The primary objective is to build an on-going data base by sampling a few selected sites each year.

Special compliance macroinvertebrate studies are now testing the Department's new biological protocol for evaluating the discharge permit criterion of "no significant alteration of the aquatic biota in receiving waters", as a result of on-site disposal systems greater than 6,500 gpd.

The Department continues to operate monitoring programs to ascertain compliance of publicly-operated treatment works. Most recently, short-term intensive studies have begun for some compliance correction plans.

With regard to staff resource allocations since 1981, four temporary chemistry laboratory positions have been made permanent, increasing the analytical staff to nine plus two

long-term temporaries. The Special Studies and Surveillance staff now is composed of four permanent, one limited service, and two long-term temporary positions, compared to three permanent positions in the early 1980's. The Lake and Ponds Management Unit initially had three permanent positions in the early 1980's; now there are five permanent positions and two long-term temporaries. Both the Lakes and Ponds group and the Special Studies and Surveillance group have been seeking additional permanent positions each of the last couple of years.

In 1987, a Compliance Monitoring group was disbanded, with one position reallocated to Operations and Maintenance and one position to the Special Studies and Surveillance group.

From an analytical standpoint, the Department is now reasonably well-equipped with the addition of a $250,000 gas chromotograph in 1985 and a $40,000 ± atomic absorption unit for heavy metal analyses in 1987. The Department is working on the development of a cost per sample analysis so program managers may have some cost control, since 30,000 to 40,000 samples are analyzed per year.

The State Legislature has appropriated $3.7 million for a new lab facility which will be under construction in 1988. This Department and the Agriculture Department will share the new facilities when completed in 1990-91.

6.g.2. Toxic pollutant problem identification program

The Department has initiated a Fish Flesh Contaminant Monitoring Program as a means of establishing baseline data on

selected toxics in edible fish flesh. The Department has recognized the need for such a program for several years now, but because of shortages in available resources and changing priorities, it has delayed formal program implementation until 1988. Samples collected under this program will be analyzed routinely for the heavy metals: cadmium, chromium, zinc, lead, mercury, copper, and nickel. Specific chemical contaminant determinations will be added to this list depending upon local circumstances. The Department does intend to expand its routine analyses to include PCB's, selected pesticides, and other organic contaminants as soon as the Department's laboratory is able to undertake such work.

The Department will begin a program of fish tissue banking so tissue samples will always be available for future analyses without having to make significant collection efforts. The Department also plans to continue its ambient biomonitoring program wherein macroinvertebrates are used to assess water quality and aquatic habitat. The Department has completed a statewide toxics assessment and is in the process of developing a management strategy document.

6.g.3. Fixed Station Network

The Department does not have a network of fixed stations to do statewide water column monitoring. There are, however, fixed stations which have been established under the Ambient Biomonitoring Program. Also, a certain number of lakes are monitored each spring for phosphorus, and seasonally, for acification-related parameters. The specifics of the biomonitoring program are discussed later in this chapter.

A. The Spring Phosphorus Program collects total phosphorus data from up to 75 lakes each Spring shortly after ice-out. Springtime phosphorus concentrations are related to summertime lake productivity, and a trend in the total phosphorus concentration may indicate an impending water quality problem in a lake. Sampling once a year in the spring is an efficient way to monitor the water quality of a large number of lakes. Since the start of the program in 1977, the Department has collected spring phosphorus data on approximately 195 lakes. A core of 36 lakes have ten or more years of data.

B. The Acid Precipitation Program collects chemical and biological data on lakes located in low alkalinity (acid-sensitive) regions of the State to determine the effects of acid deposition on Vermont's lakes. Nearly 200 lakes statewide were surveyed during the winters of 1980-1982 to identify the acid-sensitive areas of the State. Thirty-six lakes in these areas are now included in a long-term Acid Precipitation Program. Twelve lakes are sampled four times every year for several chemical parameters. The remaining 24 lakes are sampled four times per year, every other year. Biological sampling is also being conducted on some of the lakes each year.

C. The Lay Monitoring Program equips and trains local residents to collect lake water quality data weekly during the summer. Secchi disk transparency and chlorophyll-a data is obtained from most lakes and stations on Lake Champlain that participate in the program. Total phosphorus data is additionally collected at many Lake Champlain stations and on some smaller lakes. The tremendous success of the Lay Monitoring Program is largely due to the enthusiasm and dedication of the approximately 120 volunteers who monitor the lakes each year. They perform a valuable service for both their lake and the Department. Yearly reports prepared for the monitors by the Department allow them to learn about the water quality of their lakes and to make comparisons between lakes.

Long-term participation in the Lay Monitoring Program is encouraged. Since the initiation of this program in 1979, more than 60 lakes and 28 stations on Lake Champlain have been sampled at least one summer. Forty-five lakes and 26 Lake Champlain stations have five or more years of data.

6.g.4. Intensive Survey Program

Because of unusually high flows during 1986 (FY '86), no Assimilative Capacity Studies were undertaken. During the summer of 1987, a study on the LaPlatte River below Hinesburg was completed. An assimilative capacity study of the Stevens Branch of the Winooski River below Barre City was attempted but had to

be abandoned due to high flows.

Region I, EPA, has agreed to do an assimilative capacity study on Otter Creek between Rutland and Brandon. The work was scheduled to occur during the summer of 1987, but was cancelled because of high flows.

The Wasteload Allocation Process has been revised and was adopted as a rule September, 1987. A wasteload allocation is presently being done on the Lower Winooski River (from IBM down to the mouth of the river).

6.g.5. Biological sampling program

An Ambient Biomonitoring Program has been established by the Department to monitor long-term water quality trends as revealed by changes in the aquatic biota. In 1987, a total of 45 sites were evaluated for taxa richness, community diversity and other macroinvertebrate community parameters. The sites are located primarily below sewage treatment plant outfall pipes and in streams where there are influences from rapid development. Two of the sites below sewage treatment plants showed improvement as a result of plant upgrades (Bennington) and reduction of chlorine impact (Barre). Thirteen sites showed impairment and all other poor sites (6) showed no improvement.

Beginning in 1985, fish populations were sampled at selected ABN sites. The addition of fish population assessments to macroinvertebrate analysis will result in a more complete understanding of how the total aquatic community structure and function may be altered by watershed disturbances.

The Department of Environmental Conservation will continue with the Ambient Biomonitoring Network program, expanding and intensifying a strong biological data base for the purpose of evaluating the water quality and biological integrity of streams and rivers in Vermont.

6.g.6. Toxicity testing/health testing program

The Department has developed the capability of producing water quality-based toxicity testing data. The Department currently maintains culture of two species of daphnids: Daphnia pulex and Ceriodaphnia dubia. Acute and chronic toxicity tests can be conducted using these organisms. Current resource constraints severely limit toxicity testing activities. Proposed new laboratory facilities will enhance toxicity testing capability. This toxicity testing capability will allow the Department to carry out its "Toxic Discharge Control Strategy", the goal of which is to identify and quantify all toxic discharges in Vermont and to establish water quality criteria that can be used to regulate toxic discharges in a manner that will assure that the State Water Quality Standards and assigned receiving water classifications are maintained.

6.g.7. Use attainability studies

Revisions of the Water Quality Standards have eliminated the need for use attainability studies of Class C waters because now fecal coliform requirements for Class B waters (suitable for swimming) and Class C waters (swimming not recommended) are identical. Formerly, these studies were done to determine how to improve Class C waters to Class B standards.

6.g.8. Special monitoring studies

The Department will continue to monitor Lake Morey in the Town of Fairlee as part of a post-treatment surveillance program. The monitoring, though less intensive than prior years, will include both water quality and aquatic macroinvertebrate sampling.

The Department plans to initiate a preliminary diagnostic study on Fairfield Pond in Fairfield, Vermont if support from local municipal officials can be obtained. Fairfield Pond has algae blooms and the study is being designed to ascertain the cause(s).

Monitoring efforts will also be conducted in support of river basin planning efforts, wetland evaluations, and compliance activities.

Local lay monitoring programs have been set up under the River Watch Network for the Ottauquechee, West, and Mad Rivers, and the Batten Kill. The program runs from May to October each year and involves collecting water samples and testing them for fecal coliform, dissolved oxygen, and for acidity on some rivers. In the future, monitoring for erosion problems will be started and a monitoring program initiated for the Connecticut River. Funding has been acquired from sponsors such as Trout Unlimited.

7. SPECIAL STATE CONCERNS AND RECOMMENDATIONS

A. Special State Concerns

There are eight areas of special state concerns: nonpoint source pollution, management of lakes and ponds, combined sewer overflows, financial assistance to municipalities, wastewater facilities operation and maintenance, protection of the water quality and hydrology of upland streams, toxics in Lake Champlain and planning and protection projects.

a. Nonpoint Source Pollution. Nonpoint sources of pollution are now the most widespread remaining water pollution problems affecting the quality of the state's water. The recently completed NPS assessment indicates that:

1. the vast majority of use impairment of rivers and streams is due to nonpoint sources;
2. for Lake Champlain and Lake Memphremagog, nonpoint sources are a significant but unmeasured source of use impairment; and
3. nonpoint sources are responsible for all identified impairments on the remaining lakes and ponds.

Dominant problems include excessive nutrient and sediment loss from agricultural lands; stream sedimentation and turbidity from careless construction and logging erosion control practices, flow alteration and dissolved oxygen deficits caused by some hydroelectric dams.

Other significant nonpoint sources that were identified in the assessment include atmospheric deposition, losses of shoreline vegetation, failed septic systems, toxic substances from hazardous material sites and landfills, and aquatic

nuisances, especially Eurasian milfoil (Myriophyllum spicatum). Atmospheric deposition,a possible cause of low pH in surface waters, may be responsible for the complete absence of fish life and reduced macroinvertebrate diversity in two lakes in southern Vermont. Riparian vegetation losses have caused temperature and fishery habitat problems and promoted streambank destabilization. The majority of the state's residents have on-site sewage disposal systems, and nutrient and pathogen contributions from failed systems were noted across the state. Toxic substances occur at some sites; yet for many, in-stream impairments caused by toxics are unknown and little sampling data exists. Eurasian milfoil is discussed in detail under management of lakes and ponds.

Agriculture. Impacts associated with agricultural nonpoint source pollution have occurred throughout Vermont, with highest levels of impairment in the Lake Champlain and Lake Memphremagog drainages. Agricultural nonpoint sources are understood to be agricultural waste mismanagement (i.e. barnyard runoff, milkhouse wastes, animal manure), soil erosion from cropland, and field nutrient mismanagement.

Although a variety of programs exist to control agricultural nonpoint sources, there are however, several concerns which affect state water quality programs. Estimates from the Soil Conservation Service (SCS) in Vermont show an 85% reduction in total phosphorus runoff associated with the implementation of an agricultural waste storage and management system. Variation in funding levels between project types (e.g. PL 83-566 and RCWP) point out the inability of many farm operators to cost-share a

management practice at or below the 50% level. In the six Vermont PL 83-566 watersheds, with a 50% federal cost-share level, 123 farm contracts have been signed out of 620 farm operations. In the single Vermont RCWP project (the St. Albans Bay drainage), which has a 75% cost-share level, 63 contracts have been signed out of 98 watershed farming operations.

The limited amounts of federal funds that are obligated will reduce the degree of conservation practice planning and implementation. Additionally, an acceleration of treatment beyond existing levels is not possible. For FY '88, Vermont-SCS was allocated $150,000 for the PL 83-566 Program. Previous years' funding levels have been $300,000 to $400,000.

Soil Erosion from Construction Sites. Since 1967 the State of Vermont has undergone a strong trend toward growth and development as population and employment have increased by 30% and 71%, respectively. The two dominant patterns of growth are suburbanization adjacent to major employment centers and development near destination resorts, often associated with mountain ski towns. A recent study on statewide growth found that rapid and sustained growth is often concentrated in a few high growth towns. Most of these towns were located in six multi-town rapid growth clusters. Associated with growth and development are construction-related activities and higher potentials for soil erosion and NPS pollution. The State Land Use and Development Control Law (Act 250) is responsible for conducting environmental reviews of a wide variety of development proposals. Since 1980, approximately 4,760 applications have

been reviewed; yet, soil loss, sedimentation and erosion have been observed from many construction sites. A lack of permit compliance monitoring capabilities and the need for cumulative impact awareness are significant issues that should be considered in controlling this form of NPS pollution.

Flow Alteration. A study of 62 hydroelectric projects was done by the State in 1982 ("Hydropower in Vermont: An Environmental Assessment") to analyze the water quality problems caused by hydroelectric dams. The projects studied are located on 683 total miles of stream (headwater to mouth). Of these stream miles, 25 or 4% are bypassed; 101, or 15%, are impounded; and 130, or 19%, have regulated flows below these projects. This results in a total of about 256 of the 683 miles, or 38%, being impounded or impacted by artificial flow regulation. Finally, of the 25 miles bypassed and the 130 miles regulated below the projects, about 77 miles, or 50% are not supporting their designated uses, while about 78 miles are partially supporting their designated uses.

Many of the hydro projects in Vermont have been licensed or exempted from licensing by the Federal Energy Regulatory Commission (FERC). Federal preemption clauses limit the extent to which state regulations concerning water quality can be applied to hydro projects. Under Section 401 of the Federal Clean Water Act, the state can issue or deny a Water Quality Certificate for applicants of federal licenses or permits. A new FERC ruling however, has waived the 401 certificate process for certain projects and the state may only seek voluntary compliance

with its Water Quality Standards.

Some program efforts to control these nonpoint sources are: (1) application of agricultural best management practices through voluntary and incentive-based SCS and ASCS programs, (2) the nonpoint management program to be developed under the "State Clean Water Strategy", (3) basin planning, and (4) minimum flow requirements for hydroelectric facilities. The effects of acid precipitation are being documented but avoidance of future problems lies in coordinated action on a national level.

b. Management of Lakes and Ponds.

There are a number of special concerns specifically relating to lake management and protection in Vermont.

1. The State presently has very limited ability to assist lake associations or municipalities interested in developing lake watershed protection programs. The U.S. Soil Conservation Service (SCS) can offer some technical assistance in this area; however their resources are limited, regulations may restrict when they can become involved and other SCS program priorities must often take precedence. A state technical assistance program is needed to identify existing or potential sources of pollution in priority watersheds, develop recommendations for controlling these sources, and assist local and regional groups in implementing the recommendations.
2. Regulations to protect shorelands in Vermont are either non-existent or inadequate. Judging from recent trends,

lakes in Vermont will undergo rapid development in the near future. Above the mean water level on existing lakeshore lots established before September, 1969, the state has no jurisdiction over development or sewage unless it involves a public building. Structures continue to be built within 10 feet of lakeshores, and have highly questionable septic systems. In towns without zoning, abuses of the lakeshores are common. In post-1969 subdivisions with less than ten lots, the state has jurisdiction only over sewage disposal. Lots may still be clearcut and houses built directly on the shore. Act 250 developments are reviewed for aesthetics, erosion, and other shoreline protection criteria, but these developments are a small part of the total number of lakeshore projects being constructed. There is an immediate need for improved regulations at the state, regional and local level to protect shorelands in Vermont. State public awareness and technical assistance programs are also needed to educate the public regarding the need for protection measures and to aid municipalities in developing technically sound shoreland regulations.

3. The 1988 Lake Water Quality Assessment (Appendix 3) showed a lack of complete and reliable lake assessment data in Vermont. Only 35% of Vermont lakes have been monitored in the past five years. Lake monitoring needs to be expanded to assess the existing lake water quality of the many lakes that are presently only evaluated or unassessed. In addition, existing lake watershed land use information is now ten years old. Many changes have occurred on the

Vermont landscape in the past decade, and this information needs to be updated to better identify and assess the sources of nonpoint pollution to lakes. Unless federal financial assistance is forthcoming under the Clean Lakes Program for future lake assessments, it is unlikely that substantial gains will be made in these areas for the 1990 Lake Water Quality Assessment Report.

4. Very little is presently known about the relative importance of various nutrient sources to Lake Champlain. Phosphorus management decisions on the lake must presently be made without adequate data regarding cumulative lakewide impacts.

5. Consistent, reliable federal financial assistance for program development has not been available under the Clean Lakes Program. Preventing lake degradation is far less expensive than correcting it. Funding should be allocated for development of state lake water quality protection programs.

There is an urgent need for a lakewide nutrient budget study of Lake Champlain that can provide the basis for a long-range phosphorus management strategy for the lake. Such a study has been designed and is awaiting funding under Phase I of the Federal Clean Lakes Program. Clean Lakes Program funding should be restored for lake diagnostic and restoration studies.

6. Eurasian milfoil (Myriophyllum spicatum) is a nuisance aquatic plant which currently infests large areas of Lake Champlain and nineteen other lakes (Figure 2). It is considered a major threat to all Vermont lakes. First

"discovered" in 1962 in only one lake (Lake Champlain), it has spread quickly around the state in the past decade. Last year alone, new infestations were found in four other lakes.

Milfoil usually grows in dense weed beds which can seriously impair the recreational use of a lake, reduce the availability of fish spawning grounds, and otherwise alter a lake's natural environment. Milfoil reproduces almost exclusively by shoots which break off and drift away, then sink and take root to form a whole new plant. This fragmentation occurs both naturally and as a result of human activity, such as boating.

As an "introduced" species, Eurasian milfoil has no natural controls on its populations in North America. Therefore, it has the potential for completely infesting lakes when it occurs.

Control generally consists of mechanical harvesting or covering the lake bottom with barrier materials. Attempts to control Eurasian milfoil growth have been made on thirteen lakes (Table 26). Public education has been aimed at identification of Eurasian milfoil and requesting boaters to remove plant fragments from boat trailers so it cannot be transported and spread to other lakes. If the spread of this aquatic nuisance is to be slowed, both within infested lakes and between lakes, Vermont's Eurasian Milfoil Program must be continued and supported as a permanent part of the state's water quality management program.

Table 26

DATES OF CONFIRMED INFESTATIONS AND MANAGEMENT ACTION BEING TAKEN FOR VERMONT LAKES KNOWN TO HAVE EURASIAN MILFOIL POPULATIONS*

Waterbody Name	Town	Date of Infestation	Management Action
Berlin Pond	Berlin	1986	NC-water supply use only
Black Pond	Hubbardton	1987	BB, HP
Lake Bomoseen	Castleton	1982	H, BB, HP
Brownington Pond	Brownington, Derby	1986	NC
Lake Carmi	Franklin	197_+	H, BB
Champlain	--	1962	H, BB, HP
Glen Lake	Castleton, Fair Haven, Benson	1983	NC
Lake Hortonia	Hubbardton, Sudbury	1984	H, BB, HP
Lily Pond	Poultney	1983	H, BB, HP
Little Lake	Wells	1983	H, BB, HP
Lower Pond	Hinesburg	1987	NC
Lake Memphremagog	Newport, Derby, Coventry	198_+	BB
Metcalf Pond	Fletcher	1984	HP
Mill Pond	Windsor	1987	NC
N. Montpelier Pond	N. Montpelier, E. Calais	1982	H, HP
Norton Brook Dam (Vergennes Waterworks)	Bristol	1985	NC-no current public use
Lake Paran	Bennington, Shaftsbury	197_+	BB, DD, HP
Lake St. Catherine	Wells, Poultney	1983	H, BB, HP
Sunrise Lake	Benson, Orwell	1987	HP, BB proposed for 1988
Winona Lake	Bristol	1986	NC

Key to abbreviations:

H-mechanical harvesting
BB-bottom barrier
DD-drawdown
HP-handpulling, raking
NC-no control program at present

* As of December 1, 1987
\+ Infestation known to occur in this decade

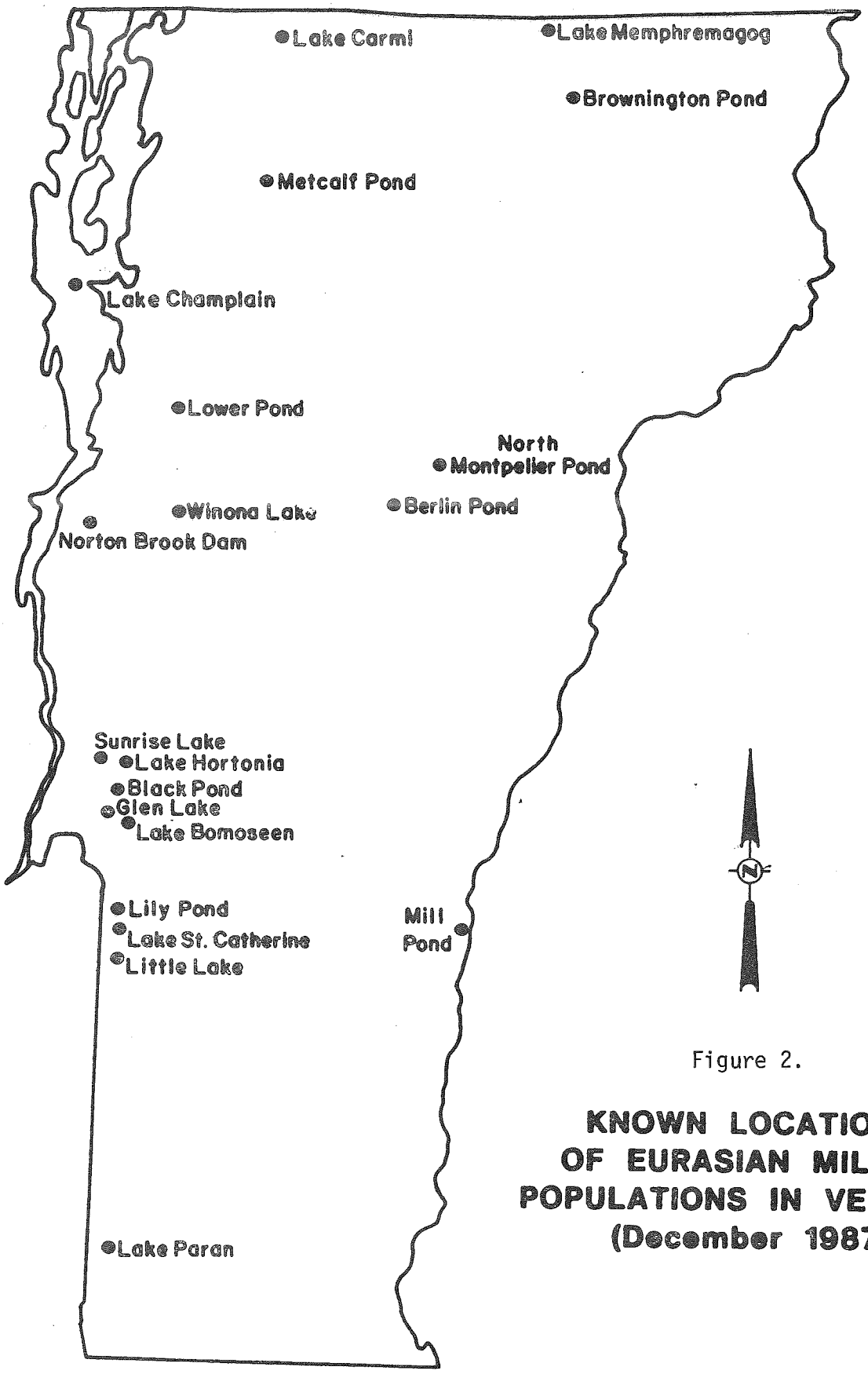


Figure 2.

KNOWN LOCATIONS OF EURASIAN MILFOIL POPULATIONS IN VERMONT (December 1987)

c. Combined Sewer Overflows

Combined sewer overflows (CSO's) are municipal sewage flows and stormwater from spring runoff and rain storms which enter the sewage system via catch basins and are transported to the sewage treatment plant. Because most sewage treatment plants are only designed to treat normal sewage flows, additional stormwater volume causes the plant to overflow. As a result, all or a portion of the stormwater and untreated sewage flows are diverted directly to the receiving water body without treatment.

Burlington has one of the most visible CSO problems in Vermont, due to the city's antiquated sewer system which has overflowed during heavy rainstorms. There have been repeated closures of city beaches along Lake Champlain due to high fecal coliforms counts caused by combined sewer overflows. It is estimated it will cost $52 million to correct the problem. Thirteen million dollars would come from a state grant; $26 million from a state loan, and the remaining $13 million from the City of Burlington.

The State Construction Grants Program has added CSO correction projects to the priority list as eligible projects. The highest priority has been given to correcting CSO's which are present in lake watersheds. CSO projects on the Pollution Control Priority List represent millions of dollars in construction costs. The projects are designed to separate storm water and sanitary wastes wherever practical, and achieve a minimum of settling and disinfection of any overflows which remain in wet weather.

d. Financial Assistance to Municipalities

Amendments to the federal Clean Water Act passed in February, 1987 provide for the termination of the federal construction grant program and in its place, the creation of state revolving loan funds. The grant program will end in 1990, and a revolving loan program will be phased in between 1988 and 1994, when states will assume primary responsibility to fund construction of municipal treatment facilities.

Following completion of all current pollution control projects in Vermont, the identified combined sewer overflow (CSO) projects are estimated to cost $70 million, and can be accomplished over a period of ten years, assuming that authorized congressional appropriations are forthcoming.

Vermont's principal concern from the perspective of providing financial assistance to municipalities, is to implement the state revolving loan fund authorized by the last legislature. This fund is the principal means through which municipalities may secure financial assistance to correct remaining combined sewer overflows and plant enlargements to accommodate population growth.

e. Wastewater Facilities Operation and Maintenance

The quality of data submitted under the permit programs is a primary concern. The Department performed laboratory evaluations of all publicly owned treatment plants in 1984. Since 1984, several full and partial evaluations have been performed as time permits. In 1987, performances check samples were sent to all permittees not receiving EPA samples. All of these efforts have

detected many failures to use approved procedures or failure to achieve an acceptable result. The Department will draft a statute and accompanying regulations for a laboratory certification program during 1988. The statute will be introduced in the 1989 legislature.

The Department adopted a chlorine reduction policy in 1984. The policy's objective was to reduce effluent chlorine in order to protect fish and aquatic biota. The policy (see Appendix 4) has been slow in implementation because its requirements are made binding when a permit is renewed (every five years). To meet the chlorine levels required in the policy, construction will be necessary in most plants. In the meantime, the permittees generally are trying to reduce chlorine levels to protect aquatic life. Reduction of chlorine use, however, has produced more coliform violations. Until the Department amends the requirements in each permit and the permittees improve the system, the Department must accept either the current coliform violation levels or substantially reduce coliform violations by advising permittees to increase the chlorine residual as high as 4 mg/l (allowed in most permits). The Department is developing an improved method of notification to the local health office and neighboring municipalities when the disinfection system at a wastewater facility fails.

Falsification of test results by permittees and operators was identified in three cases during 1987. The entire program depends on self-monitored data. The Department is preparing a falsification policy to direct certification, supervision and

revocation actions, and enforcement action against the permittee in falsification cases.

f. Protection of the Water Quality and Hydrology of Upland Streams.

Upland streams are generally more susceptible than lowland streams to changes in hydrology and degradation of water quality because they have steeper slopes, thinner soils, and smaller stream volumes. High density developments in upland waters (for example, recreational facilities, condominiums, residences, and commercial establishments) have impaired and continue to threaten water quality.

Increased peak flows, unnaturally low flows, sedimentation, channel widening, bank scouring, nutrient enrichment, pathogens, toxic spills and urban runoff have affected some upland streams. Alteration of the natural drainage pattern and increased impervious surface areas have radically changed the hydrology of some watersheds. Low flows occur when water is withdrawn for snowmaking at ski areas. Poor construction practices, lack of soil erosion controls, and failed on-site septic systems are the major sources of sedimentation, nutrient enrichment, and pathogens in developed upland watersheds. On-site septic systems may exceed the capacity of soils to adequately treat effluent before it reaches surface waters, and failures have occurred. Downstream effects of hydrological alterations include sedimentation and loss of fishery habitat, turbid conditions, loss of riparian land and increased flood potential, and reduction in recreational and aesthetic values.

Recently passed legislation requires that all land waste disposal systems over 6,500 gallons per day capacity be regulated as indirect discharges to State waters. The 1986 legislature designated as "Class A" all waters above 2,500 feet in elevation, and additional waters as may be classified "A" by the Water Resources Board (10 V.S.A. 1253). "Class A" designation provides protection to surface waters by controlling development in the watershed, by limiting new indirect discharges in fragile soils to less than 1,000 gpd, and by requiring existing indirect discharges of 6,500 gpd or more to obtain a permit to continue operating.

The 1987 legislature [10 V.S.A. Subsection 1422 (a)] and the Water Resources Board, by rule (Subsection 1-03C, Water Quality Standards) have provided for the designation of Outstanding Resource Waters (ORW). Once designated, the outstanding value(s) for which the waterbody was designated would be protected. Specific protections granted by law include strict limitations on gravel mining in ORW's and a ban on construction of hydroelectric dams.

There is no program to control alterations of upland stream hydrology. Soil erosion controls, storm water discharge, septic system design and location are regulated by various state permit programs. Future efforts could focus on management of development in upland areas through town zoning, the development of cumulative impact assessment and use of the "Class A" stream and outstanding resource waters designation processes. Increased permit compliance monitoring is also needed to ensure that proper erosion control practices are used.

g. Toxics in Lake Champlain

The presence of elevated levels of PCB's in a small sample of lake trout from Lake Champlain requires further investigation. Follow up sampling for various species and locations on Lake Champlain will be conducted by the Vt. Agency of Natural Resources and the Vt. Department of Health during 1988 in order to more clearly define the extent of PCB fish flesh contamination in the lake.

h. Planning and Protection Projects

Each river basin or river corridor should have a detailed plan for its management which will be tied to workable strategies for implementation.

Outstanding water resources, including lakes, rivers, important aquifers, shoreland, and wetlands must be given special attention and protection.

B. Recommendations

Based on the findings in this report, it is clear that the majority of Vermont waters meet or exceed state and federal standards for high quality waters. However, there are certain serious existing and potential problems which must be addressed if Vermont's high water quality is to be maintained. Recommendations for resolution of some of these problems are discussed below.

a. Nonpoint Source Pollution

The 1988 Nonpoint Source Pollution Assessment has pointed out many problems which need to be resolved or assessed further:

1. Federal funding will be needed to implement the goals of the Nonpoint Source Management Plan.

2. Federal cost-share programs for farms administered through the Soil Conservation Service must be consistently funded. Many farm operators cannot cost-share a management practice at or below the 50% level. Federal funds have dwindled in recent years for programs such as PL 83-566, created to identify and reduce land-based nonpoint sources of water pollution. These funds must increase to adequately promote conservation practice planning and implementation in Vermont.

3. Federal funding is needed to expand water quality monitoring programs for rivers and streams in Vermont. Permanent monitoring stations must be established. Six categories of nonpoint source pollution need further assessment of their impact on receiving waters.

4. Federal Energy Regulatory Commission licensing procedures for hydroelectric plants preempt state jurisdiction. State water quality concerns are often not adequately addressed. Since flow regulation below hydroelectric dams was found to be one of the major causes of water quality impairment in Vermont, the federal licensing procedures should be changed to accommodate greater state input.

b. Lakes and Ponds Management

1. Consistent, reliable federal funding for the Clean Lakes Program is crucial. Federal funding should be restored to the Clean Lakes Program for Phase I and II studies and for lake assessment activities. The following projects will require funding under the Clean Lakes Program:

a) Lake Assessment Project

Only 35% of Vermont lakes have been monitored in the past five years. Monitoring studies must be updated and expanded. Existing lake watershed land use information is now ten years old. In light of the large contribution of land-based nonpoint source pollution to lake water quality impairment, watershed land use studies should be updated and expanded.

b) Lake Champlain Eutrophication Study

There is an urgent need for a lakewide nutrient budget study of Lake Champlain that can provide the basis of a long-range phosphorus management strategy for the lake.

2. Federal funding is needed for lake protection program development, either as part of the Clean Lakes Program or as a specified part of other program planning funding.

3. Federal funding is needed for a Clean Lakes Demonstration Project to develop effective methods of controlling Eurasian milfoil growth in heavily infested lakes.

c. Municipal Wastewater Treatment Plant Projects

Amendments to the federal Clean Water Act passed in February, 1987 provide for the termination of the federal construction grant program, to be replaced by state revolving loan funds for municipal wastewater treatment plant projects. However, two initial treatment plants must still be constructed in Vermont, five plants must be upgraded from primary to secondary, and other plants must be upgraded and enlarged. Cost of combined sewer overflow corrections alone is estimated to be

$70 million for the most necessary projects. Restoration of federal financial assistance would expedite these projects and significantly improve receiving water quality.

d. Ground Water Management

Vermont ground water management programs must initiate an intensive effort to collect and analyze data. Ideally, data management would involve use of a Geographical Information System. Continuing federal funding will be needed to accomplish this work.

e. Planning Projects

Each river basin or river corridor should have a detailed plan for its management which will be tied to workable strategies for implementation. Federal funding will be needed for these planning programs.

f. Toxic Management

Monitoring needs to be conducted at sources suspected of causing toxic problems - point and nonpoint - to have available reliable data upon which management decisions can be based. Federal funding will be needed to accomplish this work.

Appendix 1.

NONPOINT SOURCE POLLUTION TASK FORCE MEMBERS

Members	Affiliation
Ronald Allbee	Commissioner, Dept. of Agriculture
Robert Shattuck	Hydraulics Engineer, Agency of Transportation
Dr. Jack C. Clausen	UVM, School of Natural Resources
Michael Zahner	Environmental Board
Winston Seeley	Natural Resources Conservation Council
Richard A. Moore	Natural Resources Conservation Council
Edward Pomainville, Jr.	Natural Resources Conservation Districts
John W. Irwin	Representative, and Natural Resources Conservation Districts
Leonard Gerardi	Department of Fish and Wildlife
William Keogh	Associated General Contractors
Dick Cate	Barre City Manager
Joe Parkinson	VT Ski Areas Association
Francis M. Keeler	Soil Conservation Service
Craig Heindel	Wagner, Heindel & Noyes Inc.
Mollie H. Beattie	Commissioner, Dept. of Forests, Parks Recreation
Stephen Sease	Director of Planning, Agency of Natura Resources
Patrick Parenteau	Commissioner, Dept. of Environmental Conservation
Steve Harper	Supervisor, Green Mtn. National Forest
Roma Jean Douglas	Home Builders Assoc. of Northern VT
Bill Aswad	President, VT Association of Planning & Development Agencies

Appendix 2.

Categories and Subcategories of Nonpoint Sources,
Which Add Significant Pollution to
Each Waterbody Listed in Table 13
Which Contribute to Not Meeting
Water Quality Standards

NOTE:

Assessment Type Codes

1 = Qualitative assessment based on knowledge of land use patterns (perhaps from maps), location and category of sources, and citizen complaints.

2 = Assessments carried out with desktop predictive models using actual or estimated source data (including effluent toxicity). Models are not calibrated or verified.

3 = Assessments carried out with calibrated models. Model calibration data is less than 5 years old.

4 = Assessment based on biological or chemical data collected at fixed stations over time.

5 = Assessment based on effluent toxicity testing data and knowledge of the receiving waterbody's hydrology.

6 = Assessment based on site visit by a qualified biologist. Rapid bioassessment protocols may be used. Limited sampling of sediments, water, or biota carried out.

7 = Assessment based on field work that exceeded one 24-hour period, and includes extensive sampling of water column, sediments, and biota for chemical analysis; biosurveys involving macroinvertebrates, fish and periphyton; ambient toxicity analyses may be carried out.

WATERBODY NAME : Hoosic River
WATERBODY ID # : VT01-02
BASIN : 01-Hoosic
WATERBODY TYPE : RIVER SIZE : 7.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 5 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	7.0

---------- NONATTAINMENT CAUSES ----------

6 - AMMONIA	10 - pH
3 - PRIORITY ORGANICS	5 - METALS
11 - SILTATION	8 - OTHER INORGANICS
17 - PATHOGENS	19 - OIL AND GREASE

---------- NONATTAINMENT SOURCES ----------

1 - INDUSTRIAL	63 - LANDFILLS
64 - INDUSTRIAL LAND TREATMENT	65 - ON-SITE WASTEWATER SYS.
51 - SURFACE MINING	82 - WASTE STORAGE, TANK LEAKS

WATERBODY NAME : Walloomsac River
WATERBODY ID # : VT01-03
BASIN : 01-Walloomsac
WATERBODY TYPE : RIVER SIZE : 104.7 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	91.7	FULLY SUPPORTED/THREAT.	11.2
PARTIALLY SUPPORTED	1.8	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	11 - SILTATION
4 - NON-PRIORITY ORGANICS	16 - OTHER HABITAT ALTERATIONS
5 - METALS	1 - UNKNOWN TOXICITY
10 - pH	9 - NUTRIENTS

---------- NONATTAINMENT SOURCES ----------

51 - SURFACE MINING	43 - SURFACE RUN-OFF
64 - INDUSTRIAL LAND TREATMENT	63 - LANDFILLS
1 - INDUSTRIAL	66 - HAZARDOUS WASTE
2 - MUNICIPAL	86 - NATURAL
32 - LAND DEVELOPMENT	81 - ATMOSPHERIC DEPOSITION

WATERBODY NAME : Batten Kill Main Stem
WATERBODY ID # : VT01-04
BASIN : 01-Battenkill
WATERBODY TYPE : RIVER SIZE : 21.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	20.9
PARTIALLY SUPPORTED	0.1	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	11 - SILTATION
5 - METALS	12 - ORGANIC ENRICHMENT/DO
7 - CHLORINE	15 - FLOW ALTERATION
9 - NUTRIENTS	16 - OTHER HABITAT ALTERATIONS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	63 - LANDFILLS
11 - NON-IRRIGATED CROP PROD.	32 - LAND DEVELOPMENT
86 - NATURAL	43 - SURFACE RUN-OFF

WATERBODY NAME : Minor Tribs - Direct to N.Y.
WATERBODY ID # : VT01-07
BASIN : 01-NewYork
WATERBODY TYPE : RIVER SIZE : 23.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	22.7	FULLY SUPPORTED/THREAT.	0.1
PARTIALLY SUPPORTED	0.2	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	12 - ORGANIC ENRICHMENT/DO
0 - CAUSE UNKNOWN	9 - NUTRIENTS
11 - SILTATION	

---------- NONATTAINMENT SOURCES ----------

85 - IN-PLACE CONTAMINANTS	63 - LANDFILLS
14 - PASTURE LAND	

WATERBODY NAME : Poultney Main Stem and Tribs
WATERBODY ID # : VT02-01
BASIN : 02-Poultney
WATERBODY TYPE : RIVER SIZE : 20.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	3.0	FULLY SUPPORTED/THREAT.	2.0
PARTIALLY SUPPORTED	15.5	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	15 - FLOW ALTERATION
11 - SILTATION	17 - PATHOGENS
12 - ORGANIC ENRICHMENT/DO	14 - THERMAL MODIFICATION

---------- NONATTAINMENT SOURCES ----------

74 - FLOW REGULATION	11 - NON-IRRIGATED CROP PROD.
14 - PASTURE LAND	86 - NATURAL
77 - STREAMBANK MODIFICATION	

WATERBODY NAME : Hubbardton River
WATERBODY ID # : VT02-02
BASIN : 02-Poultney
WATERBODY TYPE : RIVER SIZE : 17.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	6.5	FULLY SUPPORTED/THREAT.	2.5
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	8.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	17 - PATHOGENS
11 - SILTATION	14 - THERMAL MODIFICATION
12 - ORGANIC ENRICHMENT/DO	16 - OTHER HABITAT ALTERATIONS
7 - CHLORINE	

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	77 - STREAMBANK MODIFICATION
11 - NON-IRRIGATED CROP PROD.	14 - PASTURE LAND
18 - ANIMAL HOLDING	86 - NATURAL

WATERBODY NAME : Castleton River
WATERBODY ID # : VT02-03
BASIN : 02-Poultney
WATERBODY TYPE : RIVER SIZE : 36.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	35.9	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	0.1	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL
32 - LAND DEVELOPMENT

WATERBODY NAME : Upper Poultney Watershed
WATERBODY ID # : VT02-04
BASIN : 02-Poultney
WATERBODY TYPE : RIVER SIZE : 59.2 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	45.7	FULLY SUPPORTED/THREAT.	4.5
PARTIALLY SUPPORTED	9.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE
19 - OIL AND GREASE
3 - PRIORITY ORGANICS
5 - METALS
1 - UNKNOWN TOXICITY
11 - SILTATION
16 - OTHER HABITAT ALTERATIONS
17 - PATHOGENS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL
63 - LANDFILLS
85 - IN-PLACE CONTAMINANTS
14 - PASTURE LAND
18 - ANIMAL HOLDING
76 - REMOVAL OF RIPARIAN VEG.
11 - NON-IRRIGATED CROP PROD.
65 - ON-SITE WASTEWATER SYS.

WATERBODY NAME : Mettawee Watershed
WATERBODY ID # : VT02-05
BASIN : 02-Mettawee
WATERBODY TYPE : RIVER SIZE : 47.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	26.0	FULLY SUPPORTED/THREAT.	10.5
PARTIALLY SUPPORTED	11.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	17 - PATHOGENS
11 - SILTATION	16 - OTHER HABITAT ALTERATIONS
12 - ORGANIC ENRICHMENT/DO	2 - PESTICIDES
14 - THERMAL MODIFICATION	1 - UNKNOWN TOXICITY

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	86 - NATURAL
14 - PASTURE LAND	63 - LANDFILLS
18 - ANIMAL HOLDING	76 - REMOVAL OF RIPARIAN VEG.
77 - STREAMBANK MODIFICATION	

WATERBODY NAME : Lower Otter Creek
WATERBODY ID # : VT03-01
BASIN : 03-Otter
WATERBODY TYPE : RIVER SIZE : 29.7 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	2.1	FULLY SUPPORTED/THREAT.	4.0
PARTIALLY SUPPORTED	17.2	NOT SUPPORTED	6.4

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	21 - SUSPENDED SOLIDS
11 - SILTATION	14 - THERMAL MODIFICATION
12 - ORGANIC ENRICHMENT/DO	15 - FLOW ALTERATION
17 - PATHOGENS	22 - NOXIOUS AQUATIC PLANTS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	43 - SURFACE RUN-OFF
11 - NON-IRRIGATED CROP PROD.	77 - STREAMBANK MODIFICATION
14 - PASTURE LAND	86 - NATURAL
18 - ANIMAL HOLDING	4 - COMBINED SEWER OUTFLOW
32 - LAND DEVELOPMENT	74 - FLOW REGULATION

WATERBODY NAME : Minor Tribs - Mid Main Stem Otter Ck.
WATERBODY ID # : VT03-04
BASIN : 03-Otter
WATERBODY TYPE : RIVER SIZE : 33.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	16.0	FULLY SUPPORTED/THREAT.	5.0
PARTIALLY SUPPORTED	1.2	NOT SUPPORTED	10.8

---------- NONATTAINMENT CAUSES ----------

15 - FLOW ALTERATION	21 - SUSPENDED SOLIDS
11 - SILTATION	16 - OTHER HABITAT ALTERATIONS
8 - OTHER INORGANICS	7 - CHLORINE
10 - pH	1 - UNKNOWN TOXICITY

---------- NONATTAINMENT SOURCES ----------

74 - FLOW REGULATION	77 - STREAMBANK MODIFICATION
2 - MUNICIPAL	11 - NON-IRRIGATED CROP PROD.
83 - HIGHWAY MAINT., RUN OFF	63 - LANDFILLS
1 - INDUSTRIAL	88 - UPSTREAM IMPOUNDMENT
56 - MILL TAILINGS	43 - SURFACE RUN-OFF

WATERBODY NAME : Upper Main Stem Otter Ck.
WATERBODY ID # : VT03-05
BASIN : 03-Otter
WATERBODY TYPE : RIVER SIZE : 14.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	2.3	FULLY SUPPORTED/THREAT.	11.2
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	0.5

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	11 - SILTATION
15 - FLOW ALTERATION	16 - OTHER HABITAT ALTERATIONS
8 - OTHER INORGANICS	12 - ORGANIC ENRICHMENT/DO
21 - SUSPENDED SOLIDS	9 - NUTRIENTS

---------- NONATTAINMENT SOURCES ----------

82 - WASTE STORAGE, TANK LEAKS	84 - SPILLS
74 - FLOW REGULATION	56 - MILL TAILINGS
43 - SURFACE RUN-OFF	32 - LAND DEVELOPMENT
2 - MUNICIPAL	4 - COMBINED SEWER OUTFLOW

WATERBODY NAME : Minor Tribs - Upper Main Stem Otter Ck.
WATERBODY ID # : VT03-06
BASIN : 03-Otter
WATERBODY TYPE : RIVER SIZE : 4.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	1.0
PARTIALLY SUPPORTED	3.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	4 - NON-PRIORITY ORGANICS
5 - METALS	11 - SILTATION
16 - OTHER HABITAT ALTERATIONS	8 - OTHER INORGANICS

---------- NONATTAINMENT SOURCES ----------

85 - IN-PLACE CONTAMINANTS	63 - LANDFILLS
31 - HIGHWAY, ROAD, BRIDGE	32 - LAND DEVELOPMENT
43 - SURFACE RUN-OFF	

WATERBODY NAME : Lewis Creek
WATERBODY ID # : VT03-08
BASIN : 03-Champlain
WATERBODY TYPE : RIVER SIZE : 40.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	24.0	FULLY SUPPORTED/THREAT.	14.5
PARTIALLY SUPPORTED	1.5	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	17 - PATHOGENS
11 - SILTATION	12 - ORGANIC ENRICHMENT/DO
20 - TASTE & ODOR	2 - PESTICIDES
16 - OTHER HABITAT ALTERATIONS	

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	14 - PASTURE LAND
18 - ANIMAL HOLDING	77 - STREAMBANK MODIFICATION
86 - NATURAL	76 - REMOVAL OF RIPARIAN VEG.

WATERBODY NAME : Dead Creek
WATERBODY ID # : VT03-09
BASIN : 03-Otter
WATERBODY TYPE : RIVER SIZE : 20.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	15.0
PARTIALLY SUPPORTED	1.0	NOT SUPPORTED	4.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	11 - SILTATION
12 - ORGANIC ENRICHMENT/DO	14 - THERMAL MODIFICATION
17 - PATHOGENS	22 - NOXIOUS AQUATIC PLANTS
21 - SUSPENDED SOLIDS	

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	77 - STREAMBANK MODIFICATION
14 - PASTURE LAND	65 - ON-SITE WASTEWATER SYS.
18 - ANIMAL HOLDING	85 - IN-PLACE CONTAMINANTS
88 - UPSTREAM IMPOUNDMENT	13 - SPECIALTY CROP PROD.
86 - NATURAL	76 - REMOVAL OF RIPARIAN VEG.

WATERBODY NAME : Lemon Fair River
WATERBODY ID # : VT03-10
BASIN : 03-Otter
WATERBODY TYPE : RIVER SIZE : 27.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	6.5
PARTIALLY SUPPORTED	14.5	NOT SUPPORTED	6.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	11 - SILTATION
17 - PATHOGENS	12 - ORGANIC ENRICHMENT/DO
2 - PESTICIDES	14 - THERMAL MODIFICATION
21 - SUSPENDED SOLIDS	

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	77 - STREAMBANK MODIFICATION
14 - PASTURE LAND	18 - ANIMAL HOLDING
86 - NATURAL	85 - IN-PLACE CONTAMINANTS
13 - SPECIALTY CROP PROD.	76 - REMOVAL OF RIPARIAN VEG.

WATERBODY NAME : New Haven River
WATERBODY ID # : VT03-11
BASIN : 03-Otter
WATERBODY TYPE : RIVER SIZE : 49.4 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	37.4	FULLY SUPPORTED/THREAT.	11.0
PARTIALLY SUPPORTED	1.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	11 - SILTATION
17 - PATHOGENS	14 - THERMAL MODIFICATION
16 - OTHER HABITAT ALTERATIONS	

---------- NONATTAINMENT SOURCES ----------

63 - LANDFILLS	11 - NON-IRRIGATED CROP PROD.
18 - ANIMAL HOLDING	51 - SURFACE MINING
1 - INDUSTRIAL	77 - STREAMBANK MODIFICATION
86 - NATURAL	14 - PASTURE LAND

WATERBODY NAME : East Creek
WATERBODY ID # : VT03-14
BASIN : 03-Otter
WATERBODY TYPE : RIVER SIZE : 29.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	10.5	FULLY SUPPORTED/THREAT.	6.0
PARTIALLY SUPPORTED	3.6	NOT SUPPORTED	9.4

---------- NONATTAINMENT CAUSES ----------

5 - METALS	15 - FLOW ALTERATION
11 - SILTATION	16 - OTHER HABITAT ALTERATIONS
12 - ORGANIC ENRICHMENT/DO	19 - OIL AND GREASE
3 - PRIORITY ORGANICS	

---------- NONATTAINMENT SOURCES ----------

32 - LAND DEVELOPMENT	82 - WASTE STORAGE, TANK LEAKS
63 - LANDFILLS	84 - SPILLS
74 - FLOW REGULATION	43 - SURFACE RUN-OFF
88 - UPSTREAM IMPOUNDMENT	87 - RECREATION ACTIVITY

WATERBODY NAME : Clarendon River
WATERBODY ID # : VT03-15
BASIN : 03-Otter
WATERBODY TYPE : RIVER SIZE : 17.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	16.9	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	0.1	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL

WATERBODY NAME : Upper Otter Creek Watershed
WATERBODY ID # : VT03-18
BASIN : 03-Otter
WATERBODY TYPE : RIVER SIZE : 51.2 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	47.2	FULLY SUPPORTED/THREAT.	1.0
PARTIALLY SUPPORTED	3.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

11 - SILTATION	3 - PRIORITY ORGANICS
4 - NON-PRIORITY ORGANICS	16 - OTHER HABITAT ALTERATIONS

---------- NONATTAINMENT SOURCES ----------

21 - HARVESTING, RESTORATION	84 - SPILLS
32 - LAND DEVELOPMENT	

WATERBODY NAME : East Creek
WATERBODY ID # : VT04-03
BASIN : 04-LowerChamplain
WATERBODY TYPE : RIVER SIZE : 10.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	6.5	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	4.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

2 - PESTICIDES	12 - ORGANIC ENRICHMENT/DO
7 - CHLORINE	14 - THERMAL MODIFICATION
9 - NUTRIENTS	17 - PATHOGENS
11 - SILTATION	

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	76 - REMOVAL OF RIPARIAN VEG.
11 - NON-IRRIGATED CROP PROD.	13 - SPECIALTY CROP PROD.
14 - PASTURE LAND	18 - ANIMAL HOLDING

WATERBODY NAME : Rock River
WATERBODY ID # : VT05-01
BASIN : 05-UpperChamplain
WATERBODY TYPE : RIVER SIZE : 17.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	10.5	FULLY SUPPORTED/THREAT.	5.0
PARTIALLY SUPPORTED	1.5	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	14 - THERMAL MODIFICATION
11 - SILTATION	12 - ORGANIC ENRICHMENT/DO
17 - PATHOGENS	

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	14 - PASTURE LAND
18 - ANIMAL HOLDING	

WATERBODY NAME : St. Albans Bay Drainage
WATERBODY ID # : VT05-07
BASIN : 05-UpperChamplain
WATERBODY TYPE : RIVER SIZE : 21.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6 7

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	7.5
PARTIALLY SUPPORTED	11.0	NOT SUPPORTED	2.5

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	5 - METALS
12 - ORGANIC ENRICHMENT/DO	2 - PESTICIDES
9 - NUTRIENTS	11 - SILTATION
17 - PATHOGENS	22 - NOXIOUS AQUATIC PLANTS

---------- NONATTAINMENT SOURCES ----------

85 - IN-PLACE CONTAMINANTS	32 - LAND DEVELOPMENT
2 - MUNICIPAL	43 - SURFACE RUN-OFF
11 - NON-IRRIGATED CROP PROD.	77 - STREAMBANK MODIFICATION
14 - PASTURE LAND	41 - STORM SEWERS
18 - ANIMAL HOLDING	

WATERBODY NAME : Lower Northeast Arm Direct
WATERBODY ID # : VT05-08
BASIN : 05-UpperChamplain
WATERBODY TYPE : RIVER SIZE : 9.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	7.0	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	2.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	2 - PESTICIDES
11 - SILTATION	17 - PATHOGENS

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	14 - PASTURE LAND
18 - ANIMAL HOLDING	65 - ON-SITE WASTEWATER SYS.

WATERBODY NAME : Malletts Bay Drainage
WATERBODY ID # : VT05-09
BASIN : 05-UpperChamplain
WATERBODY TYPE : RIVER SIZE : 26.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	13.5	FULLY SUPPORTED/THREAT.	11.0
PARTIALLY SUPPORTED	1.5	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	11 - SILTATION
13 - SALINITY / TDS / CHLORIDE	9 - NUTRIENTS
17 - PATHOGENS	7 - CHLORINE
16 - OTHER HABITAT ALTERATIONS	5 - METALS

---------- NONATTAINMENT SOURCES ----------

63 - LANDFILLS	43 - SURFACE RUN-OFF
65 - ON-SITE WASTEWATER SYS.	83 - HIGHWAY MAINT., RUN OFF
11 - NON-IRRIGATED CROP PROD.	66 - HAZARDOUS WASTE
14 - PASTURE LAND	18 - ANIMAL HOLDING
32 - LAND DEVELOPMENT	

WATERBODY NAME : Burlington Direct Land Drainage
WATERBODY ID # : VT05-10
BASIN : 05-UpperChamplain
WATERBODY TYPE : RIVER SIZE : 0.6 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6 7

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	0.1
PARTIALLY SUPPORTED	0.5	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	8 - OTHER INORGANICS
5 - METALS	19 - OIL AND GREASE
11 - SILTATION	

---------- NONATTAINMENT SOURCES ----------

85 - IN-PLACE CONTAMINANTS	83 - HIGHWAY MAINT., RUN OFF
4 - COMBINED SEWER OUTFLOW	84 - SPILLS
32 - LAND DEVELOPMENT	43 - SURFACE RUN-OFF
66 - HAZARDOUS WASTE	

WATERBODY NAME : Shelburne Bay Direct Drainage
WATERBODY ID # : VT05-11
BASIN : 05-UpperChamplain
WATERBODY TYPE : RIVER SIZE : 35.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	8.5	FULLY SUPPORTED/THREAT.	2.0
PARTIALLY SUPPORTED	16.5	NOT SUPPORTED	8.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	14 - THERMAL MODIFICATION
7 - CHLORINE	16 - OTHER HABITAT ALTERATIONS
11 - SILTATION	17 - PATHOGENS
12 - ORGANIC ENRICHMENT/DO	22 - NOXIOUS AQUATIC PLANTS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	43 - SURFACE RUN-OFF
30 - CONSTRUCTION	77 - STREAMBANK MODIFICATION
10 - AGRICULTURE	83 - HIGHWAY MAINT., RUN OFF
66 - HAZARDOUS WASTE	85 - IN-PLACE CONTAMINANTS
89 - SALT STORAGE SITES	71 - CHANNELIZATION

WATERBODY NAME : Lower Missisquoi River
WATERBODY ID # : VT06-01
BASIN : 06-Missisquoi
WATERBODY TYPE : RIVER SIZE : 33.1 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	31.9
PARTIALLY SUPPORTED	1.1	NOT SUPPORTED	0.1

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE	16 - OTHER HABITAT ALTERATIONS
9 - NUTRIENTS	17 - PATHOGENS
11 - SILTATION	12 - ORGANIC ENRICHMENT/DO
15 - FLOW ALTERATION	21 - SUSPENDED SOLIDS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	21 - HARVESTING, RESTORATION
1 - INDUSTRIAL	32 - LAND DEVELOPMENT
11 - NON-IRRIGATED CROP PROD.	64 - INDUSTRIAL LAND TREATMENT
14 - PASTURE LAND	74 - FLOW REGULATION
18 - ANIMAL HOLDING	77 - STREAMBANK MODIFICATION

WATERBODY NAME : Mid Missisquoi River
WATERBODY ID # : VT06-02
BASIN : 06-Missisquoi
WATERBODY TYPE : RIVER SIZE : 19.9 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	1.0	FULLY SUPPORTED/THREAT.	18.8
PARTIALLY SUPPORTED	0.1	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	16 - OTHER HABITAT ALTERATIONS
11 - SILTATION	17 - PATHOGENS
12 - ORGANIC ENRICHMENT/DO	21 - SUSPENDED SOLIDS
15 - FLOW ALTERATION	14 - THERMAL MODIFICATION

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	74 - FLOW REGULATION
11 - NON-IRRIGATED CROP PROD.	14 - PASTURE LAND
85 - IN-PLACE CONTAMINANTS	18 - ANIMAL HOLDING
21 - HARVESTING, RESTORATION	77 - STREAMBANK MODIFICATION

WATERBODY NAME : Minor Tribs - Lower Missisquoi River
WATERBODY ID # : VT06-03
BASIN : 06-Missisquoi
WATERBODY TYPE : RIVER SIZE : 19.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	17.5	FULLY SUPPORTED/THREAT.	1.9
PARTIALLY SUPPORTED	0.1	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

5 - METALS	11 - SILTATION
3 - PRIORITY ORGANICS	9 - NUTRIENTS
4 - NON-PRIORITY ORGANICS	17 - PATHOGENS
12 - ORGANIC ENRICHMENT/DO	

---------- NONATTAINMENT SOURCES ----------

63 - LANDFILLS	61 - SLUDGE
66 - HAZARDOUS WASTE	18 - ANIMAL HOLDING
32 - LAND DEVELOPMENT	11 - NON-IRRIGATED CROP PROD.

WATERBODY NAME : Black Creek
WATERBODY ID # : VT06-05
BASIN : 06-Missisquoi
WATERBODY TYPE : RIVER SIZE : 44.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	32.0	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	2.0	NOT SUPPORTED	10.0

---------- NONATTAINMENT CAUSES ----------

2 - PESTICIDES	17 - PATHOGENS
9 - NUTRIENTS	6 - AMMONIA
11 - SILTATION	14 - THERMAL MODIFICATION
12 - ORGANIC ENRICHMENT/DO	22 - NOXIOUS AQUATIC PLANTS

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	76 - REMOVAL OF RIPARIAN VEG.
14 - PASTURE LAND	2 - MUNICIPAL
18 - ANIMAL HOLDING	21 - HARVESTING, RESTORATION
65 - ON-SITE WASTEWATER SYS.	

WATERBODY NAME : Tyler Branch
WATERBODY ID # : VT06-06
BASIN : 06-Missisquoi
WATERBODY TYPE : RIVER SIZE : 30.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	27.5	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	2.5	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

2 - PESTICIDES	12 - ORGANIC ENRICHMENT/DO
9 - NUTRIENTS	6 - AMMONIA
11 - SILTATION	14 - THERMAL MODIFICATION

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	14 - PASTURE LAND
21 - HARVESTING, RESTORATION	18 - ANIMAL HOLDING

WATERBODY NAME : Trout River
WATERBODY ID # : VT06-07
BASIN : 06-Missisquoi
WATERBODY TYPE : RIVER SIZE : 45.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	36.0	FULLY SUPPORTED/THREAT.	5.5
PARTIALLY SUPPORTED	3.5	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	14 - THERMAL MODIFICATION
9 - NUTRIENTS	16 - OTHER HABITAT ALTERATIONS
11 - SILTATION	17 - PATHOGENS
12 - ORGANIC ENRICHMENT/DO	

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	65 - ON-SITE WASTEWATER SYS.
14 - PASTURE LAND	76 - REMOVAL OF RIPARIAN VEG.
18 - ANIMAL HOLDING	83 - HIGHWAY MAINT., RUN OFF
21 - HARVESTING, RESTORATION	63 - LANDFILLS
32 - LAND DEVELOPMENT	

WATERBODY NAME : Upper Missisquoi
WATERBODY ID # : VT06-08
BASIN : 06-Missisquoi
WATERBODY TYPE : RIVER SIZE : 108.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	94.4	FULLY SUPPORTED/THREAT.	5.1
PARTIALLY SUPPORTED	8.4	NOT SUPPORTED	0.1

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE	14 - THERMAL MODIFICATION
9 - NUTRIENTS	22 - NOXIOUS AQUATIC PLANTS
11 - SILTATION	15 - FLOW ALTERATION
12 - ORGANIC ENRICHMENT/DO	8 - OTHER INORGANICS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	74 - FLOW REGULATION
11 - NON-IRRIGATED CROP PROD.	77 - STREAMBANK MODIFICATION
14 - PASTURE LAND	51 - SURFACE MINING
18 - ANIMAL HOLDING	57 - MINE TAILINGS
32 - LAND DEVELOPMENT	86 - NATURAL

WATERBODY NAME : Lower Lamoille
WATERBODY ID # : VT07-01
BASIN : 07-Lamoille
WATERBODY TYPE : RIVER SIZE : 8.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	5.0	NOT SUPPORTED	3.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	15 - FLOW ALTERATION
11 - SILTATION	16 - OTHER HABITAT ALTERATIONS
12 - ORGANIC ENRICHMENT/DO	14 - THERMAL MODIFICATION
17 - PATHOGENS	

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	76 - REMOVAL OF RIPARIAN VEG.
18 - ANIMAL HOLDING	86 - NATURAL
14 - PASTURE LAND	88 - UPSTREAM IMPOUNDMENT
65 - ON-SITE WASTEWATER SYS.	74 - FLOW REGULATION

WATERBODY NAME : Lower Mid-Lamoille
WATERBODY ID # : VT07-02
BASIN : 07-Lamoille
WATERBODY TYPE : RIVER SIZE : 5.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED		FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	3.5	NOT SUPPORTED	2.3

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	15 - FLOW ALTERATION
11 - SILTATION	16 - OTHER HABITAT ALTERATIONS
12 - ORGANIC ENRICHMENT/DO	17 - PATHOGENS
14 - THERMAL MODIFICATION	

---------- NONATTAINMENT SOURCES ----------

14 - PASTURE LAND	18 - ANIMAL HOLDING
65 - ON-SITE WASTEWATER SYS.	74 - FLOW REGULATION
88 - UPSTREAM IMPOUNDMENT	

WATERBODY NAME : Upper Mid-Lamoille
WATERBODY ID # : VT07-04
BASIN : 07-Lamoille
WATERBODY TYPE : RIVER SIZE : 48.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	48.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	11 - SILTATION
15 - FLOW ALTERATION	16 - OTHER HABITAT ALTERATIONS
12 - ORGANIC ENRICHMENT/DO	17 - PATHOGENS
14 - THERMAL MODIFICATION	7 - CHLORINE

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	76 - REMOVAL OF RIPARIAN VEG.
11 - NON-IRRIGATED CROP PROD.	77 - STREAMBANK MODIFICATION
14 - PASTURE LAND	86 - NATURAL
18 - ANIMAL HOLDING	88 - UPSTREAM IMPOUNDMENT
74 - FLOW REGULATION	51 - SURFACE MINING

WATERBODY NAME : Upper Lamoille River
WATERBODY ID # : VT07-07
BASIN : 07-Lamoille
WATERBODY TYPE : RIVER SIZE : 15.7 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	15.7

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	11 - SILTATION
12 - ORGANIC ENRICHMENT/DO	14 - THERMAL MODIFICATION
15 - FLOW ALTERATION	16 - OTHER HABITAT ALTERATIONS
17 - PATHOGENS	20 - TASTE & ODOR

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	74 - FLOW REGULATION
18 - ANIMAL HOLDING	83 - HIGHWAY MAINT., RUN OFF
21 - HARVESTING, RESTORATION	86 - NATURAL
32 - LAND DEVELOPMENT	88 - UPSTREAM IMPOUNDMENT
43 - SURFACE RUN-OFF	

WATERBODY NAME : Minor Tribs - Upper Lamoille
WATERBODY ID # : VT07-08
BASIN : 07-Lamoille
WATERBODY TYPE : RIVER SIZE : 11.8 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	9.8	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	2.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

14 - THERMAL MODIFICATION
15 - FLOW ALTERATION
16 - OTHER HABITAT ALTERATIONS

---------- NONATTAINMENT SOURCES ----------

74 - FLOW REGULATION
88 - UPSTREAM IMPOUNDMENT

WATERBODY NAME : Gihon River
WATERBODY ID # : VT07-15
BASIN : 07-Lamoille
WATERBODY TYPE : RIVER SIZE : 40.8 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	37.9	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	2.0	NOT SUPPORTED	0.9

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE
9 - NUTRIENTS
15 - FLOW ALTERATION
11 - SILTATION
12 - ORGANIC ENRICHMENT/DO
16 - OTHER HABITAT ALTERATIONS
17 - PATHOGENS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL
74 - FLOW REGULATION
11 - NON-IRRIGATED CROP PROD.
76 - REMOVAL OF RIPARIAN VEG.
88 - UPSTREAM IMPOUNDMENT
14 - PASTURE LAND
83 - HIGHWAY MAINT., RUN OFF
18 - ANIMAL HOLDING
65 - ON-SITE WASTEWATER SYS.

WATERBODY NAME : Lower Headwaters Lamoille River
WATERBODY ID # : VT07-21
BASIN : 07-Lamoille
WATERBODY TYPE : RIVER SIZE : 33.3 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	21.8	FULLY SUPPORTED/THREAT.	0.1
PARTIALLY SUPPORTED	11.4	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

1 - UNKNOWN TOXICITY	16 - OTHER HABITAT ALTERATIONS
9 - NUTRIENTS	17 - PATHOGENS
11 - SILTATION	14 - THERMAL MODIFICATION
12 - ORGANIC ENRICHMENT/DO	15 - FLOW ALTERATION

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	86 - NATURAL
74 - FLOW REGULATION	14 - PASTURE LAND
21 - HARVESTING, RESTORATION	63 - LANDFILLS
83 - HIGHWAY MAINT., RUN OFF	88 - UPSTREAM IMPOUNDMENT

WATERBODY NAME : Lower Winooski River
WATERBODY ID # : VT08-01
BASIN : 08-Winooski
WATERBODY TYPE : RIVER SIZE : 20.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	20.0

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	4 - NON-PRIORITY ORGANICS
5 - METALS	7 - CHLORINE
20 - TASTE & ODOR	12 - ORGANIC ENRICHMENT/DO
14 - THERMAL MODIFICATION	15 - FLOW ALTERATION

---------- NONATTAINMENT SOURCES ----------

1 - INDUSTRIAL	2 - MUNICIPAL
32 - LAND DEVELOPMENT	43 - SURFACE RUN-OFF
63 - LANDFILLS	74 - FLOW REGULATION
82 - WASTE STORAGE, TANK LEAKS	83 - HIGHWAY MAINT., RUN OFF
84 - SPILLS	88 - UPSTREAM IMPOUNDMENT

WATERBODY NAME : Minor Tribs - Lower Winooski
WATERBODY ID # : VT08-02
BASIN : 08-Winooski
WATERBODY TYPE : RIVER SIZE : 23.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	3.9	FULLY SUPPORTED/THREAT.	0.2
PARTIALLY SUPPORTED	0.9	NOT SUPPORTED	18.0

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	4 - NON-PRIORITY ORGANICS
5 - METALS	11 - SILTATION
12 - ORGANIC ENRICHMENT/DO	14 - THERMAL MODIFICATION
17 - PATHOGENS	20 - TASTE & ODOR

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	64 - INDUSTRIAL LAND TREATMENT
14 - PASTURE LAND	71 - CHANNELIZATION
32 - LAND DEVELOPMENT	76 - REMOVAL OF RIPARIAN VEG.
43 - SURFACE RUN-OFF	84 - SPILLS
63 - LANDFILLS	85 - IN-PLACE CONTAMINANTS

WATERBODY NAME : Lower Mid-Winooski
WATERBODY ID # : VT08-03
BASIN : 08-Winooski
WATERBODY TYPE : RIVER SIZE : 20.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	0.7	NOT SUPPORTED	19.3

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	17 - PATHOGENS
11 - SILTATION	20 - TASTE & ODOR
12 - ORGANIC ENRICHMENT/DO	16 - OTHER HABITAT ALTERATIONS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	64 - INDUSTRIAL LAND TREATMENT
11 - NON-IRRIGATED CROP PROD.	65 - ON-SITE WASTEWATER SYS.
76 - REMOVAL OF RIPARIAN VEG.	77 - STREAMBANK MODIFICATION
83 - HIGHWAY MAINT., RUN OFF	14 - PASTURE LAND
18 - ANIMAL HOLDING	32 - LAND DEVELOPMENT

WATERBODY NAME : Upper Mid-Winooski
WATERBODY ID # : VT08-05
BASIN : 08-Winooski
WATERBODY TYPE : RIVER SIZE : 15.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	8.0	NOT SUPPORTED	7.0

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	12 - ORGANIC ENRICHMENT/DO
7 - CHLORINE	17 - PATHOGENS
9 - NUTRIENTS	16 - OTHER HABITAT ALTERATIONS
11 - SILTATION	15 - FLOW ALTERATION

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	63 - LANDFILLS
11 - NON-IRRIGATED CROP PROD.	64 - INDUSTRIAL LAND TREATMENT
14 - PASTURE LAND	65 - ON-SITE WASTEWATER SYS.
32 - LAND DEVELOPMENT	74 - FLOW REGULATION
43 - SURFACE RUN-OFF	83 - HIGHWAY MAINT., RUN OFF

WATERBODY NAME : Upper Winooski River
WATERBODY ID # : VT08-07
BASIN : 08-Winooski
WATERBODY TYPE : RIVER SIZE : 19.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	2.2	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	16.8	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

11 - SILTATION	12 - ORGANIC ENRICHMENT/DO
14 - THERMAL MODIFICATION	15 - FLOW ALTERATION

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	86 - NATURAL
14 - PASTURE LAND	88 - UPSTREAM IMPOUNDMENT
74 - FLOW REGULATION	65 - ON-SITE WASTEWATER SYS.
83 - HIGHWAY MAINT., RUN OFF	

WATERBODY NAME : Minor Tribs - Upper Winooski
WATERBODY ID # : VT08-08
BASIN : 08-Winooski
WATERBODY TYPE : RIVER SIZE : 34.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	20.2	FULLY SUPPORTED/THREAT.	11.8
PARTIALLY SUPPORTED	2.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS
11 - SILTATION
16 - OTHER HABITAT ALTERATIONS

---------- NONATTAINMENT SOURCES ----------

66 - HAZARDOUS WASTE
86 - NATURAL

WATERBODY NAME : Winooski Headwaters
WATERBODY ID # : VT08-09
BASIN : 08-Winooski
WATERBODY TYPE : RIVER SIZE : 10.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	7.5	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	1.0	NOT SUPPORTED	2.0

---------- NONATTAINMENT CAUSES ----------

15 - FLOW ALTERATION
16 - OTHER HABITAT ALTERATIONS
9 - NUTRIENTS
14 - THERMAL MODIFICATION

---------- NONATTAINMENT SOURCES ----------

74 - FLOW REGULATION
88 - UPSTREAM IMPOUNDMENT
64 - INDUSTRIAL LAND TREATMENT

WATERBODY NAME : Lower Little River
WATERBODY ID # : VT08-11
BASIN : 08-Winooski
WATERBODY TYPE : RIVER SIZE : 31.6 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 3 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	19.0	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	11.3	NOT SUPPORTED	1.3

---------- NONATTAINMENT CAUSES ----------

12 - ORGANIC ENRICHMENT/DO	11 - SILTATION
14 - THERMAL MODIFICATION	15 - FLOW ALTERATION
16 - OTHER HABITAT ALTERATIONS	

---------- NONATTAINMENT SOURCES ----------

31 - HIGHWAY, ROAD, BRIDGE	77 - STREAMBANK MODIFICATION
32 - LAND DEVELOPMENT	74 - FLOW REGULATION
51 - SURFACE MINING	88 - UPSTREAM IMPOUNDMENT
43 - SURFACE RUN-OFF	86 - NATURAL
76 - REMOVAL OF RIPARIAN VEG.	

WATERBODY NAME : Upper Little River
WATERBODY ID # : VT08-12
BASIN : 08-Winooski
WATERBODY TYPE : RIVER SIZE : 30.6 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	13.6	FULLY SUPPORTED/THREAT.	7.0
PARTIALLY SUPPORTED	10.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

5 - METALS	9 - NUTRIENTS
11 - SILTATION	16 - OTHER HABITAT ALTERATIONS
12 - ORGANIC ENRICHMENT/DO	17 - PATHOGENS
14 - THERMAL MODIFICATION	10 - pH

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	65 - ON-SITE WASTEWATER SYS.
18 - ANIMAL HOLDING	76 - REMOVAL OF RIPARIAN VEG.
32 - LAND DEVELOPMENT	77 - STREAMBANK MODIFICATION
43 - SURFACE RUN-OFF	81 - ATMOSPHERIC DEPOSITION
51 - SURFACE MINING	87 - RECREATION ACTIVITY

WATERBODY NAME : North Branch - Winooski River
WATERBODY ID # : VT08-13
BASIN : 08-Winooski
WATERBODY TYPE : RIVER SIZE : 56.1 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	42.1	FULLY SUPPORTED/THREAT.	12.5
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	1.5

---------- NONATTAINMENT CAUSES ----------

5 - METALS	10 - pH
11 - SILTATION	12 - ORGANIC ENRICHMENT/DO
17 - PATHOGENS	20 - TASTE & ODOR
21 - SUSPENDED SOLIDS	22 - NOXIOUS AQUATIC PLANTS

---------- NONATTAINMENT SOURCES ----------

32 - LAND DEVELOPMENT	43 - SURFACE RUN-OFF
65 - ON-SITE WASTEWATER SYS.	81 - ATMOSPHERIC DEPOSITION
83 - HIGHWAY MAINT., RUN OFF	

WATERBODY NAME : Jail Branch - Winooski River
WATERBODY ID # : VT08-15
BASIN : 08-Winooski
WATERBODY TYPE : RIVER SIZE : 23.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	21.4	FULLY SUPPORTED/THREAT.	0.1
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	1.5

---------- NONATTAINMENT CAUSES ----------

5 - METALS	15 - FLOW ALTERATION
9 - NUTRIENTS	16 - OTHER HABITAT ALTERATIONS
11 - SILTATION	12 - ORGANIC ENRICHMENT/DO

---------- NONATTAINMENT SOURCES ----------

32 - LAND DEVELOPMENT	74 - FLOW REGULATION
43 - SURFACE RUN-OFF	76 - REMOVAL OF RIPARIAN VEG.
83 - HIGHWAY MAINT., RUN OFF	77 - STREAMBANK MODIFICATION
63 - LANDFILLS	64 - INDUSTRIAL LAND TREATMENT

WATERBODY NAME : Stevens Branch - Winooski River
WATERBODY ID # : VT08-16
BASIN : 08-Winooski
WATERBODY TYPE : RIVER SIZE : 28.7 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	22.6	FULLY SUPPORTED/THREAT.	0.1
PARTIALLY SUPPORTED	0.2	NOT SUPPORTED	5.8

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	4 - NON-PRIORITY ORGANICS
5 - METALS	7 - CHLORINE
9 - NUTRIENTS	11 - SILTATION
16 - OTHER HABITAT ALTERATIONS	20 - TASTE & ODOR

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	63 - LANDFILLS
32 - LAND DEVELOPMENT	64 - INDUSTRIAL LAND TREATMENT
43 - SURFACE RUN-OFF	82 - WASTE STORAGE, TANK LEAKS
56 - MILL TAILINGS	83 - HIGHWAY MAINT., RUN OFF
62 - WASTEWATER	85 - IN-PLACE CONTAMINANTS

WATERBODY NAME : Dog River
WATERBODY ID # : VT08-17
BASIN : 08-Winooski
WATERBODY TYPE : RIVER SIZE : 53.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	51.3	FULLY SUPPORTED/THREAT.	2.1
PARTIALLY SUPPORTED	0.1	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

1 - UNKNOWN TOXICITY	7 - CHLORINE
9 - NUTRIENTS	17 - PATHOGENS
12 - ORGANIC ENRICHMENT/DO	11 - SILTATION
16 - OTHER HABITAT ALTERATIONS	

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	14 - PASTURE LAND
18 - ANIMAL HOLDING	63 - LANDFILLS
77 - STREAMBANK MODIFICATION	

WATERBODY NAME : Upper Mad River
WATERBODY ID # : VT08-20
BASIN : 08-Winooski
WATERBODY TYPE : RIVER SIZE : 31.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	11.1	FULLY SUPPORTED/THREAT.	14.9
PARTIALLY SUPPORTED	2.0	NOT SUPPORTED	3.0

---------- NONATTAINMENT CAUSES ----------

10 - pH	15 - FLOW ALTERATION
11 - SILTATION	16 - OTHER HABITAT ALTERATIONS
12 - ORGANIC ENRICHMENT/DO	17 - PATHOGENS
14 - THERMAL MODIFICATION	19 - OIL AND GREASE

---------- NONATTAINMENT SOURCES ----------

32 - LAND DEVELOPMENT	43 - SURFACE RUN-OFF
63 - LANDFILLS	65 - ON-SITE WASTEWATER SYS.
74 - FLOW REGULATION	82 - WASTE STORAGE, TANK LEAKS
84 - SPILLS	87 - RECREATION ACTIVITY
88 - UPSTREAM IMPOUNDMENT	

WATERBODY NAME : First Branch - White River
WATERBODY ID # : VT09-04
BASIN : 09-White
WATERBODY TYPE : RIVER SIZE : 61.9 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	55.8	FULLY SUPPORTED/THREAT.	6.0
PARTIALLY SUPPORTED	0.1	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE	17 - PATHOGENS
9 - NUTRIENTS	11 - SILTATION
16 - OTHER HABITAT ALTERATIONS	

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	76 - REMOVAL OF RIPARIAN VEG.
77 - STREAMBANK MODIFICATION	86 - NATURAL
11 - NON-IRRIGATED CROP PROD.	14 - PASTURE LAND
18 - ANIMAL HOLDING	32 - LAND DEVELOPMENT
21 - HARVESTING, RESTORATION	83 - HIGHWAY MAINT., RUN OFF

WATERBODY NAME : Second Branch - White River
WATERBODY ID # : VT09-05
BASIN : 09-White
WATERBODY TYPE : RIVER SIZE : 50.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	36.5	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	14.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	11 - SILTATION
12 - ORGANIC ENRICHMENT/DO	16 - OTHER HABITAT ALTERATIONS
17 - PATHOGENS	14 - THERMAL MODIFICATION

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	86 - NATURAL
14 - PASTURE LAND	18 - ANIMAL HOLDING
76 - REMOVAL OF RIPARIAN VEG.	77 - STREAMBANK MODIFICATION

WATERBODY NAME : Third Branch - White River
WATERBODY ID # : VT09-06
BASIN : 09-White
WATERBODY TYPE : RIVER SIZE : 95.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	74.4	FULLY SUPPORTED/THREAT.	9.6
PARTIALLY SUPPORTED	11.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE	16 - OTHER HABITAT ALTERATIONS
3 - PRIORITY ORGANICS	17 - PATHOGENS
11 - SILTATION	14 - THERMAL MODIFICATION
9 - NUTRIENTS	22 - NOXIOUS AQUATIC PLANTS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	63 - LANDFILLS
85 - IN-PLACE CONTAMINANTS	76 - REMOVAL OF RIPARIAN VEG.
65 - ON-SITE WASTEWATER SYS.	86 - NATURAL
51 - SURFACE MINING	17 - AQUACULTURE
10 - AGRICULTURE	77 - STREAMBANK MODIFICATION

WATERBODY NAME : Lower Ottauquechee River
WATERBODY ID # : VT10-01
BASIN : 10-Ottauquechee
WATERBODY TYPE : RIVER SIZE : 16.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	11.0
PARTIALLY SUPPORTED	1.0	NOT SUPPORTED	4.5

---------- NONATTAINMENT CAUSES ----------

11 - SILTATION	15 - FLOW ALTERATION
9 - NUTRIENTS	16 - OTHER HABITAT ALTERATIONS
12 - ORGANIC ENRICHMENT/DO	17 - PATHOGENS
14 - THERMAL MODIFICATION	7 - CHLORINE

---------- NONATTAINMENT SOURCES ----------

32 - LAND DEVELOPMENT	77 - STREAMBANK MODIFICATION
74 - FLOW REGULATION	86 - NATURAL
2 - MUNICIPAL	65 - ON-SITE WASTEWATER SYS.
88 - UPSTREAM IMPOUNDMENT	51 - SURFACE MINING
5 - STORM SEWERS	

WATERBODY NAME : Upper Ottauquechee River
WATERBODY ID # : VT10-05
BASIN : 10-Ottauquechee
WATERBODY TYPE : RIVER SIZE : 11.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	1.5	FULLY SUPPORTED/THREAT.	5.0
PARTIALLY SUPPORTED	5.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	16 - OTHER HABITAT ALTERATIONS
11 - SILTATION	17 - PATHOGENS
12 - ORGANIC ENRICHMENT/DO	14 - THERMAL MODIFICATION
15 - FLOW ALTERATION	

---------- NONATTAINMENT SOURCES ----------

30 - CONSTRUCTION	77 - STREAMBANK MODIFICATION
51 - SURFACE MINING	86 - NATURAL
62 - WASTEWATER	2 - MUNICIPAL
65 - ON-SITE WASTEWATER SYS.	76 - REMOVAL OF RIPARIAN VEG.
71 - CHANNELIZATION	83 - HIGHWAY MAINT., RUN OFF

WATERBODY NAME : Lower Black River
WATERBODY ID # : VT10-11
BASIN : 10-Black
WATERBODY TYPE : RIVER SIZE : 8.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	7.9
PARTIALLY SUPPORTED	0.1	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE	9 - NUTRIENTS
19 - OIL AND GREASE	1 - UNKNOWN TOXICITY
11 - SILTATION	16 - OTHER HABITAT ALTERATIONS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	42 - COMBINED SEWERS
32 - LAND DEVELOPMENT	66 - HAZARDOUS WASTE
43 - SURFACE RUN-OFF	87 - RECREATION ACTIVITY
83 - HIGHWAY MAINT., RUN OFF	84 - SPILLS

WATERBODY NAME : Mid-Black River
WATERBODY ID # : VT10-13
BASIN : 10-Black
WATERBODY TYPE : RIVER SIZE : 19.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	8.0	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	9.0	NOT SUPPORTED	2.0

---------- NONATTAINMENT CAUSES ----------

15 - FLOW ALTERATION	14 - THERMAL MODIFICATION

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	74 - FLOW REGULATION

WATERBODY NAME : Minor Tribs - Upper Ottauquechee
WATERBODY ID # : VT10-06
BASIN : 10-Ottauquechee
WATERBODY TYPE : RIVER SIZE : 17.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.3	FULLY SUPPORTED/THREAT.	7.2
PARTIALLY SUPPORTED	9.5	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	16 - OTHER HABITAT ALTERATIONS
17 - PATHOGENS	15 - FLOW ALTERATION
19 - OIL AND GREASE	11 - SILTATION
10 - pH	14 - THERMAL MODIFICATION

---------- NONATTAINMENT SOURCES ----------

65 - ON-SITE WASTEWATER SYS.	32 - LAND DEVELOPMENT
86 - NATURAL	63 - LANDFILLS
31 - HIGHWAY, ROAD, BRIDGE	77 - STREAMBANK MODIFICATION
87 - RECREATION ACTIVITY	43 - SURFACE RUN-OFF
74 - FLOW REGULATION	83 - HIGHWAY MAINT., RUN OFF

WATERBODY NAME : Kedron Brook
WATERBODY ID # : VT10-07
BASIN : 10-Ottauquechee
WATERBODY TYPE : RIVER SIZE : 9.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	4.5	FULLY SUPPORTED/THREAT.	4.4
PARTIALLY SUPPORTED	0.1	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE	11 - SILTATION
9 - NUTRIENTS	17 - PATHOGENS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	32 - LAND DEVELOPMENT
14 - PASTURE LAND	65 - ON-SITE WASTEWATER SYS.
83 - HIGHWAY MAINT., RUN OFF	

WATERBODY NAME : North Branch - Black River
WATERBODY ID # : VT10-16
BASIN : 10-Black
WATERBODY TYPE : RIVER SIZE : 19.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	14.0	FULLY SUPPORTED/THREAT.	1.0
PARTIALLY SUPPORTED	3.0	NOT SUPPORTED	1.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	17 - PATHOGENS
22 - NOXIOUS AQUATIC PLANTS	11 - SILTATION
14 - THERMAL MODIFICATION	16 - OTHER HABITAT ALTERATIONS

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	77 - STREAMBANK MODIFICATION
14 - PASTURE LAND	86 - NATURAL
21 - HARVESTING, RESTORATION	32 - LAND DEVELOPMENT
65 - ON-SITE WASTEWATER SYS.	

WATERBODY NAME : Lower Williams River
WATERBODY ID # : VT11-01
BASIN : 11-Williams
WATERBODY TYPE : RIVER SIZE : 10.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	7.5	FULLY SUPPORTED/THREAT.	2.9
PARTIALLY SUPPORTED	0.1	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE	11 - SILTATION
9 - NUTRIENTS	16 - OTHER HABITAT ALTERATIONS
20 - TASTE & ODOR	17 - PATHOGENS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	11 - NON-IRRIGATED CROP PROD.
14 - PASTURE LAND	18 - ANIMAL HOLDING
43 - SURFACE RUN-OFF	

WATERBODY NAME : Middle Branch - Williams River
WATERBODY ID # : VT11-03
BASIN : 11-Williams
WATERBODY TYPE : RIVER SIZE : 35.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	27.0	FULLY SUPPORTED/THREAT.	5.0
PARTIALLY SUPPORTED	3.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

10 - pH	11 - SILTATION
12 - ORGANIC ENRICHMENT/DO	14 - THERMAL MODIFICATION
8 - OTHER INORGANICS	16 - OTHER HABITAT ALTERATIONS
3 - PRIORITY ORGANICS	17 - PATHOGENS

---------- NONATTAINMENT SOURCES ----------

82 - WASTE STORAGE, TANK LEAKS	43 - SURFACE RUN-OFF
66 - HAZARDOUS WASTE	86 - NATURAL
77 - STREAMBANK MODIFICATION	11 - NON-IRRIGATED CROP PROD.

WATERBODY NAME : Lower Saxtons River
WATERBODY ID # : VT11-05
BASIN : 11-Saxtons
WATERBODY TYPE : RIVER SIZE : 18.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	18.4	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	0.1	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE	17 - PATHOGENS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL

WATERBODY NAME : Ball Mtn Brook
WATERBODY ID # : VT11-15
BASIN : 11-West
WATERBODY TYPE : RIVER SIZE : 20.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	16.9
PARTIALLY SUPPORTED	3.1	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	14 - THERMAL MODIFICATION
10 - pH	15 - FLOW ALTERATION
11 - SILTATION	16 - OTHER HABITAT ALTERATIONS
8 - OTHER INORGANICS	17 - PATHOGENS

---------- NONATTAINMENT SOURCES ----------

21 - HARVESTING, RESTORATION	77 - STREAMBANK MODIFICATION
32 - LAND DEVELOPMENT	81 - ATMOSPHERIC DEPOSITION
43 - SURFACE RUN-OFF	83 - HIGHWAY MAINT., RUN OFF
60 - LAND DISPOSAL	87 - RECREATION ACTIVITY
71 - CHANNELIZATION	76 - REMOVAL OF RIPARIAN VEG.

WATERBODY NAME : Winhall River
WATERBODY ID # : VT11-16
BASIN : 11-West
WATERBODY TYPE : RIVER SIZE : 38.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	25.0	FULLY SUPPORTED/THREAT.	3.5
PARTIALLY SUPPORTED	10.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	5 - METALS
10 - pH	11 - SILTATION
14 - THERMAL MODIFICATION	16 - OTHER HABITAT ALTERATIONS
17 - PATHOGENS	15 - FLOW ALTERATION

---------- NONATTAINMENT SOURCES ----------

32 - LAND DEVELOPMENT	62 - WASTEWATER
81 - ATMOSPHERIC DEPOSITION	70 - HYDROMODIFICATION
21 - HARVESTING, RESTORATION	65 - ON-SITE WASTEWATER SYS.
86 - NATURAL	83 - HIGHWAY MAINT., RUN OFF

WATERBODY NAME : Minor Tribs - Upper West
WATERBODY ID # : VT11-18
BASIN : 11-West
WATERBODY TYPE : RIVER SIZE : 23.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	13.0	FULLY SUPPORTED/THREAT.	5.0
PARTIALLY SUPPORTED	4.0	NOT SUPPORTED	1.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	12 - ORGANIC ENRICHMENT/DO
17 - PATHOGENS	11 - SILTATION
15 - FLOW ALTERATION	16 - OTHER HABITAT ALTERATIONS
19 - OIL AND GREASE	

---------- NONATTAINMENT SOURCES ----------

65 - ON-SITE WASTEWATER SYS.	23 - ROAD CONSTRUCTION
32 - LAND DEVELOPMENT	77 - STREAMBANK MODIFICATION
62 - WASTEWATER	74 - FLOW REGULATION
88 - UPSTREAM IMPOUNDMENT	21 - HARVESTING, RESTORATION

WATERBODY NAME : Lower Deerfield River
WATERBODY ID # : VT12-01
BASIN : 12-Deerfield
WATERBODY TYPE : RIVER SIZE : 8.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.5	FULLY SUPPORTED/THREAT.	3.0
PARTIALLY SUPPORTED	1.0	NOT SUPPORTED	3.5

---------- NONATTAINMENT CAUSES ----------

10 - pH	9 - NUTRIENTS
15 - FLOW ALTERATION	12 - ORGANIC ENRICHMENT/DO
17 - PATHOGENS	7 - CHLORINE
5 - METALS	

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	74 - FLOW REGULATION
81 - ATMOSPHERIC DEPOSITION	88 - UPSTREAM IMPOUNDMENT

WATERBODY NAME : Upper Deerfield River
WATERBODY ID # : VT12-03
BASIN : 12-Deerfield
WATERBODY TYPE : RIVER SIZE : 15.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	5.2	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	9.8

---------- NONATTAINMENT CAUSES ----------

11 - SILTATION	10 - pH
15 - FLOW ALTERATION	14 - THERMAL MODIFICATION
12 - ORGANIC ENRICHMENT/DO	

---------- NONATTAINMENT SOURCES ----------

74 - FLOW REGULATION	88 - UPSTREAM IMPOUNDMENT
81 - ATMOSPHERIC DEPOSITION	21 - HARVESTING, RESTORATION

WATERBODY NAME : North Branch Deerfield
WATERBODY ID # : VT12-05
BASIN : 12-Deerfield
WATERBODY TYPE : RIVER SIZE : 36.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 4 6 7

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	12.5	FULLY SUPPORTED/THREAT.	14.0
PARTIALLY SUPPORTED	7.5	NOT SUPPORTED	2.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	14 - THERMAL MODIFICATION
11 - SILTATION	15 - FLOW ALTERATION
10 - pH	16 - OTHER HABITAT ALTERATIONS
12 - ORGANIC ENRICHMENT/DO	5 - METALS

---------- NONATTAINMENT SOURCES ----------

62 - WASTEWATER	30 - CONSTRUCTION
74 - FLOW REGULATION	81 - ATMOSPHERIC DEPOSITION
14 - PASTURE LAND	87 - RECREATION ACTIVITY
2 - MUNICIPAL	63 - LANDFILLS
77 - STREAMBANK MODIFICATION	76 - REMOVAL OF RIPARIAN VEG.

WATERBODY NAME : Sacketts Brook
WATERBODY ID # : VT13-12
BASIN : 13-Connecticut
WATERBODY TYPE : RIVER SIZE : 7.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	4.2	FULLY SUPPORTED/THREAT.	2.0
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	1.3

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE	9 - NUTRIENTS
11 - SILTATION	17 - PATHOGENS
12 - ORGANIC ENRICHMENT/DO	1 - UNKNOWN TOXICITY
22 - NOXIOUS AQUATIC PLANTS	

---------- NONATTAINMENT SOURCES ----------

64 - INDUSTRIAL LAND TREATMENT	61 - SLUDGE
62 - WASTEWATER	65 - ON-SITE WASTEWATER SYS.
2 - MUNICIPAL	

WATERBODY NAME : Western Ompompanoosuc River
WATERBODY ID # : VT14-02
BASIN : 14-Ompompanoosuc
WATERBODY TYPE : RIVER SIZE : 30.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	24.0	FULLY SUPPORTED/THREAT.	1.0
PARTIALLY SUPPORTED	3.5	NOT SUPPORTED	2.0

---------- NONATTAINMENT CAUSES ----------

5 - METALS	10 - pH
17 - PATHOGENS	9 - NUTRIENTS
14 - THERMAL MODIFICATION	11 - SILTATION
12 - ORGANIC ENRICHMENT/DO	16 - OTHER HABITAT ALTERATIONS

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	76 - REMOVAL OF RIPARIAN VEG.
14 - PASTURE LAND	57 - MINE TAILINGS
21 - HARVESTING, RESTORATION	74 - FLOW REGULATION
51 - SURFACE MINING	

WATERBODY NAME : Ompompanoosuc River
WATERBODY ID # : VT14-03
BASIN : 14-Ompompanoosuc
WATERBODY TYPE : RIVER SIZE : 32.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	23.0	FULLY SUPPORTED/THREAT.	6.0
PARTIALLY SUPPORTED	1.5	NOT SUPPORTED	2.0

---------- NONATTAINMENT CAUSES ----------

5 - METALS	10 - pH
12 - ORGANIC ENRICHMENT/DO	16 - OTHER HABITAT ALTERATIONS
14 - THERMAL MODIFICATION	11 - SILTATION
9 - NUTRIENTS	17 - PATHOGENS

---------- NONATTAINMENT SOURCES ----------

51 - SURFACE MINING	57 - MINE TAILINGS
76 - REMOVAL OF RIPARIAN VEG.	88 - UPSTREAM IMPOUNDMENT
11 - NON-IRRIGATED CROP PROD.	14 - PASTURE LAND
21 - HARVESTING, RESTORATION	32 - LAND DEVELOPMENT

WATERBODY NAME : Lower Waits River
WATERBODY ID # : VT14-04
BASIN : 14-Waits
WATERBODY TYPE : RIVER SIZE : 16.3 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	16.2	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	0.1	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL

WATERBODY NAME : Passumpsic Main Stem
WATERBODY ID # : VT15-01
BASIN : 15-Passumpsic
WATERBODY TYPE : RIVER SIZE : 23.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	10.5	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	6.3	NOT SUPPORTED	6.2

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE	16 - OTHER HABITAT ALTERATIONS
11 - SILTATION	17 - PATHOGENS
14 - THERMAL MODIFICATION	3 - PRIORITY ORGANICS
15 - FLOW ALTERATION	20 - TASTE & ODOR

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	63 - LANDFILLS
18 - ANIMAL HOLDING	74 - FLOW REGULATION
88 - UPSTREAM IMPOUNDMENT	

WATERBODY NAME : Joe's Brook
WATERBODY ID # : VT15-02
BASIN : 15-Passumpsic
WATERBODY TYPE : RIVER SIZE : 40.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	28.0	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	10.0	NOT SUPPORTED	2.0

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	15 - FLOW ALTERATION
11 - SILTATION	12 - ORGANIC ENRICHMENT/DO
14 - THERMAL MODIFICATION	

---------- NONATTAINMENT SOURCES ----------

18 - ANIMAL HOLDING	74 - FLOW REGULATION
86 - NATURAL	88 - UPSTREAM IMPOUNDMENT

WATERBODY NAME : Sleepers River
WATERBODY ID # : VT15-04
BASIN : 15-Passumpsic
WATERBODY TYPE : RIVER SIZE : 47.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	46.7	FULLY SUPPORTED/THREAT.	0.2
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	0.1

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	16 - OTHER HABITAT ALTERATIONS
4 - NON-PRIORITY ORGANICS	19 - OIL AND GREASE
5 - METALS	14 - THERMAL MODIFICATION
15 - FLOW ALTERATION	

---------- NONATTAINMENT SOURCES ----------

74 - FLOW REGULATION	84 - SPILLS
88 - UPSTREAM IMPOUNDMENT	

WATERBODY NAME : Upper Minor Tribs - Passumpsic River
WATERBODY ID # : VT15-05
BASIN : 15-Passumpsic
WATERBODY TYPE : RIVER SIZE : 35.2 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	34.9	FULLY SUPPORTED/THREAT.	0.1
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	0.2

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	4 - NON-PRIORITY ORGANICS
11 - SILTATION	16 - OTHER HABITAT ALTERATIONS

---------- NONATTAINMENT SOURCES ----------

63 - LANDFILLS	23 - ROAD CONSTRUCTION

WATERBODY NAME : East Branch Passumpsic
WATERBODY ID # : VT15-08
BASIN : 15-Passumpsic
WATERBODY TYPE : RIVER SIZE : 38.6 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	28.0	FULLY SUPPORTED/THREAT.	8.6
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	2.0

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	4 - NON-PRIORITY ORGANICS
11 - SILTATION	16 - OTHER HABITAT ALTERATIONS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	21 - HARVESTING, RESTORATION
23 - ROAD CONSTRUCTION	82 - WASTE STORAGE, TANK LEAKS

WATERBODY NAME : Moose River
WATERBODY ID # : VT15-09
BASIN : 15-Passumpsic
WATERBODY TYPE : RIVER SIZE : 60.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	50.5	FULLY SUPPORTED/THREAT.	8.8
PARTIALLY SUPPORTED	0.7	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

5 - METALS	12 - ORGANIC ENRICHMENT/DO
9 - NUTRIENTS	20 - TASTE & ODOR
10 - pH	21 - SUSPENDED SOLIDS
11 - SILTATION	

---------- NONATTAINMENT SOURCES ----------

41 - STORM SEWERS	64 - INDUSTRIAL LAND TREATMENT
65 - ON-SITE WASTEWATER SYS.	81 - ATMOSPHERIC DEPOSITION

WATERBODY NAME : Moore Impoundment
WATERBODY ID # : VT16-04
BASIN : 16-Connecticut
WATERBODY TYPE : RIVER SIZE : 12.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	2.5	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	9.5

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	15 - FLOW ALTERATION
11 - SILTATION	20 - TASTE & ODOR
12 - ORGANIC ENRICHMENT/DO	22 - NOXIOUS AQUATIC PLANTS
14 - THERMAL MODIFICATION	

---------- NONATTAINMENT SOURCES ----------

1 - INDUSTRIAL	11 - NON-IRRIGATED CROP PROD.
74 - FLOW REGULATION	88 - UPSTREAM IMPOUNDMENT
18 - ANIMAL HOLDING	

WATERBODY NAME : Comerford Impoundment
WATERBODY ID # : VT16-05
BASIN : 16-Connecticut
WATERBODY TYPE : RIVER SIZE : 7.1 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	1.8	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	5.3

---------- NONATTAINMENT CAUSES ----------

9 - NUTRIENTS	15 - FLOW ALTERATION
11 - SILTATION	20 - TASTE & ODOR
12 - ORGANIC ENRICHMENT/DO	22 - NOXIOUS AQUATIC PLANTS
14 - THERMAL MODIFICATION	17 - PATHOGENS

---------- NONATTAINMENT SOURCES ----------

11 - NON-IRRIGATED CROP PROD.	74 - FLOW REGULATION
88 - UPSTREAM IMPOUNDMENT	18 - ANIMAL HOLDING

WATERBODY NAME : Canaan Direct Tribs
WATERBODY ID # : VT16-08
BASIN : 16-Connecticut
WATERBODY TYPE : RIVER SIZE : 14.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 4

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	13.4	FULLY SUPPORTED/THREAT.	0.1
PARTIALLY SUPPORTED	1.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

4 - NON-PRIORITY ORGANICS	3 - PRIORITY ORGANICS
11 - SILTATION	16 - OTHER HABITAT ALTERATIONS

---------- NONATTAINMENT SOURCES ----------

21 - HARVESTING, RESTORATION	64 - INDUSTRIAL LAND TREATMENT
83 - HIGHWAY MAINT., RUN OFF	86 - NATURAL

WATERBODY NAME : East Branch - Nulhegan
WATERBODY ID # : VT16-10
BASIN : 16-Connecticut
WATERBODY TYPE : RIVER SIZE : 13.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	11.0
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	2.0

---------- NONATTAINMENT CAUSES ----------

11 - SILTATION	15 - FLOW ALTERATION
16 - OTHER HABITAT ALTERATIONS	

---------- NONATTAINMENT SOURCES ----------

21 - HARVESTING, RESTORATION	23 - ROAD CONSTRUCTION

WATERBODY NAME : Nulhegan River
WATERBODY ID # : VT16-11
BASIN : 16-Connecticut
WATERBODY TYPE : RIVER SIZE : 64.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	0.0	FULLY SUPPORTED/THREAT.	60.5
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	4.0

---------- NONATTAINMENT CAUSES ----------

11 - SILTATION
15 - FLOW ALTERATION
16 - OTHER HABITAT ALTERATIONS

---------- NONATTAINMENT SOURCES ----------

21 - HARVESTING, RESTORATION
23 - ROAD CONSTRUCTION

WATERBODY NAME : Maidstone-Guildhall Direct Drainage
WATERBODY ID # : VT16-14
BASIN : 16-Connecticut
WATERBODY TYPE : RIVER SIZE : 18.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	17.2	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	0.8

---------- NONATTAINMENT CAUSES ----------

11 - SILTATION

---------- NONATTAINMENT SOURCES ----------

32 - LAND DEVELOPMENT
51 - SURFACE MINING

WATERBODY NAME : Lake Memphremagog Direct
WATERBODY ID # : VT17-01
BASIN : 17-Memphremagog
WATERBODY TYPE : RIVER SIZE : 5.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 4 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	1.0	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	4.5

---------- NONATTAINMENT CAUSES ----------

6 - AMMONIA	17 - PATHOGENS
9 - NUTRIENTS	21 - SUSPENDED SOLIDS
11 - SILTATION	12 - ORGANIC ENRICHMENT/DO

---------- NONATTAINMENT SOURCES ----------

18 - ANIMAL HOLDING

WATERBODY NAME : Tomifobia River
WATERBODY ID # : VT17-02
BASIN : 17-Memphremagog
WATERBODY TYPE : RIVER SIZE : 9.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	8.0	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	1.0

---------- NONATTAINMENT CAUSES ----------

6 - AMMONIA	21 - SUSPENDED SOLIDS
11 - SILTATION	12 - ORGANIC ENRICHMENT/DO
17 - PATHOGENS	

---------- NONATTAINMENT SOURCES ----------

18 - ANIMAL HOLDING	2 - MUNICIPAL

WATERBODY NAME : Coaticook River
WATERBODY ID # : VT17-03
BASIN : 17-Memphremagog
WATERBODY TYPE : RIVER SIZE : 37.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	28.1	FULLY SUPPORTED/THREAT.	0.0
PARTIALLY SUPPORTED	8.4	NOT SUPPORTED	0.5

---------- NONATTAINMENT CAUSES ----------

11 - SILTATION	12 - ORGANIC ENRICHMENT/DO
16 - OTHER HABITAT ALTERATIONS	14 - THERMAL MODIFICATION
15 - FLOW ALTERATION	

---------- NONATTAINMENT SOURCES ----------

23 - ROAD CONSTRUCTION	74 - FLOW REGULATION
88 - UPSTREAM IMPOUNDMENT	

WATERBODY NAME : Lower Clyde River
WATERBODY ID # : VT17-04
BASIN : 17-Clyde
WATERBODY TYPE : RIVER SIZE : 32.0 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 6

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	22.8	FULLY SUPPORTED/THREAT.	5.2
PARTIALLY SUPPORTED	0.0	NOT SUPPORTED	4.0

---------- NONATTAINMENT CAUSES ----------

1 - UNKNOWN TOXICITY	9 - NUTRIENTS
14 - THERMAL MODIFICATION	12 - ORGANIC ENRICHMENT/DO
15 - FLOW ALTERATION	17 - PATHOGENS
16 - OTHER HABITAT ALTERATIONS	20 - TASTE & ODOR

---------- NONATTAINMENT SOURCES ----------

74 - FLOW REGULATION	83 - HIGHWAY MAINT., RUN OFF
88 - UPSTREAM IMPOUNDMENT	66 - HAZARDOUS WASTE
11 - NON-IRRIGATED CROP PROD.	32 - LAND DEVELOPMENT
18 - ANIMAL HOLDING	76 - REMOVAL OF RIPARIAN VEG.
65 - ON-SITE WASTEWATER SYS.	77 - STREAMBANK MODIFICATION

WATERBODY NAME : Upper Clyde River
WATERBODY ID # : VT17-05
BASIN : 17-Cylde
WATERBODY TYPE : RIVER SIZE : 43.1 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1 2

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	35.8	FULLY SUPPORTED/THREAT.	5.5
PARTIALLY SUPPORTED	1.8	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

7 - CHLORINE	14 - THERMAL MODIFICATION
9 - NUTRIENTS	11 - SILTATION
12 - ORGANIC ENRICHMENT/DO	15 - FLOW ALTERATION
16 - OTHER HABITAT ALTERATIONS	17 - PATHOGENS

---------- NONATTAINMENT SOURCES ----------

2 - MUNICIPAL	88 - UPSTREAM IMPOUNDMENT
18 - ANIMAL HOLDING	21 - HARVESTING, RESTORATION
23 - ROAD CONSTRUCTION	74 - FLOW REGULATION

WATERBODY NAME : Lower Black River
WATERBODY ID # : VT17-09
BASIN : 17-Black
WATERBODY TYPE : RIVER SIZE : 24.5 STREAM MILES

ASSESSMENT DATE : 8801 ASSESSMENT TYPE : 1

---------- USE SUPPORT SIZE UNITS IN STREAM MILES ----------

FULLY SUPPORTED	21.4	FULLY SUPPORTED/THREAT.	0.1
PARTIALLY SUPPORTED	3.0	NOT SUPPORTED	0.0

---------- NONATTAINMENT CAUSES ----------

3 - PRIORITY ORGANICS	4 - NON-PRIORITY ORGANICS
5 - METALS	8 - OTHER INORGANICS
11 - SILTATION	16 - OTHER HABITAT ALTERATIONS

---------- NONATTAINMENT SOURCES ----------

63 - LANDFILLS	51 - SURFACE MINING

Appendix 3.

Vermont 1988 Lake Water Quality Assessment

VERMONT
LAKE WATER QUALITY ASSESSMENT
1988

Agency of Natural Resources
Department of Environmental Conservation
Water Quality Division
Waterbury, Vermont

Table of Contents

Tables and Figures

Vermont Lakes and Ponds Program

The primary objective of Vermont's Lakes and Ponds Program is to assure that the maximum sensible recreational potential of every Vermont lake is achieved and maintained. The program has four major elements: (1) monitoring and surveillance, (2) special studies, (3) management and restoration, and (4) protection. Each of these elements will be discussed in more detail in the following sections.

(1) Monitoring and Surveillance

There are six basic monitoring programs in Vermont that together provide information on lake nutrient enrichment, algal and macrophyte productivity, water clarity, Eurasian milfoil populations, bacteriological contamination, and the effects of acid precipitation on acid-sensitive lakes.

Under the Spring Phosphorus Program, up to 75 lakes are sampled for total phosphorus concentration once in the spring shortly after ice-out. Multiple cores of water are collected at 2-3 stations on each lake to determine the average phosphorus concentration for the lake. Nearly 200 lakes have been sampled at least one spring since 1977, and more than 100 lakes have been sampled for three or more years. A core of 36 lakes have ten or more years of data. This program provides the majority of the information used to determine the trophic status of Vermont's lakes and identifies potential problem lakes with elevated or increasing nutrient levels.

Under the Lay Monitoring Program, local residents are equipped and trained to collect lake water quality data weekly during the summer. Secchi disk transparency and chlorophyll-a data is obtained from all lakes participating in the advanced program. Total phosphorus data is collected on some lakes as well. Since the initiation of the program in 1979, more than 60 lakes and 28 stations on Lake Champlain have been sampled at least one summer. Approximately 45 lakes and 26 Lake Champlain stations have five or more years of data. This program provides direct information regarding the summer productivity and water quality of sampled lakes. The baseline data collected on each lake will be useful in documenting future changes in lake water quality.

Under the Aquatic Plant Survey Program, detailed qualitative aquatic macrophyte surveys are conducted on selected lakes and areas of Lake Champlain from mid-June to early September each year. All of the species present are identified and mapped with an indication of density and extent of cover. Due to the fact that Lake Champlain has 380 miles of shoreline in Vermont, plant surveys on Lake Champlain have generally been restricted to mapping and describing the location of only nuisance levels of macrophyte growth. Selected high use areas of the lake have been surveyed more thoroughly, however. Detailed aquatic plant surveys have been completed on 90 lakes and 15 major areas of Lake Champlain since 1982. These surveys will be useful in documenting future changes in both the extent and the species composition of aquatic plant communities in Vermont's lakes.

The Aquatic Plant Survey Program has given special emphasis to Eurasian milfoil in recent years. Lakes with known milfoil infestations have been surveyed periodically to document the spread of this nuisance species, and uninfested lakes in the vicinity of known infestations have been searched for milfoil plants. In addition, a statewide Milfoil Watchers Program has been established under the auspices of Vermont's Eurasian Milfoil Control Program. Through the Milfoil Watchers Program, volunteers are trained in milfoil identification and search techniques and pledge to watch for milfoil on a presently uninfested lake. It is hoped that this program and the searches conducted by state personnel will allow the discovery of new milfoil infestations early enough to make eradication possible.

Under the Cooperative Bacteriological Sampling Program, a limited number of lakes are sampled during July and August each year for near-shore fecal coliform bacteria levels. Local volunteers are used to sample shoreline areas where poorly functioning or failing septic systems may be found. Sites with elevated bacteria counts are resampled and investigated further if high counts persist. This program serves the dual purpose of involving lake residents in the monitoring of septic systems and ensuring that the existing high bacteriological quality of Vermont's lakes is maintained.

Under the Acid Precipitation Program, chemical and biological data is collected on lakes located in low alkalinity (acid-sensitive) regions of the state to monitor the effects of acid deposition on Vermont's lakes. Nearly 200 lakes statewide were surveyed during the winters of 1980-1982 to identify

the acid-sensitive areas of the state. Thirty-six lakes in these areas are now included in the Long-term Lake Monitoring Program. Twelve lakes are sampled four times every year for several chemical parameters. The remaining 24 lakes are sampled four times per year, every other year. Biological sampling including fisheries and macroinvertebrate populations is also being conducted on some of the lakes. The information collected through the Acid Precipitation Program is being used to document the harmful effects of acid precipitation on Vermont's acid sensitive lakes. There are 107 lakes in Vermont considered to be threatened by acid precipitation. Of these, six are already impacted by high acidity. Until the sources of acid precipitation have been corrected, it is not anticipated that any attempt will be made to mitigate its impact on these lakes.

The six basic monitoring and surveillance programs described above are on-going programs that will be continued until there is no further need for the information being collected or until a change in priorities dictates a change in program emphasis.

(2) Special Studies

Special studies are conducted as part of Vermont's Lakes and Ponds Program for a wide variety of reasons, but they can be generally categorized into three classes - diagnostic studies, lake modelling studies, and planning and management studies.

Diagnostic studies are initiated on selected lakes to diagnose a cause when water quality problems have been experienced or a change in water quality has been detected. Federally-funded Clean Lakes Program diagnostic studies have been completed on three lakes in Vermont - Lake Morey in Fairlee, Harvey's Lake in Barnet, and Lake Iroquois in Hinesburg. State-funded diagnostic studies of more limited scope have been completed on Lower Orange Reservoir in Orange, Inman Pond in Fair Haven, Lake Pinneo in Hartford and Silver Lake in Barnard. In every case, causes have been determined and recommendations for management or restorative action have resulted from the studies. In response to a need for state-funded full scale diagnostic studies, a comprehensive study is currently in progress on Fairfield Pond in Fairfield, Vermont, using local volunteer samplers. If this volunteer approach is successful, low cost state-funded full scale

diagnostic studies may be attempted on other qualified lakes. Presently, limited assistance can be given to no more than one to two lakes at a time over a two to three year period. This situation is expected to continue unless additional funding becomes available for supplemental full-time staff.

Where point source nutrient discharges presently exist or may be anticipated in the future, special lake modelling studies are undertaken to assess the water quality impact of the discharge(s). Modelling studies have been conducted on several Lake Champlain embayments including St. Albans Bay, where a municipal discharge was expanded and upgraded; Burlington Bay, where combined sewer overflows and nearby municipal discharges are scheduled for separation, and expansion and upgrading, respectively; Hawkins Bay, where a fish hatchery discharge was anticipated; and Shelburne Bay, where three municipal discharges are scheduled for expansion and upgrading. Lake Memphremagog was also studied prior to the upgrade of the Newport City wastewater treatment facility, as was Arrowhead Mountain Lake before and after the construction of a whey processing plant discharge. The purpose of these modelling studies is to assure that Vermont Water Quality Standards are not being and will not be violated by the discharges, and that undue adverse impacts will not occur.

Special planning and management studies are initiated in Vermont when additional data is required to make informed management decisions. In response to recent concerns regarding possibly dangerous levels of toxic substances in Lake Champlain fish, a special Fish Tissue Monitoring Program has been developed to assess the existence and/or extent of toxic contamination in fish tissue in the lake. Following the monitoring program, corrective action will be taken where appropriate to control sources, and health advisories will be issued if deemed necessary. Toxic pollutants are not considered to be a significant problem in other Vermont lakes, and no other statewide toxic contamination survey specific to lakes is planned at this time.

Management decisions for Lake Champlain are made particularly difficult by the size and complexity of the lake and the lack of current lakewide nutrient budget information. A Lake Champlain Eutrophication Management Study has recently been proposed to gather data on nutrient sources to the lake and in-lake responses over a two year period. The information collected

during this time would then be used to develop broad based phosphorus management policies for Lake Champlain as well as segment-specific eutrophication standards and phosphorus allocations to assure that the water quality of each portion of the lake and the lake as a whole is protected. The recent loss of Clean Lakes Program funding has caused this proposal to be temporarily suspended. State funding alone is not sufficient to undertake a study of this magnitude. A piecemeal nutrient budget approach conducted over several years with small yearly funding allotments would introduce an unacceptable number of between-year and time variables into the process. The entire project will therefore be pursued when adequate funding becomes available.

To date, most of the lake modelling studies conducted on Lake Champlain have focused on the impact of discharges on open water lake water quality. However, near-shore periphyton growth is a recognized problem in some areas of the lake, and a method is needed to relate periphyton growth to lake water quality, thereby enabling a prediction of the impact of nutrient discharges on periphyton growth. A special periphyton study was initiated on Lake Champlain in 1987 to collect lake water quality and periphyton data and determine whether a relationship exists. The data is presently being analyzed and additional data may be necessary before a practical method can be developed to predict periphyton response to changes in lake water nutrient levels. When ultimately developed, the periphyton model will be used in conjunction with the special lake modelling studies described earlier in this report to determine and assure compliance with Vermont's Water Quality Standards.

The protection of existing and potential lake uses has received a considerable amount of emphasis, both federally and in Vermont, in recent years. However, very little information is available in the literature relating lake uses with lake water quality. Thus, management decisions regarding the protection of lake uses such as swimming, boating and aesthetic value are being made without a scientific basis. A lake user perception survey was conducted in Vermont in 1987 to determine how the recreational users of Vermont's lakes perceive various lake water quality conditions. The water quality data and simultaneous user opinions collected in 1987 are being analyzed to develop a relationship between lake water quality

and Vermont user satisfaction. It is hoped that the resulting relationship will provide a more scientific basis for determining compliance with water quality standards and enable true protection of lake uses in Vermont.

The rapid spread of Eurasian milfoil in Vermont and the associated severe impairment of recreational uses in heavily infested lakes has made the development of satisfactory milfoil management techniques a top priority of the Lakes and Ponds Program in recent years. Under the auspices of Vermont's Eurasian Milfoil Control Program, special demonstration projects are being conducted within the state to assess the effectiveness of various milfoil management techniques. Lake water level drawdown was attempted unsuccessfully on one lake, several types of bottom barriers are currently being studied, and a very large scale mechanical harvesting project may be initiated on one lake in 1989. More limited mechanical harvesting has been shown to be unsuccessful once an infestation becomes severe in a large lake. Other mechanical control methods such as rotavating and hydroraking may be attempted in Vermont in 1988. Biological control methods such as grass carp and possible chemical controls are also being considered for use in Vermont on a demonstration/special study basis. The results of these special milfoil demonstration projects help guide overall lake management recommendations for Eurasian milfoil control in Vermont.

The special studies described above were in existence or were planned as of December 1987. This element of the Lakes and Ponds Program is very dynamic with most studies having a fairly short life span and new studies being continually developed as the need arises and funding becomes available.

(3) Management and Restoration

Once the cause of a lake's water quality problem has been identified, there are two possible courses of action. Either a feasibility study is initiated to gather information and determine what management or restoration measures would be appropriate, or management or restoration activities may immediately be recommended if a study is not warranted. In Vermont, a distinction is made between aquatic nuisance management activities and lake restoration activities. Management activities are those control measures that manage a nuisance but do nothing to eliminate the source of the

nuisance. Restoration activities are aimed at eliminating the source of a problem in order to achieve long-term benefits.

Aquatic nuisance management activities in Vermont are almost exclusively used to control excessive rooted macrophyte growth. When several alternative plant control methods are possible on a lake, a feasibility study is conducted by state personnel to determine the best alternative(s). Financial assistance is then available to municipalities through the Aquatic Nuisance Control Program if needed for the implementation of recommended lake management activities. To date, fourteen municipalities have received assistance under this program. In addition, the U.S. Army Corps of Engineers and the State of Vermont cooperate in funding the Lake Champlain Aquatic Nuisance Control Program to manage water chestnut and Eurasian milfoil growth in portions of Lake Champlain. Management techniques such as copper sulfate treatments for the control of excessive algae growth are rarely used in Vermont. Rather, it is generally recommended that the cause of nuisance algal growth be controlled before any management measures are implemented.

Lake restoration activities have been undertaken on several Vermont lakes, and recommendations for lake restoration have been developed for several others. Funding for lake restoration activities may include federal, state, or local sources, or a combination of these. Lake Morey, in Fairlee, Vermont, underwent an alum treatment in May of 1986 as part of a federal, state, and locally funded Clean Lakes Program restoration project. Significant water quality improvements resulted from the treatment, although fish populations may now be suffering due to the decline in lake productivity. The U.S. Soil Conservation Service and local farmers have been instrumental in lake restoration activities in Vermont through the implementation of best management practices on agricultural land in lake watersheds. Lake Parker, Lake Carmi, Lake Iroquois, Lake Memphremagog and Lake Champlain have all benefited from Soil Conservation Service programs in recent years. In addition, an erosion control plan is currently being developed for the Silver Lake watershed in Barnard, Vermont, by the staff of the George D. Aiken Resource Conservation and Development Area. The Town of Barnard and the Silver Lake Association will implement the completed plan. State-funded restoration projects are being conducted on two lakes where early infestations of Eurasian milfoil were discovered in 1987. An

immediately implemented project involving hand pulling and bottom barriers, combined with continued surveillance for several years, may have already eliminated Eurasian milfoil from Black Pond in Hubbardton. A similar project is being planned for Sunrise Lake in Benson for 1988 in an attempt to eradicate milfoil from that lake as well.

The implementation of lake restoration activities requires a strong local commitment in addition to federal and state financial and technical assistance. Lake restoration recommendations have been developed for several lakes including Harvey's Lake in Barnet and Lake Iroquois in Hinesburg, only to be shelved due to a lack of local initiative to complete the projects. In the future, lake diagnostic and feasibility studies will only be initiated on lakes where there is a high likelihood that recommended actions will be implemented in a timely manner.

Lake management and restoration activities are often complex and very expensive. A continued partnership of federal, state and local resources for both technical and financial assistance is imperative for the successful implementation of these activities.

(4) Protection

Vermont is fortunate to have only a limited number of lakes which do not presently meet water quality standards and are in need of extensive lake management or lake restoration work. However, the 1987 lake assessment data presented in Table II (Appendix B) indicates that the water quality of 62 percent of Vermont's lakes that currently fully support their uses is threatened. If the present high water quality of these lakes is to be maintained, effective broad-based lake protection measures must be implemented soon to generally reduce common threats, and lake-specific protection measures must be developed for priority lake watersheds.

To date, lake protection has been addressed only on a general scale in Vermont, using a three pronged approach of monitoring and surveillance, education, and regulation. The monitoring and surveillance programs described earlier in this report are an important part of lake protection. The early detection of a water quality problem often leads to a simpler, less expensive and more effective solution. By the time a problem becomes visible to lake users, corrective measures are often expensive and may not

even be feasible. Although Vermont's monitoring programs are fairly extensive for a small state, the 1987 lake assessment data showed that only 35 percent of Vermont's lakes were actually monitored from 1983-1987. These lakes do reflect 96 percent of the total acreage of Vermont's lakes, indicating the emphasis placed on monitoring larger lakes, particularly Lake Champlain, when funding is limited. However, the smaller Vermont lakes are an important resource worthy of protection, and monitoring and surveillance programs should include these lakes as well.

Education plays a critical role in lake protection. Public awareness and cooperation can result in the widespread implementation of lake protection measures that are difficult or impossible to achieve through any other means. Two Lake Protection Conferences were held in Vermont in 1982, a movie on Lake Eutrophication and a slide/tape show on Lake Protection are available to the public, a slide show on Eurasian milfoil is currently being developed, numerous brochures are available on topics ranging from septic system maintenance to Eurasian milfoil control, periodic newsletters are distributed by the Lay Monitoring Program and the Eurasian Milfoil Control Program, newspaper articles and radio and television spots appear statewide every summer, metal signs have been placed at all lake access areas warning boaters to control the spread of aquatic plants, and the Department of Environmental Conservation staff prepares exhibits and talks for many public meetings each year. However, despite these efforts, a large number of citizens continue to make uninformed decisions that threaten the water quality of Vermont's lakes. Educational programs must be continued and expanded to reach more people involved with lake management in Vermont. This is particularly true in the area of shoreland management, where no comprehensive statewide program presently exists. Education and technical assistance is urgently needed to encourage the development and implementation of effective shoreland protection measures at the state, regional, local and individual level.

Vermont has several regulatory programs that provide protection to lakes. The underlying basis to most of these programs is the Vermont Water Quality Standards, which generally prohibit activities that will result in an undue adverse impact on the quality of the State's waters. Permits are required under Title 10 V.S.A., Chapter 47, to discharge waste, either

directly or indirectly, into Vermont's lakes. Permits are also required under Title 29 V.S.A., Chapter 11, for encroachments into public lakes. The introduction of chemicals to waters of the state to control nuisance aquatic conditions requires a permit under Title 10 V.S.A., Chapter 37, as does the control of nuisance aquatic plant growth by powered mechanical devices or bottom barrier materials. Legislation currently under consideration in the Vermont legislature would make the transport of Eurasian milfoil to or from lakes illegal. Other statewide regulatory measures that protect lakes either directly or indirectly include Vermont's Land Use and Development Law (Act 250), the Department of Environmental Conservation's Environmental Protection Regulations, and a ban on the sale of phosphorus-containing detergents in Vermont. The Department of Environmental Conservation is currently developing Indirect Discharge Regulations, Groundwater Protection Regulations, Wetland Regulations and other rules and procedures that will provide additional protection to lakes. The Water Resources Board also has jurisdiction over lake water levels and surface use under Title 10 V.S.A., Chapter 37 and Chapter 49.

Although considerable statutory and regulatory controls exist in Vermont to protect lake water quality, many of these controls are inadequate to address the accelerating development and pollution pressures now facing Vermont's lakes. Proposed changes to Vermont's statutes are currently being prepared for future legislative consideration to afford special protection to Vermont's lakes and shorelands.

The lake protection programs described above all approach lake protection from a general, statewide perspective. The need for lake protection programs specific to lakes is not currently being met in Vermont. In order to meet this need, additional lake assessment data must first be obtained, a lake protection classification system must be developed, and Vermont's lakes must be prioritized for lake protection measures. Significant progress in this direction will only be possible if additional funding is forthcoming for lake assessment and classification activities. Once priority lakes have been identified, a technical assistance program will be needed to assist regional and local planners in the development of comprehensive watershed protection programs for threatened lakes.

Due to its large size and tremendous recreational value, Lake Champlain has already been identified as a high priority for lake protection measures. The state environmental agencies in New York and Vermont are presently developing a Cooperative Lake Agreement that will provide guidance for management and protection programs on Lake Champlain in the future. It is hoped that interstate cooperation and a renewed emphasis on the issues affecting the water quality of Lake Champlain will result in a comprehensive watershed management plan for Vermont's largest lake.

Lake Identification and Classification Survey - 1988

The Vermont Lakes and Ponds Program provides the structural framework for the sound management of the state's lakes and ponds. Program priorities are reviewed on a periodic basis and alterations are made when needed to address new or changing issues. The prioritization of lakes within these programs, however, has only been occasionally reviewed on a statewide basis.

The first Vermont Lake Classification Survey, completed in December 1980, summarized lake water quality and watershed land use data for the majority of the state's lakes larger than fifteen acres in size. A ranking system was created to prioritize the lakes for restoration purposes, and sixteen lakes were designated as high priority for lake restoration projects. Lake restoration efforts in Vermont since 1980 have been largely guided by the findings and recommendations of the Lake Classification Survey.

Table I outlines the present status of the sixteen high priority lakes listed in the 1980 Lake Classification Survey. Lake restoration has been found to be a lengthy and costly process, but some progress has been made. Significant improvements can be seen in the water quality of Lake Parker, in Glover, and Lake Morey, in Fairlee. Lake Champlain and Lake Memphremagog have benefited from extensive work by the U.S. Soil Conservation Service on farms in their watersheds, as well as from the upgrade of discharging municipal wastewater treatment facilities to tertiary treatment and phosphorus removal. Lake Carmi is being monitored to determine the impact of recently implemented Soil Conservation Service agricultural best management practices on nine farms in its watershed. Unfortunately, not all the news has been good. New infestations of Eurasian milfoil, a non-native nuisance aquatic plant, have significantly impaired the use of several high

Table I

1988 Status of Lakes Listed as High Priority for Restoration in 1980

Lake	Basic WQ Study	Diagnostic Study	Restoration Project	Management Project	Present WQ Status
Lake Carmi	Completed		SCS watershed project completed	Aquatic Plant Harvesting (APH) in progress	Uses not supported due to plant and algae growth and bacteria levels. Success of restoration project yet to be determined.
Cedar Lake	Completed				Native plant growth impairs part of lake. Lake is threatened by Eurasian milfoil in nearby lake.
Curtis Pond	Limited data available				Uses impaired by native plants and algae in part of lake. Eurasian milfoil from nearby lake is a threat.
Lake Elmore	Completed			Limited APH in progress	Native plant growth impairs part of lake; otherwise uses supported.
Fairfield Pond	Completed	In progress			Declining - Uses not supported due to algae growth, some plant growth.
Harvey's Lake	Completed	Completed	Proposed		Uses impaired by algae and some native plants. Restoration project needs local support to proceed.
Lake Hortonia	Completed			APH in progress	Declining - Eurasian milfoil impairs portions of lake, threatens entire lake.
Lake Iroquois	Completed	Completed	Some SCS work completed; additional work proposed		Plant and algae growth impair uses. Restoration project needs local support to proceed.

Table I (continued)

Lake	Basic WQ Study	Diagnostic Study	Restoration Project	Management Project	Present WQ Status
Lake Morey	Completed	Completed	Alum treatment completed	APH in progress	Improving - Restoration project successful to date.
Lake Parker	Completed		SCS watershed project completed	APH in progress	Improving - Restoration project successful and plant growth has been reduced.
Lake St. Catherine	Completed			APH in progress	Declining - Eurasian milfoil impairs portion of lake, threatens entire lake.
Shelburne Pond	On-going		Some SCS watershed work completed		Uses not supported due to extensive plant and algae growth, summer fish kill in 1985.
Star Lake	Completed				Native plant growth impairs small portion of lake, otherwise uses supported.
Lake Winona	Completed				Eurasian milfoil impairs portion of lake. Lakewide winter fish kills occur - of natural origin.
Lake Champlain	On-going	Modelling study proposed	SCS watershed projects in progress; 3° STP upgrades in progress	APH in selected areas	Eurasian milfoil impairs portion of lake. Point sources impair portions. Much of lake is threatened.
Lake Memphremagog	On-going	Modelling study completed	SCS watershed projects in progress; 3° STP upgrade completed		Eurasian milfoil impairs portion of lake, threatens other areas.

priority lakes since 1980, and many more lakes are threatened. To date, management projects have proved unsatisfactory in slowing the spread or alleviating the impact of milfoil in Vermont.

In June of 1987, the Department of Environmental Conservation determined that accelerating development and pollution pressures and the rapid spread of Eurasian milfoil in Vermont had made the 1980 Lake Classification Survey too obsolete to merely be updated to comply with the expanded lake assessment requirements included in the reauthorized Clean Water Act. The decision was made to undertake a major new lake assessment effort in order to prepare this 1988 Lake Water Quality Assessment Report.

The first step of the 1987 lake assessment project was the development of a computerized Lakes and Ponds Inventory data base incorporating lake and watershed data that was readily available from Department of Environmental Conservation reports and files. A considerable amount of basic lake water quality data collected since the 1980 classification survey was entered into the inventory during this step. The second step of the project involved the acquisition of new information from a wide variety of professionals and lay persons regarding lake uses; existing lake water quality; existing use impairments; and pollution threats, causes and sources. This was accomplished through the distribution of Lake Assessment Questionnaires (Appendix A). All questionnaires returned by December 31, 1987, were evaluated and the information was incorporated into the Lakes and Ponds Inventory. Information from questionnaires received in 1988 or later will be held for inclusion in the 1990 Lake Water Quality Assessment. The following 1988 lake water quality assessment is based on information obtained during the 1987 lake assessment project.

There are 719* significant lakes and ponds in Vermont, totalling 229,146 acres. Table II (Appendix B) provides a list of these lakes, with the official name and location of each lake and the latitude and longitude of the outlet of the lake. The outlet was chosen as the identifying location since this site could be more accurately determined than the approximate center of the lake which was requested in the Environmental Protection Agency's guidance document.

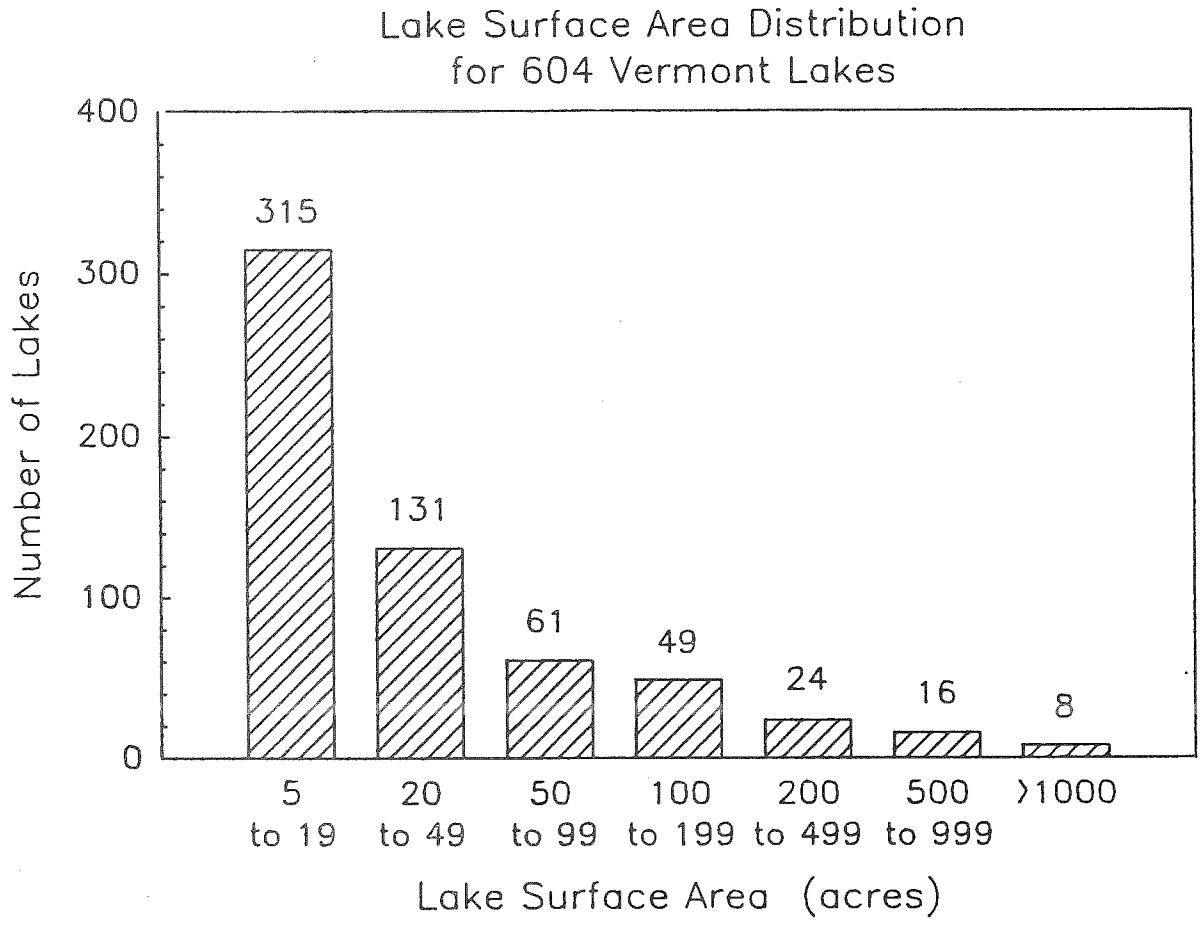
* This includes 11 segments of Lake Champlain and 2 segments of Lake Memphremagog (Lake Memphremagog and South Bay) as distinct lakes.

A lake is considered significant in Vermont if it is included on the Vermont Lakes and Ponds Inventory. The criteria for inclusion is all lakes and ponds greater than or equal to five acres in size, and all lakes and ponds smaller than five acres that are specifically named on the most recent U.S. Geological Survey topographic maps. There are 604 lakes at least five acres in size in Vermont, and 289 lakes twenty acres or larger (Figure I). There are 115 lakes less than five acres in size included on the Inventory.

Table II indicates whether a significant lake is presently public or private. Fifty-seven percent of Vermont's lakes (409 lakes) are known to be public waters. Only nine percent of the lakes (68 lakes) are known to be private. The status of 242 lakes is presently unknown. Public waters in Vermont include any natural lake at least twenty acres in size, and any lake, natural or artificial, regardless of size, having more than one adjoining landowner. Private waters, and public waters with little public use, are still considered significant in Vermont for several reasons. First, the State has regulatory jurisdiction over these waters in many areas such as the application of chemicals for the control of aquatic nuisances. In addition, land ownership and public use patterns are changing rapidly in the state. As lakefront property continues to rise in value, private waters may become public with the sale of shoreland property, and lakes that are rarely used now may become much more popular. It is imperative that all of these lakes be assessed and included in Vermont's management and protection programs to insure that their water quality will meet the needs of future generations. The inclusion of these lakes will also allow the lake assessment information to be used to establish priorities for public land acquisition on lakes that are currently private waters. Improved public access to lakes is one of the goals of the 1988 Vermont Recreation Plan.

The Department of Environmental Conservation collected information regarding the present level of public use of the state's significant lakes and ponds during the 1987 lake assessment project. However, this information has not yet been compiled and entered on the Lakes and Ponds Inventory, and therefore is not included on Table II. The amount of public use is one factor considered when lakes are prioritized for lake restoration and protection activities in Vermont.

FIGURE I


Lake Surface Area Distribution
for 604 Vermont Lakes
Number of Lakes
400
300
200
100
0
315
131
61
49
24
16
8
5 to 19
20 to 49
50 to 99
100 to 199
200 to 499
500 to 999
>1000
Lake Surface Area (acres)

When known, a lake's trophic condition is listed in Table II. Trophic state was determined on 130 lakes using water quality data collected since 1983, according to the following criteria:

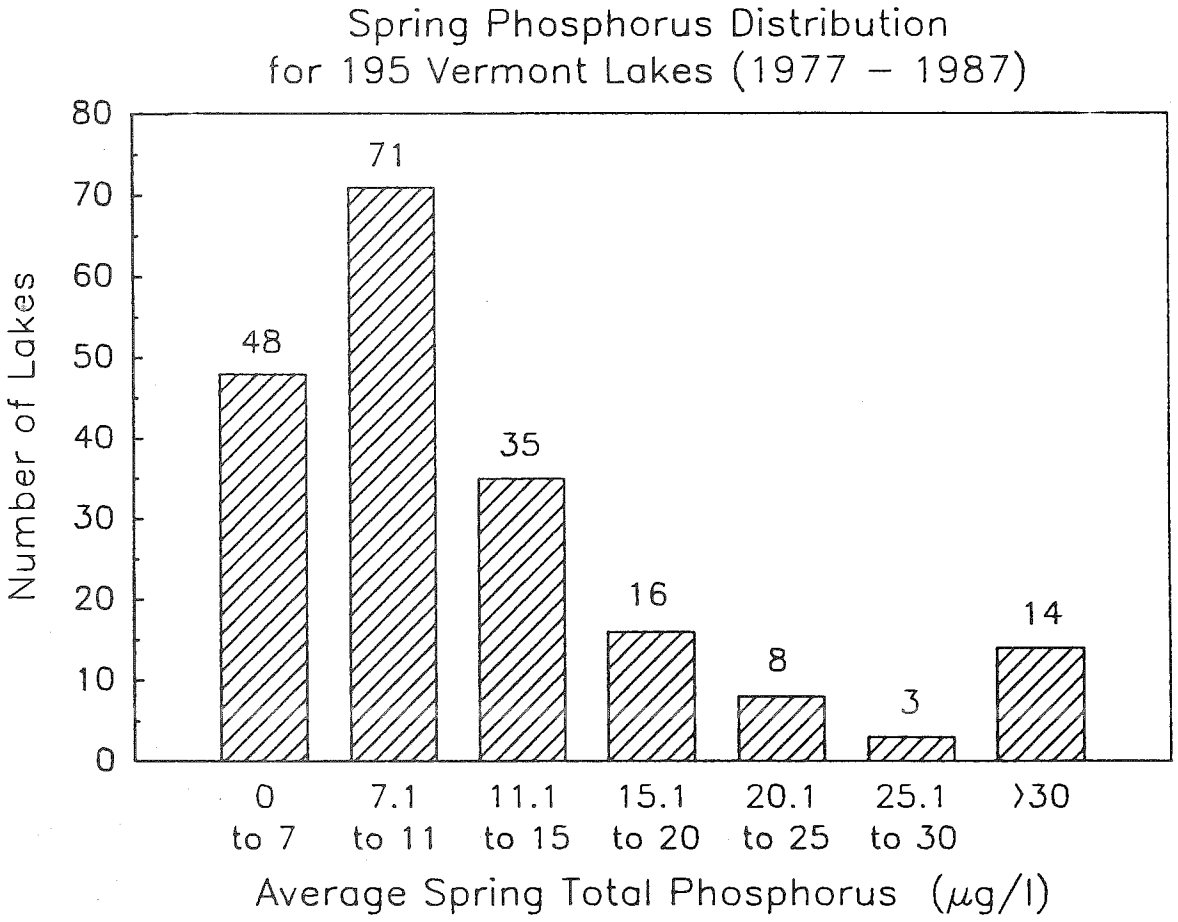
Trophic State	Avg. Summer Secchi disk transparency	Avg. Summer Chlorophyll-a Concentration	Avg. Spring Total Phosphorus Concentration	Color
Eutrophic	0-3.0 meters	7.0 ug/l or more	15 ug/l or more	--
Mesotrophic	3.0 - 5.5	3.5 - 7.0	7.0 - 15	--
Oligotrophic	5.5 or more	0 - 3.5	7.0 or less	--
Dystrophic	---	---	---	50 or more platinum-cobalt units

When monitoring data gave conflicting information, spring total phosphorus concentrations were weighted more heavily, then chlorophyll-a, then Secchi disk transparency. There are 19 lakes in Vermont classified as oligotrophic according to this method. A total of 72 lakes have been classified as mesotrophic, 28 are eutrophic, and 11 are dystrophic.

Spring total phosphorus levels have been monitored on 195 Vermont lakes larger than 15 acres since 1977 under the Spring Phosphorus Program (described earlier). Table II and Figure II show the results of this program, and give a more general indication of the trophic status of Vermont's lakes. There are 48 Vermont lakes with an average spring total phosphorus concentration of 7.0 ug/l or less, a level which generally indicates oligotrophic conditions. There are 45 lakes with an average spring total phosphorus concentration of 15 ug/l or greater, indicating probable eutrophic conditions. The majority of the lakes sampled have intermediate phosphorus levels that indicate they are mesotrophic in character (102 lakes).

The remaining information presented in Table II relates to the water quality status/use impairment of each lake. Appendix C describes the methods used to determine these impairments and threats. Appendix D gives specific information regarding the causes and sources of the identified use

FIGURE II


Spring Phosphorus Distribution
for 195 Vermont Lakes (1977 – 1987)
Number of Lakes
80
70
60
50
40
30
20
10
0
48
71
35
16
8
3
14
0 to 7
7.1 to 11
11.1 to 15
15.1 to 20
20.1 to 25
25.1 to 30
>30
Average Spring Total Phosphorus (µg/l)

impairments or threats on each lake. Designated uses are presently impaired on 21 percent of the lake acreage in Vermont (49,206 acres). There are 139 lakes with impaired uses in at least some portion of the water body. The major causes of these use impairments are summarized in Table III. More than one-third of the impaired lake acres in Vermont are impacted by noxious aquatic plants, including Eurasian milfoil, other rooted macrophytes, and blue-green algae. Nutrients that contribute to noxious plant growth are another major cause of use impairments.

Siltation and/or turbidity impairs more lake acreage than any other cause, but relatively little of the impact is high. Major examples of this impact are turbid waters in southern Lake Champlain, Missisquoi Bay, and off Otter Creek, and deposits of sediment in deltas off the mouths of inlet streams on numerous lakes.

Most (92 percent) of the lake acres affected by organic enrichment, specifically, low dissolved oxygen concentrations, are in Malletts Bay in Lake Champlain. The District Fisheries Manager for Malletts Bay indicates that the bay's coldwater fisheries are partially impaired due to low dissolved oxygen concentrations in the cool hypolimnetic waters during the summer.

Flow alteration, specifically the fluctuation of water levels for power generation, impacts the fisheries of several large Vermont reservoirs.

Most of the lake acres impaired by pathogens are in Lake Champlain, South Bay and Lake Memphremagog, where point source discharges and combined sewer overflows are responsible for periodic discharges of untreated or inadequately treated sewage. This problem has existed for many years, but has received increased visibility since 1987, when several beaches on Lake Champlain in the Burlington, Vermont, area were repeatedly closed due to the high bacteria counts that followed heavy rainstorms and the subsequent discharge of untreated sewage into the lake. Vermont's Water Pollution Control Program has added combined sewer overflow (CSO) correction projects to the priority list as eligible projects. The highest priority has been given to correcting existing overflows in lake watersheds, with the cities of Burlington, on Lake Champlain, and Newport, on Lake Memphremagog, given first priority. The Vermont legislature is also considering legislation in 1988 that will establish a loan program from which municipalities may obtain funding to separate and treat combined sewer overflows.

Table III

Causes for Lake Acres Not Fully Supporting Uses

Cause	High Impact		Moderate/Slight Impact		Total Acres + Impacted
	Excl. L.C.*	Lake Champlain	Excl. L.C.*	Lake Champlain	
Other Inorganics			6		6
Nutrients	1,943	3,098	3,277	5,812	14,130
pH	44		69		113
Siltation/Turbidity	872	230	2,278	13,906	17,286
Organic Enrichment/D.O.	684		366	13,512	14,562
Thermal Modification			7		7
Flow Alteration	1,887		4,173		6,060
Other Habitat Alterations			27		27
Pathogens	30	711	121	10	872
Noxious Aquatic Plants	2,462	4,743	3,479	5,812	16,496

* Statewide excluding Lake Champlain acres.

+ The sum of these acreages exceeds the total acres not fully supporting uses since the same acres may be impacted by more than one cause.

Other causes of use impairments on lakes in Vermont include low pH, inorganics, habitat alterations other than flow, and thermal modifications.

The uses of 67 percent of the lake acreage in Vermont are not presently impaired but are considered imminently threatened. Of the lakes in Vermont that presently fully support their uses (379 lakes), 62 percent (234 lakes) have at least a portion of their waters threatened, primarily by rapid development in the vicinity of the lake, excessive nutrient levels within the lake, nearby Eurasian milfoil populations, or continued acid precipitation. The presence of polychlorinated biphenyls (PCBs) in the flesh of certain fish species also threatens some fishing uses of Lake Champlain.

No attempt will be made in this report to present specific data and information for each impaired and threatened lake in Vermont. Much of the information itemized in the Environmental Protection Agency's Clean Lakes Program guidance document is available upon request from the Vermont Lakes and Ponds Inventory computerized data base. The chemical and biological data collected through the Lakes and Ponds Program is available in detail from STORET and Department of Environmental Conservation Water Quality Division files. Portions of this data are summarized on the Lakes and Ponds Inventory. The Inventory also identifies the recreational values or uses currently impaired or threatened on each lake and the reasons. The general characteristics of each lake such as maximum depth, mean depth, surface area, etc., are included where known. Watershed area and land uses have been entered into the Inventory for most lakes larger than fifteen acres. The topography and major soil types of these watersheds are available from file maps or from U.S. Soil Conservation Service data. Very few lakes in Vermont receive discharges from major point sources. Where point sources do exist, the state's regulatory programs control the pollution through the issuance of NPDES permits. The location of major point sources on lakes will be included in the Vermont Waterbody System when it is completed.

As mentioned earlier, Appendix D contains specific information on the causes and sources of use impairments on Vermont's lakes. Since very few Vermont lakes receive point source discharges, nonpoint pollution sources are responsible for nearly all of these use impairments. The nonpoint sources listed for each lake in Appendix D are identified almost entirely from evaluated information, and the reliability of this information is

unknown. Past experience has shown that reliable information regarding the significant sources of nonpoint pollution on specific lakes can only be obtained through watershed monitoring programs, unless gross nonpoint sources are present. Diagnostic studies conducted on three lakes in Vermont all concluded that the major source of nonpoint pollution to the lake was something other than what professionals had believed it to be from personal evaluations made prior to the monitoring programs. There is therefore a definite need for further lake assessment work and diagnostic studies to better identify the major nonpoint pollution sources on specific lakes in Vermont.

Vermont's Nonpoint Source Assessment report identifies the major sources of nonpoint pollution in Vermont. It is expected that the relative importance of these sources on a statewide basis is consistent with their importance to lakes in Vermont. The State nonpoint programs currently in place to control these sources are of a general nature and, while lakes do receive some benefit, the programs do not deal specifically with lakes. However, the protection and improvement of lake water quality is a high priority of the U.S. Soil Conservation Service in Vermont, and major projects have been completed in the watersheds of Lake Champlain, Lake Memphremagog, Lake Parker, and Lake Carmi. Unfortunately, the Soil Conservation Service work is limited by national program priorities and funding allocations. There is a need for a State nonpoint source control program in Vermont that can address nonpoint problems on a lake watershed basis and provide technical and financial assistance to local and regional officials to implement recommended control procedures in priority lake watersheds.

Lake Water Quality Trends

There are 379 lakes in Vermont that presently meet water quality standards and fully support designated uses throughout their waters. Many other Vermont lakes fully support designated uses in a portion of their waters. Overall, there are presently 177,915 lake acres fully supporting their designated uses in Vermont, which represents 78% of the lake acreage in the state. It is alarming, however, that 86% of these acres is threatened by imminent pollution sources.

Rapid growth is a major threat to Vermont's lakes, primarily because the mechanisms are not yet in place to regulate this growth to prevent lake water quality degradation. Point source discharges are regulated so as not to cause an undue adverse impact on the state's waters. However, once these discharges are established, new unregulated nonpoint sources added on to the adverse impact of the point source discharges can result in significant water quality degradation over time. Lakes receiving point source discharges must therefore be particularly protected from the cumulative impacts of unregulated nonpoint sources in their watersheds through the establishment of in-lake eutrophication standards and watershed management programs. Lake Champlain, which ultimately receives point source discharges from nearly half of the state's land area, is the highest priority for implementation of this procedure.

At the present time, large-scale development in Vermont is regulated by Vermont's Land Use and Development Law (Act 250). Smaller land subdivisions and development on existing lots receive only limited review under the Department of Environmental Conservation's Environmental Protection Regulations or local municipal zoning ordinances, where they exist. The review of new development under any of these authorities very rarely takes into consideration existing development in a lake watershed and the overall cumulative impact of all nonpoint sources of pollution to the lake. There are presently 76 Vermont lakes located in towns that have been identified as "rapid growth" towns according to a Growth Areas Research Project conducted by the Vermont Law School's Environmental Law Center. These lakes are most likely experiencing a tremendous increase in development pressure somewhere in their watersheds. A technical assistance program is needed to assist regional and local planners in the development of comprehensive watershed protection programs for these threatened lakes.

On a more general scale, lakeshore property statewide has undergone a dramatic rise in value in recent years, resulting in increased shoreland development. Vermont has no statewide shoreland zoning laws, and much of the shoreland development currently taking place receives little or no review. Education and technical assistance is urgently needed to encourage the development and implementation of effective shoreland protection measures at the state, regional, local and individual level before it is too late.

Eurasian milfoil is perhaps the greatest threat to the recreational use of Vermont's lakes at this time. Seven percent of Vermont's lakes twenty acres or greater in size are currently infested with this nuisance weed, including the state's three largest lakes - Lake Champlain, Lake Memphremagog, and Lake Bomoseen. Another thirty-seven percent of these lakes (107 lakes) are situated within ten miles of a lake that is already infested, making them particularly vulnerable to the introduction of Eurasian milfoil by boaters or wildlife. There are uncounted numerous smaller lakes less than twenty acres in size also in close proximity to infested lakes. The Vermont Eurasian Milfoil Control Program has made control of the between-lake spread of Eurasian milfoil a top priority. However, the Milfoil Watchers Program and statewide educational efforts must be expanded if significant progress is to be made in this area. In addition, effective ways to eliminate small new infestations must be found to supplement the control program when educational approaches have failed to prevent the spread of Eurasian milfoil into a new lake.

There are twenty lakes in Vermont with average spring total phosphorus concentrations of 15-20 ug/l as P (Table II). Most of these lakes are not presently experiencing nuisance algae blooms. However, phosphorus concentrations in the 15-20 ug/l range approach the threshold concentration when periodic nuisance blooms can be expected to occur. It is imperative that the nutrient sources to these lakes be identified and controlled and watershed protection plans be implemented before algae problems arise and lake uses are impaired.

There are 107 lakes in Vermont considered to be threatened by acid precipitation. Of these, six lakes are already impacted by high acidity with one lake, Lake-of-the-Clouds in Cambridge, consistently exhibiting a pH of less than 4.5. Vermont has no program or plans to mitigate the effects of high acidity in these lakes or to control the toxics mobilized by this acidity. The recommended course of action on these lakes, as it is for all lakes requiring management, restoration or protection in Vermont, is to control the source of the problem or threat first, then treat any resulting in-lake problems if necessary.

A study conducted for the Vermont Department of Environmental Conservation's Air Pollution Control Division concluded that 99.9 percent of

the pollutants responsible for wet sulfate deposition in Vermont originates from out-of-state sources. Vermont therefore encourages the implementation of federal emission standards to reduce the discharge of pollutants responsible for acid precipitation and intends to pursue all available legal and political avenues to reach this end. The state's Acid Precipitation Program continues to provide extensive lake and precipitation data from Vermont to support these efforts.

Toxic contamination is not considered to be a widespread problem in Vermont's lakes. However, limited fish tissue sampling has raised some concern recently that PCBs and other toxic substances may be threatening a portion or all of Lake Champlain's fishery. A special Fish Tissue Monitoring Program has been initiated in Vermont to assess the existence and/or extent of toxic contamination in fish tissue in Lake Champlain. If necessary, a management plan will be prepared to address any problems that are discovered through the monitoring program.

The five basic threats outlined above - rapid growth, Eurasian milfoil, threshold in-lake nutrient levels, acid precipitation, and toxic contamination in Lake Champlain - represent the major threats to Vermont's lakes that exist today. The Vermont Lakes and Ponds Program provides a sound framework for dealing with these threats and managing and restoring lakes that already have impaired uses. However, if the Vermont program is to continue to be successful and hold the line on eutrophication in the state, consistent federal Clean Lakes Program funding is needed. Periodic, unpredictable funding does not allow for the development of long-range program plans. Funding is specifically needed for lake assessment activities in order to set priorities for diagnostic, restoration and protection projects. In addition, on-going basic program grants are needed under the Clean Lakes Program and the Nonpoint Source Management Program to enable Vermont to develop an experienced staff that can implement critical statewide lake protection programs and provide technical assistance to lake watershed protection programs at the local level. With 86 percent of Vermont's unimpaired lake acreage threatened, lake protection on a statewide and watershed-specific basis must be a top priority. A strong partnership of federal, state and local resources will be needed to ensure that Vermont's lakes continue to fully support their designated uses in future years.

Appendix A
Questionnaire - Fish and Wildlife Wardens

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Lake Assessment Questionnaire

December 1987

1. How would you describe the Fishable Status of this lake or pond?
   (Refer to letter)
   _____ fishable supported
   _____ fishable not supported
   _____ fishable not attainable
   If not supported or not attainable, please describe the problem.

   _____

   _____

2. How would you describe the recreational fishing value?
   _____ excellent
   _____ good
   _____ fair
   _____ poor

3. How would you describe the water quality?
   _____ excellent
   _____ good
   _____ fair
   _____ poor

4. If good, fair or poor (in #2 or #3 above), describe the water quality problem(s). Please elaborate when appropriate.
   _____ excessive aquatic plant growth
   _____ excessive algae/periphyton growth
   _____ sedimentation at stream mouths and along shoreline
   _____ acid precipitation
   _____ reduced water clarity
   _____ other, please specify

   _____

5. In your opinion, has the water quality changed over the past 10 years?

_____ no _____ yes, improved _____yes, declined

6. If you think this lake is experiencing water quality problems, please indicate the possible source of the problem.

_____ poor shoreline septic systems
_____ poor watershed septic systems
_____ logging operation runoff
_____ dirt road erosion
_____ farmland runoff
_____ urban runoff (parking lots, paved roads, etc.)
_____ construction runoff
_____ shoreline erosion
_____ introduction of non-native nuisance plant species
_____ other, please specify

_____

Appendix A (cont.)

Questionnaire - District Fisheries Managers

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Lake Assessment Questionnaire

January 1988

1. How would you describe the Fishable Status of this lake or pond? (Refer to letter)

_____ fishable supported

_____ fishable not supported

_____ fishable not attainable

If not supported or not attainable, please describe the problem.

_____

_____

2. Is this lake or pond currently being stocked? _____ If so, are the current water quality conditions likely to support a natural, balanced population with out this stocking effort?

_____ yes _____ no _____ unknown

If not supported, please describe the problem.

_____

_____

3. How would you describe the level of impairment to the aquatic biota, fish and wildlife?

_____ not impaired

_____ partially impaired

_____ impaired

_____ threatened

4. How would you describe the level of impairment to the recreational fishing value?

_____ not impaired

_____ partially impaired

_____ impaired

_____ threatened (please elaborate)

_____

5. If the water quality is impaired (#3 or #4 above), describe the problem. Please elaborate when appropriate.

_____ excessive aquatic plant growth
_____ excessive algae/periphyton growth
_____ sedimentation at stream mouths and along shoreline
_____ acid precipitation
_____ reduced water clarity
_____ other, please specify

6. In your opinion, has the water quality changed over the past 10 years?

_____ no _____ yes, improved _____ yes, declined

_____

7. If you think this lake is experiencing water quality problems, please indicate the possible source of the problem.

_____ existence of a dam
_____ flow regulation/modification
_____ poor shoreline septic systems
_____ poor watershed septic systems
_____ logging operation runoff
_____ dirt road erosion
_____ farmland runoff
_____ urban runoff (parking lots, paved roads, etc.)
_____ construction runoff
_____ shoreline erosion
_____ introduction of non-native nuisance plant species
_____ other, please specify

_____

Appendix A (cont.)
Questionnaire - Town Clerks and Lake Associations

Vermont Department of Environmental Conservation
Lake Assessment Questionnaire
November 1987

1) Lake _____ Town _____

2) Name (person completing this questionnaire) _____

Address _____

_____

Telephone_____

Organization and position _____

_____

3) Is the shoreline owned by more than one landowner?
____ yes ____ no, lake is entirely on one person's property.

4) If yes to #3, approximately how many different shoreland owners are there on this lake?_____

5) Approximately how many camps or residences are there along the shoreline (within 500 feet of the water)? _____

6) Please describe the available public access to the lake by checking the choice(s) below which apply. Please indicate the number of each access type (for instance: 1 State boat ramp, 3 private campgrounds).

a. Municipal adjoining land:

developed:
____ boat ramp
____ carry-in boating, only
____ swimming
____ picnicking, hiking
____ other (please describe)

undeveloped:
____ adjoining land
____ adjoining road right-of-way
____ other (please specify)

_____

_____

b. State adjoining land:

developed:
____ boat ramp
____ carry-in boating, only
____ swimming
____ picnicking, hiking
____ other (please describe)

undeveloped:
____ adjoining land
____ adjoining road right-of-way
____ other (please specify)

_____

_____

c. Federal adjoining land:

developed:
____ boat ramp
____ carry-in boating, only
____ swimming
____ picnicking, hiking
____ other (please describe)

undeveloped:
____ adjoining land
____ adjoining road right-of-way
____ other (please specify)

_____

_____

d. Power Utility adjoining land:

developed:
____ boat ramp
____ carry-in boating, only
____ swimming
____ picnicking, hiking
____ other (please describe)

undeveloped:
____ adjoining land
____ adjoining road right-of-way
____ other (please specify)

_____

_____

e. ____ summer camp for children
f. ____ motel/inn
g. ____ private campground (public use for a fee)
h. ____ private day-use area (public use for a fee)
i. ____ entire shoreline privately owned, no public access
j. ____ other (please specify)

_____

7) If possible, please describe the amount and seasons of public use (other than shoreland property owners) of this lake:

_____ heavy (more than 20 people per day)
____ winter ____ spring ____ summer ____ fall

_____ moderate (10-19 people per day)
____ winter ____ spring ____ summer ____ fall

_____ light (0-9 people per day)
____ winter ____ spring ____ summer ____ fall

8) How would you describe the water quality of this lake?
_____ excellent ____ good ____ fair ____ poor

9) If good, fair or poor (in #8 above), please describe the water quality problem(s):

_____ excessive algae growth
_____ excessive nuisance weed growth
_____ reduced water clarity
_____ sedimentation at stream mouths and along shoreline
_____ poor fishery
_____ other, please specify

_____

10) If good, fair or poor (in #8 above), what values and uses of the lake listed below are reduced due to the water quality problem(s):

_____ aesthetics
_____ quality habitat for fish and wildlife
_____ swimming
_____ boating (motorized and non-motorized)
_____ fishing
_____ nature observation (bird watching, photography etc.)
_____ other, please specify

_____

11) In your opinion, has the water quality changed over the past 10 years?

_____ no _____ yes, improved _____ yes, declined

12) If you think this lake is experiencing water quality problems, what do you think might be the source of these problems? (Please check one or more below.)

_____ poor shoreline septic systems
_____ poor watershed septic systems
_____ logging operation runoff
_____ dirt road erosion
_____ farmland runoff
_____ urban runoff (parking lots, paved roads etc.)
_____ construction runoff
_____ shoreline erosion
_____ introduction of non-native nuisance plant species
_____ other, please specify

_____

13) If the lake is currently of good to excellent quality, do you think any of the following activities might threaten to degrade the water quality?

_____ increasing shoreline development
_____ increasing development in watershed
_____ dirt road erosion
_____ urban runoff (parking lots, paved roads, etc.)
_____ construction runoff
_____ shoreline erosion
_____ farmland runoff
_____ logging operation runoff
_____ introduction of non-native nuisance plant species
_____ other, please specify

_____

14) Does this town have zoning regulations specifically for lakeshores?

____yes ____no

Thank you very much for your assistance.

Please return by December 20 to:

Susan Warren
Water Quality Division - 10 North
Department of Environmental Conservation
103 South Main Street
Waterbury, VT. 05676

081-0903-BH8

Appendix B

Table II

Identification and Classification of Significant Vermont Lakes

Key

Name: official name unless followed by a semi-colon(;)

Town: municipality at location of lake outlet

Lat: latitude at lake outlet, degrees and minutes

Long: longitude at lake outlet, degrees and minutes

Lake Area: acres

PW?: Public Water? Y = yes N = no U = unknown

Trophic (OMED): O = oligotrophic M = mesotrophic E = eutrophic
D = dystrophic; Based on 1983 - 1987 data

Mean Spring P: average spring total phosphorus concentration in ug/l as P; Based on 1977 - 1987 data

Not Sup: acres where uses designated in Vermont Water Quality Standards are not supported

Par Sup: acres where designated uses are partially supported

Threat: acres where designated uses are threatened

Ful Sup: acres that fully support designated uses

* : lakes impaired due to high acidity

TABLE II

Identification and Classification of Significant Vermont Lakes

Name	Town	Lat	Long	Lake Area (acres)	PW ?	Trophic (OMED)	Mean Spring P (ug/l)	Not Supp	Part Supp	Threat	Full Supp
ABBEY	RIPTON	4402	7304	3	Y					3	
ABENAKI	THETFORD	4350	7214	44	Y		9.0			44	
ADAM	JAMAICA	4307	7246	7	U					7	
ADAMS (ENOS)	ENOSBURG	4453	7243	11	Y						
ADAMS (WOOD)	WOODFORD	4253	7302	21	Y		12.0			21	
ALBANY-NE;	ALBANY	4441	7217		U						
ALBERT LORD;	CAVENDISH	4326	7233	7	N						
AMHERST	PLYMOUTH	4329	7242	76	Y		8.4			76	
ANDOVER;	ANDOVER	4314	7245	11	Y				11		
ANSEL	BETHEL	4350	7237	2	Y					2	
ARROWHEAD MOUNTAIN	MILTON	4440	7306	732	Y	E	14.0	732			
ATHENS	ATHENS	4307	7236	21	Y		5.0				21
ATHENS - 357;	ATHENS	4307	7236	6	U						
AUSTIN	HUBBARDTON	4343	7312	28	Y		6.0		28		
BACK	BRIGHTON	4449	7152	10	U						
BAILEY	MARSHFIELD	4420	7221	17	N						17
BAILEYS MILLS;	CHESTER	4318	7236	10	Y						
BAKER (BART)	BARTON	4445	7214	51	Y					25	26
BAKER (BROOK)	BROOKFIELD	4404	7238	35	Y		8.0	35			
BAKERSFIELD - N;	BAKERSFIELD	4450	7247	10	U						
BALD HILL	WESTMORE	4444	7159	104	Y	M	6.7				104
BALDWIN	STARKSBORO	4414	7303	9	U				9		
BALL MOUNTAIN	JAMAICA	4308	7247	85	Y				85		
BANCROFT	PLAINFIELD	4415	7223	14	U		3.0				
BARBER	POWNAL	4248	7312	19	N		7.0		19		
BARBOS	SANDGATE	4309	7309	7	N						7
BEAN (LYN)	LYNDON	4433	7204	24	Y		6.0		24		
BEAN (SUT)	SUTTON	4442	7205	30	Y		6.0		30		
BEAR	CAMBRIDGE	4433	7248	1	U	D				1	
BEAVER (HART)	HARTLAND	4334	7228	2	N						2
BEAVER (HOL)	HOLLAND	4500	7157	40	Y					40	
BEAVER (HYDE);	HYDE PARK	4436	7232	16	U					16	
BEAVER (MEN)	MENDON	4340	7251	6	Y				3	3	
BEAVER (PROCT)	PROCTOR	4340	7303	9	Y						9
BEAVER (ROXBURY)	ROXBURY	4404	7243	10	U					10	
BEAVER MEADOW B - L;	ENOSBURG	4452	7244	18	Y						
BEAVER MEADOW B - U;	ENOSBURG	4454	7243	14	Y						
BEAVER MEADOW;	BALTIMORE	4321	7234	5	U						
BEAVER MEADOWS	CHITTENDEN	4346	7254	3	Y						3
BECK	NEWARK	4444	7155	6	Y					6	
BEEBE (HUB)	HUBBARDTON	4344	7311	100	Y	M	15.2		5	95	
BEEBE (SUND)	SUNDERLAND	4303	7302	8	Y	D				8	
BEECHER	BRIGHTON	4449	7151	15	U						
BELDING	JOHNSON	4437	7243	4	U			4			
BELVIDERE - NE;	BELVIDERE	4447	7237	9	U						9
BERKSHIRE;	BERKSHIRE	4458	7247	8	U						
BERLIN	BERLIN	4411	7235	256	Y	M	8.7			51	205
BIG	WOODFORD	4253	7304	31	Y	M	7.8		31		
BIG MUD	MT. TABOR	4319	7256	15	Y					15	
BIG MUDDY	EDEN	4445	7236	17	Y					17	
BILLINGS	SEARSBURG	4254	7301	4	Y						
BILLINGS MARSH	WEST HAVEN	4336	7323	56	Y					56	

TABLE II
Identification and Classification of Significant Vermont Lakes

Name	Town	Lat	Long	Lake Area (acres)	PW ?	Trophic (OMED)	Mean Spring P (ug/l)	Not Supp	Part Supp	Threat	Full Supp
BLACK (PLY)	PLYMOUTH	4333	7245	20	U				3	17	
BLAKE (SHEF)	SHEFFIELD	4438	7207	7	N						7
BLAKE (SUT)	SUTTON	4443	7204	8	Y						8
BLISS	CALAIS	4421	7230	46	Y	E	18.8			46	
BLODGETT;	BRADFORD	4402	7206	15	U						15
BLOODSUCKER	SPRINGFIELD	4320	7226	4	U						
BLUE	CALAIS	4425	7228	6	U						
BLUEBERRY	WARREN	4405	7250	48	Y	M	12.7			48	
BM1145;	PLYMOUTH	4330	7243	8	N						
BM746;	BROOKFIELD	4403	7234	9	U						
BOG (FAIRLEE)	FAIRLEE	4357	7209	1	U						
BOLSTER	BARRE	4409	7232	5	Y					5	
BOMOSEEN	CASTLETON	4339	7313	2360	Y	M	15.0	500	1860		
BOURN *	SUNDERLAND	4306	7300	48	Y				48		
BRANCH	SUNDERLAND	4305	7301	34	Y	D				34	
BREESE	HUBBARDTON	4343	7313	12	Y				2		10
BRILYEA EAST	ADDISON	4404	7320	126	Y		137.0				
BRILYEA WEST	ADDISON	4404	7321	186	Y		85.0				
BRISTOL - NW;	BRISTOL	4410	7309	9	U						
BROCKLEBANK;	TUNBRIDGE	4356	7225	7	Y						7
BROWN	WESTMORE	4444	7159	15	U						15
BROWNINGTON	BROWNINGTON	4453	7209	136	Y	E	13.7		18		118
BROWNS	BAKERSFIELD	4449	7247	10	U						
BRUCE	SHEFFIELD	4438	7211	27	Y					27	
BRUNSWICK SPRING	BRUNSWICK	4444	7138	16	U						
BUCK	WOODBURY	4428	7224	39	Y	O	8.0			39	
BUGBEE;	WOODFORD	4253	7305	8	U						
BULLHEAD (BENSON)	BENSON	4344	7320	7	U			7			
BULLHEAD (MANCH)	MANCHESTER	4313	7301	5	Y					5	
BULLIS;	FRANKLIN	4458	7258	11	Y			11			
BURBEE	WINDHAM	4309	7244	23	Y					23	
BURLESON	BERKSHIRE	4458	7248	2	U						
BURNELL	BRANDON	4350	7305	7	U						
BURNHAM MTN;	TOPSHAM	4411	7212	8	U						8
BURR (PITT)	PITTSFORD	4342	7258	20	Y						20
BURR (SUD)	SUDBURY	4346	7311	74	Y	M	8.6	10		64	
BUTLER	PITTSFORD	4342	7305	3	U						3
C.C.C.	SHARON	4349	7224	9	Y				9		
CAMBRIDGEPORT;	ROCKINGHAM	4309	7233	6	U						
CAP HILL;	JERICHO	4432	7258	9	Y					9	
CARLTON	WOODSTOCK	4336	7233	4	Y						4
CARMI	FRANKLIN	4458	7252	1375	Y	E	23.7	412	963		
CASPIAN	GREENSBORO	4435	7219	739	Y	O	6.0				739
CEDAR	MONKTON	4415	7308	114	Y	E	16.4	13	10	10	81
CENTER	NEWARK	4443	7155	80	Y	O	5.7			80	
CHAMPAGNE	RANDOLPH	4357	7236	3	U					3	
CHANDLER	WHEELOCK	4432	7206	65	Y						65
CHANDLER;	WATERFORD	4423	7157	6	N						6
CHAPELS	EAST MONTPELIER	4419	7231	2	U						
CHARLESTON	CHARLESTON	4454	7203	40	Y					40	
CHESTER	CHESTER	4317	7238	5	Y						5
CHILDS	THETFORD	4349	7211	10	N					10	
CHIPMAN	TINMOUTH	4324	7302	81	Y		10.0			16	65

TABLE II
Identification and Classification of Significant Vermont Lakes

Name	Town	Lat	Long	Lake Area (acres)	PW ?	Trophic (OMED)	Mean Spring P (ug/l)	Not Supp	Part Supp	Threat	Full Supp
CHITTENDEN	CHITTENDEN	4344	7255	674	Y	M	10.3		674		
CHOATE	ORWELL	4347	7316	11	N						11
CLARA	WHITINGHAM	4248	7253	18	Y						18
CLEAR	HYDE PARK	4437	7230	8	U						8
CLOSSON	ROCKINGHAM	4314	7229	1	U						
CLYDE	DERBY	4456	7210	177	Y					35	142
COBB	DERBY	4455	7208	27	Y						27
COBURN	RYEGATE	4415	7205	5	Y			5			
COGGMAN	WEST HAVEN	4338	7322	20	Y		73.0	20			
COITS	CABOT	4427	7220	40	Y		7.0			20	20
COLBY	PLYMOUTH	4328	7240	20	Y		11.0				20
COLCHESTER	COLCHESTER	4433	7307	167	Y					167	
COLE	JAMAICA	4309	7248	41	Y	O	8.2			41	
COLES	WALDEN	4431	7213	125	Y	M	7.0				125
COLES-E;	STANNARD	4431	7212		U						
COLLINS	HYDE PARK	4437	7230	16	Y		5.0				16
COLTON	SHERBURNE	4342	7249	27	Y		9.5		6	21	
COOK	LUDLOW	4326	7242	3	Y					3	
COOKS (SHREWS)	SHREWSBURY	4331	7251	12	N						12
COOKS (WEATHERS)	WEATHERSFIELD	4323	7227	10	N						
COREZ	EDEN	4446	7231	9	N						
COW HILL;	PEACHAM	4423	7212	8	U						
COW MOUNTAIN	GRANBY	4434	7142	10	U					10	
COX	WOODSTOCK	4337	7234	2	N						2
CRANBERRY BOG	WEYBRIDGE	4404	7217	2	Y						
CRANBERRY MEADOW	WOODBURY	4425	7227	28	Y		16.0			28	
CRESCENT	SHARON	4348	7225	20	N						
CROW HILL;	ST. JOHNSBURY	4425	7203	5	U						
CRYSTAL (BARTON)	BARTON	4444	7209	778	Y	O	4.6			155	623
CRYSTAL (HART)	HARTLAND	4336	7229	2	N						2
CRYSTAL (WILM)	WILMINGTON	4255	7255	3	Y						
CURTIS	CALAIS	4423	7230	76	Y	E	15.6	5	20	10	41
CUSHING HILL;	UNDERHILL	4429	7254	9	U						
CUTLER	HIGHGATE	4459	7302	25	Y					12	13
CUTTER	WILLIAMSTOWN	4405	7233	16	N						
CUTTINGSVILLE;	SHREWSBURY	4329	7255		U						
DANBY	DANBY	4322	7303	56	Y		10.0			11	45
DANIELS	GLOVER	4441	7216	61	Y		9.3		20		41
DANIELS-W;	GLOVER	4445	7216		N						
DANVILLE	DANVILLE	4425	7210	2	Y						
DANYOW	FERRISBURG	4411	7318	192	Y					38	154
DEER PARK	HALIFAX	4247	7243	22	Y		7.0				
DEER PARK - WEST;	HALIFAX	4247	7243	6	U					6	
DENNIS	BRUNSWICK	4444	7139	185	Y						185
DERBY	DERBY	4457	7207	206	Y	M	15.7		206		
DEWEYS	HARTFORD	4339	7224	56	Y					56	
DOBSON	WOODBURY	4426	7227	9	U			9			
DOLLIF;	BRIGHTON	4450	7156	5	U						5
DOLLOFF - N	SUTTON	4442	7202	3	Y						3
DOLLOFF - S	SUTTON	4441	7202	3	Y				3		
DOUGHTY	BENSON	4346	7317	17	Y					17	
DOW	MIDDLEBURY	4401	7306	11	U					11	

TABLE II

Identification and Classification of Significant Vermont Lakes

Name	Town	Lat	Long	Lake Area (acres)	PW ?	Trophic (OMED)	Mean Spring P (ug/l)	Not Supp	Part Supp	Threat	Full Supp
DRY RIDGE;	JOHNSON	4437	7243	6	U						
DUCK (BURKE)	BURKE	4436	7157	4	N				4		
DUCK (CRAFT)	CRAFTSBURY	4440	7222	9	N						9
DUCK (HOL)	HOLLAND	4500	7156	6	Y						6
DUCK (SHEF)	SHEFFIELD	4440	7208	7	Y						7
DUCK (SHEL)	SHELBURNE	4423	7316	4	N					4	
DUCK (SUT)	SUTTON	4442	7204	8	Y						8
DUCK (WATER)	WATERFORD	4423	7156	16	Y		5.0				16
DUPRESNE	MANCHESTER	4311	7302	8	Y					8	
DUNKLEE	RUTLAND	4337	7258	3	U				3		
DUNMORE	SALISBURY	4354	7305	985	Y	M	7.6		20	170	795
DUTTON	MAIDSTONE	4438	7137	12	U						
EAGLE	ALBURG	4456	7316	2	U						
EAST CALAIS MILL;	CALAIS	4422	7226	6	U						
EAST CHARLESTON;	CHARLESTON	4450	7159	18	U						
EAST CREEK	ORWELL	4348	7319	31	Y		26.0				31
EAST LONG	WOODBURY	4427	7221	177	Y		14.0			35	142
EASTMAN	NEWBURY	4408	7210	4	U						
ECHO (CHARLES)	CHARLESTON	4452	7200	544	Y	O	6.6			108	436
ECHO (HUB)	HUBBARDTON	4345	7311	53	Y	M	18.0			10	43
ECHO (PLY)	PLYMOUTH	4328	7242	96	Y		8.0			96	
EDDY	RUTLAND	4335	7258	10	U						10
EDEN	EDEN	4443	7230	186	Y	M	8.0				186
ELBOW;	MENDON	4342	7252	8	N					8	
ELFIN	WALLINGFORD	4328	7259	16	Y	M	15.4			16	
ELLIGO	GREENSBORO	4436	7221	190	Y	O	4.7				190
ELMORE	ELMORE	4432	7232	224	Y	M	12.0		22		202
ELY;	THETFORD	4353	7213	5	N					5	
EMERALD	DORSET	4316	7300	28	Y		7.7			28	
EQUINOX	MANCHESTER	4309	7305	15	N					15	
EVANSVILLE;	BARTON	4448	7210		U						
EWELL	PEACHAM	4422	7210	50	Y		16.0				50
FAIR HAVEN - W;	FAIR HAVEN	4337	7315	18	U						
FAIRFIELD	FAIRFIELD	4451	7259	464	Y	E	32.6	464			
FAIRFIELD - NE;	FAIRFIELD	4450	7251	12	U						
FAIRFIELD - SE;	FAIRFIELD	4446	7256	18	U						
FAIRFIELD - SW1;	FAIRFIELD	4446	7259	7	U						
FAIRFIELD - SW2;	FAIRFIELD	4446	7259	7	U						
FAIRFIELD SWAMP	SWANTON	4448	7300	160	Y					160	
FAIRLEE	FAIRLEE	4353	7214	463	Y	M	10.5				463
FAN;	WELLS	4326	7309	12	Y						12
FAY;	STRAFFORD	4351	7226	10	U						
FELCHNER;	NORTHFIELD	4408	7244	12	U				2		10
FERN	LEICESTER	4352	7304	61	Y	M	14.5			12	49
FIFIELD	WALLINGFORD	4324	7253	6	Y	D				6	
FLAGG	WHEELOCK	4434	7213	108	Y		8.0		25		83
FLOOD;	PERU	4314	7253		U						
FOREST (AVERILL)	AVERILL	4459	7141	62	Y	M	10.0			62	
FOREST (CALAIS)	CALAIS	4424	7227	125	Y	O	4.8			25	100
FORESTER *	JAMAICA	4305	7252	9	U				9		
FORTIER	ORWELL	4347	7315	4	Y						
FOSTERS	PEACHAM	4420	7213	62	Y		6.0				62
GALE MEADOWS	WINHALL	4310	7252	195	Y		9.3		75	120	

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Identification and Classification of Significant Vermont Lakes

Name	Town	Lat	Long	Lake Area (acres)	PW ?	Trophic (OMED)	Mean Spring P (ug/l)	Not Supp	Part Supp	Threat	Full Supp
GALUSHA;	TOPSHAM	4409	7213	5	U						5
GARFIELD	HYDE PARK	4436	7232	9	U						
GATES	WHITINGHAM	4249	7248	30	Y		8.0			30	
GATES-NE;	MARLBORO	4250	7248		U						
GEORGIA PLAINS	GEORGIA	4443	7310	19	U						
GILLETT	RICHMOND	4421	7258	30	Y		7.0		6	24	
GILMORE	BRISTOL	4405	7302	6	U	D				6	
GLEN	CASTLETON	4340	7314	191	Y	M	14.0		19	19	153
GLOVER;	GLOVER	4442	7214		U						
GOODALL	WOODBURY	4426	7226	7	U						
GOODSELL;	SHELDON	4452	7251	10	U						
GOOSE	BOLTON	4425	7250	2	U						
GOSLANTS	PEACHAM	4418	7218	5	U						
GOSLANTS MILL;	WALDEN	4428	7213	15	U						15
GOULDS;	SPRINGFIELD	4317	7228	6	U						
GRAFT;	BRIGHTON	4449	7156	12	U						
GRAHAMVILLE;	LUDLOW	4325	7242	8	N					8	
GRASS	PLYMOUTH	4333	7244	3	N						
GRAYS	LYNDON	4430	7159	1	U						
GREAT AVERILL	AVERILL	4459	7142	812	Y	O	5.5			812	
GREAT HOSMER	CRAFTSBURY	4442	7222	155	Y	E	26.7			155	
GREEN RIVER	HYDE PARK	4437	7231	554	Y	M	10.7				554
GREENWOOD	WOODBURY	4427	7225	83	Y	M	13.0			16	67
GRIFFITH	PERU	4318	7258	18	Y	D				18	
GRIGGS	ALBANY	4446	7220	6	U						
GROTON	GROTON	4416	7216	414	Y	M	8.7			414	
GROUT	STRATTON	4303	7257	86	Y		10.0			86	
GROUT-N;	STRATTON	4303	7257		U						
GUILFORD - E;	GUILFORD	4246	7234	5	U						
GUILLMETTS	RICHFORD	4458	7240	12	U						
GUT	EDEN	4442	7231	13	Y					13	
HALF MOON	HUBBARDTON	4342	7313	23	Y		4.0			7	16
HALFMOON	FLETCHER	4442	7256	21	Y				21		
HALFMOON COVE	COLCHESTER	4432	7315	14	U					14	
HALFWAY	NORTON	4459	7154	22	Y					22	
HALLOCK;	STARKSBORO	4411	7258	15	U			15			
HALLS	NEWBURY	4405	7207	84	Y	M	12.4		84		
HANCOCK (BRIGHT)	BRIGHTON	4445	7154	7	U						
HANCOCK (STAM)	STAMFORD	4249	7308	51	Y					51	
HANCOCK MT;	ROCHESTER	4356	7249	14	U						14
HANSON	NEWBURY	4410	7207	10	U						
HAPGOOD	PERU	4315	7253	7	Y					7	
HARDWICK	HARDWICK	4431	7222	145	Y			45			100
HARDWOOD	ELMORE	4428	7230	44	Y					44	
HARRIMAN (NEWBURY)	NEWBURY	4406	7205	20	Y		23.5				20
HARRIMAN (WHITING)	WHITINGHAM	4250	7253	2157	Y				2157		
HARTWELL	ALBANY	4442	7217	16	U		4.0				16
HARVEYS	BARNET	4418	7208	352	Y	M			352		
HAWKINS	CALAIS	4424	7230	9	U						
HAYSTACK *	WILMINGTON	4255	7255	27	Y			27			
HEART	ALBANY	4442	7222	6	U						
HICKORY;	WESTMINSTER	4302	7233	16	N						16
										17	

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Identification and Classification of Significant Vermont Lakes

Name	Town	Lat	Long	Lake Area (acres)	PW ?	Trophic (OMED)	Mean Spring P (ug/l)	Not Supp	Part Supp	Threat	Full Supp
HIGH (HUB)	HUBBARDTON	4342	7313	3	U						3
HIGH (SUD)	SUDBURY	4345	7309	20	Y						
HINKUM	SUDBURY	4346	7310	56	Y					11	45
HOLDENS	BROOKFIELD	4402	7235	10	U						
HOLLAND	HOLLAND	4459	7156	334	Y	M	6.7			334	
HOMER STONE;	WALLINGFORD	4325	7256		U						
HOPPER	SANDGATE	4309	7309	1	N						1
HORN OF THE MOON	EAST MONTPELIER	4419	7233	10	U						
HORSE	GREENSBORO	4437	7213	32	Y	M	8.7				32
HORTONIA	HUBBARDTON	4345	7312	449	Y	M	13.0	10		124	315
HOUGH	SUDBURY	4347	7311	16	Y		36.0				
HOVEY;	HARDWICK	4432	7219	6	U						
HOWE	READSBORO	4247	7259	50	Y	D				50	
INDIAN BROOK (ESSEX)	ESSEX	4432	7306	47	Y	E	25.0			47	
INDIAN BROOK; (COL)	COLCHESTER	4432	7309	16	U					16	
INMAN	FAIR HAVEN	4339	7316	76	Y		20.0			15	61
IROQUOIS	HINESBURG	4422	7305	229	Y	E	29.4	40	189		
ISLAND	BRIGHTON	4448	7152	608	Y	M	7.2				608
JACKSONVILLE	WHITINGHAM	4248	7249	20	Y				20		
JEROME	ADDISON	4405	7320	18	Y		220.0				
JEWELL BK #1;	LUDLOW	4322	7243	14	Y					14	
JEWELL BK #2;	LUDLOW	4322	7244	17	Y					17	
JEWELL BK #3;	LUDLOW	4323	7243	18	Y					18	
JOBS	WESTMORE	4446	7157	39	Y	O	5.4				39
JOES (MORRIS)	MORRISTOWN	4430	7237	9	U						
JOES POND	DANVILLE	4425	7213	396	Y	O	7.8		72		324
JOHNSON (KIRBY)	KIRBY	4429	7152	7	N				7		
JOHNSON (ORWELL)	ORWELL	4346	7313	15	U						15
JOHNSON (SHREWS)	SHREWSBURY	4331	7251	12	U				12		
JOHNSON'S MILL;	BAKERSFIELD	4450	7245	5	U						
JONES	CHELSEA	4403	7230	2	U						
JONES MILL	BRANDON	4348	7304	6	U						
JOSLIN TURN;	CONCORD	4422	7150	10	U						
KEELER	WOLCOTT	4434	7224	5	N					5	
KEISER	DANVILLE	4423	7210	33	Y	M	8.2				33
KENNY	NEWFANE	4259	7242	26	Y		4.0			26	
KENT	SHERBURNE	4341	7248	71	Y	M	12.3		26	45	
KENT HOLLOW;	SANDGATE	4312	7312	10	N						10
KETTLE	GROTON	4418	7219	104	Y					104	
KEYSER;	CHELSEA	4357	7226	7	N						
KIDDER	IRASBURG	4452	7219	16	U						16
KING - N	WOODBURY	4425	7226	3	U						
KING - S	WOODBURY	4425	7226	4	U						
KINGS	ROCHESTER	4352	7252	4	N						4
KINGS HILL	BAKERSFIELD	4444	7247	6	U					6	
KIRBY	KIRBY	4431	7155	10	Y				10		
KNAPP BROOK #1	CAVENDISH	4327	7234	25	Y		10.0			25	
KNAPP BROOK #2	CAVENDISH	4327	7234	35	Y		9.0			35	
KNOB HILL	MARSHFIELD	4422	7222	16	N						
LAIRD	MARSHFIELD	4418	7222	12	N						12
LAKE-OF-THE-CLOUDS*	CAMBRIDGE	4433	7249	1	U			1			
LAKOTA	BARNARD	4341	7239	20	Y					20	
LAMOILLE	MORRISTOWN	4434	7237	130	Y				26		104

TABLE II

Identification and Classification of Significant Vermont Lakes

Name	Town	Lat	Long	Lake Area (acres)	PW ?	Trophic (OHED)	Mean Spring P (ug/l)	Not Supp	Part Supp	Threat	Full Supp
LAMSON	BROOKFIELD	4404	7237	24	Y					24	
LANDFILL;	EDEN	4442	7232	7	U						7
LANDGROVE;	LANDGROVE	4317	7250		U						
LANPHER MEADOW	EDEN	4443	7236	6	U						
LAUREL	WHITINGHAM	4249	7249	16	U		14.0			16	
LC-BURLINGTON BAY	BURLINGTON	4429	7316	2532	Y	E		710	100	1722	
LC-ISLE LA MOTTE	ALBURG	4500	7319	26202	Y	M		100	80	26022	
LC-MAIN LAKE	SOUTH HERO	4442	7322	42010	Y	M		160	48	41802	
LC-MALLETTS BAY	COLCHESTER	4435	7317	13388	Y	M		208	13180		
LC-MISSISQUOI BAY	ALBURG	4500	7310	7998	Y	E		700	7298		
LC-NORTHEAST ARM	SWANTON	4458	7310	58184	Y	M		1000	2036	55148	
LC-OTTER CREEK	FERRISBURG	4416	7319	4423	Y	E		200	300	3923	
LC-PORT HENRY	FERRISBURG	4412	7322	9302	Y	E		200		9102	
LC-SHELBURNE BAY	SHELBURNE	4426	7314	2249	Y	M		23	20	2206	
LC-SOUTH LAKE	BRIDPORT	4402	7325	5388	Y	E		215	5173		
LC-ST. ALBANS BAY	ST. ALBANS	4446	7310	2499	Y	E		2499			
LEECH	WOODBURY	4425	7226	4	U						
LEFFERTS	CHITTENDEN	4343	7254	55	Y	O	7.0				55
LEIGHTON HILL;	NEWBURY	4408	7207	6	U					6	
LEVI	GROTON	4416	7214	22	Y	M	8.0			22	
LEWIN	NORWICH	4346	7213	4	N						4
LEWIS	LEWIS	4453	7147	64	Y					64	
LIGHT TROUT CLUB	MORETOWN	4417	7245	7	N					7	
LILY (ATHENS)	ATHENS	4305	7236	12	N					12	
LILY (CAS)	CASTLETON	4341	7313	9	Y						9
LILY (LON)	LONDONDERRY	4314	7245	21	Y					21	
LILY (LYN)	LYNDON	4431	7200	8	U					8	
LILY (NORWICH)	NORWICH	4344	7215	6	U						6
LILY (POUL)	POULTNEY	4330	7312	21	Y	E	41.6	21			
LILY (VERNON)	VERNON	4244	7230	41	Y		14.5			25	16
LILY PAD	COLCHESTER	4430	7310	2	U					2	
LIMEHURST	WILLIAMSTOWN	4406	7233	13	N						
LINE (BARNARD)	BARNARD	4343	7234	10	U						
LINE (HOL)	HOLLAND	4500	7155	5	Y					5	
LITTLE (CALAIS)	CALAIS	4423	7226	7	U						
LITTLE (ELM)	ELMORE	4428	7230	14	N					14	
LITTLE (FRANK)	FRANKLIN	4457	7250	95	Y					20	75
LITTLE (WELLS)	WELLS	4326	7312	172	Y	M	12.7	40		132	
LITTLE (WIN)	WINHALL	4307	7256	18	Y					18	
LITTLE (WOOD) *	WOODFORD	4255	7304	16	Y			16			
LITTLE AVERILL	AVERILL	4457	7143	483	Y	O	4.0			483	
LITTLE ELIGO	HARDWICK	4435	7222	15	U					15	
LITTLE ELMORE	ELMORE	4430	7232	24	Y						24
LITTLE HOSMER	CRAFTSBURY	4441	7223	183	Y	M	9.5			36	147
LITTLE MUD (GRANBY)	GRANBY	4435	7144	2	U						
LITTLE MUD (MT. TAB)	MT. TABOR	4319	7256	7	Y	D				7	
LITTLE MUD (WIN)	WINHALL	4308	7259	4	U					4	
LITTLE MUD (WOOD)	WOODBURY	4423	7223	10	U						
LITTLE ROCK	WALLINGFORD	4324	7257	18	Y					18	
LITTLE WHEELER	BRUNSWICK	4443	7138	9	U						9
LOCKWOOD	LOWELL	4448	7233	1	U						1
LONG (EDEN)	EDEN	4446	7236	93	Y		10.0				93

TABLE II

Identification and Classification of Significant Vermont Lakes

Name	Town	Lat	Long	Lake Area (acres)	PW ?	Trophic (OMED)	Mean Spring P (ug/l)	Not Supp	Part Supp	Threat	Full Supp
LONG (MILTON)	MILTON	4440	7312	47	Y		22.0			47	
LONG (NEWBURY)	NEWBURY	4406	7210	15	U						
LONG (SHEF)	SHEFFIELD	4441	7209	38	Y						38
LONG (WEST)	WESTMORE	4445	7201	103	Y	O	5.5			20	83
LONG HOLE	PERU	4318	7257	18	Y					18	
LONG MEADOW;	CALAIS	4421	7232	7	U						
LONG-E;	WESTMORE	4445	7202	12	U						
LOST (BELV)	BELVIDERE	4447	7239	3	U						3
LOST (GEORGIA)	GEORGIA	4446	7306	10	U					10	
LOST (GLASTEN)	GLASTENBURY	4257	7303	1	U					1	
LOST (SUND)	SUNDERLAND	4302	7302	2	Y						
LOVE'S MARSH	CASTLETON	4340	7312	62	Y					62	
LOWELL	LONDONDERRY	4313	7246	102	Y	M	9.5			102	
LOWER	HINESBURG	4421	7305	61	Y	E	18.0	61			
LOWER HURRICANE	HARTFORD	4339	7222	7	U					7	
LOWER ORANGE	ORANGE	4410	7225	8	Y						8
LOWER SYMES	RYEGATE	4415	7206	57	Y		12.0				57
LOWER WINOOSKI;	COLCHESTER	4430	7310	4	U					4	
LYE BROOK - N;	SUNDERLAND	4306	7302	10	Y						
LYE BROOK - S;	SUNDERLAND	4305	7302	18	Y						
LYFORD	WALDEN	4427	7215	33	Y	M	8.6				33
LYMAN HILL;	MARLBORO	4252	7244	9	Y						
MACKVILLE	HARDWICK	4429	7222	11	U					11	
MADELEINE	SANDGATE	4310	7309	20	N						20
MAIDSTONE	MAIDSTONE	4439	7139	796	Y	O	5.7			796	
MANSFIELD	STOWE	4428	7249	35	Y		9.0			35	
MARL	SUTTON	4442	7204	10	Y						10
MARLBORO - 431;	MARLBORO	4253	7243	10	Y						10
MARSHFIELD	MARSHFIELD	4420	7220	65	Y		12.3			13	52
MARTIN;	WILLIAMSTOWN	4409	7234	28	Y						28
MARTINS	PEACHAM	4418	7213	77	Y	M	11.0				77
MATHEWSON;	SHEFFIELD	4437	7204		U						
MAY	BARTON	4445	7207	116	Y		11.0			23	93
MCALLISTER	LOWELL	4450	7229	25	Y		17.0				25
MCCONNELL	BRIGHTON	4449	7148	89	Y					89	
MCGOWAN - E;	HIGHGATE	4456	7255	18	U						
MCGOWAN - W;	HIGHGATE	4456	7255	10	U						
MCINTOSH	ROYALTON	4349	7229	23	Y					23	
MECAWEE	READING	4333	7238	11	U					11	
MEMPHREMAGOG	NEWPORT	4459	7213	5847	Y	M		100	50	200	5497
METCALF	FLETCHER	4444	7253	71	Y	M	10.6	15		20	36
MIDDLE WOODBURY;	WOODBURY	4426	7226	9	U						
MILE	FERDINAND	4447	7148	26	Y						
MILES	CONCORD	4427	7149	206	Y	M	7.7			40	166
MILL (BENSON)	BENSON	4342	7317	39	Y		32.0		39		
MILL (WINDSOR)	WINDSOR	4328	7224	70	Y		13.0			70	
MILL (WOOD)	WOODFORD	4255	7302	7	U						
MILLER	STRAFFORD	4354	7218	63	Y		7.0				63
MILLER;	ARLINGTON	4302	7310	11	Y			11			
MILTON	MILTON	4438	7304	24	Y					24	
MINARDS	ROCKINGHAM	4309	7228	46	Y						46
MINSEY;	ALBANY	4443	7217	8	U						
MIRROR	CALAIS	4424	7227	86	Y	M	10.0			17	69

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Name	Town	Lat	Long	Lake Area (acres)	PW ?	Trophic (OMED)	Mean Spring P (ug/l)	Not Supp	Part Supp	Threat	Full Supp
MITCHELL	SHARON	4345	7224	28	Y		3.0				28
MOLLY'S	CABOT	4424	7214	38	Y				38		
MOLLY'S FALLS	CABOT	4421	7217	411	Y		9.0			100	311
MOORE - L	PLYMOUTH	4331	7243	5	N						5
MOORE - U	PLYMOUTH	4331	7243	3	Y						3
MOOSE;	MORGAN	4452	7155	10	N						10
MOREY	FAIRLEE	4355	7209	538	Y	M	34.0		35	503	
MORRISVILLE;	MORRISTOWN	4433	7236	8	U						
MOSCOW	HUBBARDTON	4341	7314	3	U						
MOSES	WESTON	4320	7251	12	Y					12	
MOUNT TABOR;	MT. TABOR	4323	7252		U						
MUD (BENSON)	BENSON	4345	7320	8	U			8			
MUD (BRAIN)	BRAINTREE	4359	7242	10	U						
MUD (BRIGHTON - E)	BRIGHTON	4449	7149	4	U						
MUD (BRIGHTON - W)	BRIGHTON	4450	7156	6	U						
MUD (BRUNS)	BRUNSWICK	4444	7140	5	U						
MUD (CHARLES)	CHARLESTON	4453	7201	4	U						
MUD (CRAFT)	CRAFTSBURY	4438	7224	35	Y				35		
MUD (EAST HAVEN)	EAST HAVEN	4436	7149	5	U			5			
MUD (EDEN - N)	EDEN	4444	7228	2	U					2	
MUD (EDEN - S)	EDEN	4442	7231	1	U						
MUD (GRANBY)	GRANBY	4435	7144	55	Y		11.0			55	
MUD (GREENS - NE)	GREENSBORO	4438	7214	9	U						
MUD (GREENS - SW)	GREENSBORO	4435	7221	5	U						
MUD (HOL)	HOLLAND	4456	7201	14	Y						14
MUD (HYDE PARK)	HYDE PARK	4436	7230	14	U						5
MUD (IRA)	IRASBURG	4447	7215	5	U						
MUD (LEICESTER)	LEICESTER	4353	7305	23	Y					23	
MUD (MORGAN - N)	MORGAN	4456	7201	35	Y					35	
MUD (MORGAN - W)	MORGAN	4455	7203	11	Y					11	
MUD (ORWELL)	ORWELL	4346	7316	10	U				10		
MUD (PEACHAM)	PEACHAM	4419	7213	34	Y						
MUD (PERU)	PERU	4313	7252	10	Y				10		
MUD (SHEF)	SHEFFIELD	4441	7208	5	N						5
MUD (STAM)	STAMFORD	4250	7302	6	Y					6	
MUD (THET)	THETFORD	4351	7215	20	Y					20	
MUD (WESTMORE)	WESTMORE	4446	7157	9	U						
MUD (WOOD - E)	WOODBURY	4426	7221	10	U						
MUD (WOOD - N)	WOODBURY	4429	7229	16	U						
MUD (WOOD - SE)	WOODBURY	4424	7223	18	U					18	
MUD CREEK	ALBURG	4459	7316	318	Y						318
MUDD	HUBBARDTON	4344	7309	20	Y					10	10
MUDDY (NEWBURY)	NEWBURY	4407	7210	3	U						
MUDDY (RUTLAND)	RUTLAND	4338	7300	10	U				10		
N.E. DEVELOPERS	WELLS	4326	7313	27	Y		21.5			10	17
NEAL	LUNENBURG	4429	7142	182	Y		12.2			182	
NELSON (E. MONT)	EAST MONTPELIER	4419	7232	10	U						
NEWARK	NEWARK	4443	7159	163	Y	M	7.0			163	
NICHOLS	WOODBURY	4427	7221	167	Y		8.0		167		
NINEVAH	MT. HOLLY	4328	7245	237	Y	M	8.7			237	
NORFORD	THETFORD	4348	7218	21	Y					21	
NORTH (BRISTOL)	BRISTOL	4406	7303	6	U					6	
										24	

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Name	Town	Lat	Long	Lake Area (acres)	PH ?	Trophic (OMED)	Mean Spring P (ug/l)	Not Supp	Part Supp	Threat	Full Supp
NORTH (CHIT)	CHITTENDEN	4345	7253	3	Y					3	
NORTH (WHITING)	WHITINGHAM	4245	7253	20	Y						20
NORTH BENNINGTON	SHAFTSBURY	4258	7309	1	U						
NORTH HARTLAND	HARTLAND	4337	7222	215	Y			215			
NORTH MONTPELIER	EAST MONTPELIER	4419	7227	72	Y		7.0	30	42		
NORTH SPRINGFIELD	SPRINGFIELD	4321	7230	290	Y				290		
NORTH UNDERHILL;	UNDERHILL	4436	7256	12	U						
NORTON	NORTON	4456	7152	583	Y	M	6.8				583
NOTCH	FERDINAND	4444	7143	22	Y					22	
NOYES	GROTON	4414	7219	39	Y		5.0			39	
NULHEGAN	BRIGHTON	4447	7149	37	Y	M	10.0			37	
NUMBER ELEVEN;	WESTFORD	4437	7258	12	U						
OAK HILL;	WILLISTON	4425	7305	8	U						
OLD MARSH	FAIR HAVEN	4338	7316	123	Y		11.0			24	99
OLYMPUS POOL	PROCTOR	4339	7302	3	Y				3		
OSMORE	PEACHAM	4418	7217	48	Y		11.0			48	
OXBOW;	SWANTON	4455	7305	27	Y					27	
PAGE	ALBANY	4443	7222	16	U						
PARAN	BENNINGTON	4256	7314	40	Y	E	14.8	26	14		
PARKER	GLOVER	4443	7214	239	Y	E	15.0		74		165
PATCH	RUTLAND	4338	7259	20	Y				20		
PAUL STREAM	BRUNSWICK	4441	7137	20	Y					20	
PEABODY;	WESTON	4319	7251		U						
PEACHAM	PEACHAM	4420	7216	331	Y	M	8.1			331	
PECKS	BARRE	4410	7232	16	Y				16		
PENSIONER	CHARLESTON	4452	7203	170	Y	M	8.7			34	136
PERCH (BENSON)	BENSON	4345	7317	24	Y	M	9.0			24	
PERCH (WOLCOTT)	WOLCOTT	4437	7230	7	Y				1		6
PERU;	PERU	4314	7254		U						
PHILLIPS	WESTFIELD	4455	7225	4	U						4
PICKEREL	MANCHESTER	4312	7301	9	N					9	
PICKETT	WOODBURY	4426	7223	5	U						
PICKLES	BROOKFIELD	4400	7236	17	Y						
PICO	SHERBURNE	4339	7249	12	N					12	
PIEDMONT	RUTLAND	4337	7258	1	U						
PIGEON	GROTON	4415	7220	72	Y					72	
PIKES;	WEATHERSFIELD	4324	7228	49	Y						
PINE	CASTLETON	4338	7312	40	Y					16	24
PINNACLE;	WELLS	4327	7308	6	N						6
PINNEO	HARTFORD	4339	7226	50	Y	E	30.5		50		
PLEASANT VALLEY	BRATTLEBORO	4253	7237	25	Y				25		
PLEIAD	HANCOCK	4356	7257	6	U				6		
POTTERS	ALBANY	4447	7219	5	U						
PRENTISS	DORSET	4315	7306	5	U				1		4
PRESTON	BOLTON	4425	7255	9	U						
PROPER	HIGHGATE	4500	7303	9	U						9
QUARRY	WEATHERSFIELD	4322	7232	1	N						
QUARRY;	CASTLETON	4336	7310	17	U					17	
RANDOLPH - N;	RANDOLPH	4359	7237	10	U					10	
RAPONDA	WILMINGTON	4253	7249	116	Y	M	9.6		25	91	
READING	READING	4330	7239	22	Y					22	
RED MILL	WOODFORD	4253	7302	7	Y						7
RESCUE	LUDLOW	4327	7242	180	Y	M	8.0		18	162	

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RESERVOIR	LUDLOW	4326	7242	32	Y		6.0			32	
REYNOLDS	PROCTOR	4339	7302	3	U						
RICHARDS;	MARSHFIELD	4422	7221	14	Y						
RICHMOND	RICHMOND	4425	7257	24	Y		18.0			24	
RICHVILLE	SHOREHAM	4351	7316	124	Y		56.0		41	83	
RICKER	GROTON	4415	7215	92	Y	M	10.0			18	74
RIDDEL	ORANGE	4408	7221	15	N				15		
RIPTON - NW;	RIPTON	4402	7303	8	Y						
RITTERBUSH	EDEN	4445	7236	14	N						14
RITTERBUSH MEADOW;	EDEN	4445	7235	10	U					10	
ROACH	HUBBARDTON	4343	7312	20	Y		4.0		10		10
ROBINSON;	NORTHFIELD	4407	7237	7	Y			7			
ROCKY	RUTLAND	4338	7300	8	U						8
ROOD	WILLIAMSTOWN	4405	7235	23	Y	M	7.0			23	
ROOT	BENSON	4341	7321	18	U		13.0				18
ROULEAU	WILLIAMSTOWN	4407	7233	1	Y						1
ROUND (EDEN)	EDEN	4442	7232	10	Y						
ROUND (HOL)	HOLLAND	4500	7156	14	Y					14	
ROUND (MILTON)	MILTON	4440	7311	22	Y		24.0			22	
ROUND (NEWBURY)	NEWBURY	4406	7210	30	Y						30
ROUND (SHEF)	SHEFFIELD	4441	7209	13	U						13
ROWE;	WEST WINDSOR	4328	7230	7	N						
ROXBURY FLAT;	ROXBURY	4405	7244	13	U						
ROYALTON HILL;	ROYALTON	4347	7234	11	U					11	
RUNNEMEDE	WINDSOR	4329	7223	53	Y		12.7			30	23
RUSH	EDEN	4440	7232	14	Y						14
RUSS	ELMORE	4428	7232	7	N					7	
RUTLAND CITY	RUTLAND	4339	7257	13	U					13	
RYDER	WHITINGHAM	4249	7251	14	N					14	
RYEGATE CENTER;	RYEGATE	4413	7207	7	Y				7		
SABIN	WOODBURY	4424	7225	142	Y	M	8.5			60	82
SADAWGA	WHITINGHAM	4247	7253	194	Y					194	
SALEM	DERBY	4456	7206	788	Y	M	9.8		78	80	630
SALMON;	PUTNEY	4259	7235	6	Y						6
SARAH MOOR	BARNET	4419	7204	13	N						
SARGENT	COVENTRY	4455	7216	6	Y				6		
SAWDUST	NEWARK	4444	7158	15	Y			15			
SAXE;	HIGHGATE	4458	7304	5	U						
SCHOFIELD	HYDE PARK	4439	7232	29	Y					29	
SEARSBURG	SEARSBURG	4255	7256	25	Y				25		
SEYMOUR	MORGAN	4454	7159	1777	Y	O	7.5			355	1422
SHADOW (CONC)	CONCORD	4424	7152	114	Y	M	8.3				114
SHADOW (GLOV)	GLOVER	4440	7213	199	Y	O	6.5				199
SHADOW (WOOD)	WOODBURY	4428	7225	2	U						
SHAFTSBURY	SHAFTSBURY	4301	7311	27	Y		11.0		27		
SHARON - E;	SHARON	4347	7224	8	N						
SHAWVILLE;	HIGHGATE	4456	7256	11	U						
SHELBURNE	SHELBURNE	4423	7310	450	Y	E	110.4	450			
SHELDON;	FAIR HAVEN	4340	7316	2	U						
SHERMAN	WHITINGHAM	4244	7255	160	Y				160		
SHIPPEE	WHITINGHAM	4245	7250	24	Y		9.0				24
SILVER (BAR)	BARNARD	4344	7237	84	Y	M	14.7		20	64	

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Name	Town	Lat	Long	Lake Area (acres)	PW ?	Trophic (OMED)	Mean Spring P (ug/l)	Not Supp	Part Supp	Threat	Full Supp
SILVER (LEICESTER)	LEICESTER	4353	7303	103	Y						103
SIMONDS	HARTFORD	4338	7221	1	U					1	
SIMPSONVILLE;	TOWNSHEND	4304	7238	12	Y						
SKYLIGHT	RIPTON	4359	7256	2	Y					2	
SLAYTON (WOOD)	WOODBURY	4426	7228	8	U					8	
SMITH (COV)	COVENTRY	4455	7217	8	N				8		
SMITH (PITT)	PITTSFORD	4343	7304	6	U				6		
SMITH (WOOD)	WOODBURY	4426	7228	4	U						
SODON	EAST MONTPELIER	4419	7230	21	Y	E	13.5			21	
SOMERSET	SOMERSET	4300	7256	1597	Y			1597			
SOMERSET-N;	SOMERSET	4301	7258		Y						
SOUTH (BROOK)	BROOKFIELD	4402	7237	16	U		4.0				16
SOUTH (CHIT)	CHITTENDEN	4343	7253	10	U					10	
SOUTH (EDEN)	EDEN	4441	7232	109	Y		12.0			109	
SOUTH (MARL)	MARLBORO	4251	7243	68	Y		3.7			68	
SOUTH AMERICA	FERDINAND	4442	7145	29	Y					29	
SOUTH BAY	NEWPORT	4456	7212	470	Y	E			470		
SOUTH MECAWEE;	READING	4332	7238		Y						
SOUTH READING;	READING	4328	7236	12	U						
SOUTH RICHFORD;	RICHFORD	4457	7239	12	U						
SOUTH STREAM	POWNAL	4249	7311	24	Y			24			
SOUTH VILLAGE	DORSET	4314	7301	5	U					5	
SOUTH WOODBURY;	WOODBURY	4425	7225	6	U						
SPECTACLE	BRIGHTON	4448	7151	102	Y	N	8.5			102	
SPOONERVILLE;	CHESTER	4319	7233	8	Y						8
SPRING (BRANDON)	BRANDON	4350	7304	5	Y						
SPRING (SHREWS)	SHREWSBURY	4330	7255	64	Y	M	15.0				64
SPRINGFIELD	WEATHERSFIELD	4321	7229	10	Y						
SPRUCE (ORWELL)	ORWELL	4346	7317	25	Y					5	20
SPRUCE (WILM)	WILMINGTON	4251	7250		U						
ST. ALBANS - N	FAIRFAX	4446	7304	35	Y						35
ST. ALBANS - S	FAIRFAX	4445	7304	27	Y						27
ST. CATHERINE	WELLS	4328	7313	852	Y	M	13.7	170		682	
STAMFORD *	STAMFORD	4249	7304	12	U				12		
STANDING	SHARON	4349	7226	15	N						
STANNARD	STANNARD	4432	7210	25	Y				5		20
STANNARD-E;	STANNARD	4432	7211		U						
STAPLES	WILLIAMSTOWN	4405	7234	15	N					15	
STAR	MT. HOLLY	4325	7249	56	Y	E	17.9	5			51
STERLING	CAMBRIDGE	4433	7247	8	Y					8	
STEVENS	MAIDSTONE	4436	7134	26	Y						146
STILES	WATERFORD	4425	7156	146	Y						5
STILLWATER	CHARLESTON	4450	7156	5	U						353
STONE BRIDGE	PANTON	4409	7320	441	Y				88		52
STOUGHTON	WEATHERSFIELD	4323	7230	65	Y		18.0		13		
STRAFFORD;	STRAFFORD	4351	7226	18	N						
STRATTON	STRATTON	4306	7258	46	Y					46	
STUART	LYNDON	4430	7201	4	U						
SUGAR HILL	GOSHEN	4355	7300	60	Y			60			
SUGAR HOLLOW	PITTSFORD	4345	7302	21	Y					21	
SUKES	BRIGHTON	4445	7154	9	U						
SUNRISE	BENSON	4346	7316	52	Y	N	12.2			10	42
SUNSET (BENSON)	BENSON	4345	7316	195	Y	O	7.1			40	155

TABLE II

Identification and Classification of Significant Vermont Lakes

Name	Town	Lat	Long	Lake Area (acres)	PW ?	Trophic (OMED)	Mean Spring P (ug/l)	Not Supp	Part Supp	Threat	Full Supp
SUNSET (BROOK)	BROOKFIELD	4402	7236	25	Y	M	6.5			12	13
SUNSET (MARL)	MARLBORO	4255	7241	95	Y					95	
SWAMP	LEICESTER	4351	7309	5	U						
SWEENEY	GLOVER	4442	7217	9	U						9
SWEET	GUILFORD	4245	7238	20	U						20
TABOR	CALAIS	4423	7229	5	U						
TELEPHONE;	CHESTER	4316	7233	15	Y						15
THE FISH	NEWBURY	4405	7204	6	U						
THE POGUE	WOODSTOCK	4338	7233	11	Y				11		
THETFORD - SW1;	THETFORD	4349	7217	19	Y					19	
THETFORD - SW2;	THETFORD	4348	7217	6	N					6	
THOMPSONS	POWNAL	4247	7311	28	Y					28	
THURMAN W. DIX	ORANGE	4411	7225	119	Y					119	
TICKLENAKED	RYEGATE	4411	7206	48	Y	E	30.9			24	24
TILDY'S	GLOVER	4439	7212	33	Y	E	19.7			8	25
TINY	LUDLOW	4328	7243	29	Y					29	
TOAD (CHARLES)	CHARLESTON	4451	7203	22	Y					22	
TOAD (MORGAN)	MORGAN	4455	7157	12	Y						12
TOWNSHEND	TOWNSHEND	4303	7242	100	Y				100		
TROUT BROOK;	BERKSHIRE	4456	7247	5	U						
TUNBRIDGE TROUT	TUNBRIDGE	4351	7228	5	U						
TURTLE	HOLLAND	4500	7155	27	Y					27	
TUTTLE (BRUN)	BRUNSWICK	4442	7138	14	U					14	
TUTTLE (HARD)	HARDWICK	4433	7219	21	Y						
TWIN	BROOKFIELD	4404	7235	16	U						
TWIN - E	ATHENS	4308	7236	3	N						3
TWIN - W	ATHENS	4308	7236	1	N						1
UNDERPASS	MORGAN	4452	7154	3	N						3
UNKNOWN (AV GORE)	AVERYS GORE	4455	7151	19	U	D				19	
UNKNOWN (FERD)	FERDINAND	4440	7143	12	U						12
UPPER DANVILLE;	DANVILLE	4426	7211	19	U						
UPPER HURRICANE	HARTFORD	4339	7222	4	U					4	
UPPER SYMES	RYEGATE	4415	7207	20	Y					20	
UPPER WINOOSKI;	COLCHESTER	4430	7310	10	U					10	
VAIL	SUTTON	4442	7205	16	Y						16
VALLEY	WOODBURY	4428	7226	83	Y	M	36.6			20	63
VERGENNES WATERSHED	BRISTOL	4409	7308	15	U			3			12
VERSHIRE - E;	VERSHIRE	4358	7215	10	N						10
VIEW	WOODSTOCK	4336	7231	4	Y						4
VONDELL	WOODSTOCK	4338	7234	10	U						10
WAITS;	TOPSHAM	4405	7218	6	U						
WALDEN - S;	WALDEN	4426	7214	8	U						
WALKER (COV)	COVENTRY	4456	7216	18	Y					18	
WALKER (HUB)	HUBBARDTON	4345	7308	13	N						
WALKER (NEWARK)	NEWARK	4444	7155	3	Y				3		
WALLACE	CANAAN	4501	7138	532	Y	M	10.0		30		502
WALLINGFORD	WALLINGFORD	4325	7254	86	Y					86	
WALTON	WOODBURY	4427	7226	13	U						
WANTASTIQUET	WESTON	4318	7249	44	Y		8.0				44
WAPANACKI	WOLCOTT	4433	7224	21	Y	M	9.3			4	17
WARDEN	BARNET	4420	7205	46	Y		3.0				46
WARNER;	JAY	4459	7226		U						
							22.0		100		723

TABLE II
Identification and Classification of Significant Vermont Lakes

Name	Town	Lat	Long	Lake Area (acres)	PW ?	Trophic (OMED)	Mean Spring P (ug/l)	Not Supp	Part Supp	Threat	Full Supp
WATERFORD - E;	WATERFORD	4424	7155	5	U						
WATSON	CALAIS	4423	7229	11	U						
WEATHERHEAD HOLLOW	GUILFORD	4244	7237	33	Y		8.3				33
WEAVER;	GRAFTON	4311	7234	12	N						
WEST FAIRLEE;	WEST FAIRLEE	4355	7214	15	U						15
WEST HILL	CABOT	4425	7221	46	Y		6.0			9	37
WEST MOUNTAIN	MAIDSTONE	4441	7140	62	Y		12.0			62	
WESTFORD	WESTFORD	4436	7304	9	U						
WESTMINSTER - E;	WESTMINSTER	4306	7227	16	Y						16
WESTMINSTER - W;	WESTMINSTER	4303	7232	8	U						
WHEELER (BART)	BARTON	4443	7206	15	Y						15
WHEELER (BRUN)	BRUNSWICK	4443	7139	70	Y	D				70	
WHEELER (WOOD)	WOODBURY	4426	7227	4	U						
WHEELOCK	CALAIS	4424	7229	4	U						
WHITCOMB	WILLIAMSTOWN	4407	7234	1	N						1
WHITEHOUSE	VERSHIRE	4359	7222	5	Y						5
WILLARD;	MT. TABOR	4323	7255		U						
WILLIAMSTOWN - NE;	WILLIAMSTOWN	4408	7228	7	U						7
WILLOUGHBY	WESTMORE	4445	7204	1653	Y	O	4.7		11	20	1622
WINHALL;	STRATTON	4306	7259		Y						
WINONA	BRISTOL	4410	7305	234	Y	E	24.0	234			
WOLCOTT	WOLCOTT	4434	7225	68	Y	D	14.0			68	
WOODBURY;	WOODBURY	4226	7225		U						
WOODWARD	PLYMOUTH	4334	7246	105	Y	M	7.2				105
WORCESTER - L	WORCESTER	4424	7232	35	Y					35	
WORCESTER - U	WORCESTER	4425	7232	11	Y				5		6
WRIGHT	HARTFORD	4339	7221	4	U					4	
WRIGHTSVILLE	MIDDLESEX	4419	7234	89	Y		6.0			10	79
YAW	READSBORO	4251	7301	2	Y						2
ZACK WOODS	HYDE PARK	4436	7230	23	Y	M	9.0				23
719				229146				11493	37713	153319	24596

Appendix C

Assessment Methods

Sources of Information

The water quality assessment of lakes was based on information derived from a wide variety of sources. Site specific water quality data was used whenever available. In addition, public opinion regarding the condition of each lake was solicited and the assessment of many lakes is based on such information. The various sources of information are detailed below.

Much lake information was obtained from Department of Environmental Conservation Lakes and Ponds Unit sampling programs and files. Basic water quality data was available from the Lay Monitoring Program, the Spring Phosphorus Program, summer bacteriological sampling, the Aquatic Plant Survey Program, and the Acid Precipitation Monitoring Program's Long-Term Lake Monitoring. In addition, several other in-depth lake studies yielded more comprehensive information on certain lakes. Yearly weed and algae complaint files and information from correspondence files aided in the assessment of public opinion regarding specific lakes.

Regional employees of the Agency of Natural Resources were contacted regarding the condition of lakes in their respective districts. Fish and Wildlife wardens were sent questionnaires about the lakes located in their towns. District Fisheries Managers were sent a different questionnaire about each lake in their district. It should be noted that the Fisheries Manager's assessment of a lake's compliance with the Clean Water Act goal of "Fishable" waters was relied on almost exclusively in making the determination of "fishable" during the assessment.

Lake questionnaires were also sent to Vermont Town Clerks. This information was used to help assess the public perception of the water quality condition of specific lakes and to gather knowledge regarding sources of existing water quality impairments. Similar questionnaires were sent to the 100 Lake Associations in Vermont known to the Department of Environmental Conservation.

Additionally, any information relevant to lakes encountered by other Water Quality Division staff members while contacting professionals and individuals around the state for the Nonpoint Source Assessment was included in the Lakes Assessment.

Assessment Definitions

Each lake was assessed according to its compliance with the eight designated uses of Vermont's Water Quality Standards outlined in the following chart.

Use	Class A	Class B	Class C
Aesthetics	Water quality of uniformly excellent character	Water quality consistently exhibits good aesthetic value	none
Contact Recreation	When compatible, suitable for the enjoyment of the water in its natural condition	swimming and recreation	not a use
Non-Contact Recreation	as for Class C	as for Class C	Recreational or other uses in which contact with the water is minimal and where ingestion of the water is not probable
Unfiltered Water Supply	Source of public water supply with disinfection when necessary	not a use	not a use
Filtered Water Supply		Public water supply with filtration and disinfection	not a use
Agricultural Water Supply		Irrigation and other agricultural uses	Irrigation of crops not used for human consumption without cooking
Industrial Water Supply			Compatible industrial uses
Biota	High quality waters which have significant ecological value	Provides high quality habitat for aquatic biota, fish and wildlife	Habitat suitable for aquatic biota, fish and wildlife

For each major use, definitions were developed that helped describe when a use was fully supported, partially supported or not supported in a lake setting, as follows:

Aesthetics

Fully Supported: Clear water and no floating algae scums. Aquatic macrophytes not present in surface mats or covered with periphyton. Few to no public complaints.

Partially Supported: Algae blooms every few years. Generally elevated algae levels (more than likely under natural conditions). Floating algae scums at low levels. Minor amounts of periphyton and/or surface mats of aquatic macrophytes. Some public complaints.

Not Supported: Regular and serious algae blooms. Persistent floating algae scums. Surface mats of nuisance aquatic macrophytes. Clumps of macrophytes washed up on shore.

Contact Recreation

Fully Supported: No algae blooms. No periphyton covering on lake bottom. Relatively clear water. No nuisance macrophyte beds (plants growing at likely natural levels). Few if any public complaints. Fecal coliform bacteria count rarely or never exceeds 200/100 ml.

Partially Supported: Infrequent algae blooms. Some nuisance macrophyte beds (but impacting relatively little of the shoreline). Algae at higher than natural levels. Some public complaints. More than one repeat fecal coliform bacteria violation (exceeding 200/100 ml) during a summer over the past five years.

Not Supported: Frequent and persistent algae blooms. Dense nuisance macrophyte beds covering much of the shoreline. Frequent public complaints. Regular fecal coliform bacteria violations (exceeding 200/100 ml) forcing public beach closings and swimming restrictions.

Non-Contact Recreation

Fully Supported: No dense surfacing nuisance macrophyte beds. Aquatic plants present at natural levels.

Partially Supported: Some dense surfacing macrophyte beds, not impacting the entire shoreline.

Not Supported: Dense surface nuisance macrophyte beds covering most of the shoreline. Frequent public complaints.

Filtered Water Supply

Fully Supported: Fecal coliform bacteria concentration rarely or never exceeds 200/100 ml.

Partially Supported: More than one repeat fecal coliform bacteria violation (exceeding 200/100 ml) during a summer over the past five years.

Not Supported: Regular fecal coliform bacteria violations (exceeding 200/100 ml).

Biota

Fully Supported: Biological community is no different from controls or ecoregion standards.

Partially Supported: Some uncertainty about quality of habitat. Some modifications in biological community noted.

Not Supported: Definite modifications in the biological community. Pollutants found at levels of concern.

Whenever possible, the likely natural condition of a lake was taken into account in addition to the above definitions when assessing use support. For instance, a naturally shallow, weedy pond cannot be expected to be used for contact recreation, so no use impairment was noted. In many cases, however, no site visit had been made to a lake so the extent of use impairment was an estimate based on information from the public. Many of the lakes, especially those in the "evaluated" category, should be visited and/or sampled by a qualified biologist in order to verify use impairment or support.

Threats to use support were identified through two major avenues. First, information received from Fish and Wildlife wardens, District Fisheries Managers, Town Clerks, Lake Associations and members of the

public often indicated a use impairment in a particular lake and the source of that impairment. When the various information sources did not agree about an impairment or its causes and sources, the lake was listed as threatened rather than not supported or partially supported. These situations all need further assessment and verification. Second, three major statewide threats to lakes were identified by the Department of Environmental Conservation. Each lake was evaluated as to its vulnerability to these three threats, according to the following criteria:

Eurasian milfoil

Lakes within ten miles of lakes already containing Eurasian milfoil were considered highly vulnerable to an infestation and were evaluated as threatened. Generally, 20% of the lake's acreage was considered threatened to correspond to the approximate acreage of the littoral zone. The cause was listed as #22.3 (non-native nuisance plants) and the source was #87 (recreational activities).

Development within a lake's watershed

Lakes located in "Rapid Growth Towns" were considered threatened by the cumulative impacts associated with land development and the subsequent runoff from urban and cleared areas. Rapid Growth Towns were defined by the Growth Areas Research Project (Vt. Law School's Environmental Law Center, 1985). This project ranked towns according to four growth indexes:

(1) Numerical increase in population and housing units (1970-1980);
(2) Rate of growth of population and housing units (1970-1980);
(3) Employment growth (1980-1984); and
(4) Monetary value and estimated construction costs of Act 250 projects in 1980 and 1984.

Any town that ranked in the top 25 in two or more of the above indicators was designated a Rapid Growth Town. Thirty-seven towns were so designated (15% statewide). The entire lake acreage was considered threatened, due to the potential for algae blooms resulting from increased nutrient loading. The in-lake cause was identified as #9.0 (nutrients), and the sources were listed as #9.0, 32, and 40 (unspecified nonpoint sources, land development and urban

runoff). In fact, the actual sources vary considerably from watershed to watershed depending on the nature of the development. In addition, the impact of development on the lakes varies considerably depending on many factors including effectiveness of local building regulations and compliance with permits. However, as an initial ranking of vulnerable lakes, this list will serve to guide lake protection efforts. The actual threat to these lakes needs further assessment.

Acid precipitation

Lakes with low alkalinities (less than 12.5 mg/l as $CaCO_3$) are considered potentially susceptible to the impacts of acid precipitation. These lakes warrant further study so that any changes in their water quality or biota that may occur can be documented. The entire acreage of these lakes was considered threatened, because a significant decrease in pH could affect the biota lake-wide. The cause was listed as #10.0 (pH) and the source was #81 (atmospheric deposition).

Appendix D

Causes and Sources of Use Impairments and Threats

The following tables present the "causes" and "sources" assessed for each use impairment or threat. The cause indicates the in-lake pollutant or condition that results in a use impairment. For instance, #22 refers to noxious aquatic plants. The source is the activity which generates the pollution. For instance, #10 refers to agriculture or #30 to construction.

In most cases, the sources of pollution could only be estimated for this assessment. Site-specific sampling would be necessary to actually determine the sources of each use impairment. This is further complicated by the fact that water quality problems on lakes are often due to cumulative impacts that result from numerous and diverse sources. Therefore, in this assessment, the source is often identified as #9 "unspecified nonpoint source", pending further investigation.

The following is a key to interpret the "Causes" and "Sources" tables.

Causes

Lake name: official name unless followed by a semicolon(;)

C1, C2, C3...etc: Cause 1, Cause 2, Cause 3...etc. The cause(s) of use impairments or threats indicated in Table II (Appendix B) of this report. Each specific cause is identified in the table by number as follows:

General In-Water Causes of Impairment

00.0:	Cause Unknown
1.0:	Unknown Toxicity
2.0:	Pesticides
3.0:	Priority Organics
4.0:	Nonpriority Organics
5.0:	Metals
6.0:	Ammonia
7.0:	Chlorine
8.0:	Other Inorganics
9.0:	Nutrients
10.0:	pH
11.0:	Siltation/Turbidity
12.0:	Organic Enrichment/DO
13.0:	Salinity/TDS/chloride
14.0:	Thermal Modifications
15.0:	Flow Alteration
16.0:	Other Habitat Alterations
17.0:	Pathogens
18.0:	Radiation
19.0:	Oil and Grease
20.0:	Taste and Odor
21.0:	Suspended Solids
22.0:	Noxious Aquatic Plants
22.1:	Algae
22.2:	Native Macrophytes
22.3:	Non-Native Macrophytes
23.0:	Filling and Draining

CM1, CM2, CM3...etc: The magnitude of Cause 1, Cause 2, Cause 3, etc.

H = high impairment

M = moderate impairment

S = slight impairment

T = threatened

The magnitude of a cause is relative to the other cause(s) in that particular lake only. The cause of the greatest use impairment is given an "H" designation regardless of its severity in relation to the same cause in other lakes.

Sources

Lake name: official name unless followed by a semicolon(;)

S1, S2, S3...etc: The source(s) of use impairments or threats indicated in Table II (Appendix B) of this report. Each specific source is identified by number on the following page.

SM1, SM2, SM3...etc: The magnitude of each source

H = high, most significant source

M = moderate, source of moderate importance

S = slight, least important source

T = threat

The source with the greatest magnitude should correspond to the cause with the greatest magnitude and so on. As with causes, these magnitudes reflect the relative importance of sources within a particular lake only.

Sources of Impairment

00 POINT SOURCES
- 01: Industrial
- 02: Municipal
- 03: Municipal Pretreatment (indirect dischargers)
- 04: Combined sewer overflows (end-of-pipe control)
- 05: Storm sewers (end-of-pipe control)

NONPOINT SOURCES
- 09: Unspecified nonpoint source

10 Agriculture
- 11: Non-irrigated crop production
- 12: Irrigated crop production
- 13: Specialty crop production (e.g., truck farming and orchards)
- 14: Pasture land
- 15: Range land
- 16: Feedlots - all types
- 17: Aquaculture
- 18: Animal holding/management areas

20 Silviculture
- 21: Harvesting, restoration, residue management
- 22: Forest management
- 23: Road construction/maintenance

30 Construction
- 31: Highway/road/bridge
- 32: Land development

40 Urban Runoff
- 41: Storm sewers (source control)
- 42: Combined sewers (source control)
- 43: Surface runoff

50 Resource Extraction/Exploration/Development
- 51: Surface mining
- 52: Subsurface mining
- 53: Placer mining
- 54: Dredge mining
- 55: Petroleum mining
- 56: Mill tailings
- 57: Mine tailings

60 Land Disposal (Runoff/Leachate From Permitted Areas)
- 61: Sludge
- 62: Wastewater
- 63: Landfills
- 64: Industrial land treatment
- 65: On-site wastewater systems (septic tanks, etc.)
- 66: Hazardous waste

70 Hydromodification
- 71: Channelization
- 72: Dredging
- 73: Dam construction
- 74: Flow regulation/modification
- 75: Bridge construction
- 76: Removal of riparian vegetation
- 77: Streambank modification/destabilization

80 Other
- 81: Atmospheric deposition
- 82: Waste storage/storage tank leaks
- 83: Highway maintenance and runoff
- 84: Spills
- 85: In-place contaminants
- 86: Spills
- 87: Recreational activities
- 88: Upstream impoundment

90 Source Unknown

Causes of Use Impairments and Threats

Lake Name	C1	CM1	C2	CM2	C3	CM3	C4	CM4	C5	CM5	C6	CM6	C7	CM7	C8	CM8
ABBEY	10.0	T														
ABENAKI	9.0	T														
ADAM	10.0	T														
ADAMS (WOOD)	10.0	T	22.3	T												
AMHERST	9.0	T	11.0	T	17.0	T	22.2	T	22.1	T						
ANDOVER:	11.0	H	9.0	H												
ANSEL	9.0	T	22.1	T	22.2	T										
ARROWHEAD MOUNTAIN	9.0	M	22.2	S	12.0	M	11.0	H	17.0	T						
AUSTIN	22.2	H	9.0	H												
BAKER (BART)	22.1	T	22.3	T	9.0	T										
BAKER (BROOK)	9.0	H	22.1	M	22.2	H										
BALDWIN	22.2	M	22.1	M	9.0	H										
BALL MOUNTAIN	11.0	H	15.0	H												
BARBER	9.0	H	22.2	H												
BEAN (LYN)	9.0	H	22.1	M	22.2	M	11.0	M								
BEAN (SUT)	22.1	M	22.2	M	9.0	H	11.0	M								
BEAR	10.0	T	9.0	T												
BEAVER (HOL)	10.0	T														
BEAVER (HYDE);	9.0	T	11.0	T												
BEAVER (MEN)	22.2	H	9.0	T	19.0	T	11.0	M								
BEAVER (ROXBURY)	10.0	T														
BECK	9.0	T	11.0	T												
BEEBE (HUB)	22.2	H	22.3	T	9.0	H										
BEEBE (SUND)	10.0	T														
BELDING	9.0	H	11.0	H												
BERLIN	22.3	T														
BIG	22.2	S	17.0	H	9.0	S	22.3	T	10.0	T						
BIG MUD	10.0	T														
BIG MUDDY	10.0	T	11.0	T												
BILLINGS MARSH	22.1	T	22.2	T	9.0	T	11.0	T								
BLACK (HUB)	22.3	T														
BLACK (PLY)	22.2	H	9.0	H												
BLISS	22.3	T														
BLUEBERRY	9.0	T														
BOLSTER	22.2	T	22.1	T	9.0	T										
BOMOSEEN	22.3	H	9.0	T												
BOURN	10.0	H														
BRANCH	10.0	T														
BREESE	9.0	H	22.1	H	22.2	H										
BROWNINGTON	22.3	H														
BRUCE	9.0	T	22.2	T	22.1	T	11.0	T								
BUCK	22.3	T														
BULLHEAD (BENSON)	22.1	H	22.2	H												
BULLHEAD (MANCH)	9.0	T														
BULLIS;	22.1	H	22.2	H	11.0	M										
BURBEE	10.0	T														
BURR (SUD)	22.2	H	22.3	T	9.0	H										
C.C.C.	9.0	H	22.2	H												
CAP HILL;	9.0	T														
CARMI	22.1	H	22.2	H	22.3	M	17.0	M	9.0	H	20.0	M	11.0	S	12.0	H
CEDAR	22.2	H	22.3	T												
CENTER	11.0	T	22.2	T	9.0	T										
CHAMPAGNE	9.0	T														
CHARLESTON	22.3	T														
CHILDS	9.0	T														
CHIPMAN	22.3	T	22.2	T	9.0	T										

Causes of Use Impairments and Threats

Lake Name	C1	CM1	C2	CM2	C3	CM3	C4	CM4	C5	CM5	C6	CM6	C7	CM7	C8	CM8
CHITTENDEN	15.0	H														
CLYDE	22.3	T														
COBURN	9.0	H	22.1	M	22.2	M	11.0	M								
COGGMAN	9.0	H	11.0	H	22.1	M	22.3	T								
COITS	22.3	T														
COLCHESTER	22.3	T	9.0	T												
COLE	10.0	T	9.0	T	22.2	T										
COLTON	9.0	H	22.2	M												
COOK	9.0	T														
COW MOUNTAIN	10.0	T														
CRANBERRY MEADOW	22.3	T	22.1	M	22.2	M	9.0	H								
CRYSTAL (BARTON)	22.3	T	11.0	T												
CURTIS	22.3	T	22.1	M	22.2	H	9.0	H	11.0	M						
CUTLER	22.3	T														
DANBY	22.3	T														
DANIELS	9.0	M	22.2	M												
DANYOW	22.3	T														
DEER PARK - WEST;	10.0	T														
DERBY	17.0	T	22.3	T	9.0	H	11.0	S	22.1	H						
DEWEYS	9.0	T	22.2	T												
DOBSON	9.0	H	22.1	M	22.2	M										
DOLLOFF - S	9.0	H	22.1	M												
DOUGHTY	9.0	T	22.2	T	22.3	T										
DOW	9.0	T														
DUCK (BURKE)	9.0	H	22.1	H												
DUCK (SHEL)	9.0	T														
DUFRESNE	9.0	T	11.0	T												
DUNKLEE	11.0	H	15.0	M												
DUNMORE	22.2	H	22.3	T												
EAST LONG	22.3	T														
ECHO (CHARLES)	22.3	T														
ECHO (HUB)	22.3	T														
ECHO (PLY)	9.0	T	22.2	T	17.0	T	11.0	T								
ELBOW;	22.2	T	9.0	T												
ELFIN	22.1	T	11.0	T												
ELMORE	22.2	M	11.0	H												
ELY;	9.0	T	11.0	T												
EMERALD	9.0	T														
EQUINOX	22.2	T	9.0	T												
FAIRFIELD	22.1	H	22.2	S	17.0	T	9.0	H	11.0	M	22.3	T	12.0	T		
FAIRFIELD SWAMP	22.3	T	9.0	T												
FELCHNER;	22.2	M	11.0	H												
FERN	22.3	T														
FIFIELD	10.0	T														
FLAGG	9.0	H	22.1	M	22.2	M										
FOREST (AVERILL)	10.0	T														
FOREST (CALAIS)	22.3	T	11.0	T												
FORESTER	10.0	H														
GALE MEADOWS	10.0	T	11.0	H	9.0	H										
GATES	10.0	T														
GILLETT	9.0	H	22.1	H	22.3	T										
GILMORE	10.0	T														
GLEN	22.3	H														
GRAHAMVILLE;	22.2	T														
GREAT AVERILL	15.0	T	10.0	T	9.0	T										

Causes of Use Impairments and Threats

Lake Name	C1	CM1	C2	CM2	C3	CM3	C4	CM4	C5	CM5	C6	CM6	C7	CM7	C8	CM8
GREENWOOD	22.3	T	9.0	H	22.1	M	22.2	M								
GRIFFITH	10.0	T														
GROTON	10.0	T	22.3	T	11.0	T										
GROUT	10.0	T														
GUT	10.0	T														
HALF MOON	22.3	T	11.0	T												
HALFMOON	22.3	T	22.2	H	11.0	H	9.0	H								
HALFMOON COVE	9.0	T														
HALFWAY	10.0	T														
HALLOCK;	22.2	H	22.1	H	9.0	H										
HALLS	9.0	H	22.2	M	22.1	H										
HANCOCK (STAM)	10.0	T	22.3	T												
HAPGOOD	10.0	T	15.0	T												
HARDWICK	9.0	H	22.1	M	11.0	H										
HARDWOOD	10.0	T														
HARRIMAN (WHITING)	10.0	T	15.0	H												
HARVEYS	9.0	H	22.2	S	22.1	M	15.0	H	11.0	M	17.0	T				
HAYSTACK	10.0	H														
HIDDEN	10.0	T														
HIGH (HUB)																
HINKUM	22.3	T														
HOLLAND	10.0	T														
HORTONIA	22.3	H	17.0	T												
HOWE	10.0	T														
INDIAN BROOK (ESSEX)	22.3	T	9.0	T												
INDIAN BROOK; (COL)	9.0	T														
IROQUOIS	22.1	M	22.2	H	22.3	T	9.0	H	11.0	H						
JACKSONVILLE	10.0	T	9.0	H	22.2	H	22.1	T								
JEWELL BK #1;	9.0	T														
JEWELL BK #2;	9.0	T														
JEWELL BK #3;	11.0	T	9.0	T												
JOES POND	9.0	H	22.1	S	22.2	M	17.0	T	11.0	H						
JOHNSON (KIRBY)	10.0	T	22.1	M	9.0	M	14.0	H	15.0	H	16.0	H				
JOHNSON (SHREWS)	22.1	H	22.2	H	9.0	H	11.0	M								
KEELER	11.0	T														
KENNY	9.0	T	22.1	T	10.0	T										
KENT	9.0	H	22.1	T	22.2	M										
KETTLE	10.0	T	22.3	T												
KINGS HILL	10.0	T														
KIRBY	9.0	M	22.1	M	11.0	M										
KNAPP BROOK #1	10.0	T	22.3	T												
KNAPP BROOK #2	22.3	T														
LAKE-OF-THE-CLOUDS	10.0	H														
LAKOTA	10.0	T														
LAMOILLE	9.0	H	11.0	H	15.0	H	22.1	M								
LAMSON	22.3	T														
LAUREL	10.0	T														
LC-BURLINGTON BAY	17.0	H	9.0	H	3.0	T	22.2	H	22.3	M	22.1	H	1.0	T	11.0	M
LC-ISLE LA MOTTE	22.3	H	9.0	H	3.0	T										
LC-MAIN LAKE	22.2	H	9.0	H	3.0	S	11.0	M	22.3	M						
LC-MALLETTS BAY	22.3	H	22.2	H	22.1	M	9.0	H	17.0	H	3.0	T	11.0	T		
LC-MISSISQUOI BAY	22.3	H	9.0	H	11.0	M	3.0	T	17.0	T	20.0	M	8.0	T		
LC-NORTHEAST ARM	22.3	H	22.2	H	22.1	H	9.0	H	17.0	M	3.0	T				
LC-OTTER CREEK	22.3	H	22.2	H	22.1	H	9.0	H	11.0	M	17.0	T	3.0	T		
LC-PORT HENRY	9.0	H	22.3	H	22.2	H	11.0	T	3.0	T						
LC-SHELBURNE BAY	22.3	H	22.2	M	22.1	H	9.0	H	11.0	M	17.0	H	3.0	T	7.0	T

Causes of Use Impairments and Threats

Lake Name	C1	CM1	C2	CM2	C3	CM3	C4	CM4	C5	CM5	C6	CM6	C7	CM7	C8	CM8
LC-SOUTH LAKE	22.3	H	11.0	M	9.0	H	3.0	T	12.0	T	17.0	T	2.0	T		
LC-ST. ALBANS BAY	22.3	H	22.2	H	22.1	H	9.0	H	12.0	M	11.0	M	20.0	S	17.0	M
LEIGHTON HILL;	9.0	T	22.2	T												
LEVI	10.0	T														
LEWIS	10.0	T														
LIGHT TROUT CLUB	11.0	T														
LILY (ATHENS)	10.0	T														
LILY (LON)	10.0	T	9.0	T												
LILY (LYN)	10.0	T														
LILY (POUL)	22.3	H	22.1	M												
LILY (VERNON)	9.0	T	22.1	T	22.2	T	11.0	T								
LILY PAD	9.0	T														
LINE (HOL)	10.0	T	9.0	M	22.2	M	11.0	M								
LITTLE (ELM)	10.0	T	11.0	T												
LITTLE (FRANK)	22.3	T														
LITTLE (WELLS)	22.1	M	22.3	H	9.0	M										
LITTLE (WIN)	10.0	T	11.0	T	9.0	T										
LITTLE (WOOD)	10.0	H														
LITTLE AVERILL	10.0	T	9.0	T												
LITTLE ELIGO	9.0	T	22.1	T	22.2	T										
LITTLE HOSMER	9.0	H	22.2	M	22.1	M	11.0	M								
LITTLE MUD (MT. TAB)	10.0	T														
LITTLE MUD (WIN)	9.0	T														
LITTLE ROCK	10.0	T														
LONG (MILTON)	22.3	T	9.0	T												
LONG (WEST)	22.3	T														
LONG HOLE	10.0	T	11.0	T												
LOST (BELV)	22.2	H	11.0	H												
LOST (GEORGIA)	9.0	T														
LOST (GLASTEN)	10.0	T														
LOVE'S MARSH	22.3	T	9.0	T												
LOWELL	10.0	T	9.0	T	22.2	T										
LOWER	22.3	H	22.1	H	9.0	H	17.0	H	11.0	M						
LOWER HURRICANE	9.0	T	15.0	T												
LOWER WINOOSKI;	9.0	T														
MACKVILLE	9.0	T	22.2	T	11.0	T										
MAIDSTONE	10.0	T	17.0	T												
MANSFIELD	10.0	T														
MARSHFIELD	22.3	T														
MAY	22.3	T	9.0	T	22.1	T										
MCCONNELL	10.0	T	11.0	M												
MCINTOSH	9.0	T														
MECAWEE	10.0	T														
MEMPHREMAGOG	22.3	H	22.1	H	22.2	M	9.0	M	17.0	M						
METCALF	22.3	H	22.1	S	11.0	M	9.0	M								
MILES	9.0	T	22.2	T	22.1	T										
MILL (BENSON)	22.3	T	9.0	M	22.1	M	11.0	H								
MILL (WINDSOR)	22.3	T	9.0	T	11.0	T	15.0	T								
MILLER;	15.0	H														
MILTON	9.0	T														
MIRROR	22.3	T														
MOLLY'S	11.0	H														
MOLLY'S FALLS	22.3	T														
MOREY	9.0	S	22.2	H	16.0	T										
MORRISVILLE;	15.0	H														
MOSES	10.0	T														

Causes of Use Impairments and Threats

Lake Name	C1	CM1	C2	CM2	C3	CM3	C4	CM4	C5	CM5	C6	CM6	C7	CM7	C8	CM8
MUD (BENSON)	22.1	H	22.2	H												
MUD (CRAFT)	9.0	H	22.1	M	22.2	M	11.0	M								
MUD (EAST HAVEN)	9.0	H	22.1	M	11.0	H										
MUD (EDEN - N)	11.0	T														
MUD (GRANBY)	10.0	T														
MUD (LEICESTER)	22.3	T														
MUD (MORGAN - N)	22.3	T														
MUD (MORGAN - W)	22.3	T														
MUD (ORWELL)	22.2	M	11.0	M	15.0	H										
MUD (PERU)	9.0	H	22.2	H												
MUD (STAM)	10.0	T														
MUD (THET)	9.0	T														
MUD (WOOD - SE)	22.3	T														
MUDD	22.2	T	9.0	T												
MUDDY (RUTLAND)	22.1	H	22.2	H	9.0	H										
N.E. DEVELOPERS	22.3	T														
NEAL	10.0	T	11.0	T												
NEWARK	11.0	T	9.0	T												
NICHOLS	22.3	T	15.0	H												
NINEVAH	10.0	T														
NORFORD	9.0	T														
NORTH (BRISTOL)	10.0	T														
NORTH (BROOK)	22.3	T														
NORTH (CHIT)	10.0	T														
NORTH HARTLAND	11.0	M	9.0	H	22.2	M			15.0	H						
NORTH MONTPELIER	22.3	H														
NORTH SPRINGFIELD	9.0	H	11.0	M	15.0	H	22.2	M								
NOTCH	10.0	T														
NOYES	22.3	T	11.0	T												
NULHEGAN	10.0	T														
OLD MARSH	22.3	T														
OLYMPUS POOL	22.2	H	9.0	H												
OSMORE	10.0	T	22.3	T												
OXBOW;	9.0	T														
PARAN	22.3	H	22.1	M	9.0	M	15.0	M								
PARKER	22.2	H														
PATCH	22.3	T	15.0	H	9.0	T										
PAUL STREAM	10.0	T														
PEACHAM	10.0	T	22.3	T												
PECKS	9.0	H	22.1	M	22.2	M	11.0	M								
PENSIONER	22.3	T														
PERCH (BENSON)	22.3	T	9.0	T	11.0	T										
PERCH (WOLCOTT)	9.0	M	11.0	M	22.1	M	22.2	M								
PICKEREL	11.0	T	9.0	T												
PICO	10.0	T	9.0	T												
PIGEON	10.0	T	22.3	T												
PINE	22.3	T	9.0	T	12.0	H										
PINNEO	9.0	H	22.1	H												
PLEASANT VALLEY	9.0	H	5.0	T	11.0	M	12.0	H	22.1	H						
PLEIAD	22.2	H	9.0	H												
PRENTISS	9.0	T	11.0	H												
QUARRY;	9.0	T														
RANDOLPH - N;	9.0	T														
RAPONDA	10.0	T	9.0	H	22.2	M	11.0	T	17.0	T						
READING	10.0	T														
RESCUE	22.1	T	9.0	H	11.0	H	22.2	M								

Causes of Use Impairments and Threats

Lake Name	C1	CM1	C2	CM2	C3	CM3	C4	CM4	C5	CM5	C6	CM6	C7	CM7	C8	CM8
RESERVOIR	9.0	T														
RICHMOND	10.0	T	22.3	T	9.0	T										
RICHVILLE	22.3	T	22.2	H	9.0	H	22.1	H	12.0	H						
RICKER	22.3	T														
RIDDEL	9.0	H	22.2	M	22.1	M										
RITTERBUSH MEADOW;	22.2	T	11.0	T												
ROACH	22.2	H	22.1	H	11.0	M	9.0	H								
ROBINSON;	9.0	H	22.1	M	22.2	M	11.0	H								
ROOD	22.3	T														
ROUND (HOL)	10.0	T	9.0	T												
ROUND (MILTON)	22.3	T	9.0	T												
ROYALTON HILL;	9.0	T														
RUNNEMEDE	22.3	T														
RUSS	10.0	T	9.0	T	22.1	T	22.2	T								
RUTLAND CITY	9.0	T														
RYDER	11.0	T														
RYEGATE CENTER;	9.0	H	22.1	M	22.2	M										
SABIN	9.0	T	11.0	T	22.2	T	9.0	T	22.3	T						
SADAWGA	10.0	T														
SALEM	22.1	M	22.2	H	9.0	H	22.3	T								
SARGENT	11.0	H														
SAWDUST	11.0	H	15.0	H												
SCHOFIELD	10.0	T	15.0	H												
SEARSBURG	15.0	H														
SEYMOUR	9.0	T	11.0	t	22.3	T										
SHAFTSBURY	22.3	T	22.2	H	12.0	M										
SHELBURNE	12.0	H	9.0	H	22.1	H	22.2	H	22.3	T						
SHERMAN	15.0	H														
SILVER (BAR)	9.0	H	11.0	M	22.1	T	22.2	M	16.0	H	17.0	T				
SILVER (GEORGIA)	22.3	T	9.0	T												
SIMONDS	9.0	T														
SKYLIGHT	10.0	T														
SLAYTON (WOOD)	10.0	T														
SMITH (COV)	9.0	S	22.2	S	11.0	H										
SMITH (PITT)	22.2	M	11.0	H	8.0	H										
SODOM	9.0	T	11.0	T	20.0	T										
SOMERSET	10.0	T	15.0	H												
SOUTH (CHIT)	10.0	T														
SOUTH (EDEN)	10.0	T	11.0	T	9.0	T										
SOUTH (MARL)	10.0	T														
SOUTH AMERICA	10.0	T														
SOUTH BAY	9.0	H	22.3	M	22.2	M	22.1	M	11.0	M	17.0	M	12.0	M		
SOUTH MECAWEE;	10.0	T														
SOUTH STREAM	9.0	T	22.3	T	15.0	H										
SOUTH VILLAGE	9.0	T														
SPECTACLE	10.0	T														
SPRUCE (ORWELL)	22.3	T														
ST. CATHERINE	9.0	M	22.1	S	22.2	S	22.3	H	17.0	T						
STAMFORD	10.0	H														
STANNARD	11.0	H														
STAPLES	9.0	T	22.1	T	22.2	T										
STAR	22.2	H	22.1	T	9.0	H										
STERLING	10.0	T	9.0	T												
STONE BRIDGE	11.0	H	22.3	T												
STOUGHTON	9.0	M	11.0	H	15.0	H	22.3	T								

Causes of Use Impairments and Threats

Lake Name	C1	CM1	C2	CM2	C3	CM3	C4	CM4	C5	CM5	C6	CM6	C7	CM7	C8	CM8
SUGAR HILL	10.0	T	15.0	H												
SUGAR HOLLOW	22.3	T														
SUNRISE	22.3	T	17.0	T												
SUNSET (BENSON)	22.3	T														
SUNSET (BROOK)	22.3	T														
SUNSET (MARL)	10.0	T	17.0	T												
THE POGUE	9.0	H	22.1	H												
THETFORD - SW1;	9.0	T														
THETFORD - SW2;	9.0	T	11.0	T												
THOMPSONS	9.0	T	22.3	T												
THURMAN W. DIX	11.0	T														
TICKLENAKED	9.0	T	22.1	T	22.2	T	11.0	T								
TILDY'S	11.0	T	9.0	T	17.0	T										
TINY	9.0	H	22.2	H												
TOAD (CHARLES)	22.3	T														
TOWNSHEND	11.0	H	15.0	H												
TURTLE	10.0	T														
TUTTLE (BRUN)	10.0	T														
UNKNOWN (AV GORE)	10.0	T														
UPPER HURRICANE	9.0	T														
UPPER SYMES	9.0	T	22.1	T	22.2	T										
UPPER WINOOSKI;	9.0	T														
VALLEY	22.3	T	11.0	T	9.0	T										
VERGENNES WATERSHED	22.3	H														
WALKER (COV)	22.3	T	22.2	T	22.1	T	9.0	T								
WALKER (NEWARK)	11.0	H	9.0	H	22.1	S	22.2	S								
WALLACE	9.0	H	22.1	H	11.0	H										
WALLINGFORD	10.0	T														
WAPANACKI	9.0	T	11.0	T												
WATERBURY	11.0	H														
WEST HILL	22.3	T														
WEST MOUNTAIN	10.0	T														
WHEELER (BRUN)	10.0	T														
WILLOUGHBY	9.0	H	22.2	H												
WINHALL;	9.0	T														
WINONA	22.3	T	22.2	H	9.0	H	12.0	H								
WOLCOTT	10.0	T	9.0	T	11.0	T										
WORCESTER - L	10.0	T	22.3	T												
WORCESTER - U	11.0	H														
WRIGHT	9.0	T														
WRIGHTSVILLE	22.2	T														

Sources of Use Impairments and Threats

Lake Name	S1	SM1	S2	SM2	S3	SM3	S4	SM4	S5	SM5	S6	SM6	S7	SM7	S8	SM8	S9	SM9	S10	SM10
ABBEY	81	T																		
ABENAKI	9	T	32	T	40	T	86	T												
ADAM	81	T																		
ADAMS (WOOD)	81	T	87	T																
AMHERST	32	T	43	T	83	T	87	T												
ANDOVER;	83	H	86	H																
ANSEL	9	T																		
ARROWHEAD MOUNTAIN	1	T	11	M	14	M	32	T	74	H	77	H	64	M	9	H	18	M		
AUSTIN	9	H	32	M	21	T														
BAKER (BART)	10	T	9	T	87	T														
BAKER (BROOK)	9	H																		
BALDWIN	65	M	20	M	10	M	9	H												
BALL MOUNTAIN	77	H	74	H																
BARBER	32	T	9	H	40	T														
BEAN (LYN)	65	M	83	M	10	M														
BEAN (SUT)	9	M	21	H	83	M														
BEAR	81	T	9	T	32	T	40	T												
BEAVER (HOL)	81	T																		
BEAVER (HYDE);	21	T	32	T	83	T														
BEAVER (MEN)	9	H	20	M	83	M	40	M	30	M	82	T	32	T						
BEAVER (ROXBURY)	81	T																		
BECK	21	T	83	T																
BEEBE (HUB)	9	H	87	T	32	T	40	T												
BEEBE (SUND)	81	T																		
BELDING	21	H	9	H																
BERLIN	87	T																		
BIG	9	M	65	H	87	T	81	T												
BIG MUD	81	T																		
BIG MUDDY	21	T	81	T																
BILLINGS MARSH	10	T	9	T	87	T														
BLACK (HUB)	87	T																		
BLACK (PLY)	9	H																		
BLISS	87	T																		
BLUEBERRY	9	T	32	T	40	T														
BOLSTER	10	T	86	T	9	T	32	T	40	T										
BOMOSEEN	87	H	32	T	9	T	40	T												
BOURN	81	H	86	H																
BRANCH	81	T																		
BREESE	83	H	9	M																
BROWNINGTON	87	H																		
BRUCE	9	T																		
BUCK	87	T																		
BULLHEAD (BENSON)	9	H																		
BULLHEAD (MANCH)	32	T	40	T	9	T														
BULLIS;	10	H	83	M	77	M														
BURBEE	81	T																		
BURR (SUD)	87	T	9	H																
C.C.C.	9	H																		
CAP HILL;	32	T	40	T	9	T														
CARMI	11	H	14	H	18	H	65	S	87	M	9	H								
CEDAR	9	H	87	T																
CENTER	83	T	65	T	21	T														
CHAMPAGNE	9	T	32	T	40	T														
CHARLESTON	87	T																		
CHILDS	9	T	32	T	40	T														

Sources of Use Impairments and Threats

Lake Name	S1	SM1	S2	SM2	S3	SM3	S4	SM4	S5	SM5	S6	SM6	S7	SM7	S8	SM8	S9	SM9	S10	SM10
CHITTENDEN	74	H																		
CLYDE	87	T																		
COBURN	83	H	10	H																
COGGMAN	10	M	87	T	77	S	83	S												
COITS	87	T																		
COLCHESTER	87	T	9	T	32	T	40	T												
COLE	81	T	32	T	65	T	83	T												
COLTON	9	H	32	T	40	T														
COOK	86	T	9	T	32	T	40	T												
COW MOUNTAIN	81	T																		
CRANBERRY MEADOW	87	T	83	H																
CRYSTAL (BARTON)	87	T	10	T	21	T														
CURTIS	87	T	9	H	32	T														
CUTLER	87	T																		
DANBY	87	T																		
DANIELS	9	H	86	M																
DANVOW	87	T																		
DEER PARK - WEST;	81	T																		
DERBY	65	M	87	T	11	M	18	M	83	M										
DEWEYS	32	T	40	T	9	T														
DOBSON	83	H	65	M																
DOLLOFF - S	83	H	77	M	21	M														
DOUGHTY	87	T	9	T																
DOW	9	T	32	T	40	T	1	T												
DUCK (BURKE)	83	H	10	M	21	M														
DUCK (SHEL)	9	T	32	T	40	T														
DUPRESNE	32	T	77	T	9	T	40	T												
DUNKLEE	40	M	32	M	74	M														
DUNMORE	9	H	87	T																
EAST LONG	87	T																		
ECHO (CHARLES)	87	T	83	M	21	S														
ECHO (HUB)	87	T																		
ECHO (PLY)	32	T	65	T	43	T	83	T	9	T										
ELBOW;	9	T	32	T	40	T														
ELFIN	10	T	83	T	32	T														
ELMORE	9	M	65	S	10	M	20	H	32	S										
ELY;	9	T	32	T	40	T	21	T	83	T										
EMERALD	9	T	32	T	40	T														
EQUINOX	9	T	32	T	40	T														
FAIRFIELD	9	H	11	H	14	M	18	H	87	T	65	S	64	M	83	M				
FAIRFIELD SWAMP	87	T	9	T	32	T	40	T												
FELCHNER;	83	H																		
FERN	87	T	65	T	63	T														
FIFIELD	81	T																		
FLAGG	9	H																		
FOREST (AVERILL)	81	T																		
FOREST (CALAIS)	87	T	83	T	32	T														
FORESTER	81	H	86	H																
GALE MEADOWS	81	T	40	M	83	H	32	H	21	M										
GATES	81	T																		
GILLETT	32	T	9	T	40	T														
GILMORE	81	T																		
GLEN	87	H																		
GRAHAMVILLE;	87	T	9	T																
GREAT AVERILL	81	T	32	T			9	T	83	T	21	T	40	T	74	T				
GREAT HOSMER	9	T																		

Sources of Use Impairments and Threats

Lake Name	S1	SM1	S2	SM2	S3	SM3	S4	SM4	S5	SM5	S6	SM6	S7	SM7	S8	SM8	S9	SM9	S10	SM10
GREENWOOD	87	T	83	H																
GRIFFITH	81	T																		
GROTON	81	T	87	T	9	T	21	T												
GROUT	81	T																		
GUT	81	T																		
HALF MOON	87	T	21	T																
HALFMOON	87	T	10	H	9	H														
HALFMOON COVE	9	T	32	T	40	T														
HALFWAY	81	T																		
HALLOCK;	9	H	65	M	10	M														
HALLS	9	H																		
HANCOCK (STAN)	81	T	87	T																
HAPGOOD	81	T	74	T	83	T	77	T	21	T										
HARDWICK	83	H	9	H																
HARDWOOD	81	T																		
HARRIMAN (WHITING)	81	T	2	T	77	H	74	H												
HARVEYS	11	H	18	H	74	H	9	H	87	T										
HAYSTACK	81	H	86	H																
HIDDEN	81	T																		
HIGH (HUB)																				
HINKUM	87	T																		
HOLLAND	81	T																		
HORTONIA	87	H	65	T																
HOWE	81	T																		
INDIAN BROOK (ESSEX)	87	T	32	T	40	T	9	T												
INDIAN BROOK; (COL)	9	T	32	T	40	T														
IROQUOIS	11	H	14	H	18	H	32	H	77	H	65	S	83	H	87	T				
JACKSONVILLE	81	T	83	T	10	T	9	H												
JEWELL BK #1;	32	T	40	T	9	T														
JEWELL BK #2;	86	T	9	T	32	T	40	T												
JEWELL BK #3;	32	T	40	T	9	T	74	T												
JOES POND	9	H	65	S	32	H	83	H	10	M										
JOHNSON (KIRBY)	81	T	21	H	32	H	74	H	77	H										
JOHNSON (SHREWS)	9	H																		
KEELER	9	T																		
KENNY	81	T	9	T																
KENT	40	T	32	T	9	H														
KETTLE	81	T	87	T																
KINGS HILL	81	T																		
KIRBY	21	H	9	H																
KNAPP BROOK #1	81	T	87	T																
KNAPP BROOK #2	87	T																		
LAKE-OF-THE-CLOUDS	81	H	86	H																
LAKOTA	81	T																		
LAMOILLE	10	M	43	M	32	M	77	M	74	H	83	M	10	T						
LAMSON	87	T																		
LAUREL	81	T																		
LC-BURLINGTON BAY	2	H	4	H	40	M	66	T	90	T	87	S	30	T	3	M	77	M	85	M
LC-ISLE LA MOTTE	90	T	2	S	87	H	65	T	10	H	32	M	31	M	77	M	83	M		
LC-MAIN LAKE	1	H	2	H	10	H	30	T	77	M	43	M	65	S	87	M	90	S	4	M
LC-MALLETTS BAY	65	M	87	H	77	M	90	T	30	M	40	M	10	H						
LC-MISSISQUOI BAY	2	M	11	H	18	H	77	M	87	M	5	M	21	T	57	T	90	M	85	T
LC-NORTHEAST ARM	10	H	2	M	31	M	32	M	40	M	65	M	87	H	77	M	83	M	90	T
LC-OTTER CREEK	2	M	1	H	10	H	60	S	77	M	90	T	32	H	40	H	87	M	83	M
LC-PORT HENRY	65	S	11	H	14	H	18	H	77	M	1	T	90	T						

Sources of Use Impairments and Threats

Lake Name	S1	SM1	S2	SM2	S3	SM3	S4	SM4	S5	SM5	S6	SM6	S7	SM7	S8	SM8	S9	SM9	S10	SM10
LC-SOUTH LAKE	11	H	13	T	14	M	18	M	87	H	32	T	86	H	77	M	90	T	1	T
LC-ST. ALBANS BAY	2	H	11	H	14	H	18	H	32	M	85	T	87	M	77	M	43	S	4	S
LEIGHTON HILL;	9	T	86	T																
LEVI	81	T																		
LEWIS	81	T																		
LIGHT TROUT CLUB	83	T	9	T																
LILY (ATHENS)	81	T																		
LILY (LON)	86	T	81	T	9	T	32	T	40	T										
LILY (LYN)	81	T																		
LILY (POUL)	87	H	10	M	77	M														
LILY (VERNON)	77	T	9	T	10	T														
LILY PAD	32	T	9	T	40	T														
LINE (HOL)	81	T	21	T	9	H														
LITTLE (ELM)	81	T	83	T	9	T														
LITTLE (FRANK)	87	T																		
LITTLE (WELLS)	9	M	87	H																
LITTLE (WIN)	81	T	21	T	32	T	40	T	9	T										
LITTLE (WOOD)	81	H	86	H																
LITTLE AVERILL	81	T	32	T	40	T	83	T												
LITTLE ELIGO	51	T																		
LITTLE MOSMER	9	H																		
LITTLE MUD (MT. TAB)	81	T																		
LITTLE MUD (WIN)	32	T	40	T	9	T														
LITTLE ROCK	81	T																		
LONG (MILTON)	87	T	9	T	32	T	40	T												
LONG (WEST)	87	T																		
LONG HOLE	81	T	77	T	21	T														
LOST (BELV)	9	H	86	H																
LOST (GEORGIA)	9	T	32	T	40	T														
LOST (GLASTEN)	81	T																		
LOVE'S MARSH	87	T	9	T	32	T	40	T												
LOWELL	81	T	32	T	40	T	9	T												
LOWER	87	H	9	H	65	H	74	H												
LOWER HURRICANE	32	T	40	T	9	T	74	T												
LOWER WINOOSKI;	32	T	9	T	40	T														
MACKVILLE	83	T	10	T																
MAIDSTONE	81	T	65	T																
MANSFIELD	81	T																		
MARSHFIELD	87	T																		
MAY	87	T	10	T																
MCCONNELL	81	T	21	M																
MCINTOSH	9	T	32	T	40	T														
MECAWEE	81	T																		
MEMPHREMAGOG	2	M	9	H	11	H	14	H	18	H	87	H	20	M	4	M				
METCALF	87	H	9	M	86	S														
MILES	9	T	65	T	21	T														
MILL (BENSON)	87	T	70	H	77	H	10	M												
MILL (WINDSOR)	87	T	32	T	74	T	83	T	10	T										
MILLER;	74	H																		
MILTON	32	T	40	T	9	T														
MIRROR	87	T																		
MOLLY'S	10	H	9	H																
MOLLY'S FALLS	87	T																		
MOREY	9	T	85	H																
MORRISVILLE;	73	H																		
MOSES	81	T	9	T																

Sources of Use Impairments and Threats

Lake Name	S1	SM1	S2	SM2	S3	SM3	S4	SM4	S5	SM5	S6	SM6	S7	SM7	S8	SM8	S9	SM9	S10	SM10
MUD (BENSON)	9	H																		
MUD (CRAFT)	10	H	9	H																
MUD (EAST HAVEN)	21	H	9	H																
MUD (EDEN - N)	21	T	83	T																
MUD (GRANBY)	81	T																		
MUD (LEICESTER)	87	T																		
MUD (MORGAN - N)	87	T																		
MUD (MORGAN - W)	87	T																		
MUD (ORWELL)	88	H	86	H																
MUD (PERU)	77	M	9	H																
MUD (STAM)	81	T																		
MUD (THET)	9	T	32	T	40	T														
MUD (WOOD - SE)	87	T																		
MUDD	9	T																		
MUDDY (RUTLAND)	9	H																		
N.E. DEVELOPERS	87	T																		
NEAL	81	T	21	T																
NEWARK	65	T	21	T	83	T	77	T												
NICHOLS	87	T	74	H																
NINEVAH	81	T																		
NORFORD	9	T	32	T	40	T														
NORTH (BRISTOL)	81	T																		
NORTH (BROOK)	87	T																		
NORTH (CHIT)	81	T																		
NORTH HARTLAND	43	M	74	H	77	M	9	M												
NORTH MONTPELIER	87	H																		
NORTH SPRINGFIELD	77	M	74	H																
NOTCH	81	T																		
NOYES	87	T	9	T																
NULHEGAN	81	T																		
OLD MARSH	87	T																		
OLYMPUS POOL	77	H																		
OSMORE	81	T	87	T																
OXBOW;	32	T	40	T	9	T														
PARAN	87	H	90	M	9	M	32	H	83	S	74	M	1	T						
PARKER	11	H	14	H	18	H														
PATCH	87	T	74	H	32	M	40	T			9	T								
PAUL STREAM	81	T																		
PEACHAM	81	T	87	T																
PECKS	11	M	86	M	9	T	32	T	40	T										
PENSIONER	87	T																		
PERCH (BENSON)	87	T	83	T	9	T														
PERCH (WOLCOTT)	77	M	9	M	83	H														
PICKEREL	9	T	32	T	40	T														
PICO	81	T	9	T	32	T	40	T												
PIGEON	81	T	87	T																
PINE	87	T	9	T	32	T	40	T	86	M										
PINNEO	32	H	9	M	86	H	40	T												
PLEASANT VALLEY	77	M	9	H	85	T														
PLEIAD	9	H																		
PRENTISS	9	H	32	T	40	T														
QUARRY;	9	T	32	T	40	T														
RANDOLPH - N;	9	T	32	T	40	T														
RAPONDA	81	T	32	T	40	T	83	T	87	T	9	H								
READING	81	T																		

Sources of Use Impairments and Threats

Lake Name	S1	SM1	S2	SM2	S3	SM3	S4	SM4	S5	SM5	S6	SM6	S7	SM7	S8	SM8	S9	SM9	S10	SM10
RESERVOIR	9	T	32	T	40	T														
RICHMOND	81	T	87	T	32	T	9	T	40	T										
RICHVILLE	87	T	10	H	9	H	77	H												
RICKER	87	T																		
RIDDEL	40	M	9	M																
RITTERBUSH MEADOW;	21	T	9	T	86	T														
ROACH	9	H																		
ROBINSON;	43	H	83	M	74	H														
ROOD	87	T																		
ROUND (HOL)	81	T	20	T																
ROUND (MILTON)	87	T	32	T	40	T	9	T												
ROYALTON HILL;	9	T	32	T	40	T														
RUNNEMEDE	87	T																		
RUSS	81	T	9	T																
RUTLAND CITY	32	T	40	T			9	T												
RYDER	77	T																		
RYEGATE CENTER;	10	M	9	M																
SABIN	87	T	86	T	32	T	77	T												
SADAWGA	81	T																		
SALEM	9	H	65	T	87	T														
SARGENT	51	H																		
SAWDUST	21	H	74	H	77	M	83	M												
SCHOFIELD	81	T	74	H	86	H														
SEARSBURG	74	H																		
SEYMOUR	20	t	87	T																
SHAFTSBURY	87	T	86	M	9	M														
SHELBURNE	9	H	10	H	11	M	14	M	64	M	87	T								
SHERMAN	74	H																		
SILVER (BAR)	83	M	40	M	21	S	9	H	74	H										
SILVER (GEORGIA)	87	T	9	T	32	T	40	T												
SIMONDS	9	T	32	T	40	T														
SKYLIGHT	81	T																		
SLAYTON (WOOD)	81	T																		
SMITH (COV)	9	M	51	H																
SMITH (PITT)	1	H																		
SODOM	9	T	83	T	82	T														
SOMERSET	81	T	74	H																
SOUTH (CHIT)	81	T																		
SOUTH (EDEN)	81	T	21	T	32	T	83	T												
SOUTH (MARL)	81	T																		
SOUTH AMERICA	81	T																		
SOUTH BAY	2	M	11	H	87	M	4	M	9	H	18	H								
SOUTH MECAWEE;	81	T																		
SOUTH STREAM	87	T	32	T	9	T	40	T	74	T										
SOUTH VILLAGE	32	T	40	T	9	T														
SPECTACLE	81	T																		
SPRUCE (ORWELL)	87	T																		
ST. CATHERINE	87	H	9	H	65	S														
STAMFORD	81	H	86	H																
STANNARD	21	H																		
STAPLES	83	T	10	T	43	T	9	T												
STAR	9	H	65	S	77	M	83	M	32	M										
STERLING	81	T	9	T	32	T	40	T												
STONE BRIDGE	10	M	83	M	9	H	87	T												
STOUGHTON	74	H	77	T	87	T														
STRATTON	81	T	9	T	32	T	40	T												

Sources of Use Impairments and Threats

Lake Name	S1	SM1	S2	SM2	S3	SM3	S4	SM4	S5	SM5	S6	SM6	S7	SM7	S8	SM8	S9	SM9	S10	SM10
SUGAR HILL	81	T	74	H																
SUGAR HOLLOW	87	T																		
SUNRISE	87	T	65	T																
SUNSET (BENSON)	87	T																		
SUNSET (BROOK)	87	T																		
SUNSET (MARL)	81	T	65	T																
THE POGUE	9	H																		
THETFORD - SW1;	9	T	32	T	40	T														
THETFORD - SW2;	9	T	40	T	32	T														
THOMPSONS	32	T	9	T	40	T	87	T												
THURMAN W. DIX	83	T	40	T	21	T														
TICKLENAKED	11	T	14	T	18	T	32	T	21	T										
TILDY'S	18	T																		
TINY	9	H	32	T	40	T														
TOAD (CHARLES)	87	T																		
TOWNSHEND	77	M	74	H																
TURTLE	81	T																		
TUTTLE (BRUN)	81	T																		
UNKNOWN (AV GORE)	81	T	32	T	23	H														
UPPER HURRICANE	9	T	32	T	40	T														
UPPER SYMES	21	T	32	T	9	T														
UPPER WINOOSKI;	9	T	32	T	40	T														
VALLEY	87	T	83	T	9	T														
VERGENNES WATERSHED	86	H																		
WALKER (COV)	87	T	86	T																
WALKER (NEWARK)	21	H	9	H	77	S														
WALLACE	21	H	83	H	77	M	65	S												
WALLINGFORD	81	T																		
WAPANACKI	77	T	9	T	21	T														
WATERBURY	77	H	74	H	9	H														
WEST HILL	87	T																		
WEST MOUNTAIN	81	T																		
WHEELER (BRUN)	81	T																		
WILLOUGHBY	10	H	9	H																
WINHALL;	32	T	9	T	40	T														
WINONA	87	T	10	H	9	H	86	M												
WOLCOTT	81	T	77	T	21	T	9	T												
WORCESTER - L	81	T	87	T																
WORCESTER - U	9	H	86	H																
WRIGHT	9	T	32	T	40	T														
WRIGHTSVILLE	86	T																		

Appendix 4.

Vermont 1988 Toxics Assessment

WATER QUALITY ACT 1987
Section 304(l)

TOXIC ASSESSMENT

State of Vermont
Agency of Natural Resources
Department of Environmental Conservation

Table of Contents

APPENDIX A

EXPLANATORY NOTES FOR WATERBODIES INCLUDED ON
LISTS A (i), A (ii), AND B DUE TO TOXIC IMPAIRMENT

In fulfillment of the initial requirement of Section 304(l) of the 1987 Clean Water Act, an assessment of Vermont waterbodies was conducted to evaluate impairment due to toxic pollutants. The three required lists of waters which were developed as a result of this assessment are enclosed.

There were no waterbodies which were found to be impaired by 307(a) toxics from point sources. Therefore there are no waterbodies on the B list.

Three waterbodies which are included on the lists require an explanation as to the nature of the source of impairment. On list A (ii) for the waterbody designated 06-08 and the facility named Agrimark-Kraft/Troy, the pollutant is listed as unknown. The reason for this is that the type of contaminant has never been documented. High levels of chlorine have been measured in the discharge, however, and this is believed to be the toxic pollutant responsible for the high level of biotic impairment downstream.

On lists A (i) and A (ii) there is site in waterbody 05-10 which is identified as the Pine Street Barge Canal. As a result of sampling at this site, only methane and trace amounts of organics have been found in the surface water. The sediments, however, have been found to contain polycyclic aromatic hydrocarbons and PCBs. In the groundwater benzene, toluene, and ethylbenzene have been found. Trout sampled from the canal contained acenaphthene and phenanthrene. The site is a designated Superfund site, and has been posted for no swimming or fishing by the State Health Department. Therefore, although surface water sampling has revealed low levels of contamination, the site is considered to be impaired by toxics.

The third site is also on the A (i) and A (ii) lists. It is located in waterbody 14-03, and is known as the Ely Mine. No surface water sampling for toxics has been conducted in relation to this site. However, the aquatic macroinvertebrate community downstream from the confluence of the stream draining the area of the mine tailings is highly impaired. A nearby waterbody is being impacted by a similar site, the Elizabeth Mine. Surface water sampling of the brook draining this site has revealed toxic levels of copper, cadmium, lead, zinc and iron. It is believed that heavy metals are also responsible for the impairment downstream from the Ely Mine site.

On the A (ii) list there are 29 waterbodies which are considered to be impaired due to municipal wastewater treatment facilities. This assessment was made by using a desk-top model to predict insteam levels of chlorine from each facility at 7Q10. The model used the discharge conditions of 1.0 mg/l total residual chlorine at maximum design flow. If the calculated instream chlorine was found to be 0.019 mg/l or greater, the facility was considered a source of impairment. A Chlorine Policy (copy enclosed - Appendix B) has been established by the Department of Environmental Conservation which would

order each of these facilities to dechlorinate when the scheduled re-issuance of each permit was made. Dechlorination is to be in place within three years of the issuance of the permit. The schedule of completion dates for these facilities is enclosed (Appendix C).

At present, the Department is in the third year of a five-year permit reissuing cycle for implementing the Chlorine Policy.

304(l) A (i) List

Vermont Waterbody ID Number	Name of Waterbody	Description of Waterbody	Type and Size of Waterbody
VT05-10	Burlington Direct Lake Champlain	Direct drainage area to lake from Burlington (Appletree Point to Red Rock Point)	River 0.6 miles
VT08-02	Minor Tributaries Lower Winooski	Minor tributaries draining into Lower Winooski (includes Alder Brook, Muddy Brook, Allen Brook, and Sunderland Brook)	River 23.0 miles
VT08-20	Upper Mad and Headwaters	Tributaries to Mad from confluence of Mill Brook to headwaters	River 31.0 miles
VT14-02	Western Ompompanoosuc River	Union Village impoundment to headwaters including tributaries	River 30.5 miles
VT14-03	Ompompanoosuc River	Union Village impoundment to headwaters including tributaries	River 32.5 miles

304(1) A (ii) List (Excluding lakes)

Vermont Waterbody ID Number	Name of Waterbody	Description of Waterbody	Type of Waterbody
VT01-02	Hoosic River	Hoosic River - Massachusetts border to New York border	River 7.0 miles
VT01-03	Walloomsac River	Mouth to headwaters including tributaries	River 104.7 miles
VT01-04	Batten Kill Main Stem	New York border to confluence of West Branch	River 21.0 miles
VT01-07	Minor Tributaries - Direct to New York	Minor tributaries flowing directly to New York	River 23.0 miles
VT02-01	Poultney Main Stem and Tributaries	Main Stem - Mouth to confluence with Castleton River and tributaries	River 20.5 miles
VT02-02	Hubbardton River	Mouth to headwaters including tributaries	River 17.0 miles
VT02-03	Castleton River	Mouth to headwaters including tributaries	River 36.0 miles
VT02-04	Upper Poultney Watershed	Poultney River - Confluence with Castleton River to headwaters including tributaries	River 59.2 miles
VT02-05	Mettawee Watershed	New York/Vermont border to headwaters including tributaries	River 47.5 miles
VT03-01	Lower Otter Creek	Main Stem - Mouth to confluence with Middlebury River	River 29.7 miles
VT03-04	Minor Tributaries - Mid-Main Stem Otter Creek	Minor tributaries draining into Mid-Main Stem	River 33.0 miles
VT03-05	Upper Main Stem Otter Creek	Main Stem - Confluence of Furnace Brook to Cold River	River 14.0 miles
VT03-06	Minor Tributaries - Upper Main Stem Otter Creek	Minor tributaries draining into Main Stem	River 4.0 miles

304(1) A (ii) List (continued)

Vermont Waterbody ID Number	Name of Waterbody	Description of Waterbody	Type of Waterbody
VT03-08	Lewis Creek	Mouth to headwaters including tributaries	River 40.0 miles
VT03-09	Dead Creek	Mouth to headwaters including tributaries	River 20.0
VT03-10	Lemon Fair River	Mouth to headwaters including tributaries	River 27.0 miles
VT03-11	New Haven River	Mouth to headwaters including tributaries	River 49.4 miles
VT03-14	East Creek	Mouth to headwaters including tributaries	River 29.5 miles
VT03-15	Clarendon Creek	Mouth to headwaters including tributaries	River 17.0 miles
VT03-18	Upper Otter Creek Watershed	Creek and direct tributaries from confluence of Mill River to headwaters	River 51.2 miles
VT04-03	East Creek	Drainage area of East Creek including tributaries	River 10.5 miles
VT05-01	Rock River	Canadian/US border to headwaters including tributaries	River 17.0 miles
VT05-07	St. Albans Bay Drainage	Drainage area to St. Albans Bay including tributaries	River 21.0 miles
VT05-08	Lower Northeast Arm Direct	Direct drainage area from Melville Landing to Sand Bar bridge (Route 2) including Stone Bridge Brook and tributaries	River 9.0 miles
VT05-09	Malletts Bay Drainage	Drainage area to inner and outer portions of Malletts Bay	River 26.0 miles

Vermont Waterbody ID Number	Name of Waterbody	Description of Waterbody	Type of Waterbody
VT05-10	Burlington Direct Land Drainage	Direct drainage area to lake from Burlington (Appletree Point to Red Rock Point)	River 0.6 miles
VT05-11	Shelburne Bay Direct Drainage	Drainage areas to Bay from Shelburne Point LaPlatte River, and Potash Brook including tributaries	River 35.0 miles
VT06-01	Lower Missisquoi River	Main Stem - Mouth to confluence of Tyler Branch	River 33.1 miles
VT06-02	Mid-Missisquoi River	Main Stem - Confluence of Tyler Branch to Canadian Border	River 19.9 miles
VT06-03	Minor Tributaries - Lower Missisquoi River	Minor tributaries draining lower segment of main stem	River 19.5 miles
VT06-05	Black Creek	Confluence with Missisquoi to headwaters including tributaries	River 44.0 miles
VT06-06	Tyler Branch	Confluence with Missisquoi to headwaters and tributaries	River 30.0 miles
VT06-07	Trout River	Confluence with Missisquoi to headwaters including tributaries	River 45.0 miles
VT06-08	Upper Missisquoi	Canadian border to headwaters including tributaries	River 108.0 miles
VT07-01	Lower Lamoille	Main stem and tributaries - Mouth to Clark Falls tributaries	River 8.0 miles
VT07-02	Lower Mid-Lamoille	Main stem Arrowhead Mountain Lake to Fairfax Dam	River 5.0 miles
VT07-04	Upper Mid-Lamoille	Main Stem - Fairfax Dam to Cady's Falls Dam	River 48.0 miles
VT07-07	Upper Lamoille River	Main Stem - Cady's Falls Dam to Hardwick Dam	River 15.7 miles

304(l) A (ii) List (continued)

Vermont Waterbody ID Number	Name of Waterbody	Description of Waterbody	Type of Waterbody
VT07-08	Minor Tributaries - Upper Lamoille River	Minor tributaries draining into Upper Lamoille	River 11.8 miles
VT07-15	Gihon River	Mouth to headwaters including tributaries	River 40.8 miles
VT07-21	Lower Headwaters Lamoille River	Lamoille - Hardwick Dam to confluence at Greensboro Brook including tributaries	River 33.3 miles
VT08-01	Lower Winooski River	Main Stem - Mouth to confluence of Alder Brook	River 20.0 miles
VT08-02	Mid Tributaries Lower Winooski River	Minor tributaries draining into Lower Winooski (includes Alder Brook, Muddy Brook, Allen Brook, and Sunderland Brook)	River 23.0 miles
VT08-03	Lower Mid-Winooski	Main Stem - Confluence of Alder Brook to confluence of Little River	River 20.0 miles
VT08-05	Upper Mid-Winooski River	Main Stem - Confluence of Little River to confluence of Stevens Branch	River 15.0 miles
VT08-07	Upper Winooski River	Main Stem - Confluence of Stevens Branch to confluence of Molly's Brook	River 19.0 miles
VT08-08	Minor Tributaries - Upper Winooski	Minor tributaries draining into Upper Winooski (includes Great Brook, Mallory Brook)	River 34.0 miles
VT08-09	Winooski Headwaters	Confluence of Molly's Brook to headwaters	River 10.5 miles
VT08-11	Lower Little River	Mouth to confluence of West Branch including tributaries	River 31.6 miles
VT08-12	Upper Little River	Confluence of West Branch to headwaters including tributaries	River 30.6 miles
VT08-13	North Branch - Winooski River	Mouth to headwaters including tributaries	River 56.1 miles

304(l) A (ii) List (continued)

Vermont Waterbody ID Number	Name of Waterbody	Description of Waterbody	Type of Waterbody
VT08-15	Jail Branch - Winooski River	Mouth to headwaters including tributaries	River 23.0 miles
VT08-16	Stevens Branch - Winooski River	Mouth to headwaters including tributaries (excluding Jail Branch)	River 28.7 miles
VT08-17	Dog River	Mouth to headwaters including tributaries	River 53.5 miles
VT08-20	Upper Mad River	Tributaries to Mad from confluence of Mill Brook to headwaters	River 31.0 miles
VT09-04	First Branch - White River	Confluence with main stem headwaters including tributaries	River 61.9 miles
VT09-05	Second Branch - White River	Confluence with main stem to headwaters including tributaries	River 50.5 miles
VT09-06	Third Branch - White River	Confluence of main stem to headwaters including tributaries	River 95.0 miles
VT10-01	Lower Ottauquechee River	Main Stem - Mouth to confluence of Kedron Brook	River 16.5 miles
VT10-05	Upper Ottauquechee River	Main Stem - Confluence of North Branch of confluence of Roaring Brook	River 11.5 miles
VT10-06	Minor Tributaries - Upper Ottauquechee	Minor tributaries and headwaters of Upper Ottauquechee	River 17.0 miles
VT10-07	Kedron Brook	Mouth to headwaters including tributaries	River 9.0 miles
VT10-11	Lower Black River	Main Stem - Mouth to dam of North Springfield Reservoir	River 8.0 miles
VT10-13	Mid-Black River	Dam of North Springfield Reservoir to Cavendish Dam including tributaries	River 19.0 miles

304(l) A (ii) List (continued)

Vermont Waterbody ID Number	Name of Waterbody	Description of Waterbody	Type of Waterbody
VT10-16	North Branch - Black River	Mouth of North Branch to headwaters including tributaries	River 19.0 miles
VT11-01	Lower Williams River	Main Stem - Mouth to confluence of Middle Branch	River 10.5 miles
VT11-03	Middle Branch - Williams River	Mouth to headwaters including tributaries	River 35.0 miles
VT11-05	Lower Saxtons River	Mouth to confluence of South Branch including tributaries	River 18.5 miles
VT11-15	Ball Mountain Brook	Mouth to headwaters including tributaries	River 20.0 miles
VT11-16	Winhall River	Mouth to headwaters including tributaries	River 38.5 miles
VT11-18	Minor Tributaries - Upper West	Minor tributaries draining into Upper West	River 23.0 miles
VT12-01	Lower Deerfield River	Massachusetts border to top of Harriman Reservoir including tributaries	River 8.0 miles
VT12-03	Upper Deerfield River	Top of Harriman Reservoir to headwaters including tributaries	River 15.0 miles
VT12-05	North Branch Deerfield	Mouth to headwaters including tributaries	River 36.0 miles
VT13-12	Sacketts Brook	Direct drainage to Connecticut River (VT13-03) from Sacketts Brook headwaters including tributaries	River 7.5 miles
VT14-02	Western Ompompanoosuc River	Union Village impoundment to headwaters including tributaries	River 30.5 miles
VT14-03	Ompompanoosuc River	Union Village impoundment to headwaters including tributaries	River 32.5 miles

304(1) A (ii) List (continued)

Vermont Waterbody ID Number	Name of Waterbody	Description of Waterbody	Type of Waterbody
VT14-04	Lower Waits River	Mouth to confluence with South Branch	River 16.3 miles
VT15-01	Passumpsic Main Stem	Mouth to confluence of East and West Branches	River 23.0 miles
VT15-02	Joe's Brook	Mouth to headwaters	River 40.0 miles
VT15-04	Sleepers River	Mouth to headwaters	River 47.0 miles
VT15-05	Upper Minor Tributaries - Passumpsic River	Stark Brook, Wheelock Brook and Sheldon Brook	River 35.2 miles
VT15-08	East Branch Passumpsic	Confluence with West Branch to headwaters including tributaries	River 38.6 miles
VT15-09	Moose River	Mouth to headwaters including tributaries	River 60.0 miles
VT16-04	Moore Impoundment	Main stem of Connecticut River from the Gilman Dam to the Moore Dam	River 12.0 miles
VT16-05	Comerford Impoundment	Main stem of Connecticut River the Moore Dam to the Comerford Dam	River 7.1 mile
VT16-08	Canaan Direct Tributaries	Direct drainage to the Uppermost Connecticut (VT16-01) from Leach Creek, Keyer Brook, and Capron Brook	River 14.5 miles
VT16-10	East Branch - Nulhegan	East Branch of the Nulhegan River from its headwaters to the confluence with the Nulhegan River	River 13.0 miles
VT16-11	Nulhegan River	From the confluence of the Connecticut to headwaters (excluding the East Branch)	River 64.5 miles

304(1) A (ii) List (continued)

Vermont Waterbody ID Number	Name of Waterbody	Description of Waterbody	Type of Waterbody
VT16-14	Maidstone - Guildhall Direct Drainage	Direct drainage to Connecticut River (VT16-03) from tributaries including Mill Brook, Washburn Brook, and Jones Brook	River 18.0 miles
VT17-01	Lake Memphremagog Direct	Direct drainage area to lake	River 5.5 miles
VT17-02	Tomifabia River	Canadian/US Border to headwaters including tributaries	River 9.0 miles
VT17-03	Coaticook River	Canadian/US Border to headwaters including tributaries	River 37.0 miles
VT17-04	Lower Clyde River	Mouth to confluence of the drainage from Echo and Seymour lakes	River 32.0 miles
VT17-05	Upper Clyde River	Confluence of Echo/Seymour lakes drainage to headwaters including tributaries	River 43.1 miles
VT17-09	Lower Black River	Mouth to confluence of Lords Creek and Black River	River 24.5 miles

Appendix B: Vermont Chlorine Policy

POLICY

Based on the scientific data available, it is evident that the discharge of chlorine and chlorinated compounds to waters of the state adversely affects the composition of the aquatic biota and the propogation of fish. It is therefore the determination of the Secretary of the Vermont Agency of Natural Resources that the discharge of chlorine and chlorinated compounds to waters of the state can and does constitute a violation of the Vermont Water Quality Standards, Section 3-06.

In order to obtain and maintain the duly established classifications of the waters of the state and still provide protection to the public from increased risk of disease it is the policy of the Vermont Agency of Natural Resources to manage the discharge of chlorine in accord with the following provisions.

1. All existing wastewater treatment facilities with existing chlorination/dechlorination disinfection systems are directed to maintain and operate the dechlorination equipment on a full time basis. If seasonal disinfection is approved as recommended in this document and these facilities are allowed to disinfect on a seasonal basis, the dechlorinating equipment would be required to be operated only during the period required for disinfection. The Permits Section will assume the primary role on this issue.

2. All existing wastewater discharges (municipal, industrial, and private) discharging chlorine and calculated to yield a resultant instream total residual chlorine level in excess of 0.019 mg/l at 7Q10 based upon a 1.0 mg/l maximum allowable total residual chlorine in the effluent flow are directed to begin planning, design, and construction of dechlorination facilities or an alternative disinfection system. Where chlorination/dechlorination is chosen as the method of disinfection the maximum allowable total residual chlorine in an effluent flow shall not exceed 0.1 mg/l at any time.

   This requirement may be waived by the Secretary of the Vermont Agency of Natural Resources when it is determined that no environmental benefit shall be realized by this activity. In such a case, the maximum allowable total residual chlorine limit shall be determined on a case by case basis.

   Compliance for this activity shall be accomplished as soon as possible but no later than three years after inclusion of this requirement in the facility's discharge permit. For primary municipal facilities included in Attachment I compliance is required on the completion date specified in the implementation schedule established under the permit program (10 V.S.A., Chapter 47).

   A listing of municipal facilities presently calculated to be unable to achieve the instream 0.019 mg/l total residual chlorine level at 7Q10 based upon 1.0 mg/l maximum allowable total residual chlorine in the effluent is attached as Attachment I to this document.

3. All remaining wastewater discharges (municipal, industrial, and private) discharging chlorine are directed to lower their effluent weekly average and daily maximum allowable total residual chlorine to the levels shown on Attachment II. Attachment II lists all remaining municipal facilities, presently utilizing chlorination as their means of disinfection. Where these total residual chlorine levels are demonstrated to cause continued "environmental risk", that is, instream total residual chlorine levels in excess of 0.011 mg/l, the Secretary of the Agency of Natural Resources may order additional reduction in the total chlorine residual level on a case by case basis.

   Compliance for this activity shall be accomplished as soon as possible but no later than three years after inclusion of this requirement in the facility's discharge permit. For primary municipal facilities included in Attachment II compliance is required on the completion date specified in the implementation schedule established under the permit program (10 V.S.A., Chapter 47).

   The Permits Section of the Department will assume the primary role on this issue with technical assistance being provided by the Environmental Engineering and Water Quality Divisions.

4. All new discharges containing chlorine will be required to achieve a 1.0 mg/l daily maximum allowable total residual chlorine level in the effluent flow. Where new discharges containing chlorine are calculated to yield an excess of 0.019 mg/l total residual chlorine instream at 7Q10 based on 1.0 mg/l in the effluent, dechlorinating facilities will be required to be incorporated into the facility design or an alternative method of disinfection (other than chlorine) will be required. In all other new discharges containing chlorine, the Secretary of the Agency of Natural Resources may require further reduction of chlorine residual where calculation of instream conditions reflect an "environmental risk" to the aquatic biota, that is instream total residual chlorine levels in excess of 0.011 mg/l. The Permits Section and Environmental Engineering Divisions will assume dual responsibility on this issue with assistance from the Water Quality Division.

5. All new facilities allowed to discharge at a 1.0 mg/l maximum total residual chlorine level should incorporate a streambank outfall structure into the facilities design.

6. Seasonal disinfection of wastewater effluents should be implemented at the earliest possible time at those facilities where it is deemed appropriate. Seasonal disinfection is recommended to take place from April 1 through October 31. Concurrence is required from both the Department of Water Resources and Environmental Engineering and the Department of Health prior to the institution of seasonal disinfection. Those facilities required to operate dechlorinating facilities will be required to operate this equipment only during those times of the year when disinfection is required.

   Vermont's Water Quality Standards, adopted January 7, 1985 contains provisions for seasonal disinfection.

7. Implementation of this policy shall be through the administration of the permit program as authorized by Title 10 V.S.A., Chapter 47, paragraph 1258b and shall follow the due process of public review and participation as specified in state and federal permit regulations.

Recommended for Approval: Patrick Parenteau

Patrick Parenteau, Commissioner
Department of Environmental Conservation

Date: 3-25-88

Signed: Jonathan Lash

Jonathan Lash, Secretary
Agency of Natural Resources

Date: 3/25/88

ATTACHMENT I

Municipality	Discharge Point	Calculated Instream TRC level at 1.0 mg/l at 7Q10
Barre City	Stevens Branch (Winooski River)	0.405
Bennington	Walloomsac River	0.166
Benson	Hubbardton River (trib)	0.200
Bradford	Waits River	0.037
Brandon	Neshobe River	0.166
Brighton (Island Pond)	Pherrins River	0.017 (1)
Burlington (North)	Winooski River	0.020
Burlington (Riverside)	Winooski River	0.010 (2)
Castleton	Castleton River	0.195
Cavendish	Black River	0.017 (1)
Chelsea	1st Branch White River	0.095
Chester	Williams River	0.085
Essex Village	Winooski River	0.030
Fair Haven	Castleton River	0.058
Hinesburg	LaPlatte River	0.186
Johnson	Lamoille River	0.020
Ludlow	Black River	0.118
Lyndonville	Passumpsic River	0.027
Manchester	Battenkill River	0.046
Montpelier	Winooski River	0.054
Newport	Clyde River	0.053
Northfield	Dog River	0.312
Orwell	East Creek	0.143
Putney	Sacketts Brook	0.076
Poultney	Poultney River	0.180
Hartford-Quechee	Ottauquechee River	0.020
Randolph	3rd Branch White River	0.181
Readsboro	Deerfield River	0.024
Rutland City	Otter Creek	0.088

ATTACHMENT I CONTINUED

Municipality	Discharge Point	Calculated Instream TRC level at 1.0 mg/l at 7Q10
Saxtons River	Saxtons River	0.059
Shelburne FD #2		0.333*
So. Burlington (Airport Pkwy.)	Winooski River	0.066 (3)
Springfield	Black River	0.128
St. Albans	Stevens Brook	0.912
St. Johnsbury	Passumpsic River	0.095
Swanton	Missisquoi River	0.018 (1)
West Rutland	Clarendon River	0.031
Williamstown	Steven Branch Trib	0.600
Wilmington	No. Branch Deerfield River	0.109
Winooski	Winooski River	0.012 (2)
Woodstock (South)	Kedron Brook	0.092

*Based upon an October mean discharge into McCabes Brook of 1.4 cfs.

(1) Although, the calculated instream TRC Level at 1.0 mg/l at 7Q10 is less then 0.019 mg/l, these plants will not be able to achieve or maintain the required total residual chlorine levels without dechlorination.

(2) These two plants were added to Attachment I due to their close proximity on the Winooski River and the resulting instream TRC level from both discharges.

(3) The calculated instream TRC level at 1.0 mg/l has been calculated based upon leakage flow released from the Green Mountain Power Dam.

ATTACHMENT II

Municipality	Discharge Point	Allowed TRC levels in the discharge (mg/l Weekly Avg.	Daily Max.
Bellows Falls	Connecticut River	1.0	2.0
Bethel	White River	1.0	2.0
Brattleboro	Connecticut River	1.0	2.0
*Bridgewater	Ottauquechee River	1.0	2.0
Burlington (Main)	Lake Champlain	1.0	2.0
*Canaan	Connecticut River	1.0	2.0
Colchester FD #1	Winooski River	1.0	2.0
*Enosburg	Missisquoi River	1.0	2.0
Fairfax FD #1	Lamoille River	1.0	2.0
Hartford (Wilder)	Connecticut River	1.0	2.0
Hartford (White River)	Connecticut River	1.0	2.0
Lunenburg FD #1	Connecticut River	1.0	2.0
*Marshfield	Winooski River	1.0	2.0
*Middlebury	Otter Creek	1.0	1.9
Milton	Lamoille River	1.0	2.0
*Morrisville	Lamoille River	0.85	1.5
*North Troy	Missisquoi River	1.0	1.9
*Pittsford	Furnace Brook	1.0	2.0
*Plainfield	Winooski River	1.0	1.9
Proctor	Otter Creek	1.0	2.0
*Richford	Missisquoi River	1.0	2.0
Richmond	Winooski River	1.0	2.0
Rutland Center	Otter Creek	1.0	2.0
Shelburne F.D.#1	Lake Champlain	1.0	2.0
Sheldon	Missisquoi River	1.0	2.0

ATTACHMENT II CONTINUED

Municipality	Discharge Point	Allowed TRC levels in the discharge (mg/l) Weekly Avg.	Daily Max.
*South Burlington Bartlett's Bay	Lake Champlain	1.0	2.0
South Royalton	White River	1.0	2.0
Vergennes	Otter Creek	1.0	2.0
Wallingford	Otter Creek	1.0	2.0
*Waterbury	Winooski River	1.0	2.0
Windsor, Main	Connecticut River	1.0	2.0
Windsor, Weston Heights	Connecticut River	1.0	2.0
*Woodstock, Main	Ottauquechee River	0.85	1.5
Woodstock, Taftsville	Ottauquechee River	1.0	2.0

* The Secretary of the Agency of Natural Resources may order additional reduction in the maximum total residual chlorine level on a case by case basis.

APPENDIX C

SCHEDULED COMPLETION FOR DECHLORINATION
AT MUNICIPAL WWTF'S

Facility	Completion Date
Montpelier	12/10/87
Hartford - Quechee	7/01/88
Readsboro	9/25/89
Lyndonville	9/26/89
Putney	5/01/90
Brighton	9/01/90
Wilmington	12/01/90
St. Johnsbury	6/30/91
Swanton	7/01/91
Springfield	9/30/91
Randolph	10/01/91
Shelburne FD #2	12/01/91
West Rutland	12/31/91
Bradford	3/31/92
Chester	3/31/92
Fair Haven	3/31/92
Johnson	3/31/92
Manchester	3/31/92
Northfield	3/31/92
Saxtons River	3/31/92
Williamstown	3/31/92
Burlington, North	12/31/92
Burlington, Riverside	12/31/92
Hinesburg	12/31/92
South Woodstock	12/31/92
Winooski	12/31/92
Brandon	3/31/93
Chelsea	3/31/93

Appendix 5.

Criteria for Designating Use Support Classification

E.P.A. Criteria for designated use support classification.

Assessment Basis	Assessment Description	Support of designated use: Fully supporting	Partially Supporting	Not Supporting
Evaluated	No site-specific ambient data. Assessment is based on land use, location of sources, citizen complaints, etc. Predictive models use estimated inputs; are not calibrated/verified.	No sources (point or nonpoint) are present that could interfere with the use. Data indicates or it is predicted that criteria are attained.	Sources are present but may not affect use or no sources present but complaints on record.	Magnitude of sources indicate use is likely to be impaired. Criteria exceedences predicted.
Monitored (Chemistry)	Fixed station sampling or survey sampling. Chemical analysis of water, sediment, or biota	For all pollutants, criteria exceeded in ≤10% of measurements and mean of measurements is less than criteria. Pollutants not found at levels of concern.	For any one pollutant, criteria exceeded 11-25% and mean of measurements is less than criteria; or criteria exceeded ≤10% & mean is greater than criteria. Pollutants not found at levels of concern.	For any one pollutant, criteria exceeded >25% or criteria exceeded 11-15% and mean of measurements is greater than criteria. Pollutants found at levels of concern.
Monitored (Biology)	Site visit by qualified biological personnel. Rapid bioassessment protocols may be used.	Use fully supported; no evidence of modification of community (within natural range of control/ ecoregion).	Some uncertainty about use support; some modification of community noted.	Use clearly not supported; definite modification of community.

CLASSIFICATION GUIDELINES FOR MULTIPLE USE WATERBODIES

Fully supporting = All uses are fully supported

Partially supporting = One or more uses partially supported and remaining uses are fully supported

Not supporting = One or more uses not supported

Appendix 6

1988 Water Quality Assessment
Waterbodies Fully Supporting/Threatened Uses [304(l)List]

Summary List

APPENDIX 6
1988 Water Quality Assessment:

Waterbodies Fully Supporting Uses/Threatened (304(1)List)
Summary List

05/26/88 WATERBODY TABULATION REPORT

WATERBODY ID #	WATERBODY NAME	DATE
VT01-05	Main Stem Tribs - Batten Kill	8801
VT03-03	Mid-Main Stem Otter Creek	8801
VT03-07	Little Otter Creek	8801
VT03-12	Middlebury River	8801
VT03-16	Cold River	8801
VT03-17	Mill River	8801
VT05-02	Pike River	8801
VT07-03	Minor Tribs - Lower Mid-Lamoille	8801
VT07-10	Lower Browns River	8801
VT07-11	Upper Browns Brook	8801
VT07-12	Seymour River	8801
VT07-13	Brewster River	8801
VT07-16	Kenfield Brook	8801
VT07-19	Wild Branch	8801
VT08-10	Huntington River	8801
VT08-18	Mad River - Main Stem	8801
VT08-19	Lower Mad River	8801
VT09-01	Lower White River Main Stem	8801
VT09-07	Upper White River Watershed	8801
VT10-03	Mid-Ottauquechee River	8801
VT10-08	Broad Brook	8801
VT10-10	Gulf Stream	8801
VT10-12	Minor Tribs - Lower Black	8801
VT10-14	Upper Black River	8801
VT10-15	Black River Headwaters	8801
VT11-04	Upper Williams	8801
VT11-07	Lower West River	8801
VT11-08	Minor Tribs - Lower West River	8801
VT11-09	Rock River	8801
VT11-10	Mid-West River	8801
VT11-11	Grassy Brook	8801
VT11-12	Minor Tribs - Mid-West River	8801
VT11-13	Cobb & Turkey Mtn Brooks	8801
VT11-14	Wardsboro Brook	8801
VT11-17	Upper West River	8801
VT12-02	West Branch Deerfield	8801
VT12-04	East Branch Deerfield	8801
VT12-07	East Branch North River	8801
VT13-01	Upper Southern Connecticut River	8801
VT13-02	Upper Mid-Southern Connecticut River	8801
VT13-03	Mid-Southern Connecticut River	8801
VT13-04	Vernon Impoundment	8801
VT13-05	Lower Connecticut River	8801
VT13-06	Hartford Direct Drainage	8801
VT13-08	Reading - Windsor Direct Drainages	8801
VT13-10	Springfield-Rockingham Direct Drainages	8801
VT13-11	Westminster Direct Drainages	8801
VT13-14	Whetstone Brook	8801
VT14-05	Upper Waits River	8801
VT14-07	Lower Wells River	8801

WATERBODY ID #	WATERBODY NAME	DATE
VT15-06	Miller's Run	8801
VT15-07	West Branch Passumpsic	8801
VT16-03	Northern Connecticut River	8801
VT16-07	Lower Northern Connecticut River	8801
VT16-09	Lemington/Bloomfield Direct Tribs	8801
VT16-13	Paul Stream	8801
VT16-15	Guildhall-Lunenburg Direct Drainages	8801
VT17-06	Willoughby River	8801
VT17-08	Upper Barton River	8801

Appendix 7

1988 Water Quality Assessment: Waterbodies Not Fully Supporting Uses [304(1)List]

Summary List

APPENDIX 7
1988 Water Quality Assessment:
Waterbodies Not Fully Supporting Uses (304(1)List)
Summary List

05/26/88 WATERBODY TABULATION REPORT

WATERBODY ID #	WATERBODY NAME	DATE
VT01-02	Hoosic River	8801
VT01-03	Walloomsac River	8801
VT01-04	Batten Kill Main Stem	8801
VT01-07	Minor Tribs - Direct to N.Y.	8801
VT02-01	Poultney Main Stem and Tribs	8801
VT02-02	Hubbardton River	8801
VT02-03	Castleton River	8801
VT02-04	Upper Poultney Watershed	8801
VT02-05	Mettawee Watershed	8801
VT03-01	Lower Otter Creek	8801
VT03-04	Minor Tribs - Mid Main Stem Otter Ck.	8801
VT03-05	Upper Main Stem Otter Ck.	8801
VT03-06	Minor Tribs - Upper Main Stem Otter Ck.	8801
VT03-08	Lewis Creek	8801
VT03-09	Dead Creek	8801
VT03-10	Lemon Fair River	8801
VT03-11	New Haven River	8801
VT03-14	East Creek	8801
VT03-15	Clarendon River	8801
VT03-18	Upper Otter Creek Watershed	8801
VT04-03	East Creek	8801
VT05-01	Rock River	8801
VT05-07	St. Albans Bay Drainage	8801
VT05-08	Lower Northeast Arm Direct	8801
VT05-09	Malletts Bay Drainage	8801
VT05-10	Burlington Direct Land Drainage	8801
VT05-11	Shelburne Bay Direct Drainage	8801
VT06-01	Lower Missisquoi River	8801
VT06-02	Mid Missisquoi River	8801
VT06-03	Minor Tribs - Lower Missisquoi River	8801
VT06-05	Black Creek	8801
VT06-06	Tyler Branch	8801
VT06-07	Trout River	8801
VT06-08	Upper Missisquoi	8801
VT07-01	Lower Lamoille	8801
VT07-02	Lower Mid-Lamoille	8801
VT07-04	Upper Mid-Lamoille	8801
VT07-07	Upper Lamoille River	8801
VT07-08	Minor Tribs - Upper Lamoille	8801
VT07-15	Gihon River	8801
VT07-21	Lower Headwaters Lamoille River	8801
VT08-01	Lower Winooski River	8801
VT08-02	Minor Tribs - Lower Winooski	8801
VT08-03	Lower Mid-Winooski	8801
VT08-05	Upper Mid-Winooski	8801
VT08-07	Upper Winooski River	8801
VT08-08	Minor Tribs - Upper Winooski	8801
VT08-09	Winooski Headwaters	8801
VT08-11	Lower Little River	8801
VT08-12	Upper Little River	8801

WATERBODY ID #	WATERBODY NAME	DATE
VT08-13	North Branch - Winooski River	8801
VT08-15	Jail Branch - Winooski River	8801
VT08-16	Stevens Branch - Winooski River	8801
VT08-17	Dog River	8801
VT08-20	Upper Mad River	8801
VT09-04	First Branch - White River	8801
VT09-05	Second Branch - White River	8801
VT09-06	Third Branch - White River	8801
VT10-01	Lower Ottauquechee River	8801
VT10-05	Upper Ottauquechee River	8801
VT10-06	Minor Tribs - Upper Ottauquechee	8801
VT10-07	Kedron Brook	8801
VT10-11	Lower Black River	8801
VT10-13	Mid-Black River	8801
VT10-16	North Branch - Black River	8801
VT11-01	Lower Williams River	8801
VT11-03	Middle Branch - Williams River	8801
VT11-05	Lower Saxtons River	8801
VT11-15	Ball Mtn Brook	8801
VT11-16	Winhall River	8801
VT11-18	Minor Tribs - Upper West	8801
VT12-01	Lower Deerfield River	8801
VT12-03	Upper Deerfield River	8801
VT12-05	North Branch Deerfield	8801
VT13-12	Sacketts Brook	8801
VT14-02	Western Ompompanoosuc River	8801
VT14-03	Ompompanoosuc River	8801
VT14-04	Lower Waits River	8801
VT15-01	Passumpsic Main Stem	8801
VT15-02	Joe's Brook	8801
VT15-04	Sleepers River	8801
VT15-05	Upper Minor Tribs - Passumpsic River	8801
VT15-08	East Branch Passumpsic	8801
VT15-09	Moose River	8801
VT16-04	Moore Impoundment	8801
VT16-05	Comerford Impoundment	8801
VT16-08	Canaan Direct Tribs	8801
VT16-10	East Branch - Nulhegan	8801
VT16-11	Nulhegan River	8801
VT16-14	Maidstone-Guildhall Direct Drainage	8801
VT17-01	Lake Memphremagog Direct	8801
VT17-02	Tomifobia River	8801
VT17-03	Coaticook River	8801
VT17-04	Lower Clyde River	8801
VT17-05	Upper Clyde River	8801
VT17-09	Lower Black River	8801

DC

State of Vermont

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation
State Geologist
Natural Resources Conservation Council

AGENCY OF NATURAL RESOURCES
103 SOUTH MAIN STREET
Waterbury, Vermont 05676

Department of Environmental Conservation

WATER QUALITY DIVISION
10 North Building
(802) 244-6951

February 27, 1989

Dear 1988 Water Quality Assessment Recipient:

Certain errors in interpretation of the amount of wetland loss due to road construction have been brought to our attention. This information occurs in the wetland section of the report, with highlights brought out in the summary.

Please insert the enclosed errata statement in your report, which corrects the wetland loss information.

Very truly yours,

Stephan B. Syz, Chief
Water Resources Planning

vld

Attachment

ERRATA SHEET
State of Vermont 1988 Water Quality Assessment
305(b) Report

page xv., last line - change "94 acres" to 36 acres.

page xvi., 1st line - change "Sixty-six percent of this loss was due to road construction." to Forty-two percent of this loss was due to light industrial.

page xvi., lines 2 and 3 - change "Light industrial and residential development . . ." to Residential and miscellaneous development . . .

page 84, lines 19 and 20 - Remove the sentence, "mitigation gains have been incorporated into these figures."

page 84, line 21, - Remove "road construction" and insert construction activity.

page 84, lines 21 and 22 - Remove "Highway and secondary roads accounted for nearly two -thirds . . ." to Light industrial construction accounted for forty-two percent.

page 85, Table 25. In the title, delete "Wetland Type and Activity Type" and insert "Type of Activity." Delete the Wetland Type portion of the table and revise the remaining table as follows:

Wetland Loss

Activity	% of Total
Light Industrial	42
Residential	22
Miscellaneous	19
Road	14
Campgrounds	3
Total	100

page 85, 1st line, 2nd paragraph - Change "The 94 acres of lost wetlands" to The 36 acres of lost wetlands.