STATE OF VERMONT

# 1986 WATER QUALITY ASSESSMENT

## 305(b) REPORT

Catching the Big Ones at Lake Bomoseen - Photo Credit: Vermont Travel Division

AGENCY OF ENVIRONMENTAL CONSERVATION
DEPARTMENT OF WATER RESOURCES
AND ENVIRONMENTAL ENGINEERING
WATER QUALITY DIVISION
WATERBURY, VERMONT

State of Vermont

AGENCY OF ENVIRONMENTAL CONSERVATION

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Department of Water Resources
and
Environmental Engineering

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Water Resources & Environmental Engineering
Natural Resources Conservation Council
State Geologist

December, 1986

To Persons Interested in Vermont's Water Resources:

We are pleased to present to you the Vermont "1986 Water Quality Assessment." Section 305 (b) of the Federal Clean Water Act requires each state to submit a biennial report to the Environmental Protection Agency (EPA) describing the quality of its waters and the recent progress made in improving the State's water quality in the proceeding two years.

The assessment points out that Vermont has continued to take positive steps towards achieving the desirable Federal goal of totally fishable and swimmable waters. We are proud to report that, on the basis of our current water quality assessment, 94% of Vermont's 4,863 miles of rivers and streams and 94% of its 224,006 acres of lakes and ponds fully support the uses designated by their classification. Of the 1,167 miles of rivers and streams closely monitored due to potential pollution from municipal and private sewage treatment plants and non-point sources of pollution, 99% support fishing and 73% support swimming.

The report points out that serious problems still remain that must be addressed if Vermont's high water quality is to be maintained for future generations. We thank you for your interest in protecting Vermont's water resources and we welcome your comments and questions about this report.

Sincerely,

Jonathan Lash

Jonathan Lash, Commissioner
Department of Water Resources and
Environmental Engineering

JL/JJM/eh

# STATE OF VERMONT

# 1986

# WATER QUALITY REPORT TO CONGRESS

Pursuant to Section 305(b) of the Clean Water Act

Agency of Environmental Conservation
Department of Water Resources
and Environmental Engineering
Water Quality Division
Waterbury, Vermont 05676

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# INTRODUCTION

Section 305(b) of the Clean Water Act requires each state to submit a biennial report to the Environmental Protection Agency (EPA) describing the quality of its navigable waters. EPA in turn, is required to transmit the State reports to Congress, along with a summary of these reports describing the quality of the nation's waters.

The Water Quality Assessment prepared by the Department of Water Resources and Environmental Engineering (DWREE) Water Quality Division, contains a collection of facts dealing with what is happening to the State's surface and ground waters and gives a good idea of Vermont's overall water quality.

The report also provides the reader with an update of the progress made and problems encountered in carrying out the goal of improving the quality of the State's waters since the previous assessment.

The report includes an analysis of the extent to which the State's waters provide for healthy fish and wildlife populations and recreation, and an analysis of the extent to which pollution control actions have achieved this level of water quality. Also included are recommendations for needed additional actions.

## A. EXECUTIVE SUMMARY/OVERVIEW

The water quality of Vermont's streams and lakes remains high and continues to improve, primarily due to continued wastewater treatment facility upgrading and construction. Presently, approximately 94% of the state's rivers and streams (4578 miles out of 4,863) fully support their designated uses. Nevertheless, threats to water quality are continuing and require innovative solutions. The construction of recreation facilities and recreation-related second homes is causing increased detrimental impacts to water quality around the state, particularly increased erosion and sedimentation. The maintenance of high water quality is a priority of the Governor, and her administration was successful in getting new legislation passed to better define and control discharges to surface waters of the state, particularly to upland streams.

Of the 1,167 segmented river miles assessed, or those rivers and streams watched closely due to potential impacts primarily from point source pollution discharges, 76% support their designated uses, 99% meet fishable criteria and 73% meet swimmable criteria. The 23%, or approximately 269 miles partially supporting the designated uses (1% does not support uses) generally are those that are impacted during periods of high runoff, such as during the spring when the wastewater treatment facilities cannot treat all the flow and must bypass it untreated. Also, erosion, sedimentation and agricultural runoff from rain and high flows cause partial support.

Compared to the 1984 305(b) reporting period, a net water quality degradation of approximately 19 miles is indicated during the two-year period. This was to be expected, because a new, more accurate reporting procedure was initiated utilizing district fisheries biologist's best professional judgement; whereas, information for the 1984 305(b) report was based primarily on historical water quality information. Improvement was due primarily to upgraded sewage treatment facilities and improved operation and maintenance of existing sewage treatment facilities. A few degraded segments were identified through new assessment efforts such as basin planning and the Ambient Biomonitoring Network (ABN) Program of heretofore non-assessed streams. Degradation was caused by direct, untreated discharges, by failed municipal, residential and ski-related development wastewater treatment facilities (WWTF) with high coliform counts and low dissolved oxygen being major problems and by siltation from nonpoint sources such as logging, agriculture and development. During this reporting period, approximately 19 miles were found to be improved, while approximately 38 miles were degraded.

Vermont has a total lake acreage of 224,006. Of this figure, 210,907 acres fully support their uses. All but 45 acres, or 99.9% meet fishable/swimmable criteria. Based on springtime phosphorus concentrations, Vermont has 5,225 acres of eutrophic lakes, 9,730 acres of mesotrophic lakes, and 21,099 acres of oligotrophic lakes. The trophic status of the balance of 188,012 acres is unknown. Of the state's estimated 200,000 acres of wetlands, 60-70 acres are being lost each year due to filling, draining, dredging and various other construction projects.

Regarding the changes in water quality in Vermont's lakes, ponds and bays, there was a net increase of 723 acres of waters supporting their designated uses compared to 1982. The major increase was caused by an upgraded sewage facility removing a 948-acre phosphorus impact to Lake Memphremagog. The main cause of nonsupport was 200 acres of additional Eurasian milfoil discovered in Lake Bomoseen.

Nutrients, pH and bacteria are the three major pollutant groups of concern in lakes and ponds. The source of this pollution is approximately 70% from nonpoint sources and the remainder from municipal combined sewer overflows and internal recycling of past nutrient loads to the lake. Acid rain appears to be the source of the high pH and loss of fish life in the two southern lakes.

Recently-begun preliminary toxicity testing of five existing discharges has found toxics present in only one - the Pownal Tannery discharge to the Hoosic River. One discharge toxicity test was inconclusive, requiring more testing. Two municipal plants and one industrial wastewater treatment plant were found to have no toxics in their discharges.

Ground water serves as the source of drinking water for approximately 55% of the state's population. Vermont's ground water has relatively few contamination problems compared to more populous industrial states. However, the state does have some ground water problems, most of which are site-specific to some particular land use activity. Leaking underground storage tanks and spills containing petroleum products and solvents have contaminated approximately 50 wells, and approximately 40 wells have elevated levels of sodium and/or chloride. This has been caused by the use or storage of rock salt for roadway deicing. It is estimated that approximately 500 wells have varying levels of contamination due to their locations adjacent to salted roads or storage facilities. Also, it is suspected that at least 300 wells statewide have been contaminated by fertilizers and/or septic systems, although fewer than ten wells have been positively identified as being contaminated by these sources. In order to prevent or mitigate future contamination problems, recently passed legislation requires the state to develop a comprehensive ground water protection program.

Pollution of surface waters from nonpoint sources, such as poor agricultural practices, careless construction and logging activities and no or low flows from hydro dams and water withdrawals is of special concern to the Department of Water Resources and Environmental Engineering. These nonpoint sources contribute to lake eutrophication and fishery habitat loss. Other items of concern include: protection of upland streams from degradation; management of waste discharges and municipal growth with decreasing state and federal funding; wastewater facilities operation and maintenance including operator training; and combined sewer overflows. Other issues and concerns which are being or need to be addressed, include: program funding, toxics identification and control, wetland loss, groundwater protection, water withdrawal for ski area snowmaking, landfills and hazardous wastes.

As of December, 1985, there were 88 public sewage treatment facilities and more than 50 industrial pretreatment plants in the state. These treatment and pretreatment facilities have improved the water quality of approximately 55 rivers and streams and three lakes in Vermont. The total cost of the public facilities has been approximately $200 million of state, federal and local funds. No estimate is available for the industrial facilities. There are only three communities remaining with no sewage treatment and eleven communities are presently served by primary treatment. All but five of these communities are in various stages of planning or construction of new facilities.

Vermont's surface water monitoring programs to assess water quality problems and maintain good water quality include trend monitoring activities such as acid precipitation monitoring, ambient biomonitoring, spring phosphorus sampling and a summer chlorophyll-a phosphorus, secchi disc program (lay monitoring) for 26 inland lakes and 26 stations on Lake Champlain. The Department of Water Resources and Environmental Engineering also does special monitoring or intensive water surveys including: compliance monitoring, water quality monitoring for hydroelectric facilities, toxicity testing, assimilative capacity studies and wasteload allocations, phosphorus modeling studies of Lake Champlain, river basin water quality management plans and special studies, such as an upland stream study and an on-site systems study.

The Department recommends that sufficient state and federal funds be appropriated to complete construction and upgrading of municipal wastewater treatment facilities. Also needed are additional fiscal resources to provide technical assistance and provide for more evaluation, follow-up and training at existing treatment facilities to improve their operation. One of the more serious remaining problems, that of nonpoint source pollution, needs to be assessed. Impacts need to be determined, priorities set and necessary programs need to be developed for its control. Combined sewer overflow impacts also need to be fully determined and a strategy and priorities set to resolve the specific problems. Finally, the methodology for setting Class C lengths needs to be refined and existing classifications reviewed and modified as needed in the public interest.

1986 Water Quality Assessment

(305(b) Report)

## B. BACKGROUND

Vermont is a rural state with a population of approximately 535,000 (July, 1985) and a surface area of approximately 9,609 square miles. The 1980 census showed the state had 511,000 residents. At a 4.6 percent rate of increase during the past four to five years, the state ranks second in growth only to New Hampshire in New England. The state Office of Policy Research and Coordination projects Vermont's population to reach 563,000 by 1990, which indicated a slower rate of growth (1%) for the remainder of the decade.

There are 17 major drainage basins in Vermont which include 4,863 miles of named and classified streams and rivers(1) and 543 lakes and ponds totaling 225,728 acres(2). Total water area is 331 square miles(3). Vermont has no ocean shoreline and no estuaries, although Lake Champlain answers many ocean-type recreational needs of Vermonters. Lakes Champlain and

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(1) The state of Vermont has approximately 8,000 miles of streams and rivers. Of these 8,000 miles, approximately 5,000 miles are capable of biosupport (propagation of fish and wildlife) on a year-round basis. The remaining 3,000 miles of rivers and streams are incapable of biosupport on a year-round basis only because of their intermittent flow characteristics during dry periods. (From 1982 STEP Report, 4/12/83.)

(2) Total acreage represents Vermont portions only.

(3) Figures are from Vermont's "ASIWPCA Nonpoint Source Assessment Project", 1985 and 1982 STEP report.

Memphremagog, Vermont's largest lakes, form portions of its borders. Lake Champlain creates part of Vermont's western boundary with New York and part of its northern boundary with Quebec. The portion of the lake within Vermont totals 172,032 acres. Lake Memphremagog, with 6,317 acres in Vermont, forms another part of the northern border with Quebec, as does Wallace Pond, with 118 acres in Vermont. The Connecticut River forms the eastern border with New Hampshire for 238 miles. The portion of the river in Vermont is 2,200 acres(4), consisting only of impoundments, because the state boundary line is actually located at low water mark on the western side of the river. The management of the river, however, is shared equally between the two states. The Poultney River is also a boundary water, forming part of the western border with New York for 24 miles.

Approximately one-half of the total land area of the state drains to Lake Champlain, which in turn, drains to the St. Lawrence River. Forty percent of the land area drains to the Connecticut River, with the remainder draining to the Hudson River (Batten Kill, Walloomsac, Hoosic Rivers) and Lake Memphremagog.

There are approximately 200,000 acres of "inland" wetlands in Vermont (not including Lake Champlain). There are no tidal wetlands but, during spring runoff from snow-melt and rain, the elevation of Lake Champlain rises from five to seven feet (depending upon many variables), creating a maximum of

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(4) Figures are from "Water and Related Land Resources of Vermont" State of Vermont and New England River Basin Commission, 1974.

approximately 29,000 acres of "new" wetlands each spring. The resulting flooding adjacent to the lake creates shallow swamps which become spawning areas for northern pike and many other species of fish and, eventually, new habitat for mammals, ducks and other birds[5].

The economy of the state is based on agriculture, light manufacturing, tourism and wood and stone products. The creation of new jobs in light manufacturing and the construction of recreation facilities and second homes as a result of tourism is causing increased impact on water quality around the state. Water quality has become a priority of the Governor and her administration was successful in getting new legislation passed recently to better define and control discharges to surface waters of the state, particularly to upland or "pristine" streams.

## C. SURFACE WATER QUALITY

### 1. Status

The water quality of Vermont's streams and lakes remains high and continues to improve, primarily due to continued wastewater treatment facility upgrading and construction. Presently, only approximately 6% of the state's rivers and streams (285 miles) experience water quality problems. (See Table 10.)

Interest continues for the use of the assimilative capacity of Vermont's waters to accommodate wastes from new development.

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(5) Information from Lake Champlain reports, prepared for the International Joint Commission by New York, Vermont and Quebec, 1977.

Requests for approval to discharge from new, privately financed facilities and for expansion of existing facilities for new development have been submitted with increased frequency in the past few years. The trend is expected to continue, with negative impacts to Vermont's surface and ground waters, not only from on-site systems and treated wastewater facility direct discharges, but also from nonpoint sources related to soil erosion from new development, particularly in the higher elevations of the state.

a. Rivers and Streams

Limited resources do not permit water quality monitoring of all the several thousands of miles of rivers and streams in the state. Vermont does have several sampling programs, however, which provide some water quality information on specific stream segments. This data, plus best professional judgement, gives a fairly good indication of the present status of Vermont's water quality.

Vermont's water quality management goals have been established by use classifications, as determined by the Water Resources Board as part of the Water Quality Standards. The water classifications are A, B, or C. Class A waters are managed for drinking water and other compatible purposes, such as recreation, and make up approximately 3% of the state's waters. Class B waters are managed primarily for recreational uses. Approximately 92% of Vermont's rivers and streams are Class B waters. Class C zones are created by a public process to allow for treated municipal and domestic waste disposal purpose. They make up approximately 6% of the state's rivers and streams. Class C zones are established to make the public aware of the fact that water-contact activities in these waters could be dangerous to their health. Vermont's "Upland Stream Policy" endeavors to protect these waters by prohibiting discharges into Class A or B waters which, before treatment, contained pathogenic organisms.

The water classifications identify water use goals by stream segment. Criteria is included for the parameters: pH, turbidity, fecal coliform, color, taste and odor. The classifications and their use goals are:

Class A Waters - As a source of public water supply with disinfection when necessary and, when compatible, for the enjoyment of water in its natural condition.

Class B Waters - Public water supply with filtration and disinfection; irrigation and other agricultural uses; swimming and recreation.

Class C Waters - Recreational boating and any recreational or other water uses in which contact with the water is minimal and where ingestion of the water is not probable, irrigation of crops not used for human consumption without cooking; and compatible industrial uses.

The Water Resources Board has formally classified all of the state's rivers and streams. The original classification work was done in the 50's, 60's and 70's, with little reclassification work done since then. A major reclassification review has begun. Results of the review with recommendations will be forwarded from the Department of Water Resources and Environmental Engineering to the Water Resources Board for action. A breakdown of the water classifications is shown in Table 1.

Table 1

A BREAKDOWN OF STREAM CLASSIFICATIONS BY CLASS AND MILEAGE

| Classification | | Stream Miles |
|---|---|---|
| Class A | | 72 |
| Class B | | 4,481 |
| Class C | | 310 |
| | Total | 4,863 |

With regard to the actual water quality, the Department has in some cases determined and in other cases assumed using best professional judgement, that certain segments do not support the use goals of the classifications. Of 1,167 segmented stream miles, 16.5 miles or 1% do not support the designated uses, 269 miles partially support the designated uses and 882 miles fully support the designated uses. Applying the not-supported and partially-supported mileages (285) to the total state stream mileage of approximately 4,863 miles, indicates that 94% of the state's rivers and streams fully support their designated uses.

Technically, Vermont could comply with the interim goal of the Clean Water Act to make all state waters fishable and swimmable. This is because the water quality criteria for both Class B and Class C are the same. In other words, the effluent from treated wastewater facilities must conform to Class B, or swimming use standards. However, from a practical point of view, Vermont does not recommend swimming in Class C waters because wastewater treatment plants are not fail-safe, and do discharge pathogens, cysts and other contaminants from time to time. For the purposes of this report, Class C water will be considered generally as fishable but not swimmable. However, of the 1,167 segmented stream miles assessed, approximately 16 miles sustain water quality violations which would make them unfishable, due to low dissolved oxygen caused by industrial and private system wastes, water withdrawals and abandoned mine wastes. Subtracting this figure from the total stream mileage of approximately 4,863 miles, indicates that 4,847 miles, or 99% support fishing use. Given sufficient resources, Vermont could make all but seven miles of its streams fishable. This particular mileage is degraded by metals, pH and low dissolved oxygen caused by mine drainage, which appears to be uncorrectable at this time.

Regarding swimmable waters, all the Class C zones, or 210 miles, would not be considered swimmable. Waters which have been degraded, a total of approximately 102[6] miles, would also not be swimmable. Comparing the total of 312 non-swimmable miles to the state stream total, provides 4,551 miles, or 94%, which are swimmable.

b. <u>Lakes, Ponds and Reservoirs</u>

Vermont has 280 lakes over 20 acres, totaling 223,329 acres and 737 acres of lakes less than 20 acres for a total

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(6) For location of these waters, refer to segment information, Table 13.

lake acreage of 224,066. Of this figure, 218,221 acres are monitored. "Monitored" lakes are those which have had total phosphorus collected in the spring at least once, and those which have been sampled for acid rain effects.

As with rivers and streams, lakes, reservoirs and ponds are also classified according to the use classes articulated in the water quality standards. Of the acreage assessed, 210,907 acres, or 94.1% support the uses according to the water classifications. All but 42 acres support fishing use, and all but 3 support swimming use.

It is doubtful that the total fishable/swimmable goal will be attained in lakes and ponds due to the fact that Vermont has no control over the acid rain problem and the fact that technology will not be likely to guarantee 100% fail-safe operation of sewage treatment plants.

For the purposes of lake trophic classification for this report, all lakes with yearly or average spring phosphorus concentrations less than 0.010 mg/l P are called "oligotrophic". Lakes with spring phosphorus concentrations greater than 0.020 mg/l P are called "eutrophic". These trophic classifications are made strictly on the basis of spring phosphorus concentrations. Where more detailed water quality data is available for a lake, a more refined trophic classification is possible.

Based on springtime phosphorus concentrations, the number of acres and lakes and their trophic status are given in Table 2.

Table 2

TROPHIC INVENTORY OF VERMONT LAKES

| Trophic Status | Acres | # Lakes |
|---|---|---|
| Eutrophic | 5,225 | 25 |
| Mesotrophic | 9,730 | 80 |
| Oligotrophic | 21,099 | 118 |
| Unknown | 188,012 | ? |

c. Wetlands

There are approximately 200,000 acres of wetlands in Vermont. This represents approximately 3% of the state's 6,149,760 total acres of surface area. It is estimated that approximately 350 acres have been lost or altered since the wetlands program began about four years ago. By educating landowners and developers about wetland values, it is conservatively estimated that 1,100 acres have been "saved" during this same period, and that yearly losses have been reduced to 60-70 acres per year.

It is estimated that approximately one-half of the yearly impacts are due to construction of bridges and highways. The remaining impacts are caused by dredging, drainage, utility rights-of-way clearing, structures, filling, boat moorings and wharves, railroad beds, logging, auto junkyards, impoundments, sanitary landfills and sewage treatment facilities.

A study of alterations to 100 randomly-selected wetlands, using aerial photographs, was performed during the summer of 1978 by a graduate student at the University of

Vermont(7). The total acreage represented approximately 11% of the wetlands identified in the 1976 inventory by the Vermont Fish and Wildlife Department. The study found that, between 1937 and 1974, 73% of the wetlands had sustained some form of modification. The report stated, "Since 1940, change has occurred at the rate of 1.1% per year. If alteration continues at this rate, by the year 2001, all wetlands in the sample would have been altered."

Table 3, from the study, shows the types of wetlands and acreage sampled in 1978. Table 4, also from the 1978 study, details the types of impacts being sustained by wetlands. These same types of impacts are continuing to happen today, with the addition of impacts from sanitary landfills and sewage treatment plants (STP's).

Table 3

TYPE AND ACREAGE OF THE 100 SAMPLE WETLANDS

| Wetland Types | Acres | Number of Wetlands |
|---|---|---|
| Seasonal Flooded Basin or Flat | 1,200 | 1 |
| Wet Meadows | 235 | 4 |
| Shallow Marsh | 2,346 | 20 |
| Deep Marsh | 1,027 | 14 |
| Open Marsh | 45 | 1 |
| Shrub Swamp | 1,230 | 27 |
| Wooded Swamp | 4,023 | 29 |
| Bog | 332 | 4 |
| TOTAL | 10,438 | 100 |

Vermont has not had formal wetland protection legislation although a wetland bill has been submitted and

(7) Study performed by Thomas Storrow, a student intern majoring in Botany and Environmental Studies. General figures from his study were used in the 1979 report, "Wetlands in Vermont. Their Identification and Protection," by Robert Wanner, which is the actual reference used in this 305(b) Report.

Table 4

SUMMARY OF OBSERVED DEVELOPMENT ACTIVITIES IN THE 100 SAMPLE WETLANDS

| | 1937-1942 | | 1962-1963 | | 1974-1975 | |
|---|---|---|---|---|---|---|
| | Frequency of Impact | Number of Activities | Frequency of Impact | Number of Activities | Frequency of Impact | Number of Activities |
| Roads* (Paved & Unpaved) | 44 | 64 roads | 51 | 75 roads | 57 | 88 roads |
| Bridges | 22 | 30 bridges | 26 | 34 bridges | 26 | 35 bridges |
| Channels & Ditches | 10 | -- | 19 | -- | 22 | -- |
| Drainage | -- | 357 acres, est. | -- | 1385 acres, est. | -- | 1436 acres, est. |
| Utility Transmission Right-of-way | 2 | 2 rights-of-way | 11 | 12 rights-of-way | 14 | 15 rights-of-way |
| Structures | 2 | 18 structures | 9 | 23 structures | 13 | 33 structures |
| Filling (Not including roads) | 2 | 14.7 acres | 5 | 21.1 acres | 11 | 33.2 acres |
| Mooring & Wharves | 0 | 0 moorings/ wharves | 4 | 4 moorings/ wharves | 9 | 10 moorings/ wharves |
| Railroad Beds (active & abandoned) | 6 | 6 rail beds | 6 | 6 rail beds | 6 | 6 rail beds |
| Logging | 6 | 120 acres | 5 | 164 acres | 3 | 99 acres |
| Auto Junkyards | 0 | 0 acres | 1 | 2 acres | 1 | 2 acres |
| Dams (Impoundment | 2 | 10 acres flooded | 5 | 178.5 acres flooded | 8 | 184 acres flooded |

*For example, between 1937 and 1942, 64 roads or road segments were found in 44 of the 100 sampled wetlands.

has just been passed by the Vermont legislature. This law amends existing statutes to provide protection for wetlands. The protection strategy also focuses on technical assistance and education. Many wetlands presentations have been given to schools and youth groups.

The Corps of Engineers has mitigated and prevented many wetland alterations. The "swampbuster" provision of the new Farm Bill could promote wetland protection once the regulation is promulgated.

2. Changes And Trends in Water Quality

Vermont does some trend monitoring in the lakes and ponds program. The Department of Water Resources and Environmental Engineering has not done trend monitoring in rivers and streams because it is believed it was more important to do short-term intensive monitoring as it is more efficient and cost-effective and because it resolves technical questions related to an existing or proposed discharge. The relatively new ambient biomonitoring network program is site-specific, and may provide some future trend monitoring information.

The intensive monitoring is done in selected water bodies which are suspected of water quality changes due to documented negative impacts. Positive changes, or improvements to water quality are usually the result of removing or improving the treatment of a municipal waste water discharge. Improved water quality can also come from the use of best management practices on farm land and effective erosion control at construction sites.

Of the 1,126 stream miles assessed in the 1984 305(b) report, 85% fully supported the designated uses. Compared with 76% fully supporting the designated uses in 1986, there is a net degradation indicated during the two-year period. The two years are not directly comparable, however, as different criteria were used to determine non-support. For instance, in 1984, there were no separate categories for "Non-Support" and "Fully Supported". Also, the assessment process has been refined, thus improving the reporting accuracy over the last reporting period. However, after analyzing the 1984 and 1986 summary figures, it appears there were approximately 173 miles degraded and approximately 59 miles improved out of the 1,167 miles assessed during the two-years. Much of this mileage was existing prior to this period due to nonpoint sources, but had not been quantified until now. Actual new segments degraded total approximately 38 miles. This was from poor logging practices, gravel removal, hydro dams, silt and effluent from ski area ponds and poorly operating wastewater treatment facilities. Actual upgraded segments totaled approximately 19 miles. All of this resulted from upgraded sewage treatment facilities going on line. Details of these findings are shown in Tables 5, 6, 7 and 13.

Table 5

SUMMARY OF SUPPORT OF DESIGNATED USES
OF RIVERS AND STREAMS

| Year | Fully Supported | Partially Supported | Not Supported | Total Miles Assessed |
|---|---|---|---|---|
| 1984 | 958<br>85% | * | 168 miles<br>15% | 1,126 miles<br>100% |
| 1986 | 882 miles<br>76% | 267 miles<br>23% | 16 miles<br>1% | 1,167 miles<br>100% |

* Figures not available for the 1984 reporting year.

Table 6

SEGMENTS UPGRADED, 1984-1986*

| Basin | Segment | Abatement Action Taken | Miles Upgraded |
|---|---|---|---|
| Batten Kill-Walloomsac-Hoosic (#1) | 1-8 | Private sewage systems in Arlington now off-stream | 2.0 |
| Winooski (#8) | 8-12 | Essex Center connected to upgraded Essex Jct. facility | 2.0 |
| Winooski (#8) | 8-13 | Williston connected to upgraded Essex Jct. facility | 6.0 |
| West-Williams-Saxtons (#11) | 11-3 | North Westminister connected to Bellows Falls | 2.0 |
| Lower Connecticut-Mill Brook (#13) | 13-4 | Upgraded Brattleboro STP now operational | 5.0 |
| Passumpsic (#15) | 15-5 | New Danville tertiary WWTF now operational | 2.0 |
| | | TOTAL | 19.0 |

*For more detailed information, refer to Table 13, page 36.

Table 7
SEGMENTS DEGRADED, 1984-1986

| Basin | Segment | Cause of Degradation | Miles Degraded | Improvement Action |
|---|---|---|---|---|
| Lake Champlain (#4 & #5) | 5-1 | STP experiencing continuing operational difficulties | 6.0 | |
| Lake Champlain (#4 & #5) | 5-8 | Domestic wastes from failed on-site waste water system in Colchester | 2.0 | Legal/Enforcement action against trailer park |
| Missisquoi (#6) | 6-10 | Dairy & Sanitary Waste | 1.0 | Dairy plant to construct a WWTF |
| Winooski (#8) | 8-14 | Ski area WWTF failure | 0.5 | WWTF to be improved |
| Ottauquechee-Black (#10) | 10-9 | Cement truck washing discharges | 1.0 | |
| Deerfield (#12) | 12-1 | Siltation from Snow Lake and municipal wastes from North Branch FD #1 spray system failure (to No. Branch Deerfield) | 5.5 | Problem under study for siltation and abatement order issued for spray system |
| Deerfield (#12) | 12-5 | North Branch FD #1 spray system failure (to Ellis Brook) | .5 | Abatement Order Issued |
| Stevens-Wells-Waits-Ompompanoosuc (#14) | 14-1 | Solids, silt from on-site gravel removal and hydro dam | 3.0 | |
| Stevens-Wells-Waits-Ompompanoosuc (#14) | 14-1A | Solids, silt from on-site gravel removal | 4.0 | Department providing technical assistance to improve operation |
| Passumpsic (#15) | 15-6 | Siltation & solids from logging & low flows from hydro dams | 9.5 | |
| Passumpsic (#15) | 15-7 | Siltation & solids from logging | 4.5 | |
| | | TOTAL | 37.5 | |

Table 8

SUMMARY OF SUPPORT OF DESIGNATED USES OF LAKES, PONDS & BAYS

| Year | Supported | Partially Supported | Not Supported | Total Acres Assessed |
|---|---|---|---|---|
| 1982* | 210,184 ac.<br>93.8% | 13,882 ac.<br>6.2% | 0 | 224,066 ac.<br>100% |
| 1986 | 210,907 ac.<br>94.1% | 13,114 ac.<br>5.9% | 45+ ac.<br><1% | 224,066 ac.<br>100% |

* Figures not available for the 1984 reporting year, therefore, 1982 figures are used for comparison purposes.

+ Includes 3 acres of Class C zones.

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Regarding the changes in water quality in Vermont's lakes, ponds and bays[8], the figures for 1984 were not available, therefore, the 1982 STEP report was used for comparison. The 1986 figures indicate, of 224,066 acres assessed, a net increase of 723 acres of waters supporting designated uses compared to 1982. This net increase was caused by phosphorus removal at the Newport STP, thereby improving 948 acres of Lake Memphremagog; an additional 200 acres of Eurasian milfoil degrading Lake Bomoseen; the improvement of 20 acres of Lake Parker (nonpoint sources); the fishing loss of Haystack and Little ponds totaling 42 acres due to acidification and the inclusion of 3 acres of Class C (non-body contact) zones which were existing but not included in the 1982 STEP report.

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(8) "Bays" refers to the bays of Lake Champlain, such as Malletts Bay, Shelburne Bay, etc.

3. Causes Of Nonsupport Of Designated Uses

a. Relative Assessment of Sources of Nonsupport

The sources of the causes of nonsupport or partial support of water uses in Vermont's stream segments are from nonpoint sources (50%), municipal discharges (22%), industrial discharges (11%), natural sources (11%) and other sources (6%). Nonpoint sources are primarily from land-based activities, such as agriculture, forestry, mineral extraction and development. Also, impacted stream segments from hydro dams are included. Municipal sources include direct discharges from malfunctioning sewage treatment facilities, combined sewer overflows, stormwater and untreated sewage. Industrial discharges are non or poorly treated industrial wastes, including toxics and wastes from other states. Natural sources include natural sloughing of stream banks into the water and unshaded shallow, slow-moving streams causing thermal pollution. Other sources are discharges from failed individual and commercial sewage treatment systems and untreated or poorly-treated wastes from dairy plants. For a detailed breakdown of the sources of use impairment, the reader is referred to Table 13, "Water Quality Inventory of Segmented River Miles", as well as Table 10 and Figure 1. Table 13 should be used with caution, as some of the monitoring programs have only recently begun and, heretofore, specific water quality information was not available. For instance, little was known about the water quality of upland streams and their impact from ski-related development until basin plan update work began about three years ago. Also, little is still known about the extent of adverse impacts to water quality by nonpoint sources and toxics. New monitoring programs, discussed further on in this report should provide some good information as they become more established and supported.

Many lakes, bays and ponds, or portions of them, are experiencing seasonal problems such as dense aquatic weed growth and nonpoint sources, which support designated uses only part of the year. Best professional judgement has been used to determine that 13,114 acres of water partially support designated uses and 45 acres do not support designated uses. Most of the cause of partial support is due to aquatic weeds. For details of the causes and percentages of partial support and nonsupport, refer to Figure 2 and Table 9.

Since the early 80's, the exotic plant, Eurasian milfoil, has been quickly spreading to more Vermont lakes. As of 1985, the plant has become established in eleven lakes, including Lake Champlain and Lake Memphremagog. Eurasian milfoil, due to its dense growth, makes swimming impossible during part of the summer and its weed beds make poor spawning areas for fish. Wildlife, waterfowl, fish and insects rarely use it as a food source. Control of milfoil growth in Vermont consists of mechanical harvesting of the weed. This activity will not eliminate the plant, however. The Department strategy includes preventing its spread to other lakes through public education programs.

The fishing use nonsupport is caused by high acidity in two lakes, rendering them fishless. The 3 acres of swimming nonsupport result from treated effluent disposal.

Table 9

INVENTORY OF THE SOURCES OF NONSUPPORT & PARTIAL SUPPORT OF DESIGNATED USES IN VT. LAKES & PONDS

| | Acreage | | | | |
|---|---|---|---|---|---|
| Water Body | Exotic Weeds | Internal Loading | Nonpoint Sources | Municipal & C.S.O.'s | Acidification |
| Bomoseen | 250 | | 50 | | |
| Carmi | 75 | | 1,300 | | |
| Burr Pond | | | | | |
| Iroquois | | | 229 | | |
| Morey | | 538 | | | |
| Star | | 28 | 28 | | |
| Paran | 40 | | | | |
| Memphremagog | 150 | | 167 | | |
| North Montpelier | 20 | | | | |
| Pinneo | | | 50 | | |
| Missisquoi Bay | 319 | | 5,423 | 638 | |
| South Lake (Lake Champlain) | 350 | | | | |
| St. Albans Bay | 55 | | 165 | 880 | |
| Shelburne Bay | 35 | | | | |
| Malletts Bay | 65 | | | | |

Table 9 (Continued)

INVENTORY OF THE SOURCES OF NONSUPPORT & PARTIAL SUPPORT OF DESIGNATED USES IN VT. LAKES & PONDS

| | Acreage | | | | |
|---|---|---|---|---|---|
| Water Body | Exotic Weeds | Internal Loading | Nonpoint Sources | Municipal & C.S.O.'s | Acidification |
| Shorelines | | | 2,259 | | |
| Haystack | | | | | 27 |
| Little | | | | | 15 |
| TOTALS | 1,359[1] 10.3% | 566[1] 4.3% | 9,671[1] 73.5% | 1,518[1] 11.5% | 42[+] .3% |

TOTAL OF ALL SOURCES - 13,156 ACRES (plus 3 acres[+] of Class C zones = 13,159 acres).

[1] Partial support
[+] Nonsupport

In the matter of nonpoint sources, the U.S. 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 watersheds of Lake Parker, Lake Carmi, Lake Memphremagog and Lake Champlain have all substantially benefited from Soil Conservation Service work in recent years.

b. Relative Assessment of Major Pollutants

The most common parameters of concern for Vermont's rivers and streams are sand and silt and fecal coliform bacteria. The violation of the Water Quality Standards for these parameters account for approximately 140 miles of the state's 285 miles of streams where standards are violated. They originate primarily from treated and untreated municipal and private wastes and nonpoint sources.

Approximately 30 of the 140 miles are violated only during high flows as a result of combined sewer overflows. Other parameters of concern, such as dissolved oxygen, nutrients, pH, temperature, toxics, turbidity, aquatic habitat and metals account for the remainder of the miles violated. For details of these parameters and their sources, the reader is referred to Table 10, "Relative Assessment of Major Parameters of Concern For Rivers and Streams".

Regarding lakes and ponds, the three major pollutant groups of concern are nutrients, pH and bacteria. At this time, studies are underway to determine the origin of these pollutants. In general, approximately 70% of the phosphorus, nutrients and bacteria come from nonpoint sources and the remainder come from municipal combined sewer overflows and internal recycling due to past loads. Acid rain, combined with a natural lack of buffering agents, as previously mentioned, has acidified two lakes in southern Vermont, rendering them fishless.

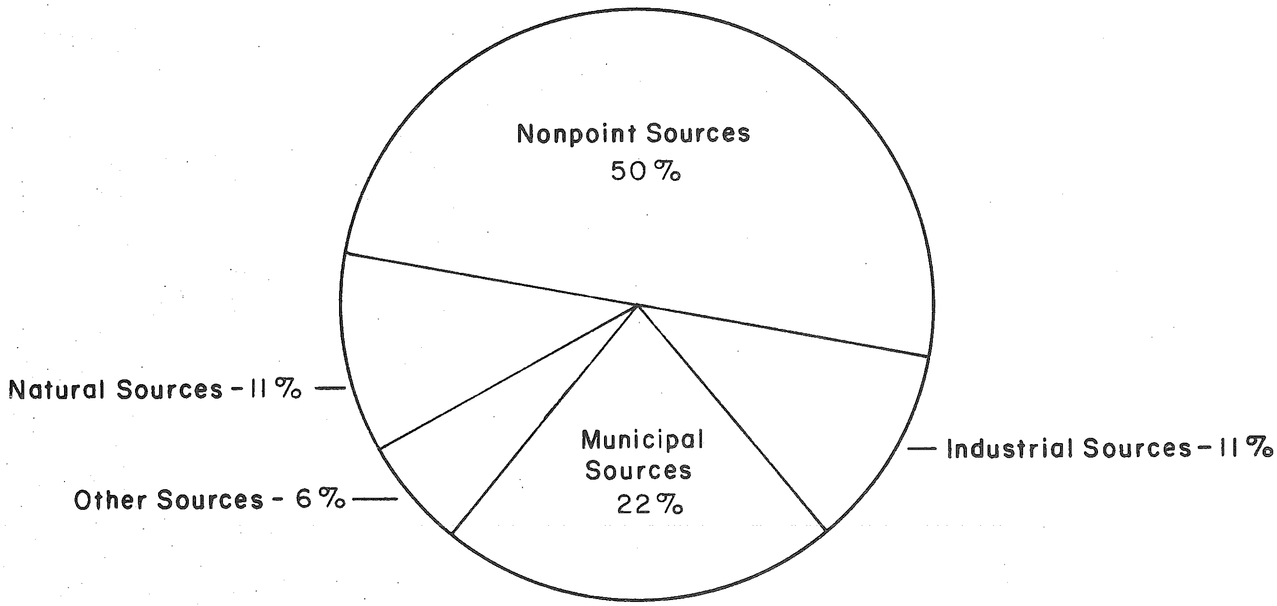


FIGURE 1

## RELATIVE ASSESSMENT OF SOURCES OF USE IMPAIRMENT OF RIVERS AND STREAMS

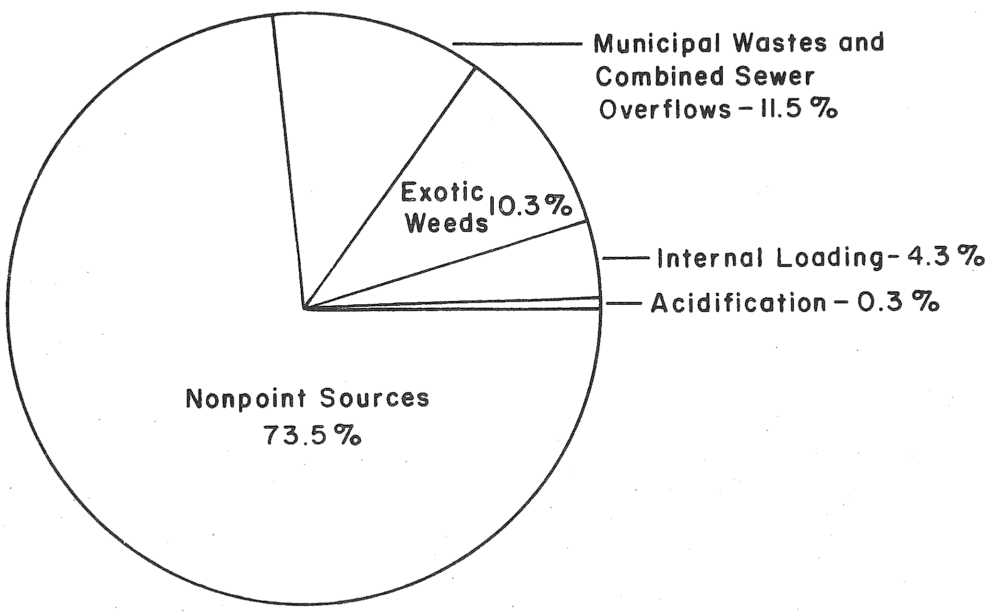


FIGURE 2

## RELATIVE ASSESSMENT OF SOURCES OF USE IMPAIRMENT OF LAKES, PONDS AND BAYS

Table 10

RELATIVE ASSESSMENT OF MAJOR PARAMETERS OF CONCERN FOR RIVERS AND STREAMS

| | Discharge Sources/miles violated | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Munic. | Indust. | Non-point | Other | Natural | Totals/% |
| Coliforms | 16.0 | .5 | 31.5 | 8.1 | | 56.1/20% |
| Dissolved Oxygen | 16.9 | 14.9 | 4.7 | 1 | .2 | 37.7/13% |
| Nutrients | 2.4 | 1.7 | 22 | 1.9 | | 28/10% |
| pH | | | 2.4 | | | 2.4/1% |
| Temperature | 1.2 | | .5 | 2.2 | 30 | 33.9/12% |
| Toxics | | 2.2 | | 1.3 | | 3.5/1% |
| Sand, Silt | 17 | 12.2 | 54.3 | .6 | | 84.1/29% |
| Turbidity | .7 | | | .8 | .1 | 1.6/1% |
| Aquatic Habitat | 8.7 | | 25.8 | .8 | .1 | 35.4/12% |
| Metals | | | 2.2 | | | 2.2/1% |
| Totals | 62.9 | 31.5 | 143.4 | 16.7 | 30.4 | 284.9 miles |
| Per Cent | 22% | 11% | 50% | 6% | 11% | 100% |

4. Public Health/Aquatic Life Concerns

a. Toxics - Related Concerns

Vermont has recently begun to do toxicity testing of existing discharges to the waters of the state, according to a proposed "Toxic Discharge Control Strategy." More information about the strategy may be found on page 100. As Vermont is not a heavily industrialized state, it is not likely that many stream miles or acres of lakes have been adversely impacted by toxic discharges. Nevertheless, there are known activities which do discharge toxic substances and these need to be identified and managed.

During 1984, five discharges were sampled in order to establish preliminary data relative to the presence or absence of toxicity. Table 11 summarizes findings to date.

Table 11

PRELIMINARY TOXICITY TESTING RESULTS FROM FIVE DISCHARGES.

| Discharge | Receiving Water | Toxicity Test Results |
|---|---|---|
| Williamstown WWTF | Stevens Branch | No toxicity |
| Burlington Main WWTF | Lake Champlain | No toxicity |
| IBM-Industrial | Winooski River | No toxicity |
| Boise-Cascade | Missisquoi River | Inconclusive; more testing required |
| Pownal Tanning | Hoosic R. (2.4 miles) | Toxicity Present; more testing required. |

Upon finalization of the "Toxic Discharge Control Strategy", a formal toxicity testing program will be initiated. According to the segment information, 2.4 miles of the Hoosic River have been impacted by toxics from the Pownal Tannery.

The Ambient Biomonitoring Network Program (ABN), begun in 1983, has identified certain areas of water quality degradation. Table 12 is a summary of water quality/macroinvertebrate observation made at ABN sites. Twelve sites on eight rivers were found to support macroinvertebrate communities which reflect very poor to poor water quality/habitat conditions. The major causative factors affecting these communities are combinations of toxic/enrichment influence from waste discharges and habitat degradation caused by surface runoff, erosion and the resultant siltation of in-stream substrate. The major effects on macroinvertebrate communities include reductions in taxa richness and diversity, increase in bio-index values, and reductions or increase in relative abundance.

As the information summarized in the table was gathered generally from only one station in each segment, mileage of toxic-elevated stream segments was impossible to obtain.

Table 12

AREAS OF WATER QUALITY DEGRADATION (BY TOXICS AND NON-TOXICS) IDENTIFIED BY AMBIENT BIOMONITORING NETWORK SAMPLING

| | Discharge | Receiving Water | Findings |
|---|---|---|---|
| 1. | Agri-Mark, Inc. of Troy. (Wash water/sanitary waste discharge). | Coburn Brook | Severe toxic/organic enrichment stress. Very few insect taxa and very low insect density combined with a high density of pollution-tolerant aquatic oligochaetes (worms). Coburn Brook is the most grossly polluted sampling site of the 68 locations studied |
| 2. | St. Johnsbury WWTF | Passumpsic River | Macroinvertebrate parameters indicate extreme organic enrichment. Moderate habitat degradation caused by sand impaction of the substrate is also indicated. The sand is apparently natural, but is also coming from large off-stream gravel mining operations in the basin. |
| 3. | Rutland WWTF | Otter Creek | Macroinvertebrate parameters indicate severe organic enrichment, as evidenced by the dominance of aquatic oligochaetes and isopods (sow bugs) as well as the presence of sewage fungus. |

Table 12 (Continued)

| | Discharge | Receiving Water | Findings |
|---|---|---|---|
| 4. | Bennington WWTF | Walloomsac River | Macroinvertebrate parameters indicate a combination of periodic toxic stress and organic enrichment. |
| 5. | NY/VT State Line (Bennington WWTF) | Walloomsac River | Macroinvertebrate parameters do not indicate the toxic stress observed further upstream, but do reflect a highly enriched condition. |
| 6. | Pownal to NY/VT State Line (Tannery) | Hoosic River | Macroinvertebrate parameters indicate severe organic enrichment and moderate habitat degradation due to sand impaction of the substrate. |
| 7. | Barre to Berlin (Barre WWTF) | Stevens Branch of the Winooski River | Macroinvertebrate fauna here indicate a combination of toxic stress (chlorine), habitat degradation and organic enrichment. |
| 8. | Sugarbush Ski Area | Rice Brook (Warren) | A severe reduction in the macroinvertebrate population indicates toxic stress and severe habitat degradation. Observation implicates parking lot sand runoff and concrete washings as possible causative agents. |
| 9. | Elizabeth Mine (So. Strafford) | Ompompanoosuc River | Macroinvertebrate community indicates severe toxic stress and habitat degradation from mine drainage emanating from the abandoned copper mine tailings in the area. |

Volatile organic chemicals of various origins were responsible for village well contaminations during the fiscal years 1983-85. These incidents involved the Williamstown and Lyndonville drinking water supplies. The Williamstown problem was caused by chemically contaminated wastewater from Interstate Uniform Service (Unifirst Corp.), an industrial dry-cleaning plant. The Lyndonville case involved contamination of ground and surface water by chlorinated hydrocarbons emanating from the Parker Landfill. A gasoline spill or a leaking underground gasoline storage tank caused contamination of the East Middlebury Village well during fiscal year 1984-85.

For a detailed inventory of statewide well contamination incidents, the reader is referred to Table 17 in the Groundwater Section (Page 64).

b. Non-Toxics Concerns

Regarding beach closures, the only areas known closed to swimming during the summer, 1985, were the northern half of Lake Carmi and Oakledge Park Beach in Burlington on Lake Champlain. The Carmi area was closed due to heavy rain which caused runoff contamination of fresh manure. The Lake Champlain site was closed due to a sewer system break. Both closures were due to high fecal coliform counts.

5. Segment Information

Table 13 has been prepared as a specific segment-by-segment assessment of the current water quality conditions for the state's river basins. Table 14 serves as a summary of the state's water quality conditions on a river basin basis. Figure 3, the map entitled "Evaluation of Designated Uses" and 4, the fold-out map entitled "Water Segment Designations With Permitted Municipal and Major Industrial Discharge Inventory," has been developed to accompany these tables by depicting the segmented river reaches and individual river basins. The segment information has been used throughout this report to indicate the status of Vermont's water quality.

The selection of the specific segments was done primarily due to point source discharges and potential impacts as a result of these discharges. It is assumed for the purpose of this report, that the non-segmented river reaches are not experiencing continuing water quality problems. However, as new information is obtained from the basin planning effort regarding upland streams and from recently-initiated monitoring programs, such as the Ambient Biomonitoring Network program and the Toxics Testing program, this data will be included.

For the majority of instances, the segment water quality problems identified are based upon best professional judgement by district fisheries biologists. Whenever current water quality data was available from any reliable source, the assessment was made utilizing that information. Caution is advised when utilizing data not based upon recent water quality surveys. In certain cases, "?" is shown as "Segmented Stream Miles Violated," even though the problem is known. This is because the length of the violated segment is unknown, pending future water quality studies.

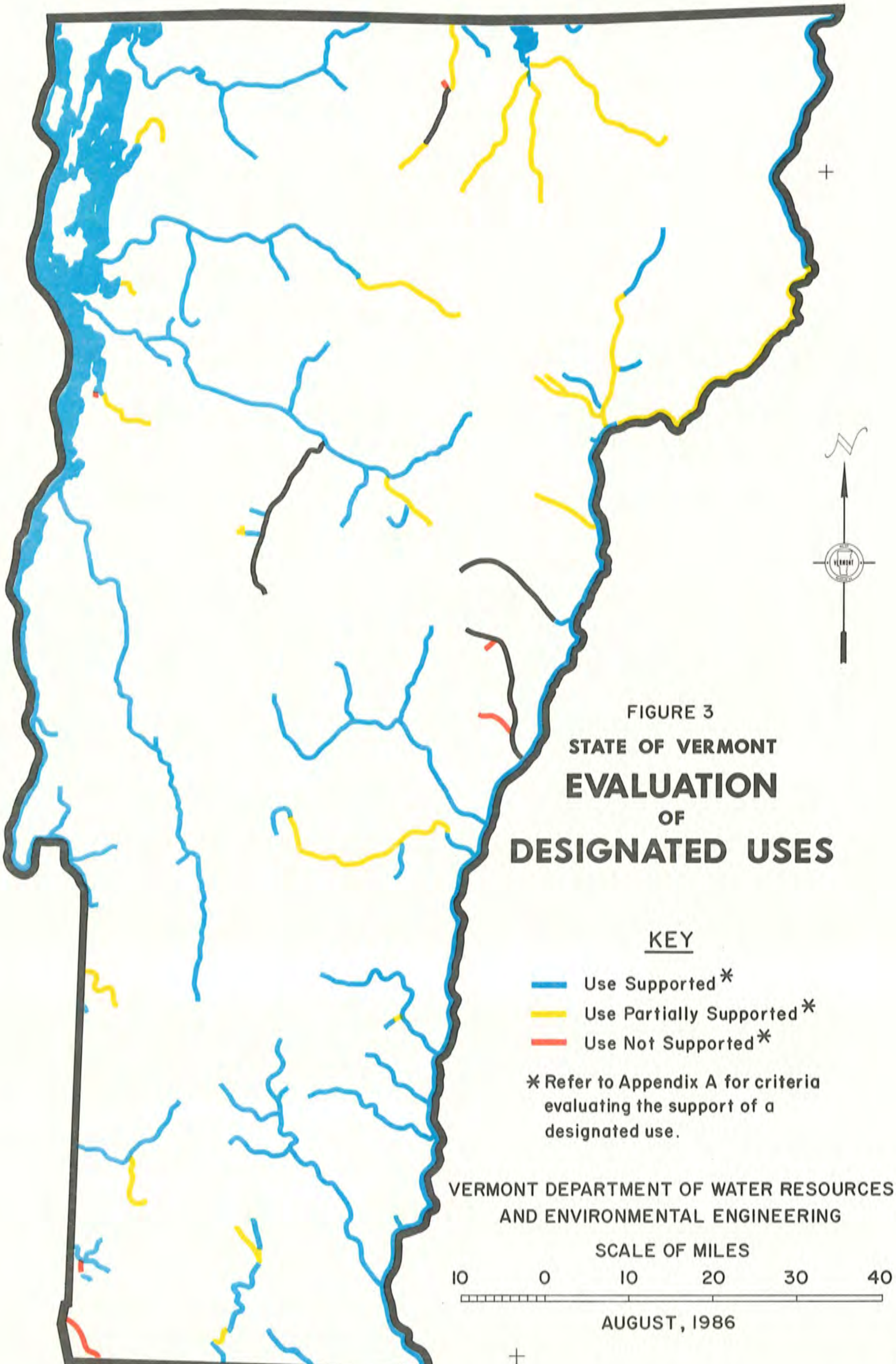
FIGURE 3
STATE OF VERMONT
EVALUATION
OF
DESIGNATED USES
KEY
Use Supported *
Use Partially Supported *
Use Not Supported *
* Refer to Appendix A for criteria evaluating the support of a designated use.
VERMONT DEPARTMENT OF WATER RESOURCES AND ENVIRONMENTAL ENGINEERING
SCALE OF MILES
10 0 10 20 30 40
AUGUST, 1986

## KEY TO WATER QUALITY INVENTORY OF SEGMENTED RIVER MILES (TABLE 13)

NOTE (1) CLASSIFICATION

<u>STATUS</u>: EL-1 - Effluent Limited Segment (presently meeting water quality standards)

EL-2 - Effluent Limited Segment (presently not meeting water quality standards)

WQ-1 - Water Quality Limited Segment (for parameters or wastes noted)

WQ-2 - Water Quality Limited Segment (with existing polluting discharge to upland stream)

Upland - Water Quality Limited Segment (without a polluting discharge to an upland stream)

<u>USE</u>: <u>Class B</u> waters are suitable for bathing and recreation, irrigation and agricultural uses; good fish habitat; good aesthetic value, acceptable for public water supply with filtration and disinfection.

<u>Class C</u> waters are suitable for recreational boating, irrigation of crops not used for consumption without cooking, habitat for wildlife and for common food and game fishes indigenous to the region; and such industrial uses as are consistent with other class uses. Number in parenthesis ( ) indicates number of Class C miles in each segment.

NOTE (2) WATERS PARTIALLY SUPPORT DESIGNATED USES (See Appendix A)

NOTE (3) WATERS DO NOT SUPPORT DESIGNATED USES (See Appendix A)

NOTE (4) WATER QUALITY STANDARDS VIOLATED

The majority of the segmented stream miles indicating elevated coliform levels as a water quality problem are listed because of temporary violations of the technical standards for swimmable waters as a result of nonpoint surface runoff and point source runoff resulting from stormwater and/or combined sewer overflows.

* Indicates a proposed or recommended Class B or Class C different from what currently exists.

TABLE 13
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: BATTEN KILL-WALLOOMSAC-HOOSIC (BASIN #1)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 1-1 | Hoosic R.-Mass. State Line to Pownal | C(2.2) | EL-2 | 2.2 | | 2.2 | D.O. | Industrial wastes entering from Massachusetts. | Yearly fish kills. No follow up with Massachusetts. |
| 1-2 | Hoosic R.-Pownal to N.Y. State Line | C(4.8) | WQ-1 | 4.8 | | 4.8 | D.O. toxics, severe organic enrichment solids (sand) | Tannery wastes and Industrial wastes entering from Massachusetts, impact of sand on substrate. | Yearly fish kills. Ambient biomonitoring and toxicity sampling completed during 1984. |
| 1-3 | Walloomsac R.-Bennington to Paran Creek | B | EL-1 | 5.5 | ? | | Coliform, toxics | Combined Sewer Overflows & Stormwater. | W.Q.S. met except during periods of high flow. |
| 1-4 | Walloomsac R.-Paran Creek to N.Y. Line | C(2.7) B | WQ-1 | 4.4 | ? | | D.O. Coliform | Municipal & Industrial Wastes. Combined sewer overflows. | Modeling results to be implemented thru discharge permit to Bennington. New tertiary upgrade to be complete by summer, 1986. |
| 1-5 | Paran Creek-S. Shaftsbury to Walloomsac R. | B | EL-1 | 5.0 | | | | | |
| 1-6 | No Name Brook-Fairdale Farms to Walloomsac R. | B | EL-2 | 3.0 | | 1.5 | Coliform | Dairy Wastes. | New pretreatment facility to be constructed by end of 1986 and waste to be piped to the Bennington WWTF. |

Refer to Key for explanation of notes (1) through (4).

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: BATTEN KILL-WALLOOMSAC-HOOSIC (BASIN #1) (Continued)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 1-7 | Batten Kill-Manchester Center Depot to Arlington | C(1.7)* | EL-1 | 11.5 | ? | | Coliform | Combined Sewer. | W.Q.S. met except during periods of high flow. |
| 1-8 | Batten Kill-Arlington to New York State Line | B | EL-1 | 7.0 | | | | | Private sewage systems now off-stream. |
| 1-9 | Warm Brook & Roaring Branch-Fayville Branch to Batten Kill | C(3.6) | EL-2 | 3.6 | 3.6 | | Coliform | Sanitary wastes from individual waste disposal systems. | Pollution being abated by individuals by temporary pollution permit to Arlington. |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: POULTNEY-METTAWEE (BASIN #2)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION[1] USE | CLASSIFICATION[1] STATUS | STREAM MILES TOTAL | STREAM MILES PS[2] | STREAM MILES NS[3] | W.Q.S.[4] VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 2-1 | Mettawee R.-Pawlet to N.Y. State Line | C(2.5)* B | EL-1 | 8.0 | 8.0 | | Silt and temperature | Nonpoint runoff, thermal problems. | Individual homeowners have corrected their systems to abate pollution. Occasional fish kills due to temp. |
| 2-2 | Poultney R.-Poultney to Castleton R. | C(3.0) B | WQ-1 | 9.0 | ? | | D.O. | Municipal Waste. | Actual miles of W.Q.S. violated unknown pending assimilative capacity water quality study, summer, 1986 or 1987. |
| 2-3 | Poultney R.-Castleton R. to Hubbardton R. | B | EL-1 | 5.0 | | | | | |
| 2-4 | Poultney R.-Hubbardton R. to Lake Champlain | B | EL-1 | 7.0 | | | | | |
| 2-5 | Castleton R.-Castleton to Poultney River | C(5.3) B | WQ-1 | 7.0 | ? | | D.O. | Municipal Waste. | Actual miles of W.Q.S. violated unknown pending assimilative capacity water quality study, summer, 1986 or 1987. |
| 2-6 | Tributary to the Hubbardton R. and the Hubbardton R. itself -Benson STP to Hubbardton R. | C(3.0) B | EL-1 | 8.0 | | | | | |
| 2-7 | Indian River-West Pawlet STP to State Line | C(20 feet) | EL-1 | 0 | | | | | |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: OTTER CREEK (BASIN #3)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 3-1 | Otter Creek-Danby to Wallingford | B* | EL-1 | 9 | | | | | |
| 3-2 | Otter Creek-Wallingford to Rutland | C(1.8) B | EL-1 | 8 | | | | | |
| 3-3 | Otter Creek-Rutland to Pittsford | C(11.7) | WQ-1 | 11.7 | ? | | D.O. Coliform | Municipal Waste, Combined Sewer Overflows, Stormwater. | Rutland STP being upgraded. Will be in operation summer, 1987. Proctor to begin upgrade, spring, 1987. |
| 3-4 | Otter Creek-Pittsford to Neshobe R. | B | EL-1 | 8 | | | | | |
| 3-5 | Otter Creek-Neshobe R. to Middlebury | B | EL-1 | 21 | ? | | Turbidity | Nonpoint Agricultural. | Stream miles violated unknown. |
| 3-6 | Otter Creek-Middlebury to Vergennes | C(2.0)* B | EL-1 | 16 | ? | | Coliform, Turbidity | Combined Sewer Overflows, Stormwater, Nonpoint Agricultural. | W.Q.S. met except during periods of high flow. |
| 3-7 | Otter Creek-Vergennes to Lake Champlain | C(2.0)* | EL-1 | 8 | ? | | Coliform, Turbidity | Combined Sewer Overflows, Stormwater, Nonpoint Agricultural. | W.Q.S. met except during periods of high flow. |
| 3-8 | Clarendon R.-West Rutland to Otter Creek | C(1.7)* | EL-1 | 1.7 | | | | | |
| 3-9 | Neshobe R.-Brandon to Otter Creek | C(1.8) B | EL-1 | 2 | | | | | Pending bond vote outcome, W. Rutland to begin constructing to Rutland STP, spring, 1987. |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: LAKE CHAMPLAIN (BASIN #4-#5)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | STATUS | STREAM MILES TOTAL | PS(2) | NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 4-1 | L. Champlain-South Bay to Crown Point | B | WQ-1 | Lake 350 acres | | | Turbidity & Nutrients | Natural Condition/ Phosphorus. Exotic weeds. | Industrial (paper wastes) & naturally turbid condition at times prevents attainment of Class B standards. |
| 4-2 | East Creek-Orwell to L. Champlain | C(2.3) B | EL-2 | 4 | | | D.O. | Natural condition causes dissolved oxygen problem. | Supports a good bass fishery. |
| 4-3 | L. Champlain-Crown Point to Addison-Chittenden County Line | B | WQ-1 | Lake | | | | Water quality threatened from upstream and direct additions of nutrients. | |
| 5-1 | Laplatte R.-Hinesburg to Shelburne | C(4.6) B | WQ-1 | 8 | 8 | | D.O. Temp, Nutrients, Coliform, Solids | Municipal Waste, Dairy Waste, Phosphorus, Nonpoint Agricultural. | Municipal facility experiencing operational difficulties. Initial modeling undertaken. ASCAP study tentatively scheduled, Summer 1986. SCS LaPlatte River Watershed Project in progress to abate Agricultural nonpoint sources. |
| 5-2 | Laplatte R.-Shelburne L. Champlain | C(0.75) B | EL-2 | 2 | | | D.O. Nutrients | Natural causes, Municipal Waste & Phosphorus. Nonpoint Agricultural. | |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: LAKE CHAMPLAIN (BASIN #4-#5) (Continued)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | PS(2) | NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 5-6 | Lake Champlain-St. Albans Bay | B | WQ-1 | Lake 1100 acres | ? | | Nutrients Coliform | Phosphorus, Municipal Wastes, Nonpoint Agricultural, combined sewer overflows. Exotic weeds. | St. Albans wastewater treatment facility being upgraded to remove phosphorus. SCS/RCWP St. Albans Bay Watershed Project in progress to abate agricultural nonpoint sources. |
| 5-7 | Main Lake-Addison-Chittenden County Line to Canadian Border | C(0.18 acre) B | WQ-1 | Lake | | | | Phosphorus/Municipal Wastes/Nonpoint Sources. Water quality threatened due to addition of nutrients. | |
| 5-8 | Pond Brook-Breezy Acres Trailer Park to Malletts Bay | B | WQ-2 | 2 | 2 | | Coliform, Toxics (Chlorine) | Domestic wastes from failed on-site waste-water system. | Legal/enforcement action being pursued. |
| 5-9 | Malletts Bay (Inner & Outer) | C(0.72 acre) B | WQ-1 | Lake 65 acres | | | | Phosphorus/Nonpoint Agricultural/ Municipal Wastes Water quality threat-ened due to addition of nutrients. Exotic weeds. | |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: LAKE CHAMPLAIN (BASIN #4-#5) (Continued)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION (1) USE | CLASSIFICATION (1) STATUS | STREAM MILES TOTAL | STREAM MILES PS (2) | STREAM MILES NS (3) | W.Q.S. (4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 5-3 | Stevens Brook-St. Albans to L. Champlain | C(5.5)<br>B | WQ-1 | 6 | 6 | | D.O.<br>Coliform<br>Nutrients | Dairy, Industrial, Municipal wastes. Phosphorus, stormwater, nonpoint Agricultural. Direct discharges from STP. | Fish kills reported. Municipal facility being upgraded to remove phosphorus and will be in operation summer, 1987. New outfall pipe will accommodate all but exceptionally high flows, which go into Stevens Brook. (Outfall pipe will discharge at mouth.) SCS St. Albans Bay Watershed Project in progress to abate agricultural nonpoint sources. |
| 5-4 | Lake Champlain-Shelburne Bay | B | WQ-1 | Lake 35 acres | | | Nutrients | Phosphorus/Nonpoint Agricultural/Municipal Wastes. Exotic weeds. | SCS LaPlatte River Watershed Project in progress to abate agricultural nonpoint sources. Shelburne FD #1 and #2, South Burlington (Bartletts Bay) are to remove phosphorus. |
| 5-5 | Lake Champlain-Burlington Harbor | B | WQ-1 | Lake | ? | | Nutrients<br>Coliform | Phosphorus, Combined Sewer Overflows, Stormwater, Municipal Wastes. | Burlington (main) STP scheduled for phosphorus removal. |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: LAKE CHAMPLAIN (BASIN #4-#5) (Continued)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 5-10 | Missisquoi Bay | B | WQ-1 | Lake 6380 acres | | | Nutrients | Phosphorus/Municipal Waste/Nonpoint Agricultural. Exotic weeds. Combined sewer overflows. | Bay experiencing advanced signs of eutrophication as evidenced by dense algal blooms. Swanton STP - planning underway for phosphorus removal. Fishery not presently impaired. May become a problem. |
| 5-11 | Lake Champlain-Northeast Malletts Bay to Hog Island | B | WQ-1 | Lake | | | | Phosphorus/water quality threatened due to addition of nutrients. | |
| 5-12 | McCabes Brook-Shelburne FD #2 STP to LaPlatte River | C(1.0) B | EL-2 | 1 | | .5 | D.O. Nutrients | Phosphorus/Municipal Wastes | Natural condition causes dissolved oxygen problems. Secondary municipal Facility operational, planning underway for phosphorus removal. |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: MISSISQUOI (BASIN #6)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION[1] USE | CLASSIFICATION[1] STATUS | STREAM MILES TOTAL | STREAM MILES PS[2] | STREAM MILES NS[3] | W.Q.S.[4] VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 6-1 | Missisquoi R.-Troy to Canada Line | C(3.0) B | EL-2 | 9.0 | 9.0 | | Aquatic habitat, solids. | Dams/Nonpoint Agricultural. | Some fish reproduction. Physical review of stream to refine ASCAP estimate. |
| 6-2 | Missisquoi R.-Canada Line to Enosburg Falls | C(1.0) B | EL-2 | 17.0 | | | | Possible Municipal Wastes from Canada. | Status of Canadian discharges unknown. |
| 6-3 | Missisquoi R.-Enosburg to Sheldon Springs | C(1.9) B | EL-1 | 12.0 | ? | | Coliform | Nonpoint Agricultural/ Combined Sewer overflows. | W.Q.S. met except during periods of high flow. |
| 6-4 | Missisquoi R.-Sheldon Springs to Swanton | C(1.5) B | EL-1 | 15.0 | | | | Nonpoint Agricultural. | |
| 6-5 | Missisquoi R.-Swanton to Lake Champlain | C(1.0) B | WQ-1 | 8.0 | ? | | Nutrients, Coliform | Phosphorus/Municipal Wastes/Combined Sewers. | Swanton STP to be upgraded to remove phosphorus. |
| 6-6 | Trout R.-Montgomery to Missisquoi R. | B | WQ-2 | 6.0 | ? | | Coliform, Solids. | Nonpoint Agricultural/ Domestic Wastes/Physical modifications. | Sanitary survey has not been performed. Department working with Town to mitigate gravel removal. |
| 6-7 | Black Creek-East Fairfield to Missisquoi R. | C(1.0) B | EL-2 | 12.0 | | | Coliform | Domestic & Industrial Waste. | Follow up on 1973 sanitary survey has not been done. |
| 6-8 | Mud Creek-Newport Center to Canada Line | C(3.0) B | EL-1 | 7.0 | | | | Nonpoint Agricultural. | |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: MISSISQUOI (BASIN #6) (Continued)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 6-9 | Burgess Branch to confluence with Missisquoi R. | B | EL-1 | 5.0 | 5.0 | | Solids (silt) | Logging/Groundwater from asbestos mine. | |
| 6-10 | Coburn Brook-Below the whey plant outfall to its confluence with the Missisquoi R. | B | WQ-2 | 1.2 | | .5 | Toxics/ organics | Dairy and sanitary wastes. | Dairy plant will construct an STP. |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: LAMOILLE (BASIN #7)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION (1) USE | CLASSIFICATION (1) STATUS | STREAM MILES TOTAL | STREAM MILES PS (2) | STREAM MILES NS (3) | W.Q.S. (4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 7-1 | Lamoille R.-Hardwick to Morrisville | C(0.9)<br>B | EL-1 | 15 | 15 | | Coliform, Solids (Silt), Aquatic habitat. | Combined Sewers/Hydro Dams/Nonpoint Agriculture. | Hydro dam flushing causes sediment. Bank erosion from cutting buffers and cattle impact. |
| 7-2 | Lamoille R.-Morrisville to Hyde Park | C(0.7)<br>B | EL-1 | 6 | 6 | | Coliform, Solids (Silt) | Combined Sewers, major agricultural runoff problem. | Gravel pits have potential for future problems. |
| 7-3 | Lamoille R.-Hyde Park to Johnson | C(1.0)<br>B | EL-1 | 9 | | | | | |
| 7-4 | Lamoille R.-Johnson to Fairfax | C(1.9)<br>B | EL-2 | 27 | | | Coliform | Several discharges from failed septic tank/leachfield systems at Jeffersonville. | Jeffersonville is to abate pollution by construction of STP if reclassification of Lamoille River is accomplished. |
| 7-5 | Lamoille R.-Fairfax to Milton | C(0.6)<br>B | EL-1 | 8 | | | | | |
| 7-6 | Lamoille R.-Milton to Lake Champlain | C(3.0)<br>B | WQ-1 | 9 | ? | | Nutrients | Phosphorus. | Milton constructed STP without phosphorus removal. Upon upgrading of STP, phosphorus removal should be required. |
| 7-7 | Brewster R.-Stanmar WWTF to Lamoille R. | B | Upland | 7 | | | | | New spray system in operation in 1985. |
| 7-8 | Browns R.-Jericho to Lamoille R. | B | Upland | 16 | ? | | Nutrients, Solids | Nonpoint Agricultural, Gravel Removal. | Department working with gravel removers to mitigate impacts. |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: WINOOSKI (BASIN #8)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 8-1 | Winooski R.-Marshfield to Plainfield | C(2.0)* B | EL-1 | 7 | | | | | |
| 8-2 | Winooski R.-Plainfield to Stevens Branch | C(4.0) B | EL-1 | 9 | | | | | |
| 8-3 | Winooski R.-Stevens Branch to Dog River | C(4.0) | EL-1 | 4 | ? | | Coliform | Combined Sewer overflows & Stormwater. | W.Q.S. met except during periods of high flow. |
| 8-4 | Winooski R.-Dog R. to Waterbury | C(2.0)* B | EL-1 | 9 | ? | | Coliform Sediment | Combined Sewer overflows. | W.Q.S. met except during periods of high flow. Supports cold & warm fishery. |
| 8-5 | Winooski R.-Waterbury to Alder Brook | C(2.7) B | EL-1 | 22 | | | | Nonpoint Agricultural. | |
| 8-6 | Winooski R.-Alder Brook to Lake Champlain | C(14.8) B | WQ-1 | 20.9 | ? | | D.O. Nutrients Coliform | Municipal & Industrial Waste, Combined Sewer Overflows & Stormwater. Phosphorus. Hydro Dams, (low flows). | Water quality survey completed for assimilative capacity. Wasteload allocation on hold, waiting for process to be revised and approved. Possible change to a warm water fishery pending. Phosphorus removal done at Essex Jct. STP, under construction at South Burlington (Airport Parkway) in planning for Winooski, Burlington Riverside and Northend. |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: BASIN #8 (Continued)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 8-7 | Jail Branch-East Barre to Stevens Branch | C(3.8) | EL-2 | 3.8 | 3.8 | | Coliform | Municipal Wastes. | E. Barre to be piped to Barre City STP by summer, 1986. |
| 8-8 | Stevens Branch-Williamstown to Jail Branch (Barre) | C(2.0)* B | EL-1 | 6 | | | | | Physical review of stream to refine ASCAP estimate - possibly summer, 1987. |
| 8-9 | Stevens Branch-Jail Branch (Barre) to Winooski R. | C(6.0) | WQ-1 | 6 | 6 | | D.O., Coliform, Chlorine, Sediment | Combined sewer overflows & stormwater. | Further water quality survey needed to complete assimilative capacity determination. Barre City STP may need to be upgraded before design flows are reached. W.Q.S. met except during periods of high flow. |
| 8-10 | Dog R.-Northfield to Winooski R. | C(1.0)* B | EL-1 | 10 | ? | | Coliform | Combined Sewers. | W.Q.S. met except during periods of high flows. |
| 8-11 | Waterbury R.-Stowe to Gold Brook | C(1.4) B | WQ-1 | 12 | | | | | Aquatec did ASCAP and submitted results to DWREE. DWREE has defined acceptable loading. Stowe STP to be upgraded for future growth. Presently, it removes phosphorus. |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: BASIN #8 (Continued)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 8-12 | Alder Brook-Essex Center to Winooski R. | B | Upland | 3 | | | | | Sewer lines have connected Essex Center to the Essex Jct. STP. |
| 8-13 | Allen Brook-Williston to Winooski R. | C(5.0) B | Upland | 6 | | | | | Williston connected to Essex Jct. STP. |
| 8-14 | Rice and Clay Brooks below Sugarbush on-site waste water disposal system to confluence with Mad River. | B | WQ-2 | 2.4 | .5 | | Aquatic Habitat, Solids, Turbidity | Failed Sugarbush leaching system. Siltation from naturally sloughing clay banks. | Sugarbush is to improve waste water disposal facility so no discharge occurs. |
| 8-15 | Mill Brook below Battleground on-site WWTF to confluence with Chase Brook. | B | WQ-2 | 2.0 | | | Aquatic Habitat | Nitrate-Nitrite from leachfield system. | |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: WHITE (BASIN #9)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION[(1)] USE | CLASSIFICATION[(1)] STATUS | STREAM MILES TOTAL | STREAM MILES PS[(2)] | STREAM MILES NS[(3)] | W.Q.S.[(4)] VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 9-1 | White R.-Rochester to Third Branch | B | WQ-2 | 18 | ? | | Coliform | Municipal Waste. | Failed municipal subsurface system has been replaced. Site #3 leachfield surfaces in the spring. New field to be constructed. |
| 9-2 | White R.-Third Branch (Bethel) to First Branch | C(3.0) B | EL-2 | 8 | ? | | Coliform | Municipal Waste (untreated). | Plans underway to construct new STP. |
| 9-3 | White R.-First Branch (So. Royalton) to Connecticut R. | C(1.4) B | EL-1 | 19 | | | | | |
| 9-4 | Third Branch-Randolph to White R. | C(1.2) B | EL-1 | 8 | ? | | Coliform, Sediment | Combined Sewers, Nonpoint sources. | W.Q.S. met except during periods of high flow. |
| 9-5 | First Branch-Chelsea to White R. | C(2.0) B | EL-1 | 16 | | | | | Severe erosion - may be due to natural causes. |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: OTTAUQUECHEE-BLACK (BASIN #10)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 10-1 | Ottauquechee R.-Sherburne Center to Bridgewater Corners | C(2.0) B | EL-1 | 10 | 10 | | Temp. | Thermal pollution impacts fishery | Sherburne FD #1 STP is operational. Fishery habitat improvement planned. |
| 10-1A | Ottauquechee R.-Bridgewater Corners to Woodstock | C(2.0) B | EL-1 | 6 | 6 | | Temp. | Thermal pollution impacts fishery | Fishery habitat improvement planned. |
| 10-1B | Kent Brook & Upper Ottauquechee R to Sherburne Center | B | WQ-2 | 4.1 | | | Coliform | Failed subsurface waste disposal systems. | Temporary pollution permits to be issued. |
| 10-2 | Ottauquechee R.-Woodstock to Deweys Mills Pond | C(3.0) B | EL-1 | 10 | 10 | | Temp. | Thermal pollution impacts fishery | Poor sludge removal practice has now been corrected. Fishery habitat improvement planned. |
| 10-3 | Ottauquechee R.-Deweys Mills Pond to Conn. R. | C(0.9) B | EL-1 | 5 | | | | | |
| 10-4 | Kedron Brook-S. Woodstock to Ottauquechee R. | C(2.0) B | EL-1 | 6 | | | | | |
| 10-5 | Black R.-Ludlow to Cavendish | C(1.5)* B | EL-1 | 6 | | | | | |
| 10-6 | Black R.-Cavendish to North Springfield Reservoir | C(2.0)* B | EL-1 | 12 | | | | | |
| 10-7 | Black R.-North Springfield Reservoir to Springfield | C(4.5)* | EL-1 | 4.5 | | | | | North Springfield wastes are now conveyed to Springfield for treatment. |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: OTTAUQUECHEE-BLACK (BASIN #10) (Continued)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION[(1)] USE | CLASSIFICATION[(1)] STATUS | STREAM MILES TOTAL | STREAM MILES PS[(2)] | STREAM MILES NS[(3)] | W.Q.S.[(4)] VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 10-8 | Black R.-Springfield to Conn. R. | C(3.7)* | WQ-1 | 3.7 | ? | | | Industrial & Municipal Waste, Combined Sewer Overflows & Stormwater. | ASCAP phosphorus screening indicates possible need for more restrictive permit conditions. Further study required. Fish kills reported from electroplating process. |
| 10-9 | Spoonerville Brook - N. Springfield industrial park to Black River. | B | EL-1 | 3.8 | 1 | | Toxics | Cement plant discharges. | Fish kills caused by cement plant. Presently o.k. but carefully watched for new problems. |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: WEST-WILLIAMS-SAXTONS (BASIN #11)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 11-1 | Williams R.-Middle Branch (Chester) to Conn. R. | C(2.0) B | EL-1 | 12 | | | | | |
| 11-2 | Saxtons R.-Saxtons R. to North Westminster | C(2.0) B | EL-1 | 14 | | | | Potential Nutrient problem in Saxtons River Reservoir. | Proposed hydro project requires bonding for phosphorus removal at Saxtons River facility. |
| 11-3 | Saxtons R.-North Westminster to Conn. R. | B | EL-1 | 2 | | | | | North Westminster sewage now piped to Bellows Falls STP. |
| 11-4 | West R.-Londonderry to Ball Mountain Dam | B | Upland | 10 | | | | | |
| 11-5 | West R.-Ball Mountain Dam to Townshend Dam | B | Upland | 8 | | | | | |
| 11-6 | West R.-Townshend Dam to Conn. R. | B | Upland | 18 | | | | | |
| 11-7 | No Name Brook (Thompsonburg Brook) - Magic Mountain Inc. to South Londonderry | B | WQ-2 | 4 | 2 | | Coliform, Temp. | Domestic Waste. Warm water in summer - cause unknown. | Fecal coliform in snowmaking pond. Sanitary survey to be done to determine sources. |
| 11-8 | Mill Brook & Winhall R.-Bromley Ski Area to West R. | B | Upland | 9 | | | | | Spray irrigation area relocated away from streams. |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: WEST-WILLIAMS-SAXTONS (BASIN #11) (Continued)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 11-9 | No. Branch Brook - Stratton Corp. to West R. | B | WQ-2 | 9 | ? | | Turbidity, Temp., Aquatic Habitat | Sanitary discharges to Class B waters, sediment, low flows. | |
| 11-10 | West R.-Weston to Londonderry | B | WQ-2 | 5 | ? | | Coliform, Temp. | Domestic Waste. | Village of Weston. Water quality assessment to be done. |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: DEERFIELD (BASIN #12)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 12-1 | No. Branch, Deerfield R.-Snow Lake to Wilmington | B | WQ-2 | 9 | 5.5 | | Turbidity, Aquatic Habitat, Nutrients, Temperature | Siltation, municipal wastes, heated water, low flows. | Siltation problem with Snow Lake under study. Abatement order issued re spray field problem. |
| 12-2 | No. Branch, Deerfield R.-Wilmington to Harriman Dam | C(1.0) B | EL-2 | 9 | | | Coliform | Municipal Waste/ Combined Sewers. | Intensive water quality studies have been done. Modeling complete. Wasteload allocation pending. Town of Wilmington is upgrading their STP. |
| 12-2A | No. Branch Deerfield R. - Harriman Dam to Readsboro | B | EL-2 | 3 | 3 | | Aquatic habitat | Lack of minimum flows caused by dam operation. | |
| 12-3 | Deerfield R.-Readsboro to Mass. State Line | C(1.0) B | EL-1 | 4 | | | | | |
| 12-4 | East Branch, North R.-Jacksonville to Mass. State Line | C(1.4) B | EL-1 | 9 | | | | | |
| 12-5 | Ellis Brook-from its headwaters to its confluence with the N. Branch of the Deerfield R. | B | WQ-2 | 4.6 | .5 | | Nutrients, Aquatic Habitat | Municipal Wastes. | Abatement Order issued. (Under study.) |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: LOWER CONNECTICUT-MILL BROOK (BASIN #13)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 13-1 | Conn. R.-Wilder Dam to Windsor | C(2.6) B | EL-2 | 15 | ? | | Coliform | Municipal & Industrial Waste/Combined Sewers. | W.Q.S. met except during periods of high flows. |
| 13-2 | Conn R.-Windsor to Bellows Falls | C(1.7) B | EL-2 | 27 | ? | | Coliform | Municipal & Industrial Waste. | W.Q.S. met except during periods of high flow. |
| 13-3 | Conn R.-Bellows Falls to Brattleboro | C(1.6) B | EL-2 | 21 | | | Coliform | Municipal & Industrial Waste, Combined Sewer Overflows & Stormwater in Bellows Falls. | Final design for Bellows Falls secondary upgrade contract nearly ready. Construction to start in 1987. |
| 13-4 | Conn. R.-Brattleboro to Ashuelot R. | C(2.3) B | EL-1 | 10 | | | | | Upgraded Brattleboro STP in operation July, 1984. |
| 13-5 | Conn R.-Ashuelot R. to Mass. State Line | B | EL-2 | 6 | | | | | |
| 13-6 | Sacketts Brook-Putney to Conn R. | C(1.3) B | EL-1 | 2 | ? | | | | |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: STEVENS-WELLS-WAITS-OMPOMPANOOSUC (BASIN #14)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 14-1 | Wells R. - Groton to South Ryegate | B | EL-2 | 3 | 3 | | Solids, Aquatic habitat | Gravel pits along river, hydroelectric dam, poor logging and ag. practices. | |
| 14-1A | Wells R.-South Ryegate to Conn. R. | C(1.0)* | EL-1 | 7 | 7 | | Solids, Aquatic habitat | Gravel pits along river, poor logging and ag. practices. | New off-stream wick-type sewage treatment facility in place. |
| 14-2 | Stevens R.-Barnet to Conn. R. | B | EL-1 | 1 | | | | | |
| 14-3 | Trib. to Ompompanoosuc R.-Ely Mine to Main Stem | B | WQ-1 | 2 | | 2 | Metals, pH, D.O. | Mine Drainage. | No action contemplated at this time to correct mine drainage. |
| 14-4 | Copperas Brook & West Branch of Ompompanoosuc-Elizabeth Mine to Main Stem | B | WQ-1 | 5 | | 5 | Metals, pH, D.O. | Mine Drainage. | No action contemplated at this time to correct mine drainage. |
| 14-5 | Waits R.-Bradford upstream municipal boundary to mouth | C(0.9) B | EL-1 | 2 | | | | | |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: PASSUMPSIC (BASIN #15)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION[1] USE | STATUS | STREAM MILES TOTAL | PS[2] | NS[3] | W.Q.S.[4] VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 15-1 | East Branch, Passumpsic R.-East Haven to West Branch | C(1.2) B | EL-1 | 12 | | | | | |
| 15-2 | Passumpsic R.-West Branch to St. Johnsbury Center | C(5.3) B | EL-1 | 11 | 11 | | Coliform, Aquatic habitat | Municipal Wastes/ Combined Sewers, Hydroelectric dams. | W.Q.S. met except during periods of high flow & low flows. |
| 15-3 | Passumpsic R.-St. Johnsbury Center to Conn. R. | C(4.8) B | EL-2 | 12 | 12 | | Coliform D.O., Aquatic habitat | Combined Sewer Overflows & Stormwater. Impact from hydro dams. | ASCAP study has been performed and modeling begun. Intensive 3-day study to be performed. Secondary STP to be built in 1987, but D.O. problem will probably exist at design flows. |
| 15-4 | Moose R.-East St. Johnsbury to Passumpsic R. | C(1.1) B | EL-2 | 5 | 1 | | Coliform, Solids (Silt) | Municipal Waste, some agricultural runoff, flushing municipal water system. | Individual direct discharges to be eliminated (presently under study to determine best alternative). |
| 15-5 | Water Andric Brook-Danville to Passumpsic River | C(3.8) B | WQ-1 | 7 | | | | | New tertiary plant now operating. |
| 15-6 | Joe's Brook-Danville Dam to Passumpsic R. | B | EL-2 | 9.5 | 9.5 | | Solids, Aquatic habitat | Poor logging practices, hydroelectric dam. | |
| 15-7 | Brown Brook-Headwaters to Joe's Brook | B | EL-2 | 4.5 | 4.5 | | Solids | Poor logging practices. | |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: UPPER CONNECTICUT-NULHEGAN-WILLARD STREAM-PAUL STREAM (BASIN #16)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | STATUS | STREAM MILES TOTAL | PS(2) | NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 16-1 | Conn. R.-Canada Line to Upper Ammonoosuc | C(2.0) B | EL-1 | 48 | | | | | |
| 16-2 | Conn. R.-Upper Ammonoosuc to Comerford Dam | C(0.9) B | WQ-1 | 44 | 44 | | D.O., Solids. | Municipal & Industrial Waste. Metcalf & Eddy study for EPA determined that extensive additional data needs to be collected for modeling re: S.O.D. | Fishery is improving due to more oxygen but certain fish lacking. Fishing derby held each year in Comerford Res. Possible paper waste problem. |
| 16-3 | Conn. R.-Comerford Dam to Wells R. | B | EL-2 | 15 | | | D.O. Coliform | Municipal & Industrial Waste & Benthic Demand. | |
| 16-4 | Conn. R.-Wells R. to Bradford | C(2.2) B | EL-2 | 18 | | | Coliform | Municipal Waste. | |
| 16-5 | Conn. R.-Bradford to Wilder Dam | C(0.9) B | EL-1 | 32 | | | | Municipal Waste. | |

TABLE 13 (Continued)
1986
WATER QUALITY INVENTORY SUMMARY OF SEGMENTED RIVER MILES

RIVER: LAKE MEMPHREMAGOG-BLACK-BARTON-CLYDE-COATICOOK (BASIN #17)

| SEGMENT NUMBER | SEGMENT DESCRIPTION | CLASSIFICATION(1) USE | CLASSIFICATION(1) STATUS | STREAM MILES TOTAL | STREAM MILES PS(2) | STREAM MILES NS(3) | W.Q.S.(4) VIOLATED | WATER QUALITY PROBLEM | CURRENT STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 17-1 | Clyde R.-Island Pond to Derby Center | C(2.0) B | WQ-1 | 21 | 21 | | Solids (Silt) | Phosphorus, Nonpoint Agricultural, Low Flows, Fish Movement Blocked, Logging. | Extreme water fluctuation and lack of adequate flows caused by hydro dams contriute to assimilative capacity problems and blockage for salmon spawning (E. Charleston to Newport #1 dam). |
| 17-2 | Clyde R.-Derby Center to Lake Memphremagog | C(0.25) B | WQ-1 | 5 | 5 | | Coliform, Nutrients, Aquatic habitat. | Phosphorus/Combined Sewer Overflows. Nonpoint Agriculture, hydro dams (low flows). | New Newport City secondary facility with phosphorus removal now operational. W.Q.S. met except during high flows and low flows. |
| 17-3 | Lake Memphremagog (Vt. Portion) | B | WQ-1 | Lake 317 acres | ? | | Nutrients, Solids | Nonpoint Agriculture/ Exotic weeds. | W.Q.S. met except during periods of high flows. S.C.S. working with farmers. |
| 17-4 | Barton R.-Glover to Barton | B | WQ-1 | 4 | 4 | | Coliform, Nutrients | Phosphorus/Nonpoint Agricultural. | Phosphorus removal implemented. S.C.S. working with farmers. |
| 17-5 | Barton R.-Barton to Lake Memphremagog | C(4.7) B | WQ-1 | 15 | 15 | | Coliform, Nutrients | Phosphorus/Nonpoint Agricultural. | Phosphorus removal implemented. Some improvements to manure storage. |
| 17-6 | Tomifobia R.-Vt. Line to Canada Line | C(0.25) | EL-1 | 1 | | | | | |
| 17-7 | Black R.-Albany to Lake Memphremagog | B | Upland | 21 | 21 | | Coliform, Nutrients | Nonpoint Agricultural. | |

TABLE 14

STATE OF VERMONT
SUMMARY OF WATER QUALITY FOR SEGMENTED RIVER MILES
1986

| MAJOR WATER AREAS INCLUDING MAINSTEM AND MAJOR TRIBS. | TOTAL MILES ASSESSED | MILES FULLY SUPPORTING WATER USES | MILES PARTIALLY SUPPORTING WATER USES | MILES NOT SUPPORTING WATER USES | WATER QUALITY* PROBLEMS | SOURCE OF WATER QUALITY PROBLEM<br>M = MUNICIPAL<br>R = RECREATIONAL<br>I = INDUSTRIAL<br>MF = MINIMUM FLOWS NOT MAINTAINED<br>CS = COMBINED SEWERS<br>NPS = NONPOINT SOURCE |
|---|---|---|---|---|---|---|
| Basin 1-Batten Kill, Walloomsac, Hoosic | 47 | 34.5 | 4 | 8.5 | 2, 5, 6, 7 | M, I, CS |
| Basin 2-Poultney, Mettawee | 44 | 36 | 8 | 0 | 2, 5 | M, NPS |
| Basin 3-Otter Creek | 85 | 85 | 0 | 0 | 2, 5, 6 | M, CS, NPS |
| Basin 4 and 5-Lake Champlain and Tributaries | 23 | 6.5 | 16 | .5 | 1, 2, 3, 5, 6 | M, I, CS, NPS |
| Basin 6-Missisquoi | 92 | 77.5 | 14 | .5 | 2, 3, 6, 7 | M, I, CS, NPS, MF |
| Basin 7-Lamoille | 97 | 76 | 21 | 0 | 1, 2, 3, 6 | M, CS, NPS, MF |
| Basin 8-Winooski | 123 | 113 | 10 | 0 | 1, 2, 3, 5, 6 | M, I, CS, NPS, R, MF |
| Basin 9-White | 69 | 69 | 0 | 0 | 2, 6 | M, CS, NPS |
| Basin 10-Ottauquechee, Black | 71 | 44 | 27 | 0 | 1, 2, 6 | M, I, CS, R |

*WATER QUALITY PROBLEMS -
1 Harmful substances
2 Physical modification (suspended solids, temp., etc.)
3 Eutrophication potential
4 Salinity, acidity, alkalinity
5 Oxygen depletion
6 Health hazards (coliform)
7 Toxics

TABLE 14 (continued)

STATE OF VERMONT
SUMMARY OF WATER QUALITY FOR SEGMENTED RIVER MILES
1986

| MAJOR WATER AREAS INCLUDING MAINSTEM AND MAJOR TRIBS. | TOTAL MILES ASSESSED | MILES FULLY SUPPORTING WATER USES | MILES PARTIALLY SUPPORTING WATER USES | MILES NOT SUPPORTING WATER USES | WATER QUALITY* PROBLEMS | SOURCE OF WATER QUALITY PROBLEM |
|---|---|---|---|---|---|---|
| Basin 11-West, Williams, Saxtons | 91 | 89 | 2 | 0 | 2, 3, 6 | M, R |
| Basin 12-Deerfield | 39 | 30 | 9 | 0 | 2, 3, 6 | M, R, CS, MF |
| Basin 13 and 16-Upper and Lower Connecticut | 238 | 194 | 44 | 0 | 2, 5, 6 | M, I, CS, NPS |
| Basin 14-Stevens, Wells, Waits, Ompompanoosuc | 20 | 3 | 10 | 7 | 1, 2, 4, 5 | NPS, MF |
| Basin 15-Passumpsic | 61 | 23 | 38 | 0 | 2, 5, 6 | M, CS, NPS, MF |
| Basin 17-Lake Memphremagog, Black, Barton and Clyde | 67 | 1 | 66 | 0 | 2, 3, 6 | M, CS, NPS, MF |
| TOTAL MILES | 1167 | 881.5 | 269 | 16.5 | | |
| % OF MILES ASSESSED | 100 | 76 | 23 | 1 | | |

*WATER QUALITY PROBLEMS -
1 Harmful substances
2 Physical modification (suspended solids, temp., etc.)
3 Eutrophication potential
4 Salinity, acidity, alkalinity
5 Oxygen depletion
6 Health hazards - (coliform)

## D. GROUNDWATER QUALITY

### 1. Overview

Vermont is a small, rural, state with relatively few ground water contamination problems compared to more populous, industrial states. Additionally, due to its humid climate, it is a water-rich state with few consumptive uses. There is no evidence of ground water mining (pumping faster than it is able to be recharged) or wide-spread degradation of quality.

There are a number of potentially contaminating activities such as old dumps, outmoded leaching facilities, floor drains, and heat pump return wells for which there is little information. The lack of such data is part of the problem. Additionally, the plan to fully implement a computerized data base in which to store records of ground water contamination has not been completed.

Ground water protection, water use and monitoring responsibilities are split between several state agencies including the Departments of Agriculture, Health and Water Resources and Environmental Engineering. Interagency coordination is addressed by a coordination committee.

Recently passed legislation requires the state to develop a comprehensive ground water protection program including the development of a management strategy, the classification of its ground water resources into 4 classes, and the adoption of a rule to manage and protect ground water.

Ground water problems in Vermont are in large measure due to the vulnerability of the resource. Vermont's aquifers are generally shallow and most deeper aquifers have discontinuous confining layers. Water tables are frequently less than ten feet below the land surface.

## 2. Ground Water Usage

Ground water serves as the source of drinking water for approximately 55% of the state's population despite the fact that most of its major population centers are supplied by surface water sources. The collection of ground water use data for community water supply systems is the responsibility of the Health Department.

Table 15

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 |

## 3. Ground Water Quality

Vermont does have some ground water problems, most of which are site specific and specific to some particular land use activity. Based on the best available information approximately 50 wells throughout the state have been identified as contaminated by chemicals such as petroleum products and solvents. Leaking underground storage tanks and accidental spills account for the bulk of these incidents. The rate of discovery of contaminated wells has been increasing as these underground tanks corrode and leak.

The second most serious problem is that of elevated levels of sodium and/or chloride in drinking water sources caused by the use or storage of rock salt for roadway deicing. Approximately 40 wells have been tested to show elevated levels of sodium and/or chloride. An estimated 500 wells are suspected of varying levels of contamination due to their locations adjacent to salted roadways or storage facilities.

Fewer than ten wells have been identified as contaminated by fertilizers and/or septic systems. However, the suspected number of cases is on the order of 300 statewide. Testing of domestic wells is rarely done for chemical constituents, thus the disparity between documented cases and the estimated number of cases.

The following tables, provided by the Vermont Department of Health, summarize contaminated well incidents. The column headings are as follows:

Year - This is the Vermont State Fiscal Year from July 1 through June 30 and represents either the time of first notification and/or first chemical analysis result.

Location - Town and/or village as appropriate.

Identified Party/Source - Are listed as name and source type where appropriate as:

- Private well - serves private home
- Public well - serves public building
- Village well - serves public community water system with 10 or more homes
- Seep - a dispersed nonpoint groundwater discharge which may be contaminated
- Spill - a recorded spill with no surface exposure or drinking water source contamination noted

Contaminant - Source and/or type of chemical contamination as follows:

Gasoline - known gasoline spill or leak
VOC - volatile organic chemicals of various origins
Silt - natural materials plugging or contaminating a well
Nitrate - uncertain whether it comes from septic systems and/or fertilizers
PCB - contamination from transformer oils
Salt - road salt contamination
Fertilizers - either home or farm related
Pesticides - contamination from normal use or spill
Bacteria - may be from variety of sources
Arsenic - naturally occurring
Oil - known oil spill or leak

Table 16

SUMMARY OF WELL CONTAMINATION INCIDENCES

| Year | Number of Incidences | Number of Wells Affected |
|---|---|---|
| 1980-81 | 7 | 7 |
| 1981-82 | 9 | 9 |
| 1982-83 | 15 | 19 |
| 1983-84 | 10 | 17 |
| 1984-85 | 22 | 24 |
| Totals | 63 | 76 |

The number of incidences listed below is not all-inclusive, as the files were not created on all contamination cases in all years. A tracking system is now in place for ground water contamination incidences.

Table 17

CONTAMINATION INCIDENT SUMMARY
VT. DEPARTMENT OF HEALTH

| Year | Location | Identified Party/Source | Contaminant |
|---|---|---|---|
| 1983-84 | Berlin | Capital City Press (public well) | V.O.C.'s (Volatile organic compounds) |
| 1982-83 | Essex | Fleming (private well) | Bacteria/Iron |
| 1983-84 | Fairfax | N. Country Dry Cleaners (public) | V.O.C.'s |
| 1983-84 | Perkinsville | Douglas (private well) | Arsenic |
| 1983-84 | S. Burlington | Air National Guard (natural seep) | V.O.C.'s |

Table 17 (Continued)

| Year | Location | Identified Party/Source | Contaminant |
|---|---|---|---|
| 1983-84 | Glover | Roberts (private well) | V.O.C.'s |
| 1983-84 | Middlesex | 6 homes (private wells) | Gasoline |
| 1983-84 | Wells | Survey (private well) | Arsenic |
| 1983-84 | Williamstown | Village well | V.O.C.'s |
| 1983-84 | Williamstown | 3 homes (private wells) | V.O.C.'s |
| 1984-85 | N. Springfield | Williams (private well) | Gasoline |
| 1984-85 | Huntington | Kelley (private well) | Gasoline |
| 1984-85 | Lyndonville | Hoffman (private well) | V.O.C.'s |
| 1984-85 | Lyndonville | Village well | V.O.C.'s |
| 1984-85 | E. Middlebury | Village well | Gasoline |
| 1984-85 | E. Middlebury | 3 private wells | V.O.C.'s |
| 1984-85 | Putney | Cole (private well) | V.O.C.'s |
| 1984-85 | Berlin | Hough (private well) | Salt |
| 1984-85 | S. Royalton | Audette (private well) | Pesticides |
| 1984-85 | Orleans | Ethan Allen (spill) | V.O.C.'s |
| 1984-85 | Highgate | Ladoux (private well) | Silt |
| 1984-85 | Putney | Sierra (private well) | Pesticides |
| 1984-85 | Manchester | K. Milles (spill) | Oil |
| 1984-85 | Gilman | Anderson (private well) | Oil |
| 1984-85 | Marlboro | Marlboro College (public well) | Oil |
| 1984-85 | Marlboro | Marlboro Elem. School (public well) | Oil |
| 1984-85 | Shaftsbury | Capossoli School (private well) | V.O.C.'s |
| 1984-85 | Vernon | Coombs (private well) | V.O.C.'s |
| 1984-85 | Wardsboro | Tropes (private well) | V.O.C.'s |
| 1984-85 | Waterford | Dussault (private well) | Salt |
| 1984-85 | Weathersfield | Perry (spill) | Gasoline |
| 1984-85 | Wolcott | Knapp (private well) | V.O.C.'s |

a. Major Sources of Contamination

Table 18, compiled by the U.S. Environmental Protection Agency, Office of Ground-Water Protection, utilizing Department of Water Resources and Environmental Engineering generated data, ranks the major sources of ground water contamination according to the reported number of incidents. Those sources without an "X" are not major sources in Vermont.

Table 18

MAJOR SOURCES OF GROUND WATER CONTAMINATION

| SOURCE | IDENTIFIED PROBLEM IN VT | RANK (VT) |
|---|---|---|
| Septic tanks | X | |
| Municipal landfills | X | 4 |
| On-site industrial landfills (excluding pits, lagoons, surface impoundments) | X[a] | |
| Other landfills | | |
| Surface impoundments (excluding oil and gas brine pits) | X | |
| Oil and gas brine pits | | |
| Underground storage tanks | X | 2 |
| Injection wells | | |
| Abandoned hazardous waste sites | X | |
| Regulated hazardous waste sites | | |
| Salt water intrusion | | |
| Land application/treatment | | |
| Agricultural activities | X | 3 |
| Road salting | X | 1 |
| Other (specify) | | |

[a] Includes uncontrolled hazardous waste sites.

b. Contaminating Substances

Ground water samples are being tested by agricultural, environmental, health and transportation agencies for a variety of contaminants including radon, volatile organic compounds, pesticides, nitrate, bacteria and other constituents. The state has to implement a single, comprehensive ground water quality data base. Table 19, compiled by EPA, utilizing Department of Water Resources and Environmental Engineering information, shows those contaminating substances in Vermont, indicated by "X".

Table 19

SUBSTANCES CONTAMINATING GROUND WATER IN VERMONT

| | |
|---|---|
| Organic chemicals:<br>Volatile<br>Synthetic | Metals |
| Inorganic chemicals:<br>Nitrates<br>Fluorides<br>Arsenic<br>Brine/salinity | Radioactive material<br><br>Pesticides |

## E. SPECIAL STATE CONCERNS

### 1. Nonpoint Sources

A special state concern is the eutrophication of embayments of Lake Champlain, Lake Memphremagog and several inland lakes due to excessive nutrient and sediment loss from agriculture and possibly from urban runoff. Also, fishery habitat loss due to stream sedimentation results from careless construction and logging erosion control practices. Some dams have created conditions for algal blooms and some release water with a dissolved oxygen deficit.

The water quality impacts caused by hydroelectric dams is also a state concern. In order to quantify the impacts, a study was done of existing hydro dams in the state. Preliminary findings indicate that water quality impacts caused by hydro dams may dwarf those impacts caused by point sources. The "Vermont Hydropower Problem Mitigation Study" was instituted by the Department of Water Resources and Environmental Engineering in 1982 under the funding provided under Section 208 of the Clean Water Act. The study was conducted in an effort to assess the environmental impacts of the 62 existing hydropower projects in the state. The primary objective of this study was to identify water quality and quantity problems at these sites resulting from the artificial regulation of stream flow. Mitigation measures were to then be determined and presented to the Federal Energy Regulatory Commission (FERC), the Vermont Public Service Department and the utilities for implementation.

Twenty-one of the 62 projects studied, or 34% have been identified as being high priority sites for mitigation. A high priority site is one which is identified as, or is suspected of, having a significant impact on the water quality and quantity of the stream on which it is located because of artificial flow regulation. This regulation is significantly impairing the uses for which the affected stream is managed.

Other major findings include the following:

(a) The 62 projects studied are located on streams totalling 526.25 miles in length. Twenty-four percent of these 526.25 miles, or 124.2 miles have been impounded (100 miles) or bypassed (24.2 miles) by these projects.

(b) Minimum flow requirement recommendations apply to 41 of the 62 projects studied. Recommendations for minimum flow requirements may be made at 12 additional sites pending further study. Finally, eight of the 62 projects studied have recently been issued Water Quality Certifications by the Department. These certifications include minimum flow requirements for the protection of water quality and fisheries.

It should be understood that the hydropower report is by no means comprehensive in identifying environmental conflicts at each site. Further investigation of the majority of projects is required to better identify problems before recommendations for mitigation are finalized and acted upon by the Department and/or Agency.

Other primary nonpoint surface water problems include acid precipitation, nuisance aquatic plants, nutrients, sediment and turbidity. These nonpoint sources threaten and moderately or severely affect the uses of fishing, swimming and boating.

Some program efforts to control these nonpoint sources are: (1) application of agricultural best management practices through voluntary/incentive SCS and ASCS programs, (2) aquatic nuisance control programs, and (3) basin planning. The effects of acid precipitation are being documented but avoidance of future problems lies in coordinated action on a national level.

2. Protection of Upland Streams

Construction of new recreational facilities, condominiums, residences and commercial establishments in areas with no municipal waste water treatment facilities and limited on-site waste disposal capabilities has degraded and threatens to further degrade the water quality of upland streams. Water quality impairment noted in the basin planning process has originated from various sources including discharges of secondarily treated effluent into Class B waters. This is partly a technical violation in that discharges are not allowed to Class B waters at the time of writing. The measurable impacts have included heavy algal growth on the bottom, foaming, and cloudiness of the water. Discharges of cement have resulted in fish kills. Sedimentation from large parking areas have destroyed the fish habitat of at least one small upland stream.

The focus of basin planning has been on rapidly developing areas, mainly on ski areas, and from that limited exposure, erosion and sedimentation has to be the major form of water pollution. There are other sources of pollution in ski areas which include scattered direct discharges of untreated effluent, discharges of secondary (off-stream) treatment plants where no discharge is permitted. Sources for this include spray areas on inappropriate soils and land forms, large leach fields and leaking sewage lagoons. Minor discharges have been observed but they are too varied to form any pattern.

The basin planning process is helping resolve water quality problems by two mechanisms. First, where a water quality violation is observed, information (visual observations, water quality testing) about it is collected and this information is forwarded to the appropriate management section for remedial action. Secondly, the problem is described in the basin plan for follow-up action. It is the Department's experience that problems result from inattention to the water quality aspects of development. The basin planning process describes how past mistakes have resulted in impacts to water quality. It is hoped that the examples of past errors will motivate future development to take these errors into account so that they can be avoided.

The Governor has selected the clarification and strengthening of water quality laws as her administration's top priority issue for the 1986 Legislature. This is because present policy does not allow direct discharges to upland streams. This policy mandates off-stream sewage systems. The policy worked well when most of the systems were small, sparse and residential in nature and did not impact on upland streams. However, in recent years, the number and size of on-site systems, especially in high elevation areas having sensitive ecosystems, have increased dramatically. Many of these large on-site systems are discharging to the stream through seeps or by overland flow. The proposed changes to existing legislation are needed to properly manage the state's upland streams by not allowing any discharge which would change the aquatic biota whether it was a direct or a nonpoint discharge.

3. Management of Waste Discharges and Municipal Growth

The monitoring of discharges is done to track increasing waste loads so that proper planning, design and construction can occur prior to exceeding permit limits and violating water quality standards. An issue of obvious concern is how to accomplish the needed replacement or upgrade of wastewater treatment facilities with significantly reduced federal and state aid.

Examples:

(1) In 1984, two assimilative capacity studies were completed. Otter Creek, which flows through Rutland, was the subject of a study which took place from January 31st - February 2nd. The purpose of the study was to observe the oxygen sag which occurs under ice cover. The second assimilative capacity

study was of the Stevens Branch during August 15th - 17th. The study examined the impact of the discharges of the Barre WWTF on the river and it appears the Barre plant will require upgrading.

(2) There were also two assimilative capacity studies completed in 1985. A study of the impact of the St. Johnsbury WWTF on the Passumpsic River was conducted during July 30th - August 1st. The St. Johnsbury WWTF will need upgrading. The Deerfield River was studied from August 13th - 15th to assess the impact of the discharge of the Wilmington WWTF on the river. A wasteload allocation may need to be done for the Deerfield, as the assimilative capacity is not large enough for the anticipated waste loading of the river. A special study of the discharge from the Waterbury State Hospital was undertaken by the Compliance Unit on November 27-28, 1984 and December 11-13, 1984. The purpose was to quantify the BOD loading that the facility was contributing to the Waterbury WWTF.

The foregoing examples indicate the on-going need to upgrade existing wastewater treatment facilities in light of increasing treatment demands and increasing costs.

4. Wastewater Facilities Operation and Maintenance, Including Operator Training

The presence of wastewater treatment facilities can not by themselves assure compliance with permitted effluent levels. The operation and maintenance of these facilities is critical to proper operation and is of concern to the state. Operator training is essential.

Wastewater treatment plant reliability is a significant factor in public health protection and water quality in general. Reliability depends on attention by well trained operators, plant maintenance, equipment redundancy and timely and sufficient monitoring. As the volume of wastewater increases and the plant increases in size and complexity or as a plant ages there is a greater maintenance requirement and breakdowns are more frequent. Analysis of Vermont wastewater treatment plant compliance monitoring data for the last ten years indicates that 60% of the time it can be expected that a treatment plant effluent will contain more coliforms than their permit limits of 500 total coliform/100 ml. Also, 10% of the time it can be expected that plant effluent will contain more than 30,000 total coliform/100 ml. This has been true in general over the last ten years. Specific facilities will have better or worse operation records depending on their design and the care in operation and maintenance.

Solids loss, particularly during the winter/spring period, is a major effluent quality concern at many wastewater treatment facilities. Several plants need to increase storage for wintertime sludge holding to prevent losses. Options being examined include construction of concrete storage bins and utilization of abandoned oil storage tanks.

5. Combined Sewer Overflows

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

The solution to the problem involves constructing separate sewer and stormwater lines, with the sewage flows directed to the sewage plant for treatment and the stormwater diverted to a settling basin to remove sand and silt, then to the stream. Sewer separation is a concern in Vermont as it is in many states, and the cost for resolution is great.

There are 10 Vermont communities with major CSO discharges. The aggregate estimated cost of separation of these sewers is $261 million (rough estimate). Vermont has held statutory authority to award 50% grants for combined sewer separation since 1981 (10 VSA Section 1626). However, funding has been allocated on a priority basis to construction of new secondary and advanced waste treatment plants, interceptor and collector sewers and primary upgrades, undertaking CSO work only to the extent necessary to insure integrity of operation of 16 new plants. Vermont will fund the last primary upgrade project in FY89, assuming continuation of the Federal grant program as it is now structured. Following that, State construction grant funds will be diverted to CSO work and possibly other pollution control or water supply needs. Federal construction grants will be used to the extent possible to support CSO correction at that time. Vermont is currently considering the means of prioritizing the CSO work to be done.

A second aspect of CSO management concerns the hydraulic expansion of treatment plants receiving, and to some extent treating combined sewer flow. Increasing sanitary (dry weather flow) to the plant, or increasing its hydraulic capacity to treat dry weather sanitary flow causes the displacement of combined flow from receiving partial treatment at the plant to being discharged untreated. Vermont is currently developing policies to deal with this issue which currently focus on insuring that the total mass load of pollutants from both the treatment plant and direct CSO discharges decrease or remain constant with hydraulic enlargement of the treatment plant.

6. Other State Concerns

Other issues and concerns which are being or need to be addressed, include:

(1) Program funding.

(2) Toxics control - industrial, municipal, and nonpoint.

(3) Toxics - overall identification.

(4) Wetland loss.

(5) Groundwater protection.

(6) Water withdrawal for snowmaking at ski areas.

(7) Landfills, hazardous wastes.

## F. WATER POLLUTION CONTROL PROGRAM

1. Point Source Control Program

Vermont's water pollution control program, administered by the Department of Water Resources and Environmental Engineering, has been very effective in cleaning up the state's rivers, streams and lakes. This has been done primarily through the construction of sewage treatment plants and pretreatment facilities. A necessary part of Vermont's clean water program has been compliance monitoring to insure that permitted dischargers are in compliance with their permits. Also, technical assistance is provided to municipal plant operators to insure that effluent limits are maintained.

As part of the Water Pollution Control program, assimilative capacity studies (ASCAP) are performed in river reaches below existing and proposed wastewater treatment facility discharges to determine the amount of properly treated waste which can be safely discharged. Finally, to determine existing and future uses of surface waters for the discharge of treated effluent and other uses, river basin water quality management plans are prepared as part of the water pollution control program. These activities and others are discussed in the following paragraphs.

a. Municipal Facilities

By 1965, Vermont had made great strides in cleaning up her rivers. At that time, there were 21 municipal waste treatment plants in operation, representing an estimated 65% of the state's population. The 21 plants provided a primary level of sewage treatment which contributed to the water quality improvement of 12 rivers. However, in 1970, when Vermont passed Act 252, prohibiting the discharge of wastes into the waters of the state without a permit, there still were some 60 communities and thousands of homes and businesses that were discharging untreated wastes. By December, 1985, 88 municipal and other public sewage treatment facilities had been constructed throughout the state (including all but three of Vermont's communities). These public waste water treatment facilities have improved the water quality of approximately 45 rivers and streams and two lakes in Vermont. In addition, more than 50 large industries have pretreated their effluent before it reaches municipal sewers and this has improved the water quality of ten other rivers and streams. Notable streams, lakes and rivers which have been "restored" include the Dog River, now known locally for its fine trout fishery; the aesthetically much-improved Winooski River between Montpelier and Essex Jct.; and the greatly improved Connecticut River, now being seriously looked to for recreation by Brattleboro and other communities along its banks. Vermont's rivers and streams have been improved so much that more than half of the state's population presently uses them for swimming and other water contact sports. The recently upgraded Newport City WWTF has improved Lake Memphremagog's water quality such that the municipal swimming beach no longer has to be closed each summer due to high bacteria counts.

Of the three municipalities requiring collection and treatment facilities, final design has been completed for two and they are scheduled for construction funding this fiscal year. The third community has requested a planning grant to evaluate the severity of its problem, along with possible solutions. There are presently 11 municipalities operating primary treatment plants which require upgrading to secondary levels. Of these, four are presently under construction and two more are scheduled to begin construction in the spring of 1986.

Table 20

SUMMARY OF MUNICIPAL WASTE TREATMENT FACILITIES AS OF JANUARY 1986

| | |
|---|---|
| Number of municipalities served by primary treatment | 11 |
| Number of municipalities served by secondary treatment | 73 |
| Number of municipalities served by off-stream disposal | 4 |
| Number of municipalities served by no treatment | 3 |
| Total number of municipalities served by central sewage collection and treatment | 88 |
| Number of major[1] treatment facilities | 21 |
| Number of minor[2] treatment facilities | 67 |
| Number of facilities requiring phosphorus removal | 14 |
| Number of facilities with phosphorus removal capability on line or under construction | 5 |

b. Industrial Facilities.

Substantial progress has been made by the state in cataloging industrial discharges and their impact on receiving water quality and on municipal treatment facility operation where the industrial discharge is to a municipal facility. The majority of industrial discharges in Vermont presently employ Best Practicable Treatment Technology.

The Department has only recently begun to initiate a toxics monitoring program, so it would be premature at this time to discuss water quality benefits resulting from implementation of toxic controls. The Ambient Biomonitoring

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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.

Network program, however, has identified some industrial toxic discharges. One of them involved the discharge of cheese whey wash water/sanitary waste to Coburn Brook in Troy. The company is presently planning to construct their own wastewater treatment facility. This will improve the water quality of approximately 1/2 mile of Coburn Brook, a tributary to the Missisquoi River, and one to two miles of the Missisquoi itself.

The proper disposal of whey, a cheese processing by-product, has been a continuing problem in Vermont. The construction of the International Cheese Whey Processing Plant in Georgia, Vermont, has eliminated most of the stream-dumping and municipal treatment plant-fouling, but there are still isolated incidents of illegal dumping of whey which has been refused by the processing plant due to spoilage. The illegally dumped whey may find its way to streams. The Department has initiated a program which works with cheese companies and recommends lands suitable for spoiled whey disposal. As the program is relatively new, it is too early to determine its effect in maintaining water quality.

c. Permit Compliance/Enforcement

The Compliance Monitoring Unit sampling serves to verify effluent data submitted by municipal and non-municipal dischargers. Permittees are considered major or minor dischargers based on volume of effluent. Major municipalities are those which discharge one million gallons per day or more. Minor municipalities discharge less than that amount. For non-municipal dischargers, any facility which has an effluent volume of 50,000 gallons per day or more is considered major, while those discharging less than that are minor.

Table 21

WASTEWATER TREATMENT FACILITIES SAMPLED, 1984-85

| | | Major | Minor |
|---|---|---|---|
| 1984: | Municipal | 3 | 40 |
| | Non-Municipal | 6 | 9 |
| 1985: | Municipal | 8 | 29 |
| | Non-Municipal | 8 | 18 |

During 1984, there was a Compliance Correction Plan (CCP) Study of the Williamstown WWTF between the dates of August 22nd-24th. The treatment process of the facility was compared with the lagoon systems of Milton WWTF, South Royalton WWTF, and Waterbury WWTF.

The Poultney WWTF was sampled on January 5, 1985 to provide data on mercury contamination of the treatment plant. The results were to be used in enforcement against the Staco Company.

Enforcement sampling was also conducted on Interstate Uniform Service of Williamstown, Vermont on February 14-15 and February 23-24, 1984. The results were used to examine the possible contamination and impact of the dry-cleaning discharge on the Williamstown WWTF.

The Breezy Acres Trailer Park in Colchester, Vermont was sampled by Compliance for legal enforcement on October 28, 1985 for discharging without a permit, and for discharging into a Class B stream.

The Woodstock WWTF and Shelburne FD #1 WWTF were subjects of enforcement sampling due to loss of solids from their treatment systems.

Table 22

NPDES EFFLUENT LIMIT VIOLATIONS OVERVIEW[1]

| | Numbers of Permits with Monitoring Requirements | Numbers of (%) Permittees in Significant Noncompliance (SNC)[2] with Effluent Limits |
|---|---|---|
| MUNICIPAL | | |
| Major | 31 | 10 (32%) |
| PL92-500 Minor | 29 | 4 (14%) |
| INDUSTRIAL | | |
| Major | 8 | 0 (0) |
| Minor | 44 | * |

1 For the period July 1, 1984 through June 30, 1985.

2 Significant noncompliance data for minor industrial permittees is compiled semi-annually for the periods ending March 31st and September 30th (effective 5/85). The categories of significant non-compliance are: violations of requirements resulting from previous enforcement action, violations of permit compliance schedules, violations of permit effluent limits, and violations of sampling and reporting requirements. (For further definition of "significant non-compliance," the reader is referred to the Department's "Compliance Policy".)

Table 23

1984 SIGNIFICANT NONCOMPLIANCE
EFFLUENT LIMIT VIOLATIONS ONLY

| | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Status 9/31/85 |
|---|---|---|---|---|---|
| Major Municipal | | | | | |
| Bennington | x | | | | Compliance |
| Berlin | x | x | | | Compliance |
| Burlington Main | x | | | | Compliance |
| Burlington North | x | | | | Compliance |
| Colchester FD #1 | | | | x | NONCOMPLIANCE |
| Hinesburg | | | x | | Compliance |
| Middlebury | | | | x | Compliance |
| Rutland City | x | | | | Compliance |
| Swanton | x | x | x | x | Compliance |
| Windsor Main | x | | | | Compliance |
| Minor Municipal | | | | | |
| Jacksonville | | | | x | Compliance |
| Whitingham | | | x | | Compliance |
| Woodstock | | | | x | Compliance |
| Major Industrial | | | | | |
| Boise Missisquoi | x | x | x | | Compliance |

14 Permittees in Significant Noncompliance during 1984 (Table 22)
13 Permittees achieved and have maintained compliance as of 9/31/85 (Table 23)

When secondary facilities fall into significant noncompliance, a Composite Correction Plan, defining the causes and their correction with a schedule is required. The status of CCP's is shown in Table 24 as provided by the Permits Section.

Table 24

COMPOSITE CORRECTION PLANS STATUS
(Currently, there are only four CCP's definitely required)

| Municipality | Receiving Water | Status |
|---|---|---|
| Burlington, Main | Lake Champlain | Complete, schedule agreed with City and in draft permit. |
| Williamstown | Stevens Branch | 100% complete, no schedule required in permit. |
| Wallingford | Otter Creek | Initial letter describing violations and need for CCP and meeting with the Fire District complete. Field work and engineering evaluations scheduled to start in June. Report complete in September 1985. |
| Middlebury | Otter Creek | Advised Town of SNC in January 1985 but did not require CCP. Town has started sampling program to find cause. Requirement for CCP sent June 1985 due to continued SNC. |
| Whitingham/ Jacksonville | Harriman Res./ East Branch North River | Town performing sampling to find cause. Requirement for CCP sent June 1985. New plants - some plant modifications being implemented. |
| Northfield | Dog River | Advised Town April 1984 of SNC. Sent requirement for CCP June 1985. |
| Richmond | Winooski River | January and April 1985 samplings put in SNC. Appears to relate to lack of adequate sludge removal. Requirement for CCP sent June 1985. |

All the following are not required to do CCP's at this time for the following reasons:

| | | |
|---|---|---|
| Berlin | Winooski River | Abandoned. |
| Hinesburg | LaPlatte R. | BOD/TSS violations due partly to International Cheese. Town operations also contribute to violations. CCP unnecessary, as problems known. |
| Manchester | Batten Kill | Isolated SNC due to testing procedure. |
| Swanton | Missisquoi R. | Problem thought industry related; pretreatment for Lucille almost operational. |
| Brighton | Pherrins R. | Documented SNC in letter, multiple blower failures thought the cause; no SNC since corrected. Will continue to review effluent data. |
| Colchester | Winooski R. | Settleable solids violations documented in letter. |
| Poultney | Poultney R. | The settleable solids violations occurred during a period of operator change and cleanup of mercury-laden sludge. The new operator has been fully trained and the violations are unlikely to reoccur. |
| Quechee | Ottauquechee R. | This plant was in a very degraded condition in early 1984. The Department required actions to correct the system. SNC occurred during the cleanup and is not expected to reoccur. |
| Cavendish | Black R. | SNC occurred for BOD in 1984. The occurrence of the violations in 1984 in months preceded by and followed by high quality effluent results, the relationship of BOD to TSS on the day of the violations, the results of previous laboratory evaluations and the ultra-high (530 mg/l) influent results occasionally reported, all point to the possibility that the laboratory results are in error. All NPDES testing is done at the facility. |

| | | |
|---|---|---|
| | | The Town has been advised of the SNC and the possible need for a CCP. They were asked to do two things:<br><br>1. For a minimum of three months, spilt the samples and have Springfield or a commercial lab run the analyses to compare with the treatment facility's results.<br><br>2. Check the dischargers to the Cavendish system for any potential high strength wastes that may cause the reported high influent strength.<br><br>If the test results are comparable on the splits, a CCP will be necessary to determine why SNC occurs. All lagoons have some NC, but the level of violation is too high here. |
| Fairfax | Lamoille R. | In June, the lagoons had their annual high benthic release period. Since two samples were taken and both exceeded the maximum day limit, SNC resulted. The problem is not unusual for lagoons and the operator has been advised to increase the air. |
| Woodstock | Ottauquechee R. | The O&M Section completed on-site training under 104(g)(1). Several recommendations were made for physical improvements (sludge storage, additional recycle ratio controller). The major problem was inadequate sludge removal. |
| Pittsford | Furnace Brook | Only one quarter of SNC. Advised Town will require CCP if happens again. Actual physical improvements necessary to assure continuous compliance already identified under on-site training (CCP already done and results could go into permit). |

The compliance actions detailed in Table 24 should have a positive impact on the water quality of portions of 16 bodies of water.

2. Nonpoint Source Control Program

The highest priority for nonpoint source pollution control has been to control nutrients from agricultural runoff in the watersheds of Lake Champlain and Lake Memphremagog. The efforts in this area have been mainly the application of agricultural best management practices by the Soil Conservation Service and ASCS programs applied to 21 subwatersheds ranked in priority order. The State Water Quality Plan for Controlling Agricultural Pollution was amended in 1983 to update the priority list of subwatersheds to receive assistance for erosion and nutrient erosion control.

This priority list establishes the order in which Federal funds are to be used to cost share the correction of agricultural nonpoint sources under the Rural Clean Water Program and under P.L. 83-566.

A significant educational effort was undertaken in FY85 in an attempt to begin resolution of often severe, localized erosion and sedimentation problems resulting from construction in rapidly developing areas, particularly in steep upland areas such as ski areas. Two workshops were conducted jointly by the University of Vermont Extension Service, the Soil Conservation Service and this Department. The workshops were aimed at architects and engineers and state personnel to assure the development of effective and site specific erosion control plans for construction projects.

As a follow-up effort, the University of Vermont Extension Service will be conducting similar workshops for contractors to enhance the implementation of the erosion control plans. In addition, the Department participated in four days of training for over 100 Vermont Agency of Transportation (AOT) highway construction personnel and resident engineers. The purpose of the training was to inform the AOT personnel of Water Quality requirements, distribute educational materials and answer their questions about water quality and environmental concerns.

The periodic output of management actions from the river basin water quality management planning program constitutes a continually developing nonpoint source program. Management actions have included examples such as erosion control from rapidly developing areas, restoration of long-term nonpoint source problems such as ski area parking lot runoff, restoration of minimum flow in streams where water withdrawal for snowmaking occurs and work toward the elimination of discharges from large-scale failed subsurface wastewater treatment systems. By continuing to bring action to cause the correction of such nonpoint sources, not only are the individual problems remedied but the plans serve as educational examples to help inform developers and municipal officials so that poor practices are not repeated.

The Environmental Protection Agency Nonpoint Source Policy (January 1985) emphasizes implementing NPS programs in watersheds affecting priority waters. It also emphasizes that states should take the lead role in developing and implementing NPS management strategies. Two examples of how Vermont is already implementing

NPS programs in priority waters are (1) the State Water Quality Plan for Controlling Agricultural Pollution which sets priority subwatersheds in which to implement best management practices under incentive and voluntary programs for SCS and ASCS; and (2) the River Basin Water Quality Management Planning efforts where priority subbasins are studied and plans are developed. Nonpoint source problem identification is a significant part of this planning effort and any activities discovered which are violating Water Quality Standards are immediately referred to the proper elements within the Department to take management actions to resolve the problems. In both the Upper Ottauquechee and Mad River basins, erosion and sedimentation problems are being handled in this matter.

Special attention is being given to the control of nonpoint pollution of groundwater. Aquifer Protection Areas are being mapped and surface land uses within these recharge areas are recorded. Where moderate to high risk activities on the land surface occur within the recharge areas of public water supplies the appropriate parties are informed of this risk. In addition, the groundwater section is determining the maximum appropriate density of leach fields to protect groundwater resources.

With regard to sludge, the Agency has general management guidelines, but legislation or regulations have not been developed.

3. Groundwater Protection Program

The Department is committed to developing guidance for the appropriate density of residences with on-site wastewater disposal systems within Department-designated Aquifer Protection Areas. The desired output is a straight-forward formulation which would be used by developers, local officials and State regulators to simplify the permitting of on-site domestic disposal systems within the area of land surface which supplies water to public water supply systems. Utilizing 205(j) funding, the Department has conducted a literature search regarding the on-site density problem. During this literature search, it became apparent that there is a scarcity of Vermont data on the issue. Therefore, in FY 1986, a study of groundwater quality down gradient of developments with varying densities of residences was begun to determine if there can be established a link between density of on-site systems and groundwater degradation. During FY 1985 the monitoring program to assess septic system density impact on groundwater was developed. In FY86, a project officer was hired by the Department of Water Resources and Environmental Engineering to oversee the implementation of the in-field study of the density of development in relation to the resultant concentration of nitrate in groundwater. The completion of this study will actually occur in Federal Fiscal Year 1987.

The Department is proceeding to develop a comprehensive coordinated groundwater protection program under recently passed legislation. A groundwater coordinating committee is discussing the whole range of groundwater management issues with a priority of protection of Class 1 aquifers which serve or have the potential to serve public water supply systems. When the program is adopted as a rule, the Department will proceed to implement those priority elements of the program for which funding is, or may become, available.

Approximately 67 landfills are regulated by the Department. Forty-nine are certified and 18 have assurances of discontinuance. Groundwater quality is measured as part of the certification. Contamination is addressed on a case-by-case basis.

Vermont plans to certify five hazardous waste storage sites and one treatment/recovery site during 1986. Permits will establish schedules to ameliorate any ground water contamination at these sites.

The discharge of unusable whey to hayfields and pastures is a potentially contaminating activity currently under study by the Department (see also page 82). Existing sites have been evaluated and criteria to protect ground and surface water quality will be established for future discharges and the selection of discharge sites. Field work is 75% complete for one of six sources of whey. A report is expected next year.

4. Cost/Benefit Assessment

As previously mentioned (page 79), 88 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 of the amount of money spent for industrial treatment facilities. In general, improved water quality has meant less weed and algae growth; therefore more and better swimming has resulted. Also, it is assumed that less sickness has occurred due to the removal of pathogens. It is difficult to quantify the benefits, but as a result of these public and private expenditures, approximately 55 rivers and three lakes have benefitted from improved water quality, enhancing recreational, fishery and aesthetic uses.

Table 25 lists the projects, by type and dollar amount, where construction has been started since January 1, 1984. The location of the municipal and major industrial facilities is shown in Figure 4.

Table 25

MUNICIPAL WASTEWATER FACILITY CONSTRUCTION STARTS
January 1, 1984 - January 1, 1986

| Project | Type | Dollar Amount |
|---|---|---|
| Town of Barre | Primary Upgrade | $ 2,500,000 |
| Town of Castleton | Sewer Extension | $ 1,600,000 |
| City of Rutland | Primary Upgrade | $15,000,000 |
| Sherburne FD #1 | Sludge Treatment | $ 500,000 |
| Town of Sherburne | Sewer Extension | $ 450,000 |
| City of South Burlington | Primary Upgrade | $ 4,300,000 |
| City of St. Albans | Primary Upgrade | $11,300,000 |
| Town of Wilmington | Primary Upgrade | $ 1,200,000 |

Vermont continues to carry out the full amount of EPA functions delegated to the state in the State-EPA agreement, and this effort will use the available 205(g) funds. A continuing and intensive effort is being made by the state to work with municipalities and their sewage treatment facility construction contractors in order to minimize contractors' extra charges for contract changes and overruns caused by delays in decision-making by the state and municipalities.

With the expected continuation of the present federal funding program at its past levels, Vermont can look forward to completing required upgrades at all of its primary plants, and to the construction of new secondary plants for all municipalities currently identified as needing some form of municipal system, in the near future. Efforts are now being made to identify other water quality problem areas, assess their impact on the beneficial uses of our surface waters, and develop a system for prioritizing these problems so that they can be addressed by the available funding programs in the proper order.

5. Surface Water Monitoring Programs

The Department has undertaken a variety of monitoring programs in order to assess water quality trends; determine where and what problems are occurring to the state's waters so as to resolve them; to insure compliance with discharge permits and to determine the capacity for assimilation of wastes. The trend monitoring programs include the following activities:

- Acid precipitation monitoring of 36 long-term study lakes.
- Ambient biomonitoring network.
- Spring phosphorus program for 70 lakes.
- Lay monitoring program.

a. Acid Precipitation Monitoring Program

Since the winter of 1979, the State of Vermont Department of Water Resources and Environmental Engineering has been monitoring lakes to ascertain their chemical characteristics.

Samples from nearly 200 lakes have been collected for chemical parameters during the winter months. For all practical purposes, every water body in the State of Vermont with a potential alkalinity of less than 12.5 miligrams/l has been sampled. This survey is based primarily on the Department's knowledge of geographic characteristics within the state as indicated by geologic formations, elevation, and land-use that result in low alkalinity water bodies (Clarkson 1982). These data have been used to estimate the percent of the total surface water acreage (exclusive of Lake Champlain and Memphremagog and the Connecticut River Reservoirs) in Vermont which falls into certain classifications related to sensitivity to acidification. This distribution is presented in the following table.

Table 26

ALKALINITY CLASSIFICATION OF VERMONT LAKES

| | Sensitivity Classification | Alkalinity Range (12.5 mlg/l) $CaCO_3$ | Number of Lakes | Area (Acres) | % of Total Lake Surface Area | Cumulative % Area |
|---|---|---|---|---|---|---|
| I. | Critically Acidic | >0 | 6 | 108 | 0.2 | 0.2 |
| II. | Extremely Sensitive | 2.5 | 24 | 2,303 | 4.9 | 5.1 |
| III. | Sensitive | 2.5-5 | 30 | 3,364 | 7.2 | 12.3 |
| IV. | Moderately Sensitive | 5-12.5 | 48 | 5,471 | 11.7 | 24.0 |
| V. | Not Sensitive | >12.5 | 420 | 35,606 | 76.0 | 58.4 |
| | TOTAL | | 528 | 46,852 | 100.0 | 100.0 |

As can be seen by Table 26, nearly one-quarter of the lake surface area in Vermont can be described as at least moderately sensitive to acidification.

b. Ambient Biomonitoring Network Program (ABN)

Vermont's rivers and streams receive and are expected to absorb most effluent discharges and surface runoff from around the state. Unfortunately, sporadic effluent wasteloads can cause a river's biota (living things) to be impacted for several months after the wasteload has moved downstream. On the other hand, changes in land use within a drainage basin can slowly change a river's character and in turn change its aquatic biota. This change usually goes unnoticed. In the past there has been no established monitoring program to evaluate the condition of the aquatic biota in Vermont's rivers and streams.

An Ambient Biomonitoring Program has now been established by the Department to monitor long-term water quality trends as revealed by changes in the aquatic biota. Ultimately, these data will assist in detecting incremental changes and use impairments on studied watercourses and in the establishment of effluent limits in water quality limited and other stream segments as necessary. Through 1984, the aquatic macroinvertebrate fauna from 57 ABN sites has been evaluated. In 1985, 33 sites were sampled: 11 new sites and 22 repeat sites.

Beginning in 1985, fish populations were sampled at selected ABN sites. Preliminary fish population assessments have been completed at ten locations thus far. The addition of fish population assessments to macroinvertebrate analysis may result in a more complete understanding of how the total aquatic community structure and function may be altered by watershed disturbances. In many cases the fish population is the primary resource to be protected, so that data collected directly from fish populations may be of paramount importance to a particular environmental question.

The Department of Water Resources and Environmental Engineering 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.

c. Spring Phosphorus Monitoring Program

Under the Spring Phosphorus Program, total phosphorus data from approximately 70 lakes is collected 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 223 lakes. A core of 36 lakes have eight or more years of data.

Based on springtime phosphorus concentrations, the trophic status of lakes is determined. For general results of this monitoring effort, see page 15.

d. Lay Monitoring Program

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 also 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 lakes and for the Department. Yearly reports prepared for the monitors by the Department allow them to follow trends in 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, a total of 56 lakes and 28 stations on Lake Champlain have been sampled during at least one summer sampling period. By 1984, 21 lakes and nine Lake Champlain stations had five or six consecutive years of reliable data.

The Department also does special monitoring or intensive water surveys including:

- Compliance monitoring
- Hydroelectric monitoring
- Toxicity testing
- Assimilative capacity studies/wasteload allocations
- Phosphorus modeling study of Lake Champlain
- River basin water quality management plans
- Special studies

e. Compliance Monitoring

Monitoring activities also include compliance monitoring for National Pollution Discharge Elimination System (NPDES) permit verification at municipal and industrial wastewater treatment facilities. It is anticipated that nearly 60 compliance sampling inspections will be undertaken during FY 1986. Additionally, intensified monitoring will be undertaken at selected municipal facilities which have been found to be in significant non-compliance with established permit conditions and for which a composite correction plan has been prepared by the Operations and Maintenance Section (see also Section F.i.C., page 82).

f. Hydroelectric Monitoring

In response to concerns about the effects of hydroelectric power generation stream flow regulation on aquatic biota, the Department of Water Resources and Environmental Engineering conducts biological assessment studies at selected hydroelectric generating facilities. The focus of this work is on the effects on fish and aquatic macroinvertebrates brought about by stream flow regulation.

The first of these studies was conducted in 1985 at a facility operated by the Central Vermont Public Service Corporation at Taftsville, Vermont on the Ottauquechee River. Fish and macroinvertebrate populations were sampled above the impoundment created by the dam and below the dam. During normal low flow periods, the impoundment/generation cycle of the facility caused rapid and extreme fluctuations in river flow below the dam, creating potential for damage to indigenous aquatic biota. Data from this study is currently being analyzed and a quality assurance project plan is to be developed for this activity.

g. Toxicity Testing

The Department of Water Resources and Environmental Engineering has developed the capability of producing water quality based toxicity testing data. The Department currently maintains culture of two species of daphnias: Daphnia pulex and Ceriodaphnia reticulata. Acute and chronic toxicity tests are conducted using these organisms. The Department will be developing the capability of conducting acute and chronic toxicity tests using the fathead minnow, Pimephales promelas. Test organisms will be obtained from external sources as physical limitations preclude the culturing of fish in the current laboratory facilities.

This toxicity testing capability will allow the Department to carry out the "Toxic Discharge Control Strategy" which is currently being developed. The goal of this "strategy" 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 (see also, "Toxics-Related Concerns", page 29).

### h. Assimilative Capacity Program/Wasteload Allocation

Water quality monitoring efforts continue to be undertaken to define the assimilative capacities of related river reaches. The Department is presently involved in developing a water quality model for the Passumpsic River to determine its assimilative capacity. This comes in response to a facility upgrade at the St. Johnsbury WWTF. The Deerfield River was also sampled during the summer of 1985. This was due to a proposed upgrade of the Wilmington WWTF and a request by a ski area for a share of the assimilative capacity. Modeling is being done to enable the Department to make a wasteload allocation.

The following ASCAP study priorities will be utilized to determine the studies to be done during the summer, 1986:

(a) Northfield (Dog River) - (A) Physical review of stream in July to refine ASCAP estimate. (B) If refined ASCAP estimate shows AWT may be needed, do intensive, three-day study in July or August.

(b) Hinesburg (LaPlatte River) - Intensive three-day study in July or August. Potential problem is whether wasteload will exist after draining and cleaning of lagoons.

(c) Barre (Stevens Branch) - Intensive study if Northfield or Hinesburg are not done.

(d) Randolph (Third Branch White River) - Physical review of stream to refine ASCAP estimate.

(e) Troy (Missisquoi River) - Physical review of stream to refine ASCAP estimate.

(f) Williamstown (Stevens Branch) - Physical review of stream to refine ASCAP estimate.

(g) St. Johnsbury (Passumpsic River) - Intensive three-day study (verification) if other intensive studies are not done ((a), (b) or (c) above).

(h) Poultney, Castleton, Fair Haven (Poultney River) - Intensive three-day study (after (a), (b), (c) and (g) above).

The Wasteload Allocation Process has been revised and a public hearing has been held. The Department presently is preparing further revisions as a result of the hearing and the Attorney General's ruling. When these are completed, the process will be formally adopted through the rule-making procedure. In addition to the Deerfield River, a wasteload allocation will need to be done for the lower Winooski River as soon as the process has been adopted.

## i. Phosphorus Modeling Study Of Lake Champlain

The Department has recently committed itself to developing a comprehensive long-term phosphorus modeling study of Lake Champlain and its tributaries. The ultimate goal of this study would be to understand better the lake as a system of interrelated parts, and to develop a phosphorus allocation process for the lake. The Burlington Bay region of the lake has been selected as the first area for study. Its selection was relatively simple considering that the competitive uses for the water resources of Burlington Bay range from wastewater disposal to drinking water supply. Also, future development in the Burlington waterfront area is greatly dependent upon having good water quality in the region. A comprehensive study plan is to be prepared and a quality assurance project plan will be developed for each data acquisition phase.

## j. River Basin Water Quality Management Plans

The Vermont River Basin Water Quality Management Plans, originally prepared in the mid-1970's, are presently being updated. The Upper Ottauquechee River Basin Water Quality Management Plan (a portion of the Black and Ottauquechee Basin), is in final draft form. Several items have arisen since the Water Resources Board rejected the proposed step-wise reclassification put forward by the Commissioner. These include:

(a) The completion of a proposed method to determine the proper length of Class C zones.

(b) The completion of a summertime assimilative capacity study.

(c) A request by the Town of Sherburne and the Killington Ski Area for the creation of a new Class C zone and,

(d) A request by local businessmen to determine the assimilative capacity in the winter and during the summer to winter transition period.

The Department must resolve these items before finalizing the plan. The tentative schedule calls for a final plan by October, 1986.

The Mad River Basin Plan has had in-house staff review. The first public meeting was held nearly a year ago. Changes in plan format have delayed final review of the plan.

The field work for the North Branch of the Deerfield River and the Upper West River basin plans was conducted during the summer of 1985. The draft Deerfield River plan has been completed and numerous management actions are being taken as a result of the findings.

Currently, the Department is analyzing which basins to work in next. The present priority, however, is to devote most of the time to bringing the four basin plans in progress to completion. Also, the completed plans will be evaluated to determine their effectiveness, noting whether problems are being properly resolved and if not, why, and how implementation can be improved.

k. Special Studies

Substantial short-term monitoring efforts have been undertaken to support an Upland Stream Study and an On-Site Systems Study. The Upland Stream Study showed that "periphytic growth did not appear to increase from the increased addition" of inorganic nitrogen and/or phosphorus to four Vermont upland streams." It is hypothesized that lack of sunlight was the limiting factor, but further research is necessary to confirm this. The On-Site Systems Study evaluates treatment levels achieved by existing on-site systems. Four spray irrigation areas were originally selected as study sites; however, after being denied access to these places, the study has had to be redefined. It is now planned to utilize a private ski area's spray disposal site which is on state forest land. Data collection has begun and will continue for a full year, with a final report due in December, 1986. A consultant has been hired to oversee the study. Also an individual has been contracted to perform a literature search.

The Department, under contract to the Department of Forests, Parks and Recreation, provides lab services for bacteriological testing of water samples from state park beaches. The Department of Forests, Parks and Recreation samples 31 beaches every two weeks during the summer months. The Water Resources lab tests for fecal coliforms. To be safe for swimming, the water must have a fecal coliform count of less than 200 per 100 ml. If the samples exceed 200 fecals, possible shutdown of the swim area is considered based on circumstances at the specific location.

## G. RECOMMENDATIONS

Vermont is taking positive steps towards achieving and maintaining its outstanding water resources. However, it is fully recognized that serious existing and potential problems still remain and must be addressed if Vermont's high water quality is to be maintained for future generations. Some of these problems and recommendations for resolution are discussed in this section.

1. <u>Wastewater Treatment Facility Construction</u>

The single most effective action which has achieved clean waters in the state has been and continues to be the construction of public and private wastewater treatment facilities and industrial pretreatment facilities. There remain but three municipalities having no central sewage treatment facilities. These will be constructed within the near future, provided that sufficient funding is available. In order to facilitate better waste treatment to achieve water quality, eleven primary treatment plants need to be upgraded to at least secondary treatment. According to assimilative capacity studies, advanced waste treatment will be necessary in some treatment facilities in order to achieve and maintain water quality standards, particularly with regard to the dissolved oxygen parameter. It is recommended that federal funding be continued to insure that public facilities may continue to be built and upgraded.

2. <u>Laboratory Evaluation/Training Program</u>

Through the Compliance Monitoring Unit, using 104(g)(1) funds, Vermont provided individual laboratory evaluation and training at each Vermont municipal facility. This program found many errors in procedure which were corrected by training. It also found a high turnover of technicians. Unfortunately, EPA would not fund the program further and it was very much reduced. This lab evaluating and training program provided additional proof that Vermont must proceed with some type of quality assurance program. Presently, funding has been secured for approximately one year, but the program needs to be and should be funded on a continuing basis.

3. Increased Wastewater Treatment Facility Inspections

It is recommended that the number of municipal wastewater treatment inspectors be increased. With only two or three inspectors for the entire state presently, and 88 treatment facilities, plant visits are very rare, and often only made when a violation is suspected. In order to improve state/local cooperation and operator efficiency, more frequent visits are necessary to offer state assistance. Cooperation to assist operators with problems on an on-going basis will result in better plant operation and cleaner receiving waters in the long run.

4. Nonpoint Source Pollution

In FY 1985, the Department completed a Nonpoint Source Assessment for the Association of State and Interstate Water Pollution Control Administrators. The completion of this survey has emphatically pointed out the lack of knowledge of nonpoint source pollution in Vermont and the need for a better assessment to determine impacts, set priorities and to develop necessary programs or to modify existing programs. In anticipation of federal legislation last year, it was estimated that almost $300,000 per year could be utilized to implement a program to control erosion and sedimentation for agricultural, silvicultural and construction activities alone. Through contracts with the Soil Conservation Service and Natural Resource Conservation Districts and by hiring three engineers/hydrologists, it is believed that the scattered and often locally very severe erosion and sedimentation problems could be significantly reduced. The survey also indicated that other areas of nonpoint source pollution control need analysis and assessment to determine impacts and proper management responses. These include wetland encroachment, existing hydroelectric facilities, urban runoff and stream channel enlargement and erosion, thermal pollution, streambank erosion, and the long-term effects of small and large on-site wastewater systems and spray irrigation systems, particularly in upland areas.

5. Combined Sewer Overflows

The water quality impact of combined sewer overflows needs to be assessed with respect to other point and nonpoint source discharges and priorities for problem resolution need to be set. A report by Metcalf and Eddy reviewing the Burlington combined sewer problem was issued in November, 1983. Further work needs to be done in Burlington and in the other 9 Vermont communities with combined sewer problems.

6. Threshold Criteria

The definition of what constitutes a discharge to surface waters from on-site wastewater disposal systems requiring a permit needs to be developed. Legislation has just been passed which addresses this need, and both the Department and the Water Resources Board will be developing regulations in response to this legislation.

7. Class C Zones

The scientific methodology for setting Class C zone length needs to be refined and implemented. In the past, Class C zone lengths have been set by using best professional judgement.

8. Water Withdrawals

Water withdrawals for snowmaking at ski areas are increasing as ski areas expand. The main impact caused by dewatering is elimination of the cold water fishery, primarily trout species. Although specific problem sites have been identified, it is unknown how widespread the problem is at this time. It is recommended that fishery statistics be assembled with the help of the Fish and Wildlife Department to determine the extent of the problem, and a strategy developed to mitigate the impacts.

## APPENDIX A

## CRITERIA FOR EVALUATING THE SUPPORT OF A DESIGNATED USE*

| SUPPORT OF DESIGNATED USE | BIOLOGICAL/ PHYSICAL INFORMATION | CHEMICAL INFORMATION | DIRECT OBSERVATION/ PROFESSIONAL JUDGEMENT |
|---|---|---|---|
| Waters support designated use<br><br>Minor/no impairment of uses | Informations show that there is no impairment of the designated aquatic life community (in all respects described on previous page). | Standard is exceeded in 0 - 10% of the analyses and the mean measured value is less than the standard. | Direct observation shows that the designated use is supported, or professional judgement indicates that there is no reason for the use not to be supported. |
| Waters partially support designated use<br><br>Moderate - some interference with designated uses | After evaluating information, there is some uncertainty that a balanced aquatic life community is fully supported. For instance, some species may not be able to propagate in the stream, although a put-and-take fishery may exist. | Standard is exceeded in 11 - 25% of the analyses and the mean measured value is less than the standard; or standard is exceeded in 0 - 10% of analyses and mean measured value exceeds the standard. | Direct observation shows that the use exists in the waterbody but professional judgement suggest the use is not supported at a maximum level (e.g. citizen complaints on record, fisherman success rates declining). |
| Waters do not support designated uses<br><br>Severe - designated uses are precluded | Data show that the waterbody does not support the designated aquatic community. For example, the aquatic community is definitely imbalanced and or severely stressed; few or none of the expected species exist in the waterbody. | Standard is exceeded in more than 25% of analyses and mean measured value is less than the standard; or standard is exceeded in 11 -24% of analyses and mean measured value exceeds the standard. | Direct observations show overt signs of obvious use impairment (e.g. severe or frequent fish kills), or provide no evidence that the use exists. Professional judgment suggests that the use can not be supported due to known or suspected water quality impacts. |
| Unknown | Limited or no data are available. | No representative data are available for assessment. | Limited or no background information or direct obs. |

* From Guidance. 1986 Water Quality Assessments. (Section 305(b) Reports). EPA. June, 1985.