STATE OF MAINE
1986 WATER QUALITY ASSESSMENT

The Carrabassett River at North Anson

DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATE OF MAINE

A Report to Congress Prepared by Maine's Bureau of Water Quality Control Pursuant to Section 305(b) of the Federal Clean Water Act

STATE OF MAINE
1986 WATER QUALITY ASSESSMENT

A Report to Congress Prepared Pursuant to Section 305(b) of the Federal Water Pollution Control Act as amended.

Prepared by
Terry McGovern

Department of Environmental Protection
Bureau of Water Quality Control

TABLE OF CONTENTS

TABLES OF CONTENTS (Continued)

PAGE

WATER QUALITY MANAGEMENT

APPENDIXES

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Section 305(b) of the Federal Water Pollution Control Act (Clean Water Act) requires each state to submit a biennial report to the U.S. Environmental Protection Agency (USEPA) 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.

This 305(b) report will be useful as a tool for water quality management and in the development of Maine's continuing planning process and annual work programs. By analyzing information to identify data quality and confidence, program successes or failures, site specific problem areas, emerging problems, information gaps and the reoccurrence of old problems, future decisions affecting Maine's waters can make full use of what is known about water quality.

Maine's 1986 Water Quality Assessment contains a collection of facts dealing with what is happening to the State's surface and ground waters. After assimilating these facts, one should have a good working knowlege of Maine's overall water quality and water quality management programs. To assist the reader, an executive summary may be found on page v. This 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 last (1984) assessment. Outlined in the report are the activities of the various Bureau of Water Quality Control programs including: Planning, Construction Grants, Licensing, Enforcement, Water Quality Monitoring, Lakes Protection, Groundwater Protection and Nonpoint Source Controls.

The report includes an analysis of the extent to which the State's waters provide for recreation and healthy fish and wildlife populations as well as an analysis of the extent to which pollution control actions have achieved this level of water quality. Maine's 1986 Water Quality Assessment contains a new section on groundwater. State programs and our understanding of the nature of groundwater problems are in an embryonic stage when compared to surface water management. The section on groundwater reflects this and provides fewer answers than questions. Maine's next (1988) water quality assessment will contain an expanded section on groundwater problems and programs. Also included in this report are recommendations for additional pollution control measures and a description of the nature and extent of nonpoint sources of pollution and recommendations for their control.

EXECUTIVE SUMMARY

Over the past 15 years, with assistance from federal and local governments and the active concern of its citizenry, the State of Maine has succeeded in reversing a long period of decline in the quality of its waters. This period of water quality degradation began in the first half of the nineteenth century and continued well into the 1970's. During this time, many of Maine's major waterways were transformed from clean, free-flowing rivers into open sewers choked with sewage and industrial pollution, where only the lowest forms of life could survive. Unregulated manufacturing, agriculture and food processing activities converted numerous lakes into prematurely eutrophic water bodies, characterized by decaying mats of slimy green algae and massive fish kills.

Although the State of Maine began making an effort to clean up its waters as far back as the 1930's, improvements were very slow in coming. Finally, with the passage of the Federal Clean Water Act Amendments of 1972, Maine was able to start making significant progress toward cleaning up its waters. The Clean Water Act authorized the funds which made possible the construction of dozens of facilities throughout Maine to treat both municipal and industrial wastewaters. The act also authorized funding to identify and clean up widely scattered non-point sources of pollution affecting rivers, streams, lakes and ground water.

Paralleling the national mood, Maine greatly increased its level of commitment to the goal of clean water. Beginning in 1968, the Maine Legislature enacted a number of innovative laws aimed at cleaning up the water and protecting the environment. Consequently, Maine came to be known as one of the leading states with regard to environmental law.

As a result of these efforts, Maine's waters are now much cleaner than they were just a few years ago. Some of the State's most polluted lakes have shown marked improvement. Atlantic salmon and other fish have returned to several Maine rivers. People are beginning to use many previously polluted streams and rivers for swimming, fishing and canoeing. Riverfront property which was virtually worthless has begun to increase in value. Major celebrations take place annually to recognize Maine's accomplishments in clean water.

Despite these improvements, a great deal more work remains to be done. Additional effort is needed not only to make further progress, but also to maintain the gains made thus far. In light of the diminished federal commitment to the construction grants program, Maine's task has grown more difficult. As the more severe municipal and industrial pollution sources have been abated, other previously ignored types of pollution have become more important. Non-point sources continue to degrade the quality of many of Maine's waters. Acid rain and hazardous wastes, practically unknown 10 years ago, menace Maine's surface and ground waters. These "newer" forms of pollution are more insidious in their effect and are more difficult to treat than the industrial and municipal wastewaters by which they had previously been overshadowed. In response to these and other threats Maine has become one of the first states to develop biological monitoring techniques and the first in the nation to incorporate these techniques into its water quality laws.

BACKGROUND INFORMATION

Statistics

Maine is New England's largest and least densely populated state. Most of the population is concentrated in the southern and coastal portions of the State and in a broad band on either side of Interstate 95. Maine's 5779 lakes and ponds cover an area somewhat larger than the State of Rhode Island. There are over 7000 brooks, streams and rivers in Maine, ranging in length from less than 2 miles to nearly 200 miles with an estimated total length of 31,672 miles. The St. Croix, St. John, St. Francis and Southwest Branch of the St. John make up part of the U.S./Canada boundary while the Salmon Falls River lies on the Maine/New Hampshire boundary. Numerous lakes lie on both the New Hampshire and Canadian boundaries. Inland and coastal wetlands and marshes in Maine are estimated to exceed 750,000 acres in area.

Over 400 river and stream systems, ranging in size from a few hundred acres to over 1850 square miles, empty into Maine's estuarine and near shore waters. For most reporting purposes, Maine is divided by the U.S. Geological Survey into 6 major drainage basins. Two of these (Southern Maine Basin and Eastern Coastal Basin) are, in fact, made up of dozens of smaller basins that empty into the Atlantic Ocean. Large portions of 5 river basins are located in New Hampshire, Quebec and New Brunswick. Table 1 presents this information in summary form. Figure 1 shows the location and extent of Maine's major and minor rivers.

Table 1. State of Maine: Population and Natural Resource Statistics

Population - 1,164,000 (Mid-1985 estimate)	
Total land area -	30,995 mi^2 (100%)
Forested Land -	27,512 mi^2 (88.7%)
Cropland -	924 mi^2 (3.0%)
Pasture -	216 mi^2 (0.7%)
Swamps and Bogs -	1171 mi^2 (3.8%)
Other land -	1172 mi^2 (3.8%)
Total area of lakes and ponds - 1554 mi^2	
Total area of marine waters - 3600 mi^2	
Total area of estuaries, bays, and near shore waters - 1850 mi^2	
Total area of offshore waters - 1750 mi^2	
Major drainage basins - 6	
Major and minor basins discharging to Atlantic Ocean - 427	
Names and mileages of inland border waters (total miles = 274)	
Saint Croix R. (U.S.- Canada) - 52 miles	
Saint Francis R. (U.S. - Canada) - 27 miles	
Saint John and Saint Francis (U.S.- Canada) - 45 miles	
SW. Branch of the St. John R. (U.S.- Canada) - 50 miles	
Salmon Falls R. (ME-NH) - 30 miles	
Border lakes: ME-NH - 15 miles; U.S.- Canada - 42 miles	
Number of lakes and ponds - 5,779	
Number of publicly owned lakes and ponds (great ponds) - 3,500	
Number of rivers, streams and brooks over two miles in length - 7,290	
Total length of rivers, streams, brooks, etc. - 31,672 miles	
Total length of rivers - 3704 miles	
Total length of streams - 3909 miles	
Total length of brooks - 22,829 miles	
Total length of other waters (creeks, outlets, etc.) - 1,230 miles	
Total length of coastline - 3,500 miles	

FIGURE 1

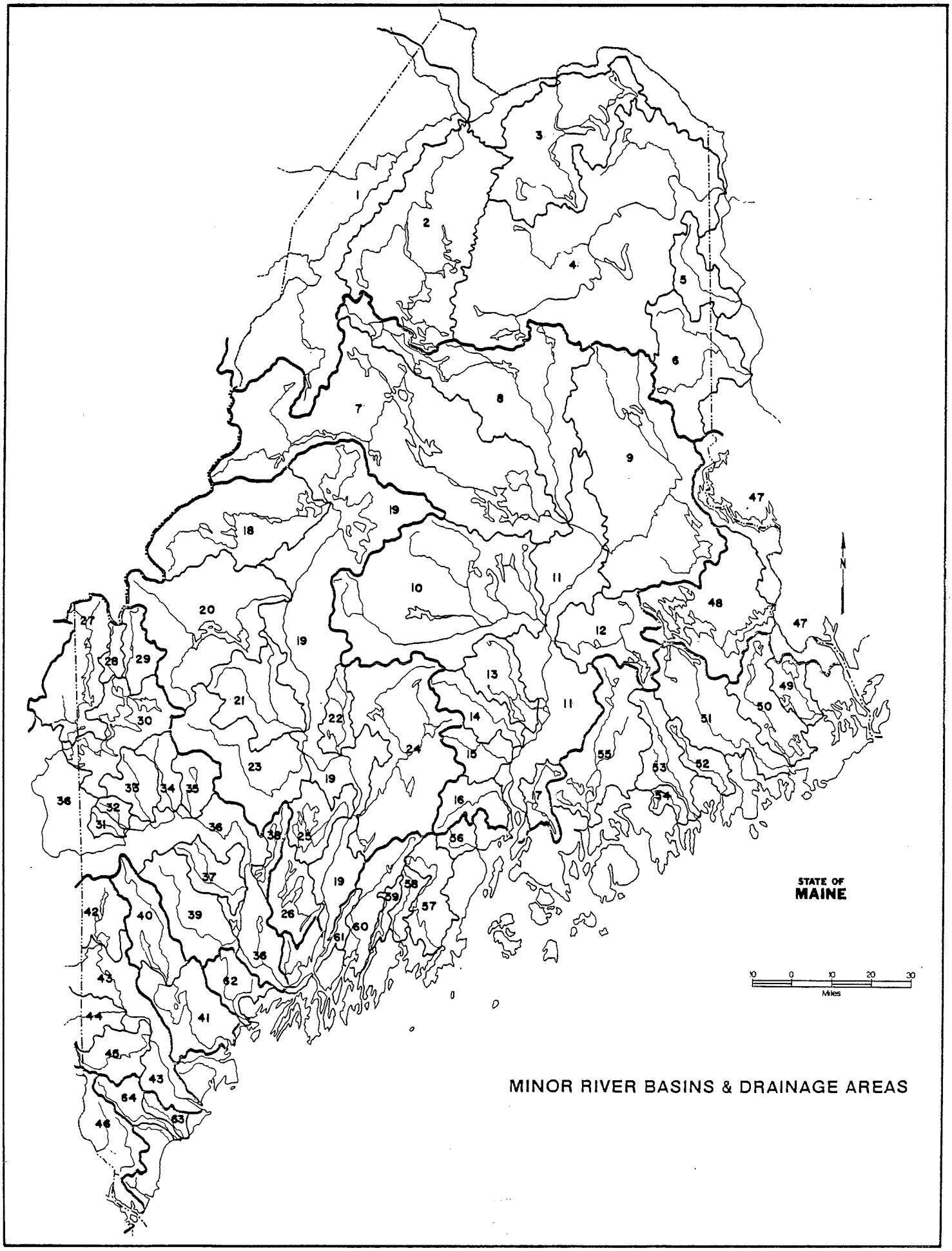

STATE OF
MAINE
N
10 0 10 20 30
Miles
MINOR RIVER BASINS & DRAINAGE AREAS

FIGURE 1 Continued

MINOR RIVER BASINS & DRAINAGE AREAS

Saint John River System
1. Main Stem
2. Allagash
3. Fish
4. Aroostook
5. Prestile
6. Meduxnekeag

Penobscot River System
7. West Branch
8. East Branch
9. Mattawamkeag
10. Piscataquis
11. Main Stem
12. Passadumkeag
13. Pushaw
14. Kenduskeag
15. Sourdnahunk
16. Marsh
17. Orland

Kennebec River System
18. Moose
19. Main Stem
20. Dead
21. Carrabassett
22. Wesserunsett
23. Sandy
24. Sebasticook
25. Messalonskee
26. Cobbosseecontee

Androscoggin River System
27. Megalloway
28. Cupsuptic
29. Kennebago
30. Lakes Area
31. Sunday
32. Bear
33. Ellis
34. Swift
35. Webb
36. Main Stem
37. Nezinscot
38. Dead
39. Little Androscoggin

Presumpscot River System
40. Songo-Crooked
41. Main Stem

Saco River System
42. Old Course Saco
43. Main Stem
44. Ossipee
45. Little Ossipee

Piscataqua River System
46. Main Stem

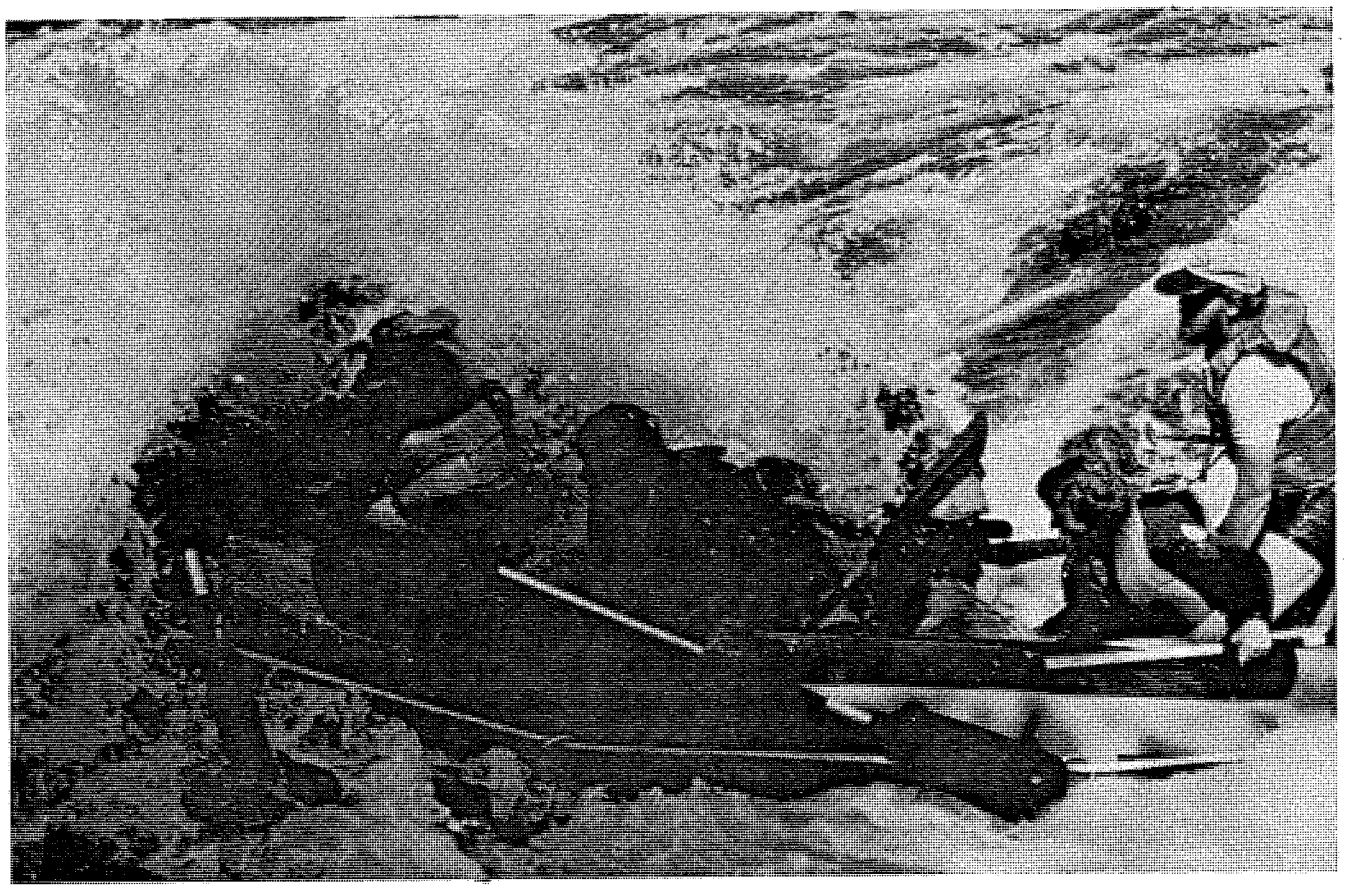
Saint Croix River System
47. Main Stem
48. West Grand Lakes

Coastal Drainage System

Eastern
49. Dennys
50. East Machias
51. Machias
52. Pleasant
53. Narraguagus
54. Union
55. Tunk

Mid Coastal
56. Passagassawakeag
57. Saint George
58. Medomak
59. Damariscotta
60. Sheepscot
61. Eastern

Southern
62. Royal
63. Kennebunk
64. Mousam



Whitewater rafting in the Kennebec River Gorge

Water Quality Overview

In general, Maine water quality is very good. Many of the rivers and lakes that were grossly polluted earlier in the century have recovered since the passage of the Clean Water Act in 1972. Most of the western and northern portions of Maine contain waters that are relatively pristine; being affected, primarily by atmospheric deposition, timber-harvesting activities and natural disasters such as forest fires.

In the more populated areas of Maine, water quality is affected by a combination of point sources such as industrial and municipal effluents, and nonpoint sources such as urban and suburban stormwater runoff, combined sewer overflows, agriculture, silviculture, construction-related runoff, and waste disposal practices. Most of the larger municipal and industrial effluents now receive the equivalent of best practicable treatment; hence the huge improvement in the water quality of major rivers in the last twenty years. Given the difficulties of controlling nonpoint sources, the low number of remaining untreated point sources and the emergence of ground water quality and hydropower as major concerns, it is doubtful that future water quality improvements will continue at the same rate as has occurred recently.

This report includes an assessment of water quality conditions in all of Maine's 31,672 miles of rivers and streams. This assessment has been made based upon a combination of chemical and biological data for those river and stream segments which were actually monitored and on the considered judgment of the Department's water quality evaluation staff. For the period covered by the report, 1984-1986, monitoring data exists for about 19% of Maine's total estimated river, stream and brook miles. Roughly 97% miles of Maine's rivers, streams and brooks fully support the designated uses of recreation in and on the water and protection and propogation of fish, shellfish and wildlife.

A significant percentage of assessed waters are not fully supporting their assigned classifications or the swimmable/fishable goal. A great majority of these waters are judged to be fully supporting the fishable part of the goal, i.e., dissolved oxygen levels are good to excellent and healthy populations of fish and aquatic invertebrates appear to be present. Many of these waters are in violation of their bacteria standard due to a combination of factors such as urban stormwater, combined sewer overflows, and untreated or inadequately-treated domestic wastewater discharges.

SURFACE WATERS

AMBIENT WATER QUALITY

Water quality can be described in terms of physical, chemical and biological characteristics but such a description is unintelligible if presented as a mass of data. Public interest in water quality is centered on the uses which can be made of water. Questions such as "Is that water safe for swimming?", "Are fish caught there safe to eat?" and "Does the water in that lake turn green in the summer?" make up a large portion of public inquiries received by the Bureau of Water Quality Control. To answer such questions, Maine waters are managed under a use-based classification system.

As established in Maine Statute, a classification consists of a designated use (such as swimming or fish habitat) and standards (such as bacteria levels or dissolved oxygen levels) which specify levels of water quality necessary to maintain the designated use(s). Thus, to answer a questions about swimming, one might reply "Yes, that river is classified as suitable for water contact recreation and the data we have collected show that bacteria standards are being met there." If a water body is meeting all its classification standards, it can be described as "attaining its classification." If a water body is not attaining its classification, the classification statute directs the DEP to take measures to improve water quality there. It may take many years, however, to improve water quality due to factors such as availability of federal funds, relative priority of the problem, etc.

Layered on top of Maine's water quality classification system are the requirements of the Federal Clean Water Act (CWA) which establish the national interim goals (designated uses) "wherever attainable ... of ... the protection and propagation of fish, shellfish and wildlife ... (and) recreation in and on the water". Maine's recently repealed classification system contained some classifications which had designated uses lower than those specified by the CWA as the nation's interim goals. Maine's revised water classification system contains no classifications with designated uses lower than the nation's interim goals. Thus, it is not very useful to describe water quality in terms of Maine's former classifications. Maine's revised classification system has yet to be approved by the USEPA administrator. Further, Maine's revised classification system is only the first step of a two step process. During 1986 and 1987, Maine will be going through a process of examining the interim classifications assigned to State waters and making many changes in the assignment of classification.

The standards to be used for assessing attainment of designated uses must be scientifically valid. Some of the standards contained in Maine's former classification system are not scientifically valid. Indeed, making the standards defensible is the primary reason that Maine's classification system has been revised (Appendix IV). Assessing Maine's water quality in terms of the invalid scientific basis of the former classification system serves little purpose.

Guidance from the USEPA on 305(b) reports requires that ambient water quality be described in two ways: 1) in terms of attaining the designated uses assigned under State law and 2) in terms of attaining the interim goals of the Clean Water Act. Because of the transitional nature of water quality

classification in Maine at the time this report is being written, the requirement for describing ambient water quality in terms of designated uses assigned under state law must be broadly interpreted. For purposes of assessing ambient water quality in this report, it will be assumed that if a water body attains the interim goals of the CWA, it also attains the requirements of Maine's revised classification system. Appendix V contains a comparison of attainment under Maine's former and revised classification systems. For further information on the revision of Maine's water quality classification system refer to Appendixes III, IV & V and the section describing Maine's water quality standards.

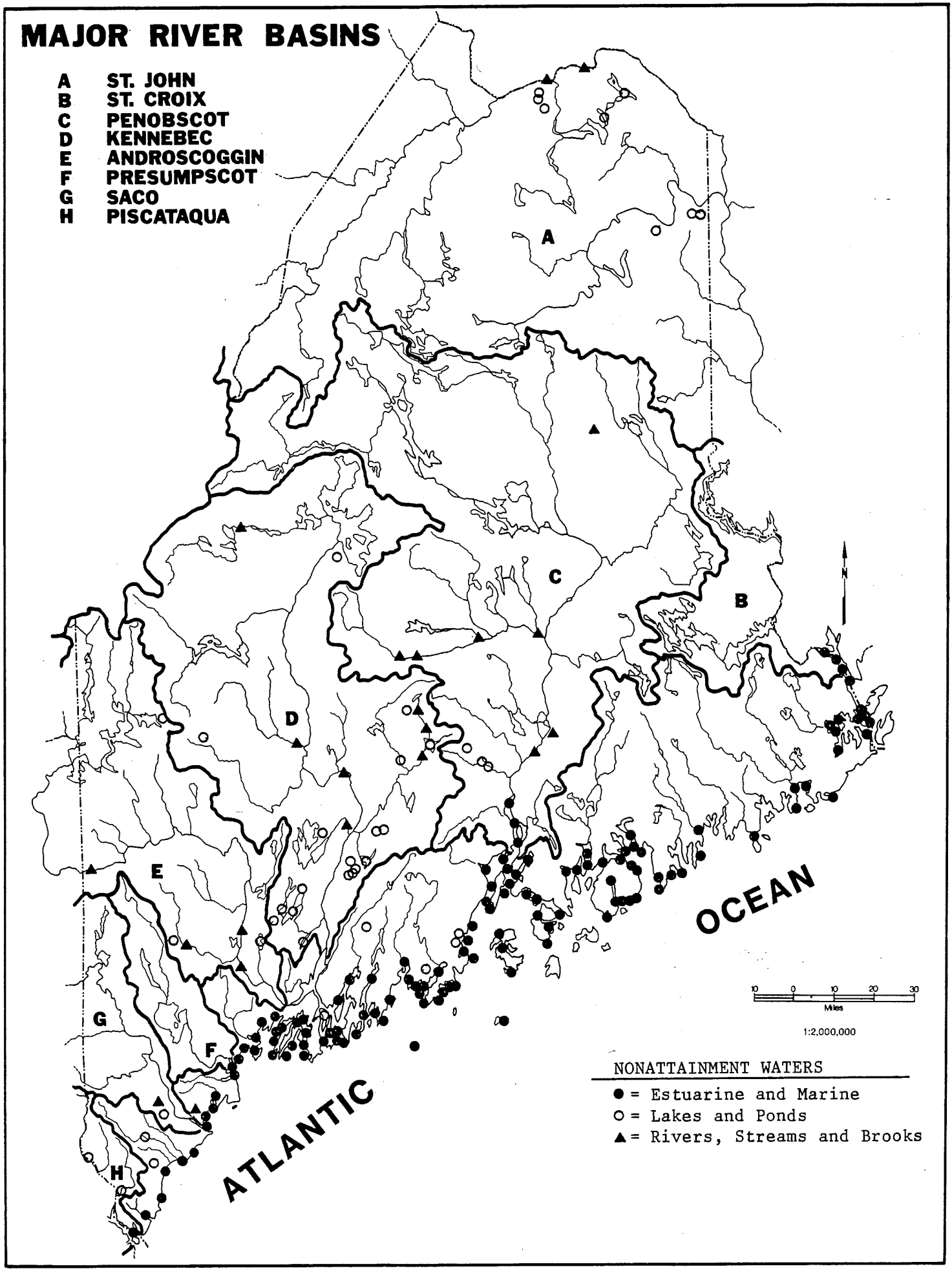
The criteria used in this report to evaluate whether surface waters are attaining the interim goals of the Clean Water Act differ markedly from those used in earlier reports. This difference is due mainly to scientific advances in evaluating water quality. Refer to Appendix IV for more information on the scientific basis of this report.

To assess what portion of Maine's lakes, rivers, streams and brooks are suitable for recreation in and on the water, this report uses the new bacteriological criteria recommended by USEPA (Federal register, Vol. 51, No. 45, p. 8013, 3/7/86) of 126 Escherichia coli/100 ml. For estuarine and marine waters, the USEPA bacteriological criteria of 35 Enterococci/100 ml is used in this report to assess suitability for recreation in and on the water. Analysis of E. coli and Enterococci levels in Maine waters began in 1984. With the enactment of a classification system using health effects-based bacteriological standards, the State of Maine leads the nation in implementing their use.

To assess what portion of Maine's rivers, streams and brooks provide for the protection and propagation of fish and wildlife, this report uses an adaptation of the dissolved oxygen (DO) criteria proposed by USEPA (Federal Register, Vol. 50, No. 76, p.15634, 4/19/85) as well as the biological criteria specified for Class C waters in Maine's proposed classification system. For DO, riverine waterbodies which are predicted to have a 7-day mean minimum DO greater than 5.0 mg/l under conditions of 7Q10 (the lowest 7-day flow which occurs only once in ten years) are considered to be providing for the protection and propagation of fish and wildlife. To assess the impact of toxics and other nonconventional pollutants, Maine uses biomonitoring of bethic macroinvertebrates. This method is much more sophisticated, sensitive and stringent than the "balanced population" criteria provided in USEPA 305(b) guidance. For biota, Maine riverine waters "of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community" and where the fish are also safe for human consumption are considered to be providing for the protection and propagation of fish and wildlife. This biological criteria is also used to assess the quality of estuarine and marine habitats along with a DO criteria of 70% of saturation. For Maine lakes, the biological criteria is somewhat more stringent, requiring that a natural habitat be maintained. Because of the occurrence of thermal stratification in most Maine lakes, Maine does not have a DO standard for lakes and ponds. Since Maine law prohibits new discharge of wastewater directly to lakes and ponds, no DO standard is necessary to ensure the protection and propagation of fish and wildlife.

Those surface waters in Maine which do not attain the interim goals of the Clean Water Act are denoted in Figure 2. Further information on the nature, extent and cause of these nonattainment areas is given in Appendixes I and V.

Figure 2. State of Maine: Surface Water Quality Attainment Status



Rivers, Streams and Brooks

The State of Maine is unique in the Northeastern United States in the number and diversity of significant natural and recreational river, stream and brook resources that it possesses. The Maine Department of Inland Fisheries and Wildlife estimates that there are 31,672 miles of permanently flowing rivers, streams and brooks in the State, a figure equivalent to one linear mile for every square mile of land surface. Rivers vary in size from the long and wide Penobscot River which drains 8570 square miles and runs 225 miles from its headwaters to the sea, to the short and narrow Rapid River flowing for five miles between lower Richardson and Umbagog Lakes. Over sixty rivers enter the ocean along the Maine coast. Four rivers form the U.S./Canadian international boundary. Three of these boundary rivers are in the headwaters of the St. John basin which at its outlet has a drainage basin 2 1/2 times as big as the Penobscot basin (the largest basin lying wholly within Maine). Among these resources are waters which are widely recognized for their outstanding values including:

a. 17 river gorges, 61 waterfalls, and 38 white water rapids identified as being outstanding geological or hydrological features with statewide significance.

b. More miles of undeveloped free-flowing rivers than any other state in the Northeast United States.

c. River corridor segments which provide habitat for diverse populations of rare and endangered plant species of State and national importance.

d. Coastal rivers which provide significant habitat for the northern bald eagle and shortnosed sturgeon, species included on the Federal Endangered Species List.

e. 192 miles of high quality river habitat for an internationally known landlocked salmon fishery and 25,000 miles of primary brook trout habitat known for its excellence throughout New England.

f. The only rivers in the eastern United States containing significant self-sustaining Atlantic salmon runs and, due to Federal and State restoration efforts, the East coast's most heavily fished Atlantic sea-run salmon river.

g. Three rivers which together account for over 60% of the state's commercial alewife catch and a number of other coastal rivers which have the potential to become profitable commercial fisheries.

h. The only two stretches of class V white water and the longest single stretch of class II-IV rapids in the entire New England region.

i. The longest and most popular extended back country canoe trips in the Northeast and almost 4000 miles of other rivers suitable to boaters of all ability levels.

Main Stems of Major Rivers

Maine rivers with a drainage area greater than 500 square miles deserve special consideration in assessing ambient water quality. This is due to settlement patterns as well as the greater opportunities for recreation and habitat on these 18 major rivers. Ten of these 18 rivers are tributaries of still larger rivers. Four of these 18 rivers (the Allagash, Dead, East Branch of the Penobscot and West Branch of the Penobscot) lie in remote areas and can be characterized as pristine.

Seven of the 18 rivers (the Androscoggin, Aroostook, Kennebec, Penobscot, Presumpscot, Saint Croix and Saint John) are pristine in their upper watersheds but pass through urbanized, industrialized areas in their lower reaches. Prior to the treatment of industrial and municipal wastewater, these seven rivers had serious pollution problems in their lower reaches. The Androscoggin River was once characterized as one of the nation's ten most polluted rivers. With Lewiston, Maine's second largest city, located on the banks of the Androscoggin, the pollution of the past generated widespread public concern for water quality. Similar situations in other cities and towns along the lower reaches of these seven rivers have resulted in unequivocal public support for clean water in this State.

Seven of these 18 rivers (the Mattawamkeag, Moose, Piscataquis, Saco, Sandy, Sebasticook and Union) are less densely settled and industrialized than the preceding group but have historically had segments with pollution problems. On three of these rivers (the Moose, Piscataquis and Sebasticook) wastewater treatment facilities are still being planned or are under construction. The lateness of the water cleanup on these rivers is due to a higher priority having been placed on severe pollution problems, such as existed on the Androscoggin River. The present status of Maine's major rivers is presented in Table 2.

Building wastewater treatment facilities will not solve all of Maine's water quality problems, however. Maine's cities and larger towns also have problems with their wastewater collection systems. In many cases, sections of the sewer system are leaky and allow groundwater to enter the sewers, thereby causing excessive flows which overload the treatment plant. An even more serious, though related, problem is combined sewer overflows (CSO's). During spring as well as during summer rain storms, the carrying capacity of sewers can be exceeded. Short of replacing the sewer system, the only solution to the problem is to design overflow structures (CSO's) into the system. The CSO's prevent sewage from backing up into basements. Correcting CSO's will be enormously expensive. Tearing up streets and installing new sewers for wastewater and stormwater is estimated to have a $500 million cost for eliminating CSO's in Maine.

Although the continuation of Federal assistance for construction of wastewater treatment facilities is uncertain, it is hoped that by 1992, all municipal wastewater in Maine will be receiving treatment. If Federal assistance is discontinued, it is almost certain that some raw sewage will still be running into Maine's rivers and streams at the turn of the century. Facility needs such as upgrading wastewater collection and treatment systems, illustrate the importance of a continuing Federal financial commitment to the infrastructure upon which clean water is dependent.

Table 2. Maine Attainment Status: Major[1] Rivers

River Name	Drainage Area (mi^2) Total	In Maine	Maine Length (miles)	Fish[2] miles	Swim[3] miles	Fish/Swim miles
Androscoggin	3,542	2,817	110	97	89	76(69%)
Kennebec	5,893	5,893	128	128	123	123(96%)
Dead	874	874	23	23	23	23(100%)
Moose	722	722	52	52	45	45 (87%)
Sandy	596	596	70	70	70	70(100%)
Sebasticook	946	946	30	23	27	23 (79%)
Penobscot	8,207	8,207	75	75	75	75(100%)
East Branch	1,120	1,120	46	46	46	46(100%)
Mattawamkeag	1,507	1,507	50	50	50	50(100%)
Piscataquis	1,453	1,453	65	57	31	31 (48%)
West Branch	2,131	2,131	49	49	49	49(100%)
Presumpscot	641	641	24	24	24	24(100%)
Saco	1,700	815	85	85	84	84 (99%)
Saint Croix	1,631	994	56	56	56	56(100%)
Saint John[4]	8,275	4,266	146	146	112	112 (77%)
Allagash	1,235	1,235	54	54	54	54(100%)
Aroostook	2,418	2,405	106	106	106	106(100%)
Union	563	563	4	4	4	4(100%)
TOTAL MILES			1173	1145	1068	1049
PERCENTAGE			(100%)	(98%)	(91%)	(89%)

1 Major: Those with a drainage area greater than 500 square miles.
2 Those which attain the criteria for protection and propagation of fish and wildlife.
3 Those which attain the criteria for recreation in and on the water.
4 That portion of the basin upstream of the Hamlin, Maine - Grand Falls, New Brunswick boundary.

Minor Rivers, Streams and Brooks.

The place name "brooks" has generally been applied to the smallest watercourses in Maine. Watercourses named as streams are usually intermediate in size between brooks and rivers. There are, however, many exceptions to this general scheme. Numerous brook and stream segments have a larger drainage area than certain river segments. Other watercourse names in Maine include creek (generally restricted to coastal streams in southwestern Maine), outlet (usually a watercourse draining a pond or lake) and thorofare (usually a watercourse running between two lakes).

As can be seen in Table 3, the percentage of watercourse miles suitable for fishing and swimming in Maine is highest for brooks and lowest for major rivers. This is due to patterns of settlement and industrialization in Maine and the rest of New England being directed by the availability of water power. Virtually every polluted river, brook and stream segment in Maine had its beginnings as a water quality problem when a dam was constructed during the 1800's or 1700's. Because of the greater power generation potential of Maine's major rivers, water pollution problems eventually became most severe there.

Since over 97% of Maine's watercourse miles attain the interim goals of the Clean Water Act, one might think Maine's water cleanup is almost complete. There are two considerations, however, which indicate that it may take a decade or more for all the State's watercourses to be suitable for fishing and swimming. The first consideration is the law of diminishing returns. The second consideration is linked to the first and is that some of the most intractable water quality problems in Maine must still be corrected. It costs much more to increase the percentage of Fish/Swim miles from 97% to 98% that it did to increase it from 87% to 88%. While the type of facility projects underway ten years ago consisted mostly of building large-scale wastewater treatment facilities to accept wastewater from existing sewers, the types of projects needed over the next ten years are quite different. Small and medium-scale wastewater treatment facility projects dominate plans for new construction. In many cases, sewage collection systems and wastewater treatment facilities need upgrading. Where water quality limited segments occur, extraordinary expenditures for wastewater treatment (advanced secondary, tertiary or even completely removing a discharge from waterbody) will be required. As outlined in the section on Monitoring and Maintenance of Wastewater Treatment Facilities, ensuring the proper functioning of treatment is a formidable task and increasingly more of the funds allocated for water quality control will be applied to this activity. Refer to Appendix I for more information on river, stream and brook segments which are not yet suitable for recreation in and on the water and the protection and propagation of fish and wildlife.

Table 3. Maine Attainment Status: Rivers, Streams and Brooks

Waterbody Type	Miles in Maine	Miles Monitored	Miles Assessed	Miles Fish/Swim[1]	Miles Partial Fish/Swim	Miles Where Eventual Fish/Swim Attainment Is Likely	Miles Where Eventual Fish/Swim Attainment Is Unlikely
Major Rivers	1,173	780	1,173	1,049(89%)	111	1,173	-0-
Minor Rivers	2,233	1,150	2,233	2,076(93%)	149	2,233	-0-
Streams	3,909	1,040	3,909	3,719(95%)	43	3,909	-0-
Brooks	22,829	3,020	22,829	22,639(99%)	190	22,829	-0-
Other	1,230	150	1,230	1,210(98%)	20	1,230	-0-
	31,672	6,140	31,672	30,695(97%)	513	31,672	-0-

1 Miles which attain criteria for recreation in and on the water and protection and propagation of fish and wildlife.

Lakes and Ponds

As detailed in Table 4, all of Maine's 5,779 lakes and ponds attain bacteriological standards for the protection of swimmers and biological standards for the protection of habitat. Despite this apparently suitable water quality, 3.6% of Maine's lake and pond surface area is classified as priority problem water due to periodic algal blooms and a resultant lack of transparency. The number of water bodies which turn green in the summer, however, is not the most important statistic pertaining to Maine's lakes and ponds. Trends in trophic state for a particular lake or pond are the statistic of greatest importance in managing the quality of a lake or pond.

Trophic state is derived from measurements of transparency, chlorophyll content, phosphorus content, etc. in a lake or pond. The function of trophic state determinations is twofold. Its most important function is as an early warning system for lakes and ponds where quality is deteriorating due to human activity. Although a casual observer would probably not notice any change in the quality of a lake with an increasing trophic state, the trends of the statistic are a reliable indication that the lake will soon have algal blooms and not fully support the uses of recreation in and on the water. A trend of increasing trophic state in a Maine lake is used as justification for more control of nonpoint source pollution in the watershed.

The second function of the trophic state statistic is to monitor water quality trends in lakes which have periodic algal blooms and which are being managed for restoration of their quality. Of the two functions of the trophic state statistic, DEP regards its prevention of water quality problems as more important that documenting the correction of problems. Another statistic relevant to assessing the quality of Maine's lakes and ponds is the vulnerability index. The vulnerability index's function is to identify lakes and ponds which, because of their hydrologic and demographic setting are very susceptible to conditions of increasing trophic state and, ultimately, algal blooms in response to development in the watershed. Refer to Appendix I for more information on problem waters not included in Table 4.

Like all other types of water resources in Maine, the quality of lakes and ponds is threatened by impending cuts in Federal funding. At the direction of the Administration, USEPA has recommended discontinuation of Section 314 funding for lake restoration. Although the Section 314 Clean Lakes Program can be faulted for being based only on the correction of problems rather than including prevention of water quality problems, elimination of it would severely impair Maine's goal of eliminating culturally-induced algal blooms from our lakes and ponds.

If the Clean Water Act is amended to facilitate better control of nonpoint source pollution, the effect of eliminating the Clean Lakes Program would be mitigated. A major fault of present Federal programs, however, is their emphasis on controlling soil erosion rather than phosphorus runoff. Although the two are related, effective control of phosphorus in lake watersheds is the best method of protecting and improving the quality of lakes and ponds.

Table 4. Maine Attainment Status: Lakes and Ponds

Type & (#)	Acres in Maine	Acres Monitored [1]	Acres Asssessed	Acres Fish/Swim [2]	Acres Partial Fish/Swim [3]	Acres Where Eventual Fish/Swim Attainment Is Likely	Acres Where Eventual Fish/Swim Attainment Is Unlikely
Those > 5,000 Acres (36)	421,022	184,810	421,022	409,479(97%)	11,543	421,022	-0-
Those < 5,000 Acres (5,743)	573,538	178,174	573,538	548,916(96%)	24,622	573,538	-0-
	994,560	362,984	994,560	958,395(96%)	36,165	994,560	-0-

1 Acres monitored for trophic state.

2 Those which attain the criteria for recreation in and on the water and protection and propagation of fish and wildlife.

3 Although all lakes and ponds in Maine attain the bacteriological and biological criteria for fish/swim there are lakes and ponds (total acreage = 36,165) which experience periodic algae blooms. Although these ponds might be considered fully suitable for swimming in some other states, both Maine statute and public opinion, categorize them as being impaired for the use of recreation in the water due to their occasional lack of transparency.

Maine's goal for the management of lakes and ponds is that they have a stable or decreasing trophic state and be free of culturally induced algal blooms which impair their use and enjoyment. While Maine statute defines this condition as acceptable water quality, it does not constitute natural or pristine water quality where lake watersheds already have extensive agricultural or residential development. Restoration of pristine water quality in lakes with developed watersheds would require "undevelopment", reforestation and other measures which are impractical. Maine's management goal results in a diversity of trophic state in Maine's lakes and ponds. Those who place a high value on water clarity or who prefer to fish only for trout and salmon can enjoy the resource of a lake with a low trophic state. Lakes with naturally high trophic state provide opportunities for those anglers who want to catch lots of large bass and pickerel. Maintaining this diversity of trophic states in the long term for Maine lakes and ponds is a formidable challenge. This challenge will be met only if supported at the Local, Regional, State and Federal levels.

Estuaries, Bays and Other Near Shore Waters

The areas included in this subcategory are those less than 60 feet deep at mean low tide in addition to areas such as Casco Bay which have portions deeper than 60 feet but which form distinct basins due to islands, peninsulas, etc. separating them from the open sea. This subcategory is thought to include all salt water in Maine where there is a measurable water quality effect due to wastewater discharges. The best available estimate of the total area of Maine's estuaries, bays and other near shore waters is 1850 square miles. This statistic was derived by the grid-square method off a 1:500,000 map and is a very "rough" estimate. Plans for Maine's 1988 305(b) report include doing digital planimetry on coastal charts to refine this statistic.

As presented in Table 5, over 98% of Maine's estuaries, bays and near shore waters fully support the uses of recreation in and on the water protection and propagation of fish, shellfish and wildlife. There are 36 square miles of near shore waters which do not fully support these uses due to high bacteria levels. Because bacteria standards are more restrictive for shellfish harvesting than for swimming, 28 square miles of these nonattainment waters support the use of swimming but not shellfish harvesting. See Appendixes I and V for more information on near shore waters with impaired uses.

The shellfish of greatest commercial value in Maine is the softshell clam (Mya arenaria). About 77 square miles of intertidal mud flats are productive enough for commercial harvesting of this species. However, 14 square miles of these mudflats are closed to shellfish harvesting due to discharges of untreated or inadequately treated wastewater. It seems unlikely that some of these closed areas (such as Portland Harbor) will ever support shellfish harvesting but in March of 1986, the Maine Legislature reaffirmed that the State's water quality management goals include "That water quality be sufficient to provide for the protection and propagation of fish, shellfish and wildlife and, provide for recreation in and on the water. The Maine Department of Environmental Protection and Department of Marine Resources are currently discussing how this Legislative mandate can be implemented. One possibility is to identify recoverable clam flats, prioritize their cleanup and develop action plans to improve water quality so that shellfish harvesting can be reestablished. Legislation may be proposed in 1987 to enhance efforts to protect and improve water quality in shellfish harvesting areas.

Offshore Marine Waters

Very little water quality monitoring has been conducted in Maine's offshore marine waters because of their presumed pristine condition. Although pollutants of human origin are present in these waters, they are present at such low levels as to be unmeasurable. As pollutants are carried away from Maine's near shore areas by currents, they undergo chemical and biological breakdown and are diluted by a factor of many orders of magnitude. Atmospheric deposition also puts pollutants into offshore waters, but again, these are unmeasurable .

Through the processes of bioaccumulation and biomagnification, elevated levels of pollutants do occur in the tissues of animals living in offshore waters, especially the tissues of higher-order predators. Animals which become contaminated while spending part of their life cycle in near shore waters and then migrate to offshore waters may be a significant source of contamination in offshore food webs.

WINTER AT SEA-TAKING IN SAIL OFF THE COAST Winslow Homer 1869

Table 5. Maine Attainment Status: Marine Waters

Hydrologic Subunit	Area in Maine (mi^2)	Monitored Area (mi^2)	Assessed Area (mi^2)	Fish/Swim Area (mi^2)	Partial Fish/Swim Area (mi^2)	Area (mi^2) Where Eventual Fish/Swim Is Likely	Area (mi^2) Where Eventual Fish/Swim Is Unlikely
Offshore Waters	1,750	-0-	1,750(100%)	1,750(100%)	-0-	1,750	-0-
Estuaries, Bays and Near Shore Waters	1,850	88	1,850	1,814(98%)	28	1,850	-0-
	3,600	88	3,600	3,564(99%)	28	3,600	-0-
**********							
Intertidal areas which are prime clam habitat	77	77	77	63(82%)	4	77	-0-

[1] Those areas which attain the criteria for recreation in and on the water and protection and propagation of fish, shellfish and wildlife.

[2] Of the 36 square miles (14 of them intertidal) of marine waters in Maine which do not support general or conditional harvesting of shellfish, 28 square miles are nonetheless suitable for recreation in and on the water.

WATER QUALITY TRENDS

To determine water quality trends on a state-wide or national level, available information must be evaluated in terms of appropriate criteria. Since water quality management in the United States is based on protection of uses, it seems that water quality trends should be evaluated in terms of attaining the interim goals of the Clean Water Act - recreation in and on the water and protection and propagation of fish, shellfish and wildlife. If the water quality of a particular river segment is evaluated in terms of its attainment/nonattainment of the nation's interim goals, analysis is both simplified and made more meaningful. The current attainment in Maine of the nation's interim water quality management goals is presented in Table 6 along with estimates of what level of attainment will exist in 1988. These attainment statistics are based on USEPA's recently published criteria for bacteria and dissolved oxygen as well as the biological standards contained in Maine's recently revised water quality standards. The trends projected to occur over the next two years represent slow but steady improvement in Maine's water quality. As attainment nears 100% in the years ahead, it is likely that the rate of improvement will slow even more due to the increasing incremental costs of water cleanup described in the section on the quality of minor rivers, streams and brooks.

The period of Maine's water cleanup which saw the most dramatic gains in ambient water quality was from 1975 to 1985. This was a direct result of the amendments made to the Clean Water Act in 1972. As detailed in the section on major rivers, it was those waterbodies which had the most severe water quality problems in 1975. The water quality problems were caused largely by the discharge of untreated and inadequately treated wastewater from 22 pulp and/or paper manufacturing facilities located within Maine and from 2 facilities located outside the State. During the years 1975-1977, secondary wastewater treatment began at all but one of the pulp and/or paper manufacturing facilities located in Maine. Although construction of numerous municipal wastewater treatment facilities was also accomplished during this period, it was the reduction of BOD loading from pulp and paper mills which caused the dramatic improvement in Maine's rivers.

While qualitative improvements in the uses made of water represent an important trend, it still seems more important to describe historical water quality in terms of scientifically valid criteria necessary to support the uses which are the nation's interim goals. Evaluating historical suitability for habitat presents different problems than does evaluation of past suitability for swimming but both evaluations require some common data bases. Currently the DEP is developing both the data bases and analytical methods necessary to provide this information. Most important in this study is preparation of a chronology of pollutant loading and wastewater treatment in the State. In the absence of data of adequate quality or quantity describing the past chemical, biological and bacteriological quality of waters, much reliance will have to be made on mathematical models of the past effects of pollution sources. Besides estimates of loading, more information on bacterial die off rates, etc., must be developed. One particular area which must be investigated is the interpretation of data produced by outdated methods. Evaluation must be made of past analyses for "Bacillus coli", total coliforms, fecal coliforms or Winkler method dissolved oxygen determinations in terms of methods such as E.coli MF determinations which are now used.

Table 6. Water Quality Trends in Maine's Surface Waters

Hydrologic Subunit	Area or Length	Percent of Area or Length Attaining Fish/Swim				
		1955	1965	1975	1985	Est. 1988
Lakes & Ponds	1,554 mi^2	**********			96.4%	96.5%
Major Rivers	1,173 mi	* MORE STUDY NEEDED *			89.4%	93.4%
Minor Rivers	2,233 mi	* THESE STATISTICS *			93.0%	94.5%
Streams	3,909 mi	* WILL BE INCLUDED *			95.1%	95.4%
Brooks	22,829 mi	* IN THE 1988 305(b) *			99.2%	99.2%
Other Inland Waters	1,230 mi	* REPORT * **********			98.4%	98.4%
Offshore Marine Waters	1,750 mi^2	100%	100%	100%	100%	100%
Estuaries, Bays and Near Shore Marine Waters	1,850 mi^2	**********			98.1%	99.0%

[1]Fish/Swim is an abreviation for water quality sufficient to support the uses of recreation in and on the water and the uses of protection and propagation of fish, shellfish and wildlife.

Complicating factors in these evaluations are reconciling present practices of weekly sampling and use of 90% confidence limits for data evaluation with past sampling which sometimes consisted of one or a few samples collected from a site each year. Coupled with these factors are institutional considerations. For example, although Maine's coastal waters are much cleaner than they were twenty years ago, the number of acres open to shellfish harvesting is about the same as 20 years ago. The reason for this is that there were areas open to harvesting twenty years ago which probably should have been closed.

CAUSE OF NONATTAINMENT

As shown in Table 7, untreated wastewater is the major cause of nonattainment for all types of Maine's surface waters except for lakes and ponds where nonpoint source pollution is the major cause. With few exceptions, the sources of untreated wastewater are municipalities or individual residences. Inadequate sewer systems are the second most important cause of nonattainment in waters other than lakes and ponds. Inadequately treated wastewater, discharged by treatment facilities which need renovation or expansion, is another significant cause of nonattainment.

While wastewater treatment facilities and sewage collection systems are most commonly thought of as the infrastructure supporting water quality control, manure storage pits, fencing to keep cattle out of streams and soil conservation projects are also important components of the infrastructure necessary for the protection of water quality. Currently, the Federal financial assistance which is necessary to meet these infrastructure needs is in jeopardy. With Congress' reauthorization of the Clean Water Act still under consideration, it is uncertain when the capital-intensive projects needed to complete Maine's water cleanup can commence. if Congress continues funding Maine's cleanup at current levels, complete attainment of the interim use goals of the Clean Water Act can be expected to occur within the next six to ten years. Without continuation of the Federal role in water quality management, the cleanup will take much longer.

PUBLIC HEALTH CONCERNS

The safeness of swimming and fish consumption are the two major public health concerns about surface waters in Maine. The revision of Maine's water quality standards in 1986 included the enactment of health-effects based standards for recreational water quality as recommended by USEPA. Implementation of these standards has several components: 1) water quality monitoring. 2) data analysis and identification of waters unsafe for swimming 3) establishment of area closures and/or advisories, 4) public education and 5) development of action plans for reduction of bacteria levels, where necessary. Even if Maine attains the interim goals of the Clean Water Act through the construction of more facilities for the collection and treatment of wastewater, occasional facility malfunctions will cause some waters to be temporarily unsafe for swimming. For this reason, recreational water quality will be a continuing public health concern. Consequently, implementation of bacteriological water quality standards will be an ongoing rather than temporary activity.

Table 7. Causes of Surface Water Nonattainment[1] in Maine

Hydrologic Subunit	Percent Nonattainment Caused By				
	Untreated Wastewater	Inadequately Treated Wastewater	Inadequate Sewer Systems	Nonpoint Sources	Other
Lakes & Ponds	0%	0.5%[2]	0%	87.7%[3]	11.8%[4]
Major Rivers	55%	10%	35%	0%	0%
Minor Rivers	93%	5%	2%	0%	0%
Streams	98%	0%	2%	0%	0%
Brooks	97%	2%	1%	0%	0%
Other Inland Waters	100%	0%	0%	0%	0%
Estuaries, Bays and Other Near Shore Waters	72%	6%	22%	0%	0%

[1] Those which do not support or which only partially support the uses of recreation in and on the water and protection and propagation of fish, shellfish and wildlife. Percentages are based on total nonattainment area or miles for each hydrologic subunit.

[2] Occasional malfunctions of the Rangeley wastewater treatment facility cause algal blooms in Haley Pond (170 acres)

[3] Annabessacook Lake (1,420 acres; 3.9% of total nonattainment area) is affected by internal recycling of phosphorus from past discharges (now discontinued) as well as nonpoint source pollution.

[4] Sebasticook Lake (4,288 acres) is affected by treated and untreated wastewater discharges as well as nonpoint source pollution.

Since 1982, the Maine DEP has been conducting fish tissue analyses to determine whether fish are safe for human consumption. All the results obtained from the DEP's sampling program have documented suitability for human consumption but some fish samples collected by USEPA and analysed for dioxin content have caused significant public health concerns in Maine. A white sucker (Catostomus commersoni) collected from the Androscoggin River by USEPA in the summer of 1984, was found to have 29 parts per trillion of dioxin on a whole-fish basis. Although dioxin levels in the fillet were well below the Food and Drug Administration's guidelines for limited consumption of fish with dioxin levels between 25 and 50 parts per trillion, the State of Maine issued a health advisory on May 20, 1985 recommending that consumption of fish caught from the Androscoggin River be limited to two or three meals per month. This consumption advisory remains in effect pending further sample analysis and study. Occassional samples of other fish have had leels of mercury in excess of FDA standards. These have been reported for older lake trout (Salvelinus namaycush) and the source is presumed to be natural.

Analysis of sludge samples from various wastewater treatment facilities in the State have revealed detectable levels of dioxin in some industrially-derived sludges. The presence of dioxin in these sludges is believed to be related to the chlorine bleaching of wood pulp prior to papermaking. The dioxin contamination of some sludges has raised public health concerns regarding the landspreading of sludge. Because sludge is produced as a result of wastewater treatment necessary to protect surface waters, public health concerns related to sludge landspreading are included in this section. The major public health concerns, however, related to lansdpreading of sludge are contamination of groundwater and food products rather than contamination of surface water. The Maine DEP is currently developing dioxin standards for sludge landspreading. Hopefully, the establishment of dioxin standards for sludge will reduce public apprehension about landspreading.

Two minor public health concerns about surface waters are the health-effects of shellfish consumption and odors from wastewater treatment systems. Maine's Department of Marine Resources (DMR) regularly determines bacteria levels in shellfish harvesting areas as required by the National Shellfish Sanitation Program. Harvesting areas which are closed due to pollution are patrolled by State and local marine wardens to prevent illegal harvesting of shellfish, thereby protecting consumers. In 1985, another concern related to shellfish consumption surfaced. Samples of crabs were found to contain elevated concentrations of heavy metals. One possible source of heavy metals contamination which has been suggested as responsible is the scraping of boat bottoms prior to repainting. Further study of this situation, including more extensive sampling of crabs and lobsters, is currently underway.

Design defficiencies in several wastewater collection and/or treatment systems in Maine have been manifested in the production of objectionable odors. The DEP's Division of Operation and Maintenance, through its technical assistance function, has succeeded in significantly reducing objectional odors from wastewater collection and treatment systems.

HABITAT FOR AQUATIC, ESTUARINE AND MARINE ORGANISMS

Protection of habitat has direct economic benefits such as commercial and sport fisheries, shellfish harvesting, aquaculture and tourism. These economic benefits, however, are secondary to the personal benefits that the people of Maine derive from a State policy prohibiting changes in water quality which would harm the resident biological community.

There are still pockets of pollution in Maine where the habitat of aquatic, estuarine and marine organisms is impaired. These situations have existed for a long time; prior to the enactment of modern water pollution control laws. The extent of impaired habitat in Maine was much greater twenty years ago. Those waters of Maine which do not fully support the uses of protection and propagation of fish, shellfish and wildlife are listed in Appendix I.

Twenty years ago, impairment of aquatic, estuarine and marine habitats in Maine was thought to be almost entirely the result of untreated wastewater reducing dissolved oxygen levels. Since the toxic effects of DDT and other substances in the environment became known, the task of water quality management has become increasingly complex. Although much progress has been made in the areas of identifying toxic substances, developing methods to measure concentrations of toxic substances, determining what concentrations of toxic substances produce conditions toxic to aquatic life, developing bioassay methods to determine the overall toxicity of effluents and developing methods for monitoring biological communities in Maine's waters, many questions remain unanswered.

Impairments of aquatic, estuarine and marine habitats in Maine fall into four categories: 1) impairment caused by untreated wastewater, 2) impairment caused by toxic wastewater which is inadequately treated, 3) impairment caused by wastewater treatment facility malfunctions and 4) impairment caused by oil spills, illegal discharge of chemical wastes, etc. In some cases, a wastewater treatment facility has been constructed which was supposed to restore habitat but after commencing operation has been found to still be impairing habitat. Table 8 provides a report of catastrophic fish kills and their causes for the period 1984-1986.

Table 8. Pollution Related Fish Kills in Maine: 1984-1986

Waterbody	Town	Date	Species	Estimated Number	Cause
1. Mile Brook & Caribou Str.	Caribou	17 June 84	Mixed	1400	Ammonia Spill
2. Tributary to Meduxnekeag R.	Littleton	9 Aug 84	Mixed	100	Pesticides
3. Mattanawcook Stream	Lincoln	11 Sept 84	W.Sucker	17	Boiler Waste
4. Wilson Stream	Wilton	18 Dec 84	Mixed	400	Concrete Spill
5. Presumpscot River	Westbrook	24 Aug 85	Mixed	200	Treatment Plant Failure
6. Trafton Lake	Limestone	23 July 85	Brk.Trout	500	Pesticides
7. Sebasticook River	Corinna	22 Sept 85	Mixed	500	Treatment Plant failure

GROUNDWATER

AMBIENT WATER QUALITY

There are many sources of ground water contamination in Maine, with septic tanks, underground storage tanks, road salt storage and municipal landfills estimated to causing the greatest problems (Table 9). The DEP has programs to study and abate pollution from the latter three sources. These studies have found more than 300 contaminated domestic and public wells near underground storage tanks, sand-salt piles and municipal landfills in Maine (Table 10). Additionally, 41 wells are known to have been contaminated by harzardous waste dumps.

Work performed on 28 sand-salt piles in Kennebec County, Maine showed an average contamination plume of 20 acres per site. Seven hundred and fifty sand-salt piles in Maine have been registered, thus an estimated 15,000 acres of ground water are potentially contaminated by this source. Contamination plumes from landfills, underground storage tanks, and septic systems are assumed to be smaller due to attenuation in soils. Despite this, the large number of leaking underground tanks and septic systems causes these sources to produce the largest area of nonattainment in Maine (Table 10). There is almost no information on contamination from other nonpoint sources, but they are estimated to contaminate at least as much ground water as septic systems and leaking underground storage tanks.

Combining the estimated areas of nonattainment due to all sources from Table 10, an estimated 760 square miles of ground water are contaminated in Maine (Table 11). This is approximately 2.5 percent of Maine's land area. A more comprehensive evaluation of Maine's groundwater resource will be available in the 1988 305 (b) report after studies have been completed.

WATER QUALITY TRENDS

Trends in the reported quality of Maine's ground water reflects more on the State's monitoring initiative and not necessarily the actual quality of the water. As efforts to monitor groundwater have intensified, more instances of contamination have been found. One area where there is a real increase in contamination is leaking underground storage tanks. Tanks placed in the ground many years ago are now showing fatigue. It is expected that the rate of failures will continue to increase with time.

CAUSES OF CONTAMINATION

Major sources of contamination are listed in Table 9. Primary areas of concern in Maine are septic tanks, underground storage tanks, salt storage and landfills. Significant contaminating substances include organic chemicals, pesticides, and fuels; inorganic chemicals including nitrates, arsenic, salts and heavy metals; and radioactive materials which are of natural geologic origin.

PUBLIC HEALTH CONCERNS

A comprehensive review of Maine's groundwater contamination problems and its influence on public health has not been undertaken. It is known that over 300 domestic wells are contaminated in the State from various sources. It is presumed that this does not represent the full extent of the impact (Table 10).

Table 9 Contaminants of Maine Groundwater and Their Sources

MAJOR SOURCES OF GROUND-WATER CONTAMINATION IN MAINE

SOURCE	CHECK	RANK
Septic Tanks	X	1
Municipal landfills	X	4
On-site industrial landfills (excluding pits, lagoons, surface impoundments)	X	
Other landfills	X	
Surface impoundments (excluding oil and gas brine pits)	X	
Oil and gas brine pits		
Underground storage tanks	X	2
Injection Wells		
Abandoned hazardous waste sites	X	
Regulated hazardous waste sites	X	
Salt water intrusion	X	
Land Application/treatment	X	
Agricultural activities	X	
Road salting (and salt storage)	X	3
Other (specify) Radon, geologic sources	X	

SUBSTANCES CONTAMINATING GROUND WATER IN MAINE

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

Table 10. Causes of Groundwater Contamination in Maine [1]

Locale	Percent Nonattainment Caused By					
	Land Fills	LUST[2]	Sand/Salt Storage	Septic Systems	Hazardous Materials	Other[3]
State of Maine	12%	14%	3%	31%	1%	39%
Androscoggin Cty.						
Aroostook Cty.						
Cumberland Cty.						
Franklin Cty.						
Hancock Cty.						
Kennebec Cty.						
Knox Cty						
Lincoln Cty.			MORE STUDY NEEDED.			
Oxford Cty.						
Penobscot Cty.			THESE STATISTICS WILL			
Piscataquis Cty.						
Somerset Cty.			BE INCLUDED IN THE			
Waldo Cty.						
Washington Cty.			1988 305(b) REPORT			
York Cty.						
Number of Domestic/Public Wells known to be contaminated by:						
State of Maine	16	150	150	unknown	41	unknown

1 Only contamination severe enough to cause groundwater to be unsuitable for drinking water supply is included in this table. Percentages are based on estimated rather than known contamination

2 Leaking Underground Storage Tanks

3 Areas underlying urbanized and industrialized areas, septic systems, wastewater lagoons, agricultural areas, road sides, areas affected by salt water intrusion, etc.

Table 11. Maine Attainment Status: Groundwater

Locale	Land Area(mi^2)	1984 Population	Known Contaminated Area (mi^2)	Estimated Contaminated Area (mi^2)
State of Maine	30,995	1,156,485		760
Androscoggin Cty.	476	100,007		
Aroostook Cty.	6,721	88,949		
Cumberland Cty.	877	223,246		
Franklin Cty.	1,699	29,029	MORE STUDY NEEDED.	
Hancock Cty.	1,537	43,433		
Kennebec Cty.	876	112,184	THESE STATISTICS	
Knox Cty	370	34,155		
Lincoln Cty.	458	27,525	WILL BE INCLUDED	
Oxford Cty.	2,053	49,656		
Penobscot Cty.	3,430	138,429	IN THE 1988 305(b)	
Piscataquis Cty.	3,986	17,998		
Sagadahoc Cty.	257	30,327	REPORT	
Somerset Cty.	3,931	46,481		
Waldo Cty.	730	29,451		
Washington Cty.	2,586	34,115		
York Cty.	1,008	151,500		

WATER QUALITY MANAGEMENT

WATER QUALITY STANDARDS

The primary consideration for each waterbody in Maine is whether its water quality is acceptable or unacceptable. The criteria used to determine acceptability are those contained in Maine's Water Classification Statutes. The purposes of these statutes is to define the minimum required quality for various waterbodies and to provide direction for Maine's Water Quality Management Plan. Simply put, Maine law requires the Department of Environmental Protection (DEP) to identify waters with quality which is unacceptable (not meeting the requirements of classification) and develop programs to upgrade the quality of those waters so that they attain their classification.

The State of Maine is in a period of transition with regard to water quality classification. Since the late 1970's, there has been a growing awareness of the inadequacies of the statutes on water classification. The problem is twofold: 1) the classifications do not provide an appropriate series of choices for the management of the State's various water resources and 2) the water quality standards of each classification are not scientifically defensible. To correct these , the DEP organized a study group which analyzed the issues and conducted scientific research into the nature of water quality in Maine. This effort resulted in the drafting of Legislative Document 1503 (later redrafted as L.D. 2283) - An Act to Amend the Classification System for Maine Waters and Change the Classification of Certain Waters. This legislation underwent intensive study by the Joint Standing Committee on Energy and Natural Resources of the 112th Maine Legislature. On April 4, 1986, the revision of Maine's water quality classification system received final approval from the Maine Legislature. On April 16, it was signed into law by Governor Joseph Brennan. Maine's revised water quality standards must still receive approval from USEPA. More information on the revision of Maine's water quality standards can be found in Appendixes III, IV and V.

The revisions contained in L.D. 2283 represent the first step of a two step process. Although this legislation has revised the system for water quality classification, the classifications assigned to specific waterbodies are still being studied. One staff person in the Division of Environmental Evaluation and Lake Studies works half-time on water quality standards and issues related to assignment of classification. Recommendations for changes in assignment of classification will be made to subsequent Legislatures. To determine the appropriate classifications for Maine waters, DEP is conducting water quality monitoring and facilitating public participation through the establishment of ten Regional Water Quality Advisory Committees (RWQAC's).

Coordinated by Maine's ten regional planning agencies, the RWQAC's are composed of nearly two hundred citizen volunteers who represent a broad range of regional and local water interests. One method being used to tap the unparalleled resource these committees represent is a questionnaire on water quality classification. The questionnaire (Appendix VI) is designed for group discussion and decision-making and consists of 25 case studies in water quality management. The discussion topics deal with real situations of water classification in Maine which are presented in hypothetical format to enhance objectivity.

The classification questionnaire is part of the first of four steps in the reassignment of classifications for the State's waters. Based on analysis of the RWQAC's response and ambient water quality data, DEP will develop draft recommendations on what changes in water quality classification are appropriate for each region. These will be sent back to each RWQAC for discussion and analysis. Each RWQAC will then form its own draft recommendations and present them at a public workshop. After the workshops, each RWQAC will develop its final recommendations to DEP on water classification.

In the second step, the DEP will make its recommendations on reassignments of water classification to the Board of Environmental Protection (BEP). In the third step, the BEP will hold public hearings on water classification and then make its recommendation to the Legislature. The fourth step will be another pubic hearing and then a decision by the Legislature as to what classification applied to which waters will best serve the public interest.

CONSTRUCTION AND LICENSING OF WASTEWATER TREATMENT FACILITIES

Although most of the large communities in Maine have publicly-owned sewage treatment facilities, there are still a number of areas where domestic sewage is either not adequately treated or not treated at all. Such areas include entire towns or villages as well as small groups of homes, businesses or seasonal dwellings.

Some communities have sewage treatment facilities that do not adequately treat sewage, either due to design deficiencies or operational problems. In other cases, the sewage collection system is in such poor condition that excessive water enters the system, either through infiltration or inflow, resulting in combined sewer overflows, ineffective treatment and/or excessive treatment and maintenance costs.

Many of the communities in Maine are characterized by low population densities and depend on individual septic systems to provide sewage treatment. Many of these communities include areas in which septic systems malfunction and other areas where treatment systems simply do not exist (straight-pipe discharges). Areas with sewage treatment problems can usually be grouped into one or more of five general categories:

1. Areas with a sewage collection system but lacking a sewage treatment facility.
2. Areas with inadequately treated or untreated individual sewage dicharges.
3. Areas with sewage treatment facilities needing design improvement or upgrading.
4. Areas with sewage treatment facilities needing process control or maintenance improvements.
5. Areas with sewage collection systems that need improvements.

Maine uses multiple approaches to deal with point source discharges. The Federal Water Pollution Control Act Amendments of 1972 (PL 92-500, also known as the Clean Water Act) require that discharges from municipal sewage collection systems receive secondary treatment (approxiamtely 85-90% removal of conventional pollutants). This requirement is reflected in Maine's sewage treatment facility construction grant and discharge licensing programs. Similarly, industrial discharges are licensed and treated in accordance with the effluent limitation requirements of the Clean Water Act.

For septic systems, the Subsurface Wastewater Disposal Rules require that homeowners with individual systems provide adequate means of treating their own wastewater, in accordance with specifications established by the rules. The rules are enforced at the municipal level and administered at the State level by the Maine Department of Human Services.

Municipal Facilities Program

Federal and State cost sharing money for the construction of municipally-owned sewage treatment facilities is administered by the Maine DEP through its Municipal Construction Grants Program. In accordance with the requirements of the Federal Clean Water Act of 1977 and Title 38 MRSA Sections 411 and 412, the State program is designed to distribute Federal and State funds on a worst-first priority basis to communities with sewage treatment problems.

DEP's Municipal Priority Point System is the mechanism used to rate individual projects by the assignment of points. The system incorporates five basic priority categories listed in descending order of relative priority as follows: 1) Water Supply Protection, 2) Shellfishery Protection, 3) Nuisance Abatement 4) Fisheries Protection, and 5) (Other) Facility Needs. Within each of these priority categories 0, 6 or 12 points are assigned depending on whether the problem's severity is assessed as low, medium or high. the DEP Priority Point System is described in more detail in the "State of Maine Municipal Construction Grants Program", published annually by the DEP Bureau of Water Quality Control's Division of Municipal Services. In addition to describing the administrative aspects of the Municipal Construction Grants Progam; the above-mentioned document lists in descending order of priority for the entire State of Maine those projects which are on the "active" list for the current fiscal year, as well as those projects which are expected to be active in subsequent years (the extended priority list). Much of this same information was used to generate the list of Priority Problem Waters presented in Appendix IV of this report.

During the period between 1983 and early 1986, 13 new or upgraded municipal wastewater treatment facilities began operating in Maine. The planning and construction of these large municipal facilities as well as facilities for small communities is coordinated by 11 engineers in DEP's Division of Municipal Services.

The progress of any municipal treatment or collection system project from planning stage to final construction is determined by a variety of factors including public opinion, availability of funds and changes in the project's priority rank, relative to other projects. At present, the threat of substantial reductions in Federal funding for the Construction Grants Program means that some projects may be delayed for a considerable time unless a town or city is able to secure an alternative means of funding the project.

State Small Community Facilities Program

In 1981, the Maine Legislature enacted a law designed to allow the State to help finance small wastewater treatment projects. The law provides up to $1 million each year for the construction of waste treatment systems. It authorizes the DEP to pay up to 90% of the cost of such systems. Grants are limited to $100,000 for each town. Projects are assigned to a priority list and then selected from that list in descending numerical order. Funds for this program are provided from bond issues approved in referendum by Maine citizens. The Small Community Facilities Program was last refunded by a bond issue which was approved in November of 1985.

This program fills a need which is largley unmet by the Federal Construction Grants Program. It allows DEP to go into a town which has a low volume of untreated wastewater entering public waters and install individual or cluster teatment systems in a very cost-effective manner. During the 4-year period during which the Small Community Facilities Program has been in existence, a total of 800 small systems in 64 towns have been constructed. As a result of these efforts, significant benefits have accrued including the reopening to harvest of over 300 acres of shellfishing areas in 8 Maine towns.

Industrial Wastewater Treatment

A wide variety of industries in Maine involve processes which result in the generation of contaminated wastewaters. Industrial discharges are treated either at a municipal sewage treatment facility or at an industrial facility designed specifically to treat wastewaters from that source. The chemical and biological constituents of wastewater from Maine's industrial point sources are as varied as the industries themselves and include everything from wood fiber to shrimp wastes to metallic compounds. Some industrial wastewater lowers a receiving waterbody's dissolved oxygen. Others may change pH or add pollutants with a potential for toxicity. Since industrial wastewater varies so much from one manufacturing process to the next, the processes used and levels of reduction required for each discharge also vary.

The period between 1972 and 1977 witnessed an intensive effort by industries to provide best practical treatment for, then untreated, discharges. By 1977, all major industries with individual discharges were providing secondary treatment or its equivalent. Since then, additional treatment of industrial-source discharges has occurred as municipal treatment facilities have been constructed and small individual, untreated industrial dischargs have been discovered. Although Federal construction grants for municipal wastewater treatment facilities has provided financial assistance for treatment of some industrial wastewater, the construction of most facilities treating industrial wastewater have been funded by the affected industries.

Licensing

Wastewater discharges in the United States are licensed under a two-pronged approach. The first consideration is technology-based. To ensure equal treatment under the law, all discharges must receive specified levels of treatment. This prevents one industry from having a competitive advantage over another and ensures parity in user charges for municipal wastewater treatment.

The second requirement is that the treated discharge not violate a state's water quality standards. For example, if an industry is complying with Federal effluent limitations, but because their high-volume discharge overwhelms the assimilative capacity of the small stream to which they are discharging and kills off its aquatic life, the industry must take additional measures to control their discharge. These additional measures could include changes in the manufacturing process, more advanced wastewater treatment and/or pumping the treated wastewater to a larger waterbody with greater asimilative capacity.

The Federal Clean Water Act, as amended, establishes national "standards of performance" for the control of discharges of pollutants, including those generated by industrial processes. Section 301 of the Act required that by 1977, industrial point source discharges of conventional pollutants be treated by the application of best practicable control technology (BPT) when they are treated at an industrial treatment facility. The Code of Federal Regulations lists conventional pollutants as follows: 1) biochemical oxygen demand (BOD), 2) total suspended solids, 3) pH, 4) fecal coliforms and 5) oil and grease. The Code of Federal Regulations, Title 40, Part 400 et. seq. establishes technology-based effluent limitation standards for conventional pollutants and some non-conventional pollutants such as metals. The amount of effluent reduction required by those regulations is related to the type of industry and amount of goods being manufactured daily.

Industrial discharges in Maine are regulated according to whether the industry discharges to a municipal sewage collection system or not. Industries other than those which discharge to a publicly owned sewage treatment facility are covered by a dual federal-state licensing system under the requirements outlined in the preceding paragraph. Such industries are issued an NPDES (National Pollutant Discharge Elimination System) permit by the U.S. Envionmental Protection Agency (USEPA) as well as a Maine discharge license from the Maine Board of Environmental Protection. In almost all cases, the effluent reduction required by the NPDES permit for a particular manufacturer is identical to the level of effluent reduction required of that manufacturer by the Maine license.

Industries which discharge wastewaters to a publicly-owned sewage treatment facility are required to pretreat wastes which would otherwise interfere with the operation of the treatment facility or which would not be adequately treated by the municipal treatment process. The pretreatment program is presently administered as part of the NPDES program by the USEPA. The State of Maine and USEPA are establishing the terms under which the Maine DEP would take over the Pretreatment Programs, as well as the remainder of the NPDES permit program.

Municipal and industrial discharges of wastewater containing toxic or hazardous pollutants are required to apply "best available control technology" (BAT) in order to achieve effluent limitations established pursuant to Sections 301 and 307 of the Clean Water Act. As with discharges of conventional polluants, effluent limitations for toxic and hazardous pollutants are included in the NPDES permits and the Maine discharge licenses for industries other than those which discharge to a publicly owned sewage treatment facility. The Administrator of the USEPA publishes effluent limitations and standards of treatment efficiency for each of the various pollutants classified as toxic or hazardous.

Using the effluent limitations required by law, and taking into account the water quality conditions in the receiving waterbody, the DEP Water Bureau's Division of Licensing and Enforcement prepares municipal, industrial, commercial and residential waste discharge licenses for evaluation by the Board of Environmental Protection (BEP). The term of these licenses is up to five years except for residential discharges which are licensed for a term of up to ten years. Once a license expires or if a modification is necessary, the BEP may impose additional pollutant reduction requirements on a particular discharger's new license if justified by the need to meet Federal standards, State water quality standards or to protect public health. License renewals are a continuous function of that Division. The Maine DEP presently employs seven staff members to coordinate wastewater discharge licensing: one for municipal discharges, two for industrial discharges and four for residential/commercial discharges.

MONITORING AND MAINTENANCE OF WASTEWATER TREATMENT FACILITIES

The DEP's Division of Operation and Maintenance employs ten staff persons whose primary responsibility is to monitor and improve the performance of wastewater treatment facilities. As part of this program, each treatment plant does daily self-monitoring. Monthly reports on the results of self-monitoring are filed with the Division of Operation and Maintenance. Discharge licenses also require immediate reporting of any major malfunctions. All large wastewater treatment facilities are inspected at least four times a year (1 major and 3 routine inspections). During inspections, the facility and facility records are checked to prevent problems which might result in license violations that would lower the quality of the receiving water. Samples of effluent are split between the treatment plant operator and the DEP inspector to check their lab's results against those of the DEP laboratory.

Although the inspection program is essential, there are several other important components of this division's activities. Maine requires that wastewater treatment plant operators be certified and the Division of Operation and Maintenance administers qualifying examinations for five levels of operator certification. This division also conducts a continuous training program for operators, dealing with such subjects as process control, microbiology, troubleshooting and plant safety.

Technical assistance for the operators of wastewater treatment facilities is also a major function of the Division of Operation and Maintenance. In addition to responding to requests for help with specific problems such as bulking and odor control, the Division conducts programs which take a more systematic approach to improving wastewater treatment operations.

Operations Management Evaluations (OME's) are done to diagnose license compliance problems and to provide on-site compliance assistance. OME's are focused on operation and maintenance problems including process, personnel and financial management. Successful OME's result in recommendations for procedural changes as well as operator training targeted towards improving wastewater treatment. The Division conducts eight OME's per year on a worst-first priority basis.

Where a more in-depth analysis of wastewater treatment operations is needed to improve license compliance, the division conducts process control studies pursuant to Section 104(g) of the Clean Water Act. These studies begin with an intensive evaluation of treatment processes based on gathering data on the efficiency of various stages in the treatment process. The particular facility's treatment process is then analyzed on a computer, using DATASTREAM software. By using this computer-based approach, various strategies for improving wastewater treatment can be evaluated. Process control studies result in recommendations for changes in operations such as pumping and aeration procedures and also assess design considerations and identify limitations of the physical plant. The Division conducts five process control studies per year on a worst-first priority basis. Although these studies were begun only in 1984, they have proved to be a powerful method for protecting and improving water quality.

Compliance with the requirements of wastewater discharge licenses is the crucial test of how effective are DEP's programs for monitoring, maintaining and improving the performance of wastewater treatment facilities. As documented in Maine's quarterly reports to USEPA on license noncompliance at wastewater treatment facilities with significant discharges, compliance rates for industrial facilities averaged 95.6% while license compliance at municipal facilities averaged 94.8%. These quarterly reports show cetain patterns of noncompliance which should be noted. For the 34 significant industrial discharges in Maine, one of them had chronic problems and was in noncompliance nearly every month of 1985. For six of the months in 1985, 1 or 2 other industrial discharges were in noncompliance. For the 100 significant municipal discharges in Maine, four of them had chronic problems and were in noncompliance nearly every month in 1985. Two other municipal facilities had extended periods of noncompliance. The lowest rates of noncompliance (92%) for municipal facilities occurred in the months of April and November and were related to heavy precipitation and hydraulic overloading of the facilities.

Some noncompliance problems can be quickly remedied but often an expensive, long-term solution is needed. As outlined in this section and the next section, the DEP works towards correction of these problems through a combination of technical assistance and enforcement action.

ENFORCEMENT ACTION

The Division of Licensing and Enforcement is responsible for all formal enforcement actions taken by the Bureau of Water Quality Control. Most enforcement cases originate from the Division of Operation and Maintenance through their review of discharge monitoring reports or special investigations. Occasionally, enforcement cases originate from other divisions, (e.g., the Division of Environmental Evaluation and Lake Studies in cases involving fish kills) and other bureaus. As detailed in the section on Control of Nonpoint Source Pollution, however, much enforcement action on nonpoint sources is conducted by the Division of Enforcement and Field Services in DEP's Bureau of Land Quality Control, Maine's Land Use Regulation Commission and other agencies.

In addition to formal enforcement actions, the enforcement section assists and confers with other divisions on violations which do not require formal action. These violations include untreated point source discharges and serious nonpoint discharges to both surface and ground waters. By fostering voluntary compliance with Maine's water pollution control laws, unnecessary litigation is avoided and the overall effectiveness of the enforcement program is maximized.

The Bureau of Water Quality Control's general philosophy is to gain compliance and resolve problems at the lowest level which is appropriate and to maximize the spirit of cooperation between the DEP and the regulated community. An important part of this approach is monthly Non-Compliance Review (NCR) meetings held between the Division of Operation and Maintenance and the Division of Licensing and Enforcement. At these meetings specific compliance problems at licensed treatment facilities are discussed and a course of action is decided. Possible responses to compliance problems range from monitoring the situation, to providing technical assistance to formal enforcement action. The NCR process is the enforcement section's major avenue for providing support to the Division of Operation and Maintenance. Although the NCR process has existed for only a year, it has improved consistency in addressing compliance problems and has facilitated the referral of violations to the enforcement section. A similar but less formal line of communication exists for complaints, unlicensed discharges and other types of non-recurring violations.

DEP enforcement priorities have generally been based on the size of violations, potential for environmental harm, recurrence of violations and precedents involved. This is illustrated by the relatively large number of industrial enforcement actions. The number of residential violators in comparison are much greater than the number of violators in any other category. However, because of the small size of the discharges and relatively low environmental impact, residential discharges have a lower enforcement priority. The same holds true for other small unlicensed point and non-point discharges.

The investigation and resolution of residential/commercial violations take up a significant amount of time of the Division of Operation and Maintenance. Residential/commercial violations which cannot be resolved in this manner are referred to the enforcement section. However, the enforcement section staff cannot address more than a handful of these violations without putting off work on higher priority violations. One method to address these lower priority violations is to utilize the ability granted to the DEP staff recently to prosecute violations before the District Court. This will require special training and certification for the enforcement staff. To smooth the transition from investigation to prosecution, the Division of Licensing and Enforcement and Operations and Maintenance are working jointly to initiate this program including the development of guidelines on when to use summonsing power.

The enforcement section of the Bureau of Water Quality Control consists of three environmental specialists. In 1985, the enforcement section completed two municipal and six industrial Administrative Consent Agreements.

Several months can pass between the occurrence of a water quality violation and a decision to take enforcement action. Several more months can pass before a consent agreement is proposed to a violator. Several of the consent agreements completed in 1985 addressed violations that had occurred over a three year period. Long delays between the occurrence of a violation and proposing a consent agreement to a violator can reduce the impact of an enforcement action and give an impression that the violation has a low priority. Improving the timeliness of enforcement action is a continuous function of the Division of Licensing and Enforcement.

In addition to completed consent agreements, the enforcement section has had a formal role in 26 other alledged violations in 1985. These include 13 industrial, 8 municipal, 4 residential and 1 agricultural waste discharge violations. Eighteen of the cases involved licensees and eight cases involved persons who did not hold waste discharge licenses. Of the 26 cases, 3 were resolved with no formal action because of the low priority of the violation and prompt remedial actions, and 1 case was referred to the Attorney General. The remaining 22 cases are under preparation or negotiation.

WATER QUALITY MONITORING

The sampling programs of DEP's Bureau of Water Quality Control are conducted to administer two sections of environmental law; 1) Classification of Surface Waters (38 MRSA §464 and 465) Wastewater Discharge (38 MRSA §413-414-A). Although the Bureau of Water Quality Control works under the authority of numerous other statutes and regulations, they can be considered as secondary and supportive of the Classification of Surface Waters and Wastewater Discharge statutes.

The following description of the entire sampling program of the Bureau of Water Quality Control illustrates activities included under Ambient Water Quality Monitoring.

I. Ambient Water Quality Monitoring

A. Assess attainment of present and proposed standards for the Classification of Surface Waters.
   1. Bacteria
   2. Dissolved oxygen
   3. Aquatic/Marine life
   4. Trophic state (for lakes)

B. Assimilative Capacity Studies. Assess whether present and proposed discharges and/or impoundments would violate the dissolved oxygen standards for Classification of Surface Waters during 7Q10 (the minimum seven day low flow which occurs once in ten years).
   1. Ambient monitoring
      a. Flow monitoring
      b. Time-of-travel studies
      c. Intensive sampling of discharges and ambient waters during preselected flow regimes
   2. Modeling to predict ambient dissolved oxygen levels at 7Q10.

C. Special Studies. Sampling programs supportive of scientific research necessary for the resolution of difficult, hypothetical and/or unusual water quality problems.

II. Compliance Monitoring

A. Assess compliance with wastewater discharges licenses by sampling effluents

B. Aid municipal treatment plant compliance by doing intensive sampling and modeling (104-G) of wastwater treatment processes.

III. Investigations

A. Respond to allegations of unlicensed discharges by sampling suspected discharges and ambient water quality above and below suspected discharges.

B. Sanitary Surveys.

Although the above descriptions compartmentalize the Bureau's sampling programs fairly well, there is some overlap between ambient water quality monitoring and compliance monitoring. An example of this overlap is how ambient water quality monitoring serves as a double-check on the license compliance of major discharges, especially with reference to cumulative impact.

The Bureau's ambient water quality monitoring program results in the following products:

1. A computerized data bank (STORET) which contains all data generated by the program.
2. A biennial report (305-B) to USEPA on what State waters are not attaining their classification.
3. Recommendations on how wastewater dicharges should be licensed and not exceed the assimilative capacity established by Water Quality Classification.
4. Special reports on what attainment impacts would result from proposed changes in classification standards and/or assignments of classification.
5. Reports, articles and news releases for the general public which describe the suitability (or lack thereof) of various State waters for swimming and fishing.

The steps necessary for generation of these products include selection of waterbodies to be sampled, selection of appropriate sampling locations on those water bodies, setting up sampling stations, the scheduling of sampling for these stations, sampling by well-trained, qualified personnel and, lastly, data processing.

Maine's ambient water quality monitoring program has gone through three phases during the last thirty years. During the 50's and 60's, the first phase consisted of the Water Improvement Commission doing intensive river basin studies during the summer months to determine how grossly polluted the State's waters were due to untreated wastewater discharges. The second phase from 1974-1982 consisted of the Primary Monitoring Network (PMN). The PMN program took monthly samples from a limited number of sites on river main stems. It was also during this period that most of the wastewater treatment facilities were constructed. The third and current phase began in 1983 and was based on gathering a more definitive data base for State waters during the summer months when their annual low-point in water quality occurs. The third phase has also included extensive research into the use of benthic macroinvertabrates and computer modeling to assess water quality. With reference to the pollution clean-up of most Maine waters, the three phases of water quality monitoring can be characterized as "before, during and after."

Selection of Waterbodies To Be Sampled

Water quality is the cumulative result of several factors. Some, such as climate, geology and biological processes, are generally beyond human control. Fortunately, these natural factors rarely cause water quality problems in Maine. Most water quality problems here are caused by people discharging the waste products of their culture into public waters. Maine's ambient water quality monitoring program is accordingly biased toward waters in the more populated areas of the State and specifically toward those waters impacted by people. Because of the variability in the extent of cultural impact on State waters, the evaluation of water quality in a moderately or highly impacted waterbody has to be based on data collected from that particular waterbody. For waters which have slight or negligible cultural impacts, however, it is possible to collect data from a select number of these waters and use the data to make generalizations about the quality of waters which are similarly situated.

The following table serves as a guide for selection of which waters are to be sampled (high priority) and which waters are not to be sampled (low priority). These listings are not definitive and much is left to professional judgement. For example, a stream which would otherwise be a medium priority due to its small size but which receives a significant industrial or sanitary discharge should be sampled.

**********HIGH PRIORITY **********

FRESH	MARINE
1. River mainstems which receive multiple major discharges. 2. Streams and brooks which drain population centers. 3. Swimming areas. 4. Select pristine waters which are considered to be representative of similarly situated waters.	1. Commercially harvested shellfish areas. 2. Swimming areas. 3. Harbors and other confined waters adjacent to population centers. 4. Select pristine waters which are considered to be representative of similarly situated waters.

********** MEDIUM PRIORITY **********

FRESH	MARINE
1. Agriculturally impacted waters. 2. Waters with threatened quality due to proposed discharges and/or activities.	1. Shellfish areas which are occasionally harvested. 2. Waters with threatened quality due to proposed discharges and/or activities

********** LOW PRIORITY **********

FRESH	MARINE
1. Pristine waters. 2. Waters too small to be included on a 15' USGS topographic map. 3. Annually intermittent streams.	1. Pristine waters.

Sampling for Bacteriological/Physical/Chemical Characteristics in Rivers, Streams and Brooks

Once a waterbody is selected for inclusion in the ambient water quality monitoring program, a decision is made as to how many sampling stations are necessary to characterize water quality. As with the selection of waterbodies, professional judgement and common sense are important inputs to making this decision. Usually a river or stream is divided into segments with each segment treated as a separate waterbody. Often, one sampling station per segment is all that is needed. For impoundments and discharge zones, however, multiple sampling stations are sometimes necessary.

The concentration of discharged pollutants usually decreases progressively with distance from the discharge points. This is due to environmental factors such as dilution, volatilization, sedimentation, chemical reactions and biological processes. Biochemical Oxygen Demand (BOD) is a pollutant of importance in managing Maine's waters for the protection of fish and other aquatic/estuarine/marine life. As organic pollutants are consumed, they

exert BOD on the receiving water and lower its dissolved oxygen (DO) content. A phenomenon known as "DO sag" is characteristic of a river which receives a high-BOD discharge. As distance (time-of-travel) from the point of discharge increases, BOD is exerted and the DO is depleted. The area of maximum depletion is the "DO sag." Depending on flow (and, hence, time-of-travel) the location of the DO sag can vary upstream or downstream by a mile or more. DO sags can cause severe impacts (including mortality) on fish and other aquatic life. For this reason, some sampling stations on major receiving waters are located to document the severity of DO sags.

Impoundments differ from free flowing rivers in many ways but the most important consideration in locating sampling stations is that impoundments may stratify chemically as well as thermally. Since stratification is density dependent, it is not assumed that homogeneous temperature indicates a well mixed water column. It is not unusual to find effluent plumes of the same temperature as the impoundment flowing along the bottom because of higher specific gravity due to dissolved solids. A DO and temperature profile of an impoundment is necessary to characterize its water quality. The lowest DO levels in an impoundment are usually found at its deepest point, often located near the dam.

The following guidelines are also considered when selecting sampling station locations for a waterbody.

1) Bridges can greatly increase sampling efficiency and are used whenever possible.
2) For large rivers, cross sectional stations (usually at mid channel, the northwesterly 1/4 of channel and the southeasterly 1/4 of channel) are established if poor mixing of discharge(s) is suspected at that location.
3) Sampling stations are located far enough below discharges so that the discharge will be thoroughly mixed within at least 1/3 of the river's channel.
4) Below high BOD discharges, sampling stations are initially located about 12 hours time-of-travel apart.
5) For rivers which do not receive major discharges, sampling stations are located ten to twenty miles apart.

The above guidelines for station location are subject to different interpretation by different people. To maintain consistency among basins and regions, draft copies of sampling station locations are forwarded to the program manager for review. Once the proposed sample station locations are approved by the program manager, the regional or basin manager starts setting up sampling stations.

Scheduling of sampling for ambient water quality monitoring (biomonitoring excepted) in Maine's rivers includes the following levels of planning:

1) Planning the route for a particular day so as to efficiently visit 20-30 sampling stations.
2) Planning a weekly route schedule for the period between May 15 and September 30 so that each station is sampled with sufficient frequency and at appropriate time intervals.

3) Planning a five-year sampling schedule which include a list of stations to be sampled every year and other stations which are to be sampled once every five years.
4) Planning special sampling schedules which are initiated by environmental events such as 7Q10 or fish kills.

A specific sampling schedule is dependent on the type of information required and the statistical, scientific and environmental considerations which ensure the validity of information generated. For the parameters of bacteria, dissolved oxygen and temperature, DEP uses the following types of sampling programs for rivers, streams and brooks:

I. Preliminary Water Quality Assessment.
This program provides a low-intensity approach which results in a limited evaluation of water quality. This program identifies pristine waters which may not require additional sampling as well as culturally impacted waters which may require a more intensive sampling program. To complete this assessment for a station, a minimum of five sample sets are collected between May 15 and September 30 with one of the sample sets being collected during runoff conditions. Data collected are DO, temperature, bacteria and river stage.

II. Assessment of Attainment for Bacterial Water Quality Standards.
To produce a valid assessment of attainment for recreational water quality criteria, a minimum of 12 samples collected between May 15 and September 30 at regular intervals (usually weekly) are required. The samples are then analyzed for Escherichia coli. Sampling for fecal coliform bacteria in Maine waters has been discontinued because of that parameter's lack of validity for assessing environmental quality.

III. Assessment of Attainment for Dissolved Oxygen Water Quality Standards in Rivers, Streams and Brooks.

Although the Preliminary Water Quality Assessment Program will identify some waters which do not attain their DO standards of classification, sampling at moderate or average low flows will result in a large number of waters where nonattainment at extreme low flows is suspected but not proven. For this reason, DO sampling should be scheduled for "worst case" conditions as regards DO levels.

The DO levels of culturally impacted waters are usually flow dependent; the lower the flow, the lower the DO. Since discharges are licensed so as to not violate classification at flows above 7Q10, the ideal situation is to determine DO levels at flows just above 7Q10. For determining the attainment of DO standards in waters which receive unlicensed discharges from activities such as agriculture, flows just above 7Q10 are again the desired sampling period. For purposes of documenting "worst case" DO levels, DEP standard procedure is that waters should be sampled at flows between 7Q10 and 7Q5 (the minimum seven day low flow which occurs once every five years).

The 7Q5 flow on rivers and streams which are not dam-controlled is about 25% higher than their 7Q10 flow. The 7Q5-7Q10 relationship for dam-controlled rivers is more of a problem than for unregulated waters. Because 7Q calculations are usually based on an entire historical data base, relatively recent changes in flow regimes caused by construction of water storage impoundments make 7Q estimiates for those rivers unreasonably low. Hence, a calculation of "Modern 7Q5 and 7Q10" is used for the scheduling of DO sampling on major dam-controlled rivers.

The final product of Maine's 7Q5 sampling scheduling is a series of 7Q5 sampling plans. Because of climatic variations in various zones of the state and the differences between flow conditions for the dam-controlled rivers, fourteen separate sampling plans are required for 7Q5 sampling; 9 for dam-controlled rivers and 5 for waters which are not dam-controlled. These 7Q5 sampling plans describe sampling routes to be made daily for a three day period when 7Q5 flows are documented and no significant precipitation seems imminent. For waters which are not dam-controlled, the State is divided into five climatic zones. In each of these zones, an automated U.S. Geological Survey gaging station is used to generalize flow conditions for that zone. Of course, dam-controlled rivers in the five climatic zones are not covered in the 7Q5 sampling plans for unregulated waters in those zones.

Scheduling of 7Q5 sampling is arranged so that:

1) data is collected from as many stations as possible
2) each station is sampled daily for three consecutive days
3) the routes are varied so that successive thirds of the stations are sampled first each day
4) sampling routes begin early enough in the day to result in each station being sampled before 0800 on one of the three days
5) where USGS staff gauges exist along the sampling route, river and stream stages are recorded
6) in addition to DO and temperature data collected during a 7Q5 event, water samples for bacterial analysis are collected from a select group of stations on major receiving waters.

What about 7Q20? If summer flows are holding below 7Q10 and nearing 7Q20, those river main stems which are major receiving waters are resampled along with a select group of unregulated waters. Although the 7Q20 sampling effort is less intensive than the 7Q5 effort, it is designed to answer the following questions:

1) Is classification violated on major receiving waters?
2) For unregulated waters which barely attained classification at 7Q5, how many are attaining classification at 7Q20?
3) For unregulated waters which did not attain DO standards at 7Q5, how much more severe is their DO deficit at 7Q20?
4) What is natural DO in pristine waters at 7Q20?

The fresh water dissolved oxygen criteria recently proposed by USEPA are based on daily 7-day and 30-day averages as well as instantaneous levels. The goal of these proposed criteria is to specify what minimum DO levels will result in an acceptable effect on the growth and reproduction of fish and other aquatic life. Maine's DO standard differs from USEPA's proposal in that it relys upon a minimum standard rather than long-term averages. Determination of long-term averages seems to require significantly more resources than are currently used or available for water sampling in Maine. Beginning in 1986, DEP will be conducting continuous monitoring of DO and temperature on a limited scale on some Maine rivers and streams.

IV. Annual Assessment of Attainment.

This program results in a five year plan which identifies stations which should be sampled every year and other stations which should be sampled one year out of every five years. The extent of this sampling program results in no more than 2 days per week of field work for 12-14 weeks for each of four DEP regions (8 days/week total). This results in about 160 stations being sampled each year. Of these, about 80 are sampled each year and 80 are sampled once every five years (total number of stations is about 500). Stations which are sampled every year are those located in the lower reaches of major receiving waters, especially those which have documented water quality problems or which are suspected problems. Stations which are sampled for one year every five years consist of other high priority stations which fit into an efficient sampling route.

Annual assessments of attainment provide the public with information on suitability for swimming and other aspects of water quality. Hence the procedures outlined in item II., Assessment of Attainment for Bacterial Water Quality Standards are incorporated into this program. Because this program also serves as a double-check on license compliance for wastewater treatment plants, the parameters of DO temperature, and apparent turbidity are also determined during some weeks at select stations.

Biological Monitoring of Rivers, Streams and Brooks

Maine conducts an extensive sampling program for assessing the overall health of aquatic communities. This program is based on determining the numbers of each genus or species of aquatic animals (benthic macroinvertebrates) in a standardized sampling unit. The program began in the early 1970's and used Surber sampling to characterize the organisms present on river bottoms. Since 1981, however, the program has used artificial substrates (wire baskets filled with rocks) to enhance the comparability of samples collected from a variety of sites. This improvement in standardization has facilitated a revision of Maine's biological water quality standards (Appendixes I and II).

About 160 sites on Maine's rivers and streams have been biologically monitored by use of artificial substrates. Sample stations have been established below all significant inland discharges of wastewater in Maine. Reference stations have been established upstream of most of these discharges as well as on pristine rivers.

Use of biological monitoring techniques have identified some priority problem waters (Appendix IV) in Maine which, through collection of dissolved oxygen data, were thought to have acceptable water quality. The DEP plans to expand its use of biological monitoring for the regulation of wastewater discharges. Studies conducted thus far have proven biological monitoring to be important in determining if water quality "provides for the protection and propagation of fish...and wildlife."

Assimilative Capacity Studies. The Toxics and Permits Section of DEP's Division of Environmental Evaluation and Lake Studies is staffed by a biologist and two engineers. This group determines what license conditions are necessary to avoid problems due to toxicity or low dissolved oxygen (DO) levels.

Although DEP relies heavily on USEPA's "Ambient Water Quality Criteria...." to avoid the occurrence of toxic effects in State waters, additional study is sometimes required. A draft of DEP's Toxic Pollution Control Strategy, sent to Region I USEPA in April 1985, details how Maine seeks to avoid the discharge of "toxic materials in toxic amounts" into State waters. In general the process is a two-tiered one.

Initially, USEPA's Ambient Water Quality Criteria are used to calculate effluent limitations. These are compared to Best Practical Technology (BPT)-based effluent limits and the lower of the two limits is proposed in the draft wastewater discharge license. The license applicant may accept the proposed effluent limitations or go to the second tier and submit toxicity testing data in support of alternate limits. Toxicity testing protocols generally follow USEPA's new acute and chronic methods manuals with a few modifications required by DEP. Toxicity testing by a license applicant must be approved as to method by the Toxics and Permits Section prior to initiation if the results are intended for use in applying for a wastewater discharge license. This effluent-specific approach is added insurance that the goal of the USEPA toxics criteria is met.

The major deviation from USEPA testing protocol is DEP's requirement that a salmonid be used for testing toxicity to fish. This is required because salmonids are indigenous to almost all of Maine's waters. The section operates a mobile laboratory which is periodically taken on-site at wastewater treatment facilities for conducting flow-through effluent toxicity tests. This method of analysis has been used in developing the State's toxics control strategy and for other special studies.

The two engineers in the Division of Environmental Evaluation and Lake Studies are responsible for determining rivers' assimilative capacity for biochemical oxygen demand (B.O.D.). This type of determination is used in the following situations:

1) For rivers where DO has been found to be lower than the requirements of classification. In this case, a study is conducted to determine how much reduction in pollutant loading is required to attain classification standards for DO.
2) For rivers where a new BOD discharge is proposed. The river is modeled to ensure that the new discharge will not violate the DO requirements of classification.
3) For rivers where construction of a new dam is proposed. This is done to ensure that the decreased aeration and increased time-of-travel caused by the dam will not violate the DO requirements of classification.

An assimilative capacity study for DO begins with field surveys designed for the calibration and verification of a water quality model. At least two data sets are collected during river conditions of low flow and high temperature. These conditions, because of the low DO levels which occur then, are considered the most critical for river habitats. The field surveys include hydraulic, physical and chemical analysis of the river including time-of-travel as determined by dye injection, measurement of cross sectional area, dissolved oxygen, temperature, salinity, sediment oxygen demand, chlorophyll a, nitrogen series, phosphorus series, BOD5 and ultimate BOD. Extensive analysis of effluents entering the river is also done during field surveys. Nonpoint sources of water pollution are also estimated if they are thought to be significantly affecting the river's water quality.

The next step involves utilizing the data sets to calibrate and verify a computerized water quality model. Model calibration is accomplished by varying parameter factors until the model output matches the field survey results for BOD, temperature, DO and other parameters. The computerized river model is considered verified when the model which was calibrated by use of the first data set is run under the flow and temperature conditions of the second data set and the model output matches the BOD and DO data collected during the second field survey. The model most often used is QUAL-2E. The modeling sometimes shows a need for additional data. This results in a third and, occasionally, a fourth field survey being done to collect the necessary data.

Once a model is calibrated and verified, it can then be used for predictive purposes. When applied to the above three situations, assimilative capacity studies can be the basis for denying a permit for proposed activities but are more commonly used to formulate management options. Since one goal of water quality management is to attain classification, these management options include actions such as effluent reduction or flow augmentation.

Lake Monitoring. The Lake Studies Section of DEP's Division of Environmental Evaluation and Lake Studies is staffed by four biologists who coordinate the monitoring program as part of their responsibilities. Maine's lake monitoring program includes the following components:

1) Volunteer Lake Monitoring Program. Volunteers are trained and provided with equipment to sample transparency, and in some cases chlorophyll and phosphorus, for five months during the open water season. The purpose of this program is two-fold. It provides a continuous baseline of data on a large number of lakes which is used to identify trends of improving or declining water quality. It also provides a unique opportunity for communication and education, since monitors often end up functioning as a liaison between the Lake Studies Section and the local lake community, keeping DEP informed on local concerns and vice-versa.

In recent years the program has included 250 to 300 monitors, but the quality of data received has been highly variable. In 1985, only 53 percent of the 262 monitors provided complete sets of data and 27 percent provided no data at all. Largely because of this data quality problem, the goals of the program are being revised. The former goal had been to include all of Maine's significantly developed lakes (400-500) in the program. DEP now plans to focus its efforts on improving the quality of sampling by reliable monitors and limiting expansion of the program to those lakes which are identified as vulnerable by Maine's recently developed vulnerability index.

2) Federal Clean Lakes (Section 314) Project Lakes. There are a number of currently active 314 projects in the State. They include Webber Pond (initiated in 1985), Sabattus Pond (nearly complete) and Cochnewagon Lake (initiated in 1986). Lakes where 314 projects have been recently completed include Salmon Lake and Sebasticook Lake. All of these lakes are monitored intensively on a regular basis for transparency, chlorophyll, nutrients, dissolved oxygen, temperature, pH, alkalinity, and phytoplankton composition. Additional parameters are included in specific projects. For example, Cochnewagon Lake (monitored by the Cobbossee Watershed District with sample analysis by DEP) will receive an aluminum treatment in June, 1986 and

will be monitored for dissolved and total aluminum as well as zooplankton density and composition to assess any toxic impacts of the treatment. Less intense, long-term follow-up monitoring is also performed on completed Section 314 project lakes such as Annabessacook Lake and Salmon Lake.

3) Diagnostic Study Lakes. Recent trends of declining water quality have been evident on several lakes, including China Lake, Cross Lake, and Chickawaukie Lake. Diagnostic studies are being conducted on these lakes as well on some chronically productive lakes not previously diagnosed (i.e., Long Lake, Sewall Pond) to determine the nature of their problems, significant external sources of nutrients, the extent of internal loading, and the feasibility of potential solutions. It is anticipated that the vulnerability index, in combination with the volunteer monitoring program will identify more lakes in need of diagnostic analysis.

4) Special Study Lakes. The department monitors a number of lakes to provide answers to specific questions. For example, the Department of Marine Resources has a program of reestablishing historical alewife runs. They plan to stock alewives in several productive lakes in Central Maine as part of their comprehensive program. The Lake Studies Section is monitoring zooplankton and phytoplankton populations in some of these lakes to determine if this stocking of efficient planktivores will encourage development of colonial blue green algal blooms through depletion of the zooplankton community. Lakes being monitored in this manner include Sabattus Pond, Sebasticook Lake, Pattee Pond, Three Mile Pond, Three-Cornered Pond, and Unity Pond.

5) Complaint Response and Investigations. Each summer the DEP receives some complaints of water quality problems in lakes. Many of these require spot-check sampling and some require follow-up monitoring.

Estuarine/Marine Sampling. Much of Maine's sampling of salt waters is conducted by the Department of Marine Resources (DMR). The bulk of DMR's sampling program is concerned with bacteria levels in shellfish propagation areas. Marine bacteriology is conducted in accordance with the protocols of the National Shellfish Sanitation Program to protect the public health. Although most of the bacteria sampling is done to reverify acceptable conditions at open shellfishing areas, much of the sampling is also done in connection with pollution abatement projects. Bacteria sampling at swimming beaches is conducted by the DEP during the summer months. These beaches are sampled at least twelve times each year with samples analyzed by the enterococci technique.

Sampling for dissolved oxygen, conductivity and temperature has determined that dissolved oxygen levels are very near the saturation point in almost all of Maine's near shore waters. Where DO depression has been documented (usually in harbors with restricted water circulation) monitoring for dissolved oxygen, conductivity and temperature is conducted by DEP during the summer months.

COST/BENEFIT ASSESSMENT

In early 1986, Maine took a novel approach to assessing the results of its water quality managment programs. A questionnaire was administered to 163 citizen volunteers who are members of the State's Regional Water Quality Advisory Committees. This approach seems appropriate in that "a favorable cost/benefit ratio" is just another way of saying that "the public's perception is that it was worth the cost." The following eight questions and their responses provide the best water quality management cost/benefit assessment available at this time:

1) Maine's water cleanup effort of the last 15 years has provided enough benefits to justify its cost.

   Yes (76.2%) No (5.5%) Don't know (18.4%)

2) Maine's water cleanup of the last 15 years has

   a. Increased employment in my region (21.6%)
   b. Had no effect on employment in my region (32.4%)
   c. Decreased employment in my region (10.8%)
   d. Don't know (35.1%)

Maine's water cleanup efforts have made my region (better, unchanged or worse) for:

		Better	Unchangd	Worse
3)	Farming	18.1%	67.6%	14.3%
4)	Industry	19.4%	51.5%	29.1%
5)	Logging	6.5%	61.3%	32.3%
6)	Residence	72.0%	24.3%	3.7%
7)	Small Business	27.6%	63.8%	8.6%
8)	Tourism	74.3%	24.8%	1.0%

CONTROL OF NONPOINT SOURCE POLLUTION

Background

Nonpoint source pollutants in Maine include all substances which contaminate surface waters and groundwaters except for effluents which are piped (point source) to surface waters. Wastewater disposal by the method of deep well injection would qualify as a point source but this practice is not permitted in Maine. Subsurface disposal of wastewater (septic systems) as permitted by the Maine State Planning Code is debatable as to whether it is a point or nonpoint source but for water quality management purposes in Maine it is considered a nonpoint source. Many nonpoint sources of water pollution are related to soil erosion on farms, logging operations, roads and construction sites. Both the spraying of pesticides and the disposal of nearly empty pesticide containers are pollution sources of concern. Solid waste disposal including landfills and the landspreading of sludge and septage is a significant nonpoint pollution source. Groundwater contamination due to sand/salt piles and leaking underground storage tanks is the nonpoint source pollution problem of greatest concern in Maine at the present.

Because of the widely varying activities which produce nonpoint source pollution, it is difficult to develop a single comprehensive plan for its control. The State of Maine has enacted numerous laws over the past 16 years to minimize the effects of nonpoint source pollution. These laws have helped reduce nonpoint source pollution without causing unreasonable hardship. Because of the many-faceted nature of nonpoint source any series of laws enacted for its control will be inherently uneven in their effectiveness at controlling a particular type of nonpoint source pollution.

A major component of Maine's current program for control of nonpoint source pollution is to make the relative effectiveness of the various control programs more even. A position of State Coordinator for Control of Nonpoint Source Pollution has been created and is staffed on a half-time basis by a member of the Division of Environmental Evaluation and Lake Studies' Planning and Grants Section. The activities of this staff person are centered around implementation of the nonpoint source component of the Federal Regulation on antidegradation of water quality. That regulation requires that the "State shall assure that there be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control. The phrase, "cost-effective and reasonable" is the benchmark against which all components of Maine's program for control of nonpoint source pollution will be compared.

Maine's nonpoint source implementation programs are aimed primarily at controlling or preventing impacts from land use activites through application of the "best management" practices presented in the State Water Quality Management Plan. These efforts are the full-time responsibility of four staff positions in the DEP Bureau of Land Quality Control and consist primarily of implementation of five State statutes plus review of projects requiring a federal license or permit for water quality certification pursuant to the Federal Clean Water Act. Other DEP efforts include lakes protection and restoration activities, the aquifer protection program, and the sludge

utilization program (all conducted by the DEP Bureau of Water Quality Control).

Lakes protection and restoration activities include working with farmers and state and federal agricultural agencies to implement best management practices (BMP) to control erosion and nutrient runoff from animal wastes. The aquifer protection program concentrates on identification of sand and gravel aquifers capable of producing significant quantities of drinking water, their primary recharge and discharge areas, approximate flow directions within them, and the nature, cause, and extent of any contamination. Particular emphasis is currently being given to reducing contamination from sand/salt piles and leaking underground storage tanks. The sludge utilization program promotes land-spreading of sewage treatment plant sludge (which meets State standards) on agricultural lands as a alternative to disposal by landfilling or other means. Appendix II contains a generalized presentation of the severity and extent of nonpoint source contributions to water quality in Maine using categories and criteria specified in USEPA's 305(b) guidance and compiled by the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA).It should be noted that while marine saltwater intrusion does occur in Maine and can have a severe localized impact, it is not regarded by DEP as a nonpoint source pollutant.

Agriculture

In some areas of Maine, agriculture is the most significant category of nonpoint source pollution. Agricultural activities result in cropland erosion and contribute to sedimentation of lake and streams in numerous locations across the state. The most recent update of the Study of Nonpoint Agricultural Pollution (SNAP) report, published in November of 1985, by the USDA Soil and Water Conservation Service (SCS),indicates that Maine farmers are making steady progress in lowering erosion rates on their farmland. The updated report cited a 28.3% improvement in Maine's sheet and rill erosion rate from 1979 to 1985. Total annual sheet and rill erosion has dropped by over 500,000 tons since 1979 but inventoried farmlands are still losing over 1.3 million tons of farm soils per year, excluding erosion from gullying, streambank and roadside erosion.

Earlier SNAP reports have inventoried the distribution of animal units (AU) on farms having 10 or more AU. (One AU = 1000 lbs of animal live weight.) The primary water quality problem associated with farm animals results from improper or inadequate manure handling facilities. Many farms lack the capacity to store manure during winter months and must stack it in fields to be spread later. Unfortunately much of the manure stored this way runs off the fields and into lakes or streams during spring runoff. Increased understanding of this problem has led to an SCS program which has resulted in the adoption of manure recycling plans and construction of storage facilities at 569 Maine livestock farms (26.9% of total).

In 1984, Maine enacted an innovative law (administered by the Maine Department of Agriculture) which requires that a deposit fee be charged on bulk pesticide containers. This law functions in the same way as does Maine's law on beer-soft drink returnable container deposits. The 1984 law has been very effective in reducing nonpoint pollution from pesticide container dumps.

Silviculture

Forested land is by far the dominant land cover type in Maine. The percentage of total land covered by forest ranges from around 75% in the urbanized towns to over 95% in the remainder of the State. Most of the forest in the northwestern third and the eastern coastal counties of Maine is held in large tracts by paper companies. The predominant forest types are spruce/fir and northern hardwood. Both types are used for milled wood products as well as for pulp and paper production. In central and southwestern Maine, most of the forest lands are held in small individually-owned parcels, as opposed to paper company lands. Hardwoods and softwoods are more evenly mixed in the south than further north. About half of Maine is very sparsely populated and has no organized town government. In these unorganized areas, Maine's Land Use Regulation Commission serves many of the same functions as does a municipality. Through their zoning and enforcement powers, the LURC staff have been very effective in controlling and reducing runoff from logging operations. Credit should also be given to the large landowners who have established a cooperative relationship with LURC regarding the protection of water quality. In municipalities the commitment to controlling erosion on logging jobs is highly variable. Often, DEP's water quality enforcement section is involved in controlling erosion in municipalities after receiving citizen complaints about municipal inaction.

The most common pollutant from forest operations is sediment. Logging roads and skid trails are generally the most serious source. Sediment may settle out in several hours or it may remain suspended in streams for several days, depending upon the sediment particle size and rates of stream flow. Sediment may also be deposited behind dams, thereby reducing usable storage capacity. In water supply ponds, sedimentation increases the level of treatment required to make the water drinkable. Sediment may effect aquatic life in several ways including smothering fish eggs, covering up areas where invertebrates live, decreasing photosynthesis and interfering with fish respiration.

In 1977, LURC and the Maine Bureau of Forestry completed a forest harvesting impacts survey.

The purposes of the Forest Harvest Practices Survey, as outlined by the Land Use Regulation Commission, were to:

1) Assess the occurrence and magnitude of activities that can have adverse impacts on surface water quality.
2) Observe and classify site characteristics and operational practices that are related to possible water quality problems, as well as, actual erosion and sedimentation; and
3) Determine which site characteristics and operational practices can be used to predict whether there will be a water quality problem at any given site.

The survey was accomplished through field inspections that classified site chacteristics and operational practices. The surveyed operations ranged in size from one to one hundred acres, with an average size of about forty acres.

Altogether, 405 sites were surveyed; 172 in LURC jurisdiction and 233 in municipalities. More than 85,000 acres of harvested sites were inspected in the field work. Of this statewide total, approximately 87% was in the LURC jurisdiction. The discrepancy between numbers of sites compared to acreages

is due to the differences in sizes of operations in the two divisions of the State.

For comparative purposes, the incidence of problem cutting sites in the LURC jurisdiction was found to be approximately 22% statewide while those cutting sites responsible for water quality problems in the municipalities amounted to approximately 24% of the total. The data suggests that wood harvesting activities in some parts of the State, cause relatively more water pollution problems than those in other areas of the State.

The figures expressed in the report do not prove conclusively that any single variable can be blamed for water quality problems resulting from wood harvesting activities in Maine. However, combinations of factors are likely to be associated with problems.

1) The site characteristics most closely correlated with water quality problems appeared to be: slope, distance to surface water, skidding method, and weather condition.
2) Small woodlot ownership combined with privately contracted wood harvesting creates an economic situation in which water quality problems are more likely to occur.
3) Survey data indicate that all documented water quality problems resulted from the transportation phase of logging operations.
4) Fording of brooks and streams by heavy equipment increases the likelihood of water quality problems.

Since this study was completed in 1977, significant progress has been made in improving control of nonpoint source pollution in areas under LURC jurisdiction. The situation in municipalities is little changed. A major challenge to DEP in the 1980's is to accelerate implementation of all reasonable and cost-effective measures to minimize logging-associated soil erosion in Maine's 496 municipalities.

An additional effect of forestry activities on water quality arises from the use of pesticides in forest managment . The Spruce Budworm Spraying Program is the largest and most significant forestry-related use of pesticides in the State of Maine. Varying types and amounts of chemical insecticides have been aerially applied to Maine forest since 1954 for control of the spruce budworm. The Maine Cooperative Spruce Budworm Suppression Project has been controversial due to doubts about its long term impact on water quality and public health, and its actual effectiveness in controlling spruce budworm. However, the expanding use of biological controls (BT) and reductions in acreage treated has considerably reduced the level of controversy surrounding the project.

Following the ban on DDT in 1967, numerous other chemical insecticides have been used in the spruce budworm program. Unlike DDT, these insecticides breakdown and lose toxicity fairly rapidly once released into the environment. As a result, food chain biomagnification is less of a problem. However, many of these insecticides are at least as toxic as DDT during their toxic stage (which may last from a few days to several weeks, depending on the chemical and the conditions under which it is applied).

The principal water quality impact of the spraying program is believed to be an overall reduction in the food supply available for fresh water fish such as salmon and trout. If the pesticide drifts to or is washed into a small brook, insects on which fish depend for food may be greatly reduced for the remainder of the summer. If a single stream is sprayed year after year with repeated applications of insecticide, the short-term toxicity of each application becomes irrelevant. The effect is the same as long-term toxicity except for the biomagnification factor. The result is that entire populations of certain insects can disappear or be greatly reduced in streams.

Aware of these and other concerns such as the apparent in vitro enhancement by certain chemicals of growth in some viruses, the Maine Bureau of Forestry has imposed numerous restrictions on the aerial spraying process. These have included buffer strips for visible waterbodies and cancellation of spraying at wind speeds greater than 15 miles per hour or when rain is imminent. The Bureau of Forestry has also made a major shift to the bacterial pesticide B.t. (up to 30% of sprayed acreage in recent years). In 1986, there is no statewide spray program planned due to a decline in budworm populations. Instead, an experimental, limited spray program will be conducted to test a new strain of the B.t. bacterium.

In 1973, the Maine State Legislature took a major step toward addressing the impacts of forest harvesting operations on water quality by passing the Mandatory Shoreland Zoning and Subdivision Control Act (12 MRSA Section 4811-4814). The Act provides for the regulation of land use activities within 250 feet of great ponds, and flowing waters which drain areas of 25 square miles or greater. The Act requires that each municipality adopt an ordinance controlling land use activities within 250 feet of these waters. The municipal ordinances must include standards that conform with minimum guidelines published by the Maine State Planning Office in 1973. Most towns have adopted verbatim the State Planning Office Guidelines as their ordinances.

Construction

Construction is a significant nonpoint source of pollution in Maine. Construction related activities have direct, immediate impacts as well as more subtle impacts which may persist long after the construction project has been completed. The most commonly identified contaminant is sediment eroded from a construction site and carried by runoff to nearby waterways.

Some construction projects continue to act as a source of sediments for years after the actual construction is completed, due to the absence of well-engineered or properly maintained erosion control measures at the site. Moreover, as a watershed is transformed through construction from a mostly forested land cover to one that is mostly residential or urbanized, its hydrologic characteristics change. Rainwater falling in such a watershed runs off the land much more quickly than in an undeveloped watershed. As a result, contaminants such as sediment, nutrients, bacteria, chemicals, etc., tend to be quickly delivered to surface waters with little opportunity for vegetation to filter them out. This long term effect of construction has been identified as a significant nonpoint source problem in the planning areas of the Greater Portland Council of Governments and the Southern Kennebec Valley Regional Planning Commission.

Regulatory progams to control NPS pollution from construction activities exist at the State and local levels. State regulation is directed primarily

toward major developments. In Maine, major developments are defined under the Site Location of Development Act, as "any State, municipal, educational, charitable, commercial or industrial development, including subdivisions, which occupies a land area in excess of 20 acres," or which involves excavating an area in excess of 60,000 square feet. Projects which fit the definition under the Site Location of Development Act are reviewed for potential impact because they may have statewide significance. Smaller scale construction activities may be reviewed under the State Subdivision Law, which requires a municipal reviewing authority to review and approve the division of parcel of land into three or more lots within any five year period. If a subdivision is greater than 20 acres it will receive both State and municipal review. All State laws pertaining to control of nonpoint source pollution are listed in Table 11.

In addition to these State laws there are a variety of locally adopted and/or enforced ordinances that relate to the control of erosion and sedimentation. These typically are one or a combination of the following types of ordinances; zoning, site plan review, subdivision, and shoreland zoning. Such local controls are authorized by the following State laws.

Municipal Land Subdivision Law, Title 30 M.R.S.A., Section 4956
Ordinance Power Limited (Home Rule) Title 30 M.R.S.A., Section 1917
Maine State Constitution (Home Rule Provision) Article VIII-A
Police Power Ordinances, Title 30 M.R.S.A., Section 2151
Zoning Ordinances, Title 30 M.R.S.A., Section 4962

Existing State laws which control various types of construction activity leave a great deal of activity unregulated due to size or location. Several municipalities in Maine have adopted sediment and erosion control provisions in various forms to fill this gap. This can be accomplished through revisions to existing ordinances or the adoption of new ones.

With regard to review at the local level, an additional issue needs to be considered, namely local technical review and enforcement capabiity. Municipal officials often must rely on the expertise of individuals trained in sediment and erosion control in order to review proposed plans for adequacy. This service has often been provided by the USDA Soil Conservation Service through the local Soil and Water Conservation Districts. As requests for this type of service have increased, it has become obvious that additional measures should be taken to ensure adequate local review. Coopeative agreements with or without financial arrangements between the districts and municipalities may be an answer. Recently, in response to this need, DEP announced that it would assist local planning boards in the review of development proposals that have the potential for environmental impacts.

There are many techniques recommended by the USDA Soil Conservation Service which can be employed to control erosion and sedimentation. Various construction projects need varying degrees of permanent and/or temporary controls. The recommended BMP's are therefore:

1) Sediment and erosion control plans should be developed for construction activities and carried out to the specifications of the SCS Maine Technical Guide Section IV.

2) Construction activities should be monitored for compliance with State laws, and local ordinances. Follow-up inspections by enforcement personnel should be done to the maximum possible extent.

Table 12. State Laws Used for Control of Nonpoint Source Pollution

Reference	Law/Enforcer	Requirements
12 MRSA §206A	Land Use Regulation Commission/LURC	Establishes land use classification districts and standards for Maine's plantations, unorganized townships, and coastal islands.
12 MRSA §4812-A	Mandatory Shoreland Zoning/ DEP and Municipalities	Protect shoreland areas from erosion.
12 MRSA §4807-4807G	Minimum Lot Size	Single family residental units which would use subsurface wastewater disposal must be built on parcels of land that are at least 20,000 square feet.
17 MRSA §2802	Miscellaneous Nuisances/ DEP, etc.	Declares as a nuisance the rendering impure the water of any river, stream, or pond or diverting them from their natural course.
22 MRSA §2642, Subsection 1	Municipal Authority in Public Water Supplies/ Municipalities	Adopt regulations governing the surface uses of sources of a public water supply, portions thereof or land overlying ground water aquifers and their recharge areas.
22 MRSA §42	Plumbing Code/DHS	Specifies system design for subsurface disposal of waste water.
30 MRSA §3221	Soil Suitability/CIO	Provide documentation that the disposed system can be constructed in compliance with Plumbing Code.
30 MRSA §4956	Subdivision Law/Municipalities	Will not cause unreasonable soil erosion or a reduction of the capacity of the land to hold water.
38 MRSA §481-5, 488-90	Site Location of Development/ DEP	1. No adverse effect on natural envionment 2. Development must be built on suitable soils.
38 MRSA §386-396	Great Pond Act/DEP	No dredged, soil, fill or structure may fall or be washed into waters covered by the Act without a permit.
38 MRSA §471-478	Coastal Sand Dune Rules/ DEP	Activites in a sand dune system must meet the minimum standards established in 38 MRSA 474, Subsection 2.

Table 12. Continued. State Laws Used for Control of Nonpoint Source Pollution (Page 2)

Reference	Law/Enforcer	Requirements
38 MRSA C. 3, Article 1-C	The Freshwater Wet Land Statute/DEP	That anyone proposing to alter a freshwater wetland which is ten or more acres in size first obtain a permit.
38 MRSA §413(1)	Waste Discharge Licenses/ DEP	License required for discharge to public waters.
38 MRSA §417	Certain Discharges Prohibited/DEP	Prohibit forest products refuse from being deposited or discharged directly into the inland or tidal waters of the State.
38 MRSA §471-478	Alteration of Coastal Wetlands/DEP	Restrict activities which harm wetlands such as dredging and filling and to provide measures of protection for these valuable areas.
38 MRSA §1301	Maine Hazardous Waste Septage, and Solid Waste Management Act/DEP	To protect the health, safety and welfare of the State's Citizens through the prevention of water, air, and land pollution.
38 MRSA §1317-1319A	Hazardous Matter Control/DEP	To protect the health, safety and welfare of the State's citizens through the prevention of water, air, and land pollution.
38 MRSA §1917	Municipal Home Rule/ Municipalities	Municipalities may, by the adoption, amendment or repeal of ordinances or bylaws, exercise any power or function which the Legislature has the power to confer upon it.
Me. Reg. 601.1-619.0	Oil Discharge Prevention and Pollution Control/DEP	Provides procedures to be followed during transfer of oil or petroleum and petroleum products.
38 MRSA §561	Underground Storage Tanks/DEP	Registration of all existing new and replacement underground oil storage facilities with the DEP.
38 MRSA §413, Subsection 2-D	Sand-Salt Pile Regulation/DEP	Owners of salt storage areas shall register the location of storage areas with DEP on or before January 1, 1986

Sludge

Most of the 100+ sewage treatment facilities operating in Maine generate sludge. At most of them, sludge must be regularly removed from the treatment facility. Sludge contains most of the substances removed from the wastewater being treated. Nitrogen compounds, bacteria, viruses, volatile organic compounds, and trace concentrations of heavy metals, are substances typically found in municipal sludge.

The 208 water quality planning programs conducted by regional planning agencies evaluated municipal disposal practices and environmental impacts in Maine. During the time these studies were conducted (1975-1978), most municipal sewage treatment facilities disposed of sludge by landfilling. In a number of instances, the 208 agencies found reason to suspect that sludge was having a negative impact on the quality of nearby waters. Often the sludge was being buried in a trench, thus increasing the potential for ground water contamination. Elsewhere, sludge was being spread at excessive rates or on inadequate soils when the ground was wet, frozen or otherwise unsuitable. Even in some situations where sludge was utilized in accordance with existing guidelines, an impending lack of storage space often was found to be a serious problem.

The situation is improving. In response to the numerous sludge-related problems identified in the 208 assessments and through its own programs, the Maine Department of Environmental Protection has fashioned a program to help farmers, nurserymen, foresters and others to use sludge from municipal and industrial wastewater treatment plants provided it is of a quality acceptable for agricultural or land reclamation purposes.

The Division of Municipal Services has assigned four persons on a full-time basis to the task of overseeing the State's sludge and residual utilization program. The program's goal is to encourage landspreading of these wastes while safe-guarding the environment and public health. Approximately 55 sewage treatment facilities have worked out sludge utilization programs with landowners. Many of the remaining sewage treatment facilities either are not interested in landspreading due to abundant landfill capacity or generate sludge with excessively high levels of heavy metal, usually chromium from tanneries. The DEP is encouraging the operators of the latter facilities to establish and enforce pretreatment agreements with industries using chromium. Such pretreatment agreements are aimed at lowering the amount of chromium in the industry's wastewater, thereby reducing the chromium content of the sludge.

In 1985, the Board of Environmental Protection adopted rules (Chapter 567) governing the use of municipal sludge on land. The rules, adopted under the authority of 38 MRSA Section 1304, apply to municipal sludges which contain acceptably low concentrations of heavy metals or other compounds, and have been treated to reduce pathogenic organisms. The purpose of the regulations was to encourage, to the maximum possible extent, the safe use of sludges from municipal wastewater treatment facilities.

Sludges other than those which qualify for landspreading utilization under the present "Rules for Land Application of Sludge and Residuals," must be disposed of in accordance with the provisions of other DEP regulations. While almost all sludge which is not landspread in Maine is buried in landfills, sludges classified as hazardous are shipped out of State to approved hazardous material disposal facilities.

GROUND WATER PROTECTION PROGRAMS

The protection of Maine's groundwater is becoming an issue of increasing concern at the local, regional, state and federal levels. Programs for effective assessment of the quality of ground water resources are underway in many areas of the State and more are planned. Serious ground water pollution problems that have occurred throughout the State and elsewhere have heightened the need for protecting groundwater supplies.

On June 10, 1985, Maine's Governor, Joseph E. Brennan, established by Executive Order a Ground Water Standing Committee under the State's Land and Water Resources Council to oversee implementation of groundwater policy. The Council, in its Annual Report to the Governor, is charged with giving a full account of the Committee's activities during the previous year. This report has been submitted to the Council in accordance with that charge. Presently, the Committee is chaired by the Commissioner of the Department of Environmental Protection. The State Coordinator of Ground Water (a position with the State Planning Office) serves as staff coordinator for the Committee. The following is a summary of Maine's ground water protection activities.

A. Groundwater Classification

1) The Groundwater Classification Subcommittee is working on a revised groundwater classification system. A draft scheme will be field tested this summer by representatives from the Department of Human Services (DHS), Department of Environmental Protection (DEP), State Planning Office (SPO) and the Maine Geological Survey (MGS) in the Southern Maine Cumulative Impact Study Area.

2) An Act to "Protect Existing Essential Public and Private Ground Water Supplies" will be introduced in the next Legislature session.

3) The Resource Protection Subcommittee will complete a draft review of groundwater protection regulations and identify gaps in State law by
June 1, 1986.

B. Aquifer Mapping

1) The State of Maine has conducted two generations of sand and gravel aquifer mapping. The first was a reconnaissance-level investigation, which covered the inhabited portions of the State in three years with approximately six person-years of effort. The second, more detailed mapping project is in its sixth year of a seven year effort to more clearly define the boundaries and yields of aquifers. The State currently has the equivalent of four full-time staff assigned to this project.

A pilot bedrock aquifer mapping program was initiated in 1985 in Aroostook County and will continue this summer. Approximately 1 1/2 staff positions are assigned to this effort.

2) A State monitoring well network, that presently consists of fifteen wells, is being added to at the rate of two or three wells annually.

C. Data Management

Many local, regional, state, and federal agencies and private sector organizations have or will be generating groundwater quality data in the months and years to come. To maximize access and use of the information, a program has been undertaken to analyze data management needs and recommend a data management system capable of assuring interagency accessibility.

D. Identification of Present and Potential Pollution Sources Impacting Groundwater

1) A DEP/DHS/SPO technical assistance effort has been instituted to aid communities in assessing development impacts and in groundwater protection planning.

2) A three year assessment of the impact of agricultural chemicals and practices on groundwater quality is under way and will be completed in 1987.

3) The DEP and Maine Association of Conservation Commissions (MACC) are conducting a pilot study to develop a methodology for locating potentially harmful buried wastes.

4) Legislation requiring sand/salt pile registration and siting requirements has been enacted. A priority list of registered sites is being compiled. Sand-salt piles that could contaminate groundwater supplies will be relocated or covered. The Maine Department of Transportation is similarly addressing its sand-salt storage areas. The Department of Environmental Protection will be submitting sand-salt storage regulations to the Board of Environmental Protection (BEP). Funding for covering sand-salt piles has not yet been provided.

5) Watershed basin boundary maps are being provided so that water utilities may identify proposed developments within their recharge areas and assess potential impacts.

6) A review of emergency response programs with recommendations for improvements has been submitted to the Groundwater Standing Committee.

E. Control of Known Sources of Groundwater Pollution

1) The Department of Human Services is charged with the responsibility of the permitting of subsurface wastewater disposal under the State of Maine Plumbing Code. This code has established subsurface disposal system guidelines and requirements for residential units and a variety of commercial establishments. In most cases, the permitting of subsurface wastewater disposal from industrial facilities must be approved by the BEP. Approximately 30 such licenses are presently held throughout the State. All industrial systems must be designed to meet State and USEPA "Best Available Technology" (BAT) requirements.

2) The Board of Environmental Protection has also licensed surface application wastewater disposal systems. These systems are very closely monitored and a license may be revoked at any time by the Board of Environmental Protection. The burden of proof is on the licensee to provide overwhelming evidence that the system is practical, scientifically sound, and does not contaminate groundwater outside a reasonably limited area.

3) There are approximately 300 solid waste disposal sites throughout the State that are presently utilized as "land fills." Most of these sites were established prior to the enactment of laws requiring them to be licensed. Approximately 10-15% of the known sites are presently licensed, others are "grandfathered". The licensed facilities are required to operate the site in compliance with the conditions of the license. The materials authorized for disposal are determined by site design and existing physical condition (soils, ground water, surface water, etc.). Land fills presently operating that may pose serious threat to human health and the environment are of most immediate concern. Besides improving operations at existing land fills, Maine's Solid Waste Management Act has resulted in the closing of over 200 landfills, thereby decreasing the extent of this source of groundwater contamination.

F. Hazardous Waste Sites

1) At the present time the State of Maine has not licensed any "Hazardous Waste Disposal Facilities" and in 1985, closed down the only Hazardous Waste Treatment Facility located here. This facility held an Interim Hazardous Waste Treatment License but an application for a final license was denied by the Board of Environmental Protection. At the present time, the DEP's Bureau of Oil and Hazardous Materials, Uncontrolled Sites Unit is working on 20 priority sites where hazardous pollutants have been identified. The sites that are presently receiving remedial action are Winthrop, Gray, Pinette Salvage (Aroostook Co.), O'Connor (Augusta), Saco Tannery Pits, and Union Chemical. These six are also classified as Superfund sites.

2) The Bureau of Oil and Hazardous Materials also is responsible for processing applications for the registration of all existing, new, and replacement underground oil storage facilities. The Board of Environmental Protection has developed rules for the design, installation, replacement, operation, and abandonment of underground oil storage facilities and tanks. These regulations are consistent with Legislative policy to provide necessary controls over underground oil storage facilities so as to ensure the protection of Maine's ground water resources and of public health, safety, welfare and the overall environment. The damage that can occur from this type of pollution of the State's groundwater has been seen all too frequently. Over 200 domestic wells have been found to be contaminated and alternate water supply sources required. The nature of underground petroleum product contamination makes it very difficult and expensive to remedy.

3) The Bureau of Oil and Hazardous Materials also licenses and periodically inspects all oil terminal facilities in the State. This process reduces the possibilities of unlawful discharge of petroleum and petroleum products into the wasters of Maine. The Bureau also staffs an "Emergency Response Team" that is highly trained in safe and immediate cleanup of oil and hazardous material spills. The Emergency Response Team also works closely with other Statewide emergency units to ensure maximum coordination and on-site effectiveness.

G. Education

The many problems that are associated with pollution of the State's groundwater are the subject of various educational efforts. A program of basic ground water instruction will be recommended this summer to the Maine Science Teachers Association and the curriculum development committee of all Maine schools. A video tape describing the methods of producing a community groundwater protection plan is being prepared. Also, production of a general groundwater information video that would be available to schools, interested adult organizations, and television stations has been recommended and funding is being pursued. The production of a general ground water information slide show specific to Maine is being investigated.

A network of State agencies and private organizations capable of providing groundwater management assistance has been identified and will be disseminated. This summer, an intern will be employed to work with selected town officials to increase their awareness of existing and potential ground water issues. Solving the many problems that will be confronted, requires the efforts of informed, experienced individuals and groups. After review of the major ground water issues, it is clear that Maine is attacking the problem head-on and leads the nation in many regards.

SPECIAL STATE CONCERNS

Maine is faced with a variety of issues that affect water quality and State programs dealing with water quality problems. The purpose of this section is to highlight some of these issues, particularly those not covered in EPA's 1984 guidance for preparation of 305(b) water quality reports. Some of these issues have been recognized for some time while others have only recently been recognized. Following are brief summaries of these issues and the present status of efforts to address these issues.

Acid Rain

Acid rain continues to be a major water quality issue in Maine. Though the full range of impacts is not well documented, several Maine ponds are exhibiting signs of acid rain impacts. There is some concern that acid rain may be adversely affecting the reproductive cycles of trout and other aquatic species as well as forest productivity though these impacts have not yet been fully documented. Maine DEP has been participating in the National Atmospheric Deposition Program's monitoring network. The four stations located in Maine have recorded a fairly consistent pattern of rainfall and dry

weather "deposition" ranging in pH from 3.8 to 4.5. DEP is participating in an EPA sponsored "National Pilot Study" of acid rain (300 lakes in Maine) and is taking additional steps to protect the public's natural resources from this threat.

In 1985, the Maine Legislature appropriated $128,250 for a study on what acid rain "threat to the State's natural resources, including its fish and wildlife, agriculture and water resources as well as to the State's economy and public health" exists. Part of the study is a State nitrogen oxides emission inventory to complement the already completed sulfur dioxide emissions inventory.

Other components of the study include

1) A resampling and measuring of the response of the State's lakes located in sensitive geologic areas:
2) An identification of sensitive receptor areas throughout the State based on, but not limited to, the following criteria: Geology; elevation; lake size; watershed area; and aquatic and terrestrial flora;
3) An assessment of the impact of acid deposition on the growth and productivity of the State's forest resources; and
4) A determination through long-range modeling techniques of the contribution of both in-state sources and out-of-state sources to acid rain deposition in the State.

The results of the study, together with recommendations for further action will be submitted to the Legislature by January 31, 1987.

Groundwater Contamination

Although much of the State's concern for groundwater protection has been detailed in the section on Groundwater Protection Programs, some results of a questionnaire administered to the 163 citizen volunteers who make up Maine's Regional Water Quality Advisory Committees serves to reemphasize how concerned the people of Maine are on this issue:

1) The quality of groundwater sources of drinking water in my region is currently threatened.

   Yes (57.8%) No (24.8%) Don't know (17.4)

2) I think that DEP provides sufficient public education regarding how to avoid contaminating groundwater in my region.

   Yes (13.1%) No (82.9%) Don't know (4.0%)

3) Should the State do (more, the same amount or less) testing of groundwater?

   More (71.4%) The same (27.6%) Less (1.0%)

4) Should all classes of business activities be presumed to threaten groundwater unless proven otherwise?

   Yes (31.7%) No (67.3%) Don't Know (1.0%)

Radon

The presence of radioactive radon gas in most granite bedrock aquifers and the soils overlying them has raised concerns regarding the effects of groundwater that had previously been regarded as safe. Though the radon is entirely from natural sources, its presence is a source of growing concern. Based on studies of miners, medical researchers have shown that high radon levels are associated with increased incidence of lung cancers. The question remaining is whether radon levels found in some Maine homes can have a similar health effect. A proposal to USEPA's program on health effects of waterborne radon to do more study on the situation in Maine is currently awaiting a USEPA decision on funding. Hopefully, work in Maine will begin soon on determining the nature and extent of this water quality problem.

Mining

The recent discovery of relatively rich metal ore deposits, notably copper, zinc and silver, in Northern and Western Maine has led to efforts by DEP to investigate the potential water quality impacts associated with metal mining operations. Many of these ore deposits are sited in Class A watersheds where State law requies businesses to comply with the ultimate goals of the Clean Water Act and discharge no polluants to public waters. A challenge facing Maine in the near future, in mining and other development possibilities, is reconciling the State's needs for clean water and economic development.

Land Use Law Enforcement

In 1983 a special legislative study commission examined the widely-perceived crisis in the enforcement of Maine's land use laws and regulations. The commission found that the effectiveness of many of these laws and regulations is in serious doubt, due to the confusing and conflicting division of responsibilities between State regulatory agencies, municipal officials and the courts. Maine's Legislature is continuing consideration of measures to rectify the situation. The State's coordinators for groundwater and for control of nonpoint source pollution are also conducting studies on how improvements in land use law enforcement can help control pollution.

Hydro Development

The energy crunch of the 70's has led to the "hydro-boom" of the 80's. A surge of hydro development proposals has flooded Maine DEP over the past 4 years. Many of these proposals would rehabilitate dams that have washed out or fallen into disrepair over the past 70 years. Accordingly, water quality benefits associated with the beaching of these dams are now being threatened. Hydro development proposals on the larger rivers threaten to reduce the capacity of those rivers to assimilate oxygen-consuming wastes discharged from Maine's industrial and municipal treatment facilities.

In 1983, Maine enacted the Maine Waterway Development and Conservation Act (MWDCA) to establish policy on where hydro development should be prohibited, where it should be permitted and under what conditions it should be permitted. In 1986, 401 certification of the controversial "Big A" and Bangor hydro projects were denied by Maine's Board of Environmental Protection on water classification and MWDCA grounds. In 1986, changes were made in the

MWDCA and the water classification law to better implement legislative intent on hydro policy. Hopefully, late 1986 and the years following it will be a period marked by more consensus and less divisiveness on hydro development in Maine.

Water Supply

Rapidly growing populations in Southern and Coastal Maine have placed increasing pressure on ground and surface supplies and accelerated the search for alternaties to existing sources. This pressure comes at a time when it is being discovered that there is less water available than previously believed, due mostly to groundwater contamination. Although some states have been gravely concerned with water quantity from their beginnings, Maine, with its abundant water resources, has only recently faced this issue. It is anticipated that growing concern over water quantity will serve to enhance concern over protecting water quality.

Control of Nuisance Insects

Biting flies have historically been a nuisance in Maine but their control by use of aquatic larvicides has never been allowed due to the unreasonable impact to nontarget organisms from the various toxic control agents. A new biological agent (Bti) is now available and has stirred interest among the public. The DEP has taken a conservative stance in allowing its use only in situations where direct and indirect effects are expected to be slight. The only current operational use of the material is for control of salt marsh mosquitoes in the town of Georgetown. Experiments conducted by the University of Maine for its use against blackflies have also been allowed. Future operational use of Bti against blackfly larvae will not be allowed unless this research can demonstrate insignificant effects to nontarget species.

Dioxin

In 1984, Maine took part in EPA's National Dioxin Survey by supplying soils and fish for analyses. It had been presumed that these sites were all uncontaminated (Tier 7) however significant levels of dioxin were found in several Maine rivers. Subsequent study of the problem led to the discovery that several Maine pulp and paper mills were generating dioxin in their process. Fish, sediments, and waste treatment sludge were all found to have varying levels of contamination. Additional study by the DEP, EPA, and the industry will be done to assess the problem and to address concerns about edibility of the fish and safe disposal methods for the sludge.

RECOMMENDATIONS

The directions in which Maine's water quality management programs are moving have been detailed in this report. Within these programs, there are already procedures in place to continually assess and improve program effectiveness as well as to respond to new problems. Maine's water quality would be best improved and protected by maintaining its present management. The prospect of impending reductions in Federal financial support for water quality management necessitates the preparation of contingency plans. Although a goal of the Bureau of Water Quality Control is to maximize the effectiveness of expenditures, the question now faced is not "how to do more with less", but rather "what programs can we do without?" The senior managers of the Bureau of Water Quality Control have developed a priority system presented in Table 13 to facilitate program changes in response to funding cuts.

1. With the passage of Legislative Documents (LD) 2283 by the 112th Legislative Session of the Maine Legislature, the Department of Environmental Protection (DEP) and Board of Environmental Protection (BEP) will be going through the public hearing process to prepare future Legislatures for water quality classification changes. This way, the DEP and BEP will meet the goal-oriented objectives of the recently passed legislation. The new regulations to be written on biomonitoring as well as lakes and ponds will establish new types of impact-oriented standards. This is where Maine can provide background and strategy which other states may follow. There will be follow-up evaluation work to refine the biological system but basic regulations will be in place by January of 1987.

2. Groundwater protection will receive higher consideration by the Land and Water Resources Council's Standing Committee on Groundwater for Maine. Groundwater protection is a high priority with the DEP and classification standards for groundwater will be proposed to future Maine Legislatures. A high priority now is for Maine to complete its mapping of sand and gravel aquifers.

3. Maine has recently submitted to USEPA for review, a schedule for National Pollution Discharge and Elimination System (NDPES) program delegation. Therefore it is uncertain at this time when Maine will have the full responsibility for this activity. NPDES delegation represents an efficient mechanism for licensing and enforcement of wastewater discharges and NPDES delegation is compatible with the DEP's overall water quality management strategy.

4. Nonpoint sources of pollution to Maine waters are important to control. This is especially true for the watersheds of lakes and ponds where we are actively controlling impacts to these highly sensitive water bodies. The nonpoint sources to rivers and streams are predominantly sediment loads from agriculture, forestry, and construction. The DEP needs to draft a comprehensive strategy for control of nonpoint source pollution. Implementation of controls will be important to meet the goals of LD 2283.

5. Acid rain and Maine lakes has been an issue for years. Maine, has for the first time initiated a broad screening project on all lakes and ponds over 2000 feet above sea level. These results will give Maine the real facts on impact and how many lakes are being threatened from this phenomenon.

6. Maine will need adequate 201 and 205 funding to complete construction of waste treatment facilities to provide appropriate levels of wastewater treatment. The DEP's goal is for all municipal waste discharges in Maine to receive treatment. Funding mechanisms must be implemented to assist communities and to provide for repair of older facilities.

7. The needs for 106 funds to carry on the water quality monitoring in Maine is necessary to ensure that classifications are being met. Some of this funding will be devoted to biological evaluation which is unique in our water quality classification statutes.

8. The DEP sees a great need for USEPA to expand its funding and support for section 314 of the Clean Water Act. All states should have a lake protection program. Most state funding is not adequate. Maine has over 5,000 lakes and a great deal of effort is going into protection programs rather than restoration.

9. Maine needs to expand its assessment of the discharge of trace organic pollutants to Maine's groundwater and surface water and to continue its surveillance of fish tissue contamination.

10 The State must continue developing and implementing regulations for the utilization of waste treatment plant sludges and other residuals such as wood ash and coal ash.

11. The State should continue its program of assistance to wastewater treatment plants in the areas of personnel training, trouble shooting and evaluation.

Table 13. Water Quality Management Program Priorities

********** LEVEL I **********

Programs essential to the function of DEP's Bureau of Water Quality Control. Although the scope of these programs could be cut back (with consequent loss of effectiveness) the function of all of them must be maintained at the highest possible level.

1) Public relations and education
2) Development of policies and programs which meet the State's water quality needs
3) Financial planning and management
4) Maintain present status of wastewater treatment at major facilities
   a) Renew licenses of major discharges with minimum resources needed to comply with statutory requirements
   b) Maintain the self-monitoring program at wastewater treatment facilities
   c) Serve notices of license violations as followup to 4(b).
   d) Sludge management programs
5) Conduct research/monitoring of environmental quality as directed by public's current and perceived needs
6) Conduct research/monitoring of environmental quality as directed by water quality standards
   a) Protection of habitat
      i) Biomonitoring
      ii) Dissolved oxygen and other chemicals
   b) Protection of swimmer health
      i) Bacteria monitoring
7) Licensing new wastewater discharges and sludge management programs
8) Improving the effectiveness of wastewater treatment by providing technical assistance to wastewater treatment facilities
9) Laboratory services
10) Monitoring and inspection of major wastewater treatment facilities
11) Enforcement actions to address license violations at major wastewater treatment facilities
12) Provide grants for the construction, upgrading and renovation of wastewater treatment facilities (commercial and industrial facilities excepted)

****

Table 13. (Continued) Water Quality Management Program Priorities

********** LEVEL II **********

Programs necessary for comprehensive water quality management. Funding cuts may cause elimination of these programs and consequently impair protection and improvement of Maine's waters. In many cases, elimination of a Level II program will adversely effect the long-term performance of Level I programs.

1) Aquifer mapping
2) Development of groundwater protection strategy
3) Implementation of groundwater protection strategy
4) Implementation of lake management strategy
5) Legislative affairs
6) Renew licenses of residential and commercial discharges
7) Monitoring and inspection of residential and commercial wastewater treatment facilities
8) Enforcement actions to address license violations by residential and commercial discharges
9) Maintain certification program for operators of wastewater treatment facilities
10) Investigate citizen reports of water quality violations
11) Control nonpoint sources of pollution
12) Maintain and improve program to make licensees pay for the cost of issuing licenses
13) Do field investigations to find remaining discharges of untreated wastewater
14) Provide support for protection of public drinking water supplies
15) Renew licenses of minor industrial and municipal discharges
16) Monitoring and inspection of minor industrial and municipal wastewater treatment facilities
17) Enforcement action to address license violations by minor industrial and municipal discharges
18) Training programs for DEP employees
19) Training programs for operators of wastewater treatment facilities
20) Restoration of water quality in overly productive lakes and ponds
21) Assimilative capacity studies/load allocation analysis
22) Special habitat studies utilizing bioassay and biomonitoring
23) Acid rain monitoring program
24) Travel necessary to obtain or disseminate technical information
25) Laboratory certification program
26) Intergovernmental liaison
27) Preparation of technical publications

****

APPENDIXES

APPENDIX I, MAINE'S PRIORITY PROBLEM WATERS

Although some would argue that all waters not in their pristine state are a priority for cleanup, it is not a realistic approach to water quality management. Society will only devote a certain portion of its resources to environmental protection; only part of that goes towards protecting water quality. Given limited resources, water quality problem priorities must be established. The following list identifies Maine water bodies that are experiencing serious water quality problems justifying their designation as priority problem waters. The reasons for their water quality problems are generally well understood. In many cases additional study and research are necessary for DEP to determine the appropriate cleanup or protection measures to be taken.

Maine's priority problem waters can be classified as one of two types. The first type is an Effluent Limited Segment (ELS). These are waters with problems that can be corrected through the use of Best Practical Treatment (BPT) for existing discharges. Most ELS's are degraded by untreated or inadequately treated municipal wastewater. As municipal wastewater treatment facilities presently planned or under construction are completed, most of the ELS's will be eliminated.

The second type of problem is a Water Quality Limited Segment (WQLS). This designation means that these waters have problems so severe that they are not expected to be suitable for swimming, fishing, and aquatic habitat even after the application of BPT to wastewater discharges. Another way to explain the WQLS concept is that a WQLS is the result of historical patterns of development where the size and number of wastewater discharges overwhelm the assimilative capacity of the receiving water unless extraordinary expenditures for wastewater treatment are made. Fortunately, there are only five WQLS's in Maine. The Federal and State governments, industries and municipalities have already invested considerable effort and expense towards correcting WQLS problems. Most have improved considerably since their initial designation. One former WQLS on the upper Penobscot River has improved enough for DEP to drop its WQLS designation, although minor water quality problems still persist.

DEP uses a rating system to assign relative priority points to wastewater treatment facility projects in the Municipal Construction Grants and Small Community programs. The rating is determined primarily on the basis of water quality and related impacts. Not all facility needs are covered by these problems. Toxic industrial discharges and lakes with water quality problems caused by nonpoint sources of pollution, are examples of high priority problems which are not included in municipal facility grant programs.

While the following list identifies Maine's high, medium, and low priority problem waters, it should be noted that there are other water bodies in Maine which experience water quality problems of varying severity and duration. Maine's DEP places a high priority on dealing with such problems as they occur. Moreover, Maine places a very high priority on protecting and maintaining high water quality in waters that are not known to be experiencing water quality problems. The vast majority of Maine's waters are of very high quality. That they are not specifically identified here should in no way be construed to mean that the DEP is not concerned with protecting their quality.

ABBREVIATIONS USED

AQU	Aquatic Life Is Unacceptably Impacted
BACT	Bacteria Levels Are Unacceptably High
CSO	Combined Sewer Overflows
CWCS	Construct Wastewater Collection System
CPOWTF	Construct Publicly Owned Wastewater Treatment Facility
CWTF	Construct Wastewater Treatment Facility
DO	Dissolved Oxygen Levels Are Unacceptably Low
ELS	Effluent Limited Segment
IRWQS	Implement Revised Water Quality Standards
ITW	Inadequately Treated Wastewater
MSN	More Study Needed
RDFW	Remove Discharge From Waterbody
RBPTD	Reduce Loading From Best Practically Treated Discharges
UAA	Use Attainability Analysis
UW	Untreated Wastewater
UWCS	Upgrade Wastewater Collection System
UWTF	Upgrade Wastewater Treatment Facility
WQLS	Water Quality Limited Segment

A. HIGH PRIORITY WATERS

1) Marine Waters

Municipality	Area	Problem	Needed Action/ Cleanup Date
Addison	Town Center	ELS,UW,BACT	CWTF/1988
Biddeford	Pool	ELS,UW,BACT	CPOWTF/1988
Bucksport	Penobscot Estuary	ELS,UW,BACT	CPOWTF/1988
Cherryfield	Town Center	ELS,UW,BACT	CWTF/1988
Cutler	Harbor	ELS,UW,BACT	CWTF/1988
Friendship	Harbor	ELS,UW,BACT	CWTF/1988
Hancock	Sullivan Harbor	ELS,UW,BACT	CWTF/1988
Harpswell	Gurnet Strait	ELS,UW,BACT	CWTF/1988
Lubec	Johnson Bay	ELS,UW,BACT	CWTF/1988
Machiasport	Machias Bay	ELS,UW,BACT	CWTF/1988
North Haven	Fox Islands Thorofare	ELS,UW,BACT	CPOWTF/1988
Old Orchard Beach	Goosefare Estuary	WQLS,ITW,BACT,DO	UWTF/1987
Portland	Harbor	ELS,CSO,BACT	MSN
Saco	Camp Ellis	ELS,UW,BACT	CWCS/1988
Saint George	Tenants Harbor	ELS,UW,BACT	CWTF/1988
Searsport	Harbor	ELS,UW,BACT	CPOWTF/1988
Sorrento	Back Cove	ELS,UW,BACT	CPOWTF/1988
Steuben	Dyer Bay	ELS,US,BACT	CWTF/1988
Stockton Springs	Penobscot Bay	ELS,UW,BACT	CWTF/1988
Sullivan	Sullivan Harbor	ELS,UW,BACT	CWTF/1988
Swans Island	Harbor	ELS,UW,BACT	CWTF/1988
Tremont	Bass Harbor	ELS,UW,BACT	CWTF/1988
Whiting	Whiting Bay	ELS,US,BACT	CWTF/1988
Yarmouth	Royal Estuary	ELS,UW,BACT	MSN

A. HIGH PRIORITY WATERS (continued)

2) Lakes and Ponds

a) Point Source Problems

Municipality	Area	Problem	Needed Action/ Cleanup Date
Portage	Portage Lake	ELS,UW,BACT,Phosphorus	RDFW/1988
Saint Agatha	Long Lake	ELS,ITW,Phosphorus	RDFW/1992
Sinclair	The Thorofare	ELS,UW,BACT,Phosphorus	RDFW/1990

b) Increasing Trophic State Problems

Those lakes and ponds with an increasing trophic state, whether or not they have culturally-induced algal blooms yet, are high priority problem waters.

i) Those with culturally-induced algal blooms (total area is 8,593 acres)

Chickawaukie Pond (Rockland & Rockport; 352 acres)(feasibility study 1986)
China Lake (China & Vassalboro; 3,845 acres)
Cochnewagon Lake (Monmouth; 410 acres)(chemical precipitation in 1986)
Cross Lake (T1,R5,W.E.L.S. & T1,R5,W.E.L.S.; 2,515 acres)
Hobbs Pond (Norway; 96 acres)
Round Pond (Dayton; 1 acre)
Three-Cornered Pond (Augusta; 182 acres)(PL 89-566 project)
Threemile Pond (China, Vassalboro and Windsor; 1,162 acres) (PL 89-566 project)
Toothaker Pond (Phillips; 30 acres)(Diversion project planned for 1987)

ii Those which do not yet have culturally-induced algal blooms (total area is 1,736 acres)

Caribou Pond (Lincoln; 825 acres)
Deer Pond (Hollis; 32 acres)
Long Pond (Lincoln; 523 acres)
Notched Pond (Gray and Raymond; 77 acres)
Upper Narrows Pond (Winthrop; 279 acres)

A. HIGH PRIORITY WATERS (continued)

3) Major Rivers

River Name	River Segment	Problem	Needed Action/ Cleanup Date
Androscoggin	NH border to Bethel	ELS,UW from Berlin NH	CWCS/1989
Androscoggin	Gulf Island Pond	WQLS,AQU,DO	IRWQS, RBPTD or UAA/MSN
Androscoggin	Lewiston to Lisbon	ELS,CSO,BACT	MSN
Kennebec	Norridgewock	ELS,UW,BACT	CWTF/1988
Kennebec	Skowhegan to Hinkley	ELS,CSO,BACT	MSN
Moose	Jackman to Long Pond	ELS,UW,BACT,DO,Phosphorus	CPOWTF/1986
Penobscot	Veazie	ELS,UW,BACT	CPOWTF/1988
Penobscot	Bangor	ELS,ITW,BACT	UWTF/1988
Piscataquis	Guilford to Dover	ELS,UW,AQU,BACT,DO	CPOWTF/1988
Presumpscot	Gorham	ELS,UW,BACT,DO	CPOWTF/1987
St. John	Ft. Kent to Quisbilis Island	ELS,CSO,UW,&ITW from Maine and New Brunswick	CWCS,CPOCWTF,UWTF/MSN

4) Minor River, Streams and Brooks

Water Body	Municipality	Problem	Needed Action/ Cleanup Date
Baskahegan Stream	Danforth	ELS,UW,BACT	CWTF/1987
Caribou Stream	Caribou	ELS,UW,BACT	RDFW/1988
Carrabassett River	New Portland	ELS,UW,BACT	CWTF/1988
Cooks Brook	Waterboro	ELS,ITW,AQU	UWTF/1987
Dennys River	Dennysville	ELS,UW, BACT	CWTF/1988
East Branch of the Sebasticook River	Dexter	WQLS,UW,AQU,BACT,DO	RDFW/1987
East Branch of the Sebasticook River	Corinna	ELS,ITW,AQU, Phosphorus	MSN
East Branch of the Sebasticook River	Newport	ELS,UW,AQU,BACT,DO, Phosphorus	CPOCWTF/1986
Fish Stream	Patten	ELS,UW,BACT	CWTF/1988
Frohocks Brook	Lincolnville	ELS,UW,BACT	RDFW/1988
Goosefare Brook	Saco	WQLS,ITW,AQU	RDFW/MSN
Little Androscoggin River	Paris to Oxford	WQLS,AQU,DO	MSN
Pleasant River	Columbia Falls	ELS,UW,BACT	CWTF/1988
St. George River	Union	ELS,UW,BACT	RDFW
Unnamed Brooks	Gorham	ELS,ITW,BACT	CWCS/1988

B. MEDIUM PRIORITY WATERS

1) Marine Waters

Municipality	Area	Needed Action/ Problem	Cleanup Date
Biddeford	City Center	ELS,CSO,BACT	UWCS&UWTF/1992
Boothbay Harbor	Bayville & Sea St.	ELS,UW,BACT	CPOWTF/1990-92
Jonesport	Moosabec Reach	ELS,UW,BACT	CWTF/1990
Kennebunkport	Goose Rocks Beach	ELS,UW,BACT	CWCS/1990
Kittery	Badger's Island, etc.	ELS,UW,BACT	CWCS/1992
Northport	Bayside	ELS,UW,BACT	CPOWTF/1989
Owl's Head	Ingraham Hill	ELS,UW,BACT	CWCS/1990
Portland	Peaks Island	ELS,UW,BACT	CPOWTF/1990
Rockport	Harbor & Clam Cove	ELS,UW,BACT	CPOWTF/1990
Southport	Squirrel Island	ELs,UW,BACT	CPOWTF/1990
Stonington	Harbor	ELS,UW,BACT	CPOWTF/1990

Other marine waters presently closed to shellfish harvesting which will not be cleaned up by specified high or medium priority facility projects are medium priority problem waters. Refer to Table 7 of Appendix V for a complete list of areas closed to shellfish harvesting.

2) Lakes and Ponds

Those which currently have acceptable quality and trophic state trends but which are found to be highly vunerable to degradation due to their hydrologic and demographic setting are medium priority problem waters. Work on Maine's Lake Vunerability Index is nearly completed. A list of Maine's highly vulnerable lakes will be available by September of 1986.

3) Major Rivers

River Name	River Segment	Problem	Needed Action/ Cleanup Date
Androscoggin	Bethel	ELS,ITW,BACT	UWCS&UWTF/1992
Androscoggin	Brunswick	ELS,ITW,BACT	MSN
Aroostook	Ashland	ELS,ITW,BACT	UWTF/1992
Aroostook	Washburn	ELS,UW,BACT	CPOWTF/1990
Kennebec	Richmond	ELS,ITW,BACT	UWTF/1992
Penobscot	Mattawamkeag	ELS,UW,BACT	CPOWTF/1990
Penobscot	Bradley	ELS,UW,BACT	CPOWTF/1992
Piscataquis	Dover to Medford	ELS,UW,BACT,DO	CPOWTF/1990
Piscataquis	Howland	ELS,UW,BACT,DO	CPOWTF/1989
Saint John	Fort Kent	ELS,ITW,BACT,DO	UWTF/1992
Saint John	Frenchville	ELS,UW,BACT,DO	CPOWTF/1991

MEDIUM PRIORITY WATERS (continued)

4) Minor Rivers, Streams and Brooks

Waterbody	Municipality	Problem	Needed Action/ Cleanup Date
Carrabassett River	Anson	ELS,UW,BACT	CWCS or CPOCWTF/1989
Meduxnekeag River	Houlton	ELS,ITW,BACT,DO	UWTF/MSN
Messalonskee Stream	Waterville	ELS,CSO,BACT	MSN
Pleasant River	Brownville	ELS,UW,BACT	CPOCWTF/1989
Prestile Stream	Mars Hill	ELS,ITW,BACT,DO	UWTF/1992
Salmon Falls River	South Berwick	ELS,ITW,BACT	UWTF/1992
Sebec River	Milo	ELS,UW,BACT,DO	CPOCWTF/1989

C. LOW PRIORITY PROBLEM WATERS

1) Rivers, Streams, Brooks, and Marine Waters Segments

Those which receive untreated or inadequately treated discharges but where the problem is so minor that they have not been listed above are low priority problem waters. In many cases, the problem is caused by illegal discharges of domestic wastewater from a few households. Some of the waters listed in Table 7 of Appendix V as being closed to shellfish harvesting are low priority waters which will not be cleaned up by the needed actions specified in the high and medium priority sections of this appendix.

2) Lakes and Ponds

Those with culturally-induced algal blooms but which have a stable or decreasing trophic state are low priority waters (total area is 27,476 acres). Thoise with asteriSk following their listing indicate restoration efforts have been initiated and improvement is expected.

Annabessacook Lake (Monmouth & Winthrop; 1,420 acres) *
Basil Pond (Fort Kent; 19 acres)
Black Lake (Fort Kent; 51 acres)
Clary Lake (Jefferson & Whitefield; 666 acres)
Cobbosseecontee lake (Litchfield, etc.; 5,543 acres) *
Daigle Pond (New Canada Plt.; 36 acres)
Douglas Pond (Palmyra & Pittsfield; 566 acres)
Ell Pond (Sanford; 32 acres)
Estes Lake (Alfred & Sanford; 387 acres) *
Etna Pond (Carmel, Etna & Stetson; 361 acres)
Fischer Lake (Fort Fairfield; 5 acres)
Fitzgerald Pond (Big Squaw Twp.; 550 acres)
Haley Pond (Rangeley; 170 acres) *
Halfmoon Pond (St. Albans; 36 acres)
Hammond Pond (Hampden; 96 acres)
Hanson Brook Lake (Mapleton & Presque Isle; 118 acres)
Havener Pond (Friendship & Warren; 83 acres)
Hermon Pond (Hermon; 461 acres)
Leighs Mill Pond (South Berwick; 37 acres) *
Lilly Pond (Rockport; 29 acres)
Little Cobbosseecontee Lake (Winthrop; 74 acres)
Long Lake (St. Agatha, 6,000 acres)(High priority to remove municipal discharge)
Lovejoy Pond (Albion; 324 acres) *
Monson Pond (Fort Fairfield; 160 acres)
Pattee Pond (Winslow; 712 acres)
Pleasant Pond (Litchfield; 746 acres) *
Sabattus Pond (Greene, Sabattus & Wales; 1,962 acres) *
Salmon Lake (Belgrade & Oakland; 666 acres) *
Sebasticook Lake (Newport; 4,288 acres) *
Spaulding Pond (Lebanon & NH; 118 acres)
Togus Pond (Augusta; 660 acres) *
Webber Pond (Vassalboro; 1,201 acres) *

APPENDIX II

ASIWPCA'S NONPOINT SOURCE ASSESSMENT PROJECT

STATE WATER RESOURCE ATLAS

1125030	population at the 1980 census.	
33562	square miles of surface area.	
9	river systems or basins, totalling and including 290 miles of boundary waters shared with other States.	31806 miles.
5777	lakes, reservoirs and ponds, totalling	994560 acres.
29	lakes and reservoirs larger than 5000 acres each, totalling	383244 acres.
3500	miles of ocean coastline.	
1820	square miles of estuaries.	
1486703	acres of inland wetlands, and	
87600	acres of tidal wetlands.	

Agency preparing this report: Maine Department of Environmental Protection

For further information, please contact:

Frank Fiore
Phone: 207-289-2811

Form approved pursuant to OMB-2040-0092 expiring September 30, 1985.

NOTES FOR THIS SUBMISSION:

a. No attempt has been made to differentiate between lakes smaller than 5000 acres and those greater than 5000 acres -- however, Long Lake in Aroostook County is the only lake larger than 5000 acres judged to be impacted or threatened by nonpoint sources.

b. Maine's present water quality monitoring system does not include sediment turbidity sampling. However, best professional judgement indicates that intermittently, concurrent with intense or prolonged storm events, hundreds of miles of rivers and streams and thousands of lakes are moderately to severely affected by sediment turbidity.

c. River miles affected by nutrients/fertilizers were associated with high sediment levels and were judged to be those within 0.25 miles of agricultural cropland fields with soil losses in excess of 3 T/A/year Impairment of uses in lakes was attributed to nutrients although sediments also were a contributing factor. Agriculture was judged to be the principal nonpoint source category affecting lakes, but runoff from residential areas is also significant.

d. Legislative approval is presently being sought for a bill to allow the Department of Environmental Protection to study the extent of acid rain impacts on pH-sensitive lakes. Given the large number of Maine's lakes and streams found within poorly buffered areas of the State, and the consistently low pH precipitation readings for Maine's 4 NADP stations, best professional judgement indicates a potentially huge scope of impact on lakes and streams results from acid precipitation. Twenty-five percent of Maine's stream miles and 10% of Maine's lake acreage is estimated to be threatend by acid precipitation.

e. Most of Maine's water quality modelling and monitoring effort for dissolved oxygen and bacteria has been oriented toward gathering data for receiving waters of known point sources in order to determine associated water quality impacts. Associated nonpoint source impacts are not adequately differentiated to permit definite conclusions about their relative severity.

STATEWIDE SUMMARY INVENTORY OF ASSESSED SURFACE WATERS

Water Body Type	Quantity of Assessed Waters	Intensity of Nonpoint Source Impact: Current Use Impairment by Nonpoint Sources — Severe	Current Use Impairment by Nonpoint Sources — Moderate	No Current Use Impairment by Nonpoint Sources — Threatened	No Current Use Impairment by Nonpoint Sources — Minor	Uses Are Impaired But Point and Nonpoint Sources Cannot Be Distinguished
Rivers (in miles)	9062	14	508	8540	unknown	0
Lakes[a/] <5000 acres (acres)	399618	8055	12263	379300	unknown	0
Inland Wetlands (acres)	unknown	unknown	unknown	unknown	unknown	unknown
Tidal Wetlands (acres)	unknown	unknown	unknown	unknown	unknown	unknown
Estuaries (square miles)	unknown	unknown	unknown	unknown	unknown	unknown
Ocean (miles of coastline)	unknown	unknown	unknown	unknown	unknown	unknown

SUMMARY OF PRIMARY NONPOINT SOURCE SURFACE WATER IMPACTS

POLLUTANTS

Water Body Type	Total Aggregate Size	Sediment/ Turbidity	Nutrients/ Fertilizer	Pesticides	Toxics	Acidity	Pathogens	Salinity	Oxygen Demand	Physical Habitat Alteration
Rivers (in miles)	9061	unknown	404	unknown	11	7951	473	not applicable	222	unknown
Lakes (acres)	399618	not applicable	300168	unknown	unknown	99450	unknown	not applicable	unknown	unknown
All Other Waters (acres)	600	not applicable	not applicable	unknown	not applicable	not applicable	unknown	600	not applicable	unknown

NONPOINT SOURCE CATEGORIES

Water Body Type	Total Aggregate Size	Agriculture	Silviculture	Construction	Urban Runoff	Resource Extraction & Residue	Land Disposal	Hydromodification	Other
Rivers (miles)	9061	672	unknown	unknown	176	unknown	unknown	unknown	8213
Lakes (acres)	399618	300168	unknown	unknown	unknown	unknown	unknown	unknown	99450*
All Other Waters (acres)	600	unknown	unknown	unknown	unknown	unknown	unknown	unknown	600

* Air pollution.

KNOWN NONPOINT SOURCE IMPACTS ON STATE SURFACE WATERS (Rivers (miles) and Lakes (acres))

Nonpoint Source Pollutant	Water Bodies Aggregate Size	Intensity of Nonpoint Source Impact			Nonpoint Source Categories							
		Severe	Moderate	Threatened	Agriculture	Silviculture	Construction	Urban Runoff	Resource Extraction and Residue	Land Disposal	Hydromodification	Other
SEDIMENT/TURBIDITY[b]												
Rivers	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown
Lakes	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown
NUTRIENTS/FERTILIZER[c]												
Rivers	404	11	62	331	404	unknown	unknown	unknown	unknown	unknown	unknown	unknown
Lakes	300168	8055	12263	279850	300168	unknown	unknown	unknown	unknown	unknown	unknown	unknown
PESTICIDES												
Rivers	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown
Lakes	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown
Groundwater	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown
TOXICS												
Rivers	12	3	2	7	----------not applicable----------					6	not applicable	6*
ACIDITY[d]												
Rivers	7951	unknown	unknown	7951	unknown	unknown	unknown	unknown	unknown	unknown	unknown	7951**
Lakes	99450			99450	unknown	unknown	unknown	unknown	unknown	unknown	unknown	99450**
PATHOGENS[e]												
Rivers	473	unknown	222	251	134	unknown	unknown	88	unknown	unknown	unknown	unknown
Lakes	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown
Groundwater	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown
SALINITY												
Groundwater	600	15	30	555	----------not applicable----------							600***
OXYGEN DEMAND[e]												
Rivers	222	unknown	222	unknown	134	unknown	unknown	88	unknown	unknown	unknown	unknown
Lakes	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown *
PHYSICAL HABITAT ALTERATION												
Rivers	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown
Lakes	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown
Wetlands	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown

* Industrial spills
** Air pollution
*** Salt Storage

GROUNDWATER

Section 1. STATE GROUNDWATER ATLAS

1. Groundwater Usage: 562510 people served by groundwater, 50% of the population.

2. Wells: 78 community wells, 3 non-community wells, 63693 private potable water wells.

Section 2. MAJOR GROUNDWATER SOURCE IMPACTS

	Known Contamination				Suspected Contamination					
		Number of Water Wells				Number of Water Wells			Other	
Type of Contaminant	Area (mi2) Contaminated	Potable Public	Potable Private	Other	Estimated Area (mi2) Suspected	Potable Public	Potable Private	Other	Groundwater Uses Impaired	Contamination Source
Chemical Nutrients\ Fertilizer	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk
Pesticides	unk	unk	19	unk	unk	unk	unk	unk	unk	Agriculture Cropland
Gasoline		0	165	not applicable	unk	unk	unk	unk	unk	Underground Tanks
Deicing Salt	unk	1	147+	unk	unk	unk	up to 1000	unk	unk	Highway Salt Storage
Hazardous Wastes	unk	unk	41	unk	unk	unk	unk	unk	All Domestic	Hazardous Waste Disposal
Biological Pathogens \Bacteria	unk	unk	unk	unk	unk	unk	1000+	5000+	unk	Poor Well Installation-Septic systems
Natural	unk	unk	1	unk	unk	unk	unk	unk	All Domestic	Wells encased in granite deposits

Section 3. STATEWIDE SUMMARY INVENTORY OF ASSESSED GROUNDWATER

	Number of Water Wells				Total Overlying	Percent Volume of
	Potable	Potable		People	Total Area	Area of	Usable Groundwater
Contamination	Public	Private	Other	Impacted*	Contaminated	Groundwater Basin	Contaminated
Known	unk	274	unk	780	unk	unk	unk
Suspected	unk	1000+	5000+	17000+	unk	unk	unk

*Includes all persons who, because of human-induced contamination, have lost a groundwater source or use treated groundwater.

Section 4. CONTROL MEASURES

1. Does your State have a groundwater strategy/management plan? Yes.

2. Does your State have legislative authority to implement the strategy/plan? Yes

	Existing	Anticipated	
Groundwater Quality	Yes	Yes	A number of groundwater quality control measures and other aspects of a groundwater management strategy are already in place. Legislative authorization to implement key elements of a more comprehensive groundwater management strategy is presently being pursued.
Groundwater Quality	No	Maybe	

3. Does your State have standards that apply to groundwater? Yes.

4. Does your State's groundwater strategy include aquifer mapping? Yes.

Sand and gravel aquifer mapping is underway. Bedrock aquifer mapping will be undertaken next.

Basis of mapping: Resistivity test, terrain conductivity well monitoring

Mapping 65% complete for sand and gravel aquifers; Not complete for bedrock aquifers. Expected completion by 1990

5. Does your State have a fixed groundwater quality monitoring network? No.

Is the network adequate? No.

CURRENT PROGRAM STATUS AND EFFECTIVENESS

PURPOSE: To index and evaluate all State programs that manage nonpoint sources of pollution.

Program	Administering Agencies Local	State	Federal	Program Type	Extent	Nonpoint Source Activity	Water Quality Effectiveness
Maine Lake Restoration and Protection Fund	Towns Lake Associations	Department of Environmental Protection (DEP)		Incentive Regulatory	Local	Agriculture Residential Development	New
Great Ponds Protection	Towns	DEP		Regulatory	Statewide	Residential Development	Partially
Site Location of Development	Towns	DEP		Regulatory	Statewide	All Development	Partially
Clean Lakes 314 Program	Town Lake Association	DEP	EPA	Incentive	Local	Agriculture Residential Development	Locally
PL-566 Small Watershed Program	SWCD'S	DEP	USDA-SCS	Incentive	Local	Agriculture	Locally
SWCC Challenge Grants Program	SWCD'S	DOA-SWCC		Incentive	Local	Agriculture	Partially
Comprehensive Land Use Planning		DOC-LURC		Regulatory	Regional	Residential Development Forest Harvesting	
Volunteers Water Quality Lake Sampling	Lake Associations Citizens	DEP		Voluntary	Local	Agriculture Residential Development	Fully
205(j)	Regional Planning Agencies	DEP	EPA	Voluntary	Local Regional	Forestry All	New
Maine State Subsurface Wastewater Disposal Rules	Towns	DHS	EPA	Regulatory	Statewide	Residential and Commercial Wastewater	Partially
Small Community Facilities Program	Towns	DEP		Voluntary Regulatory	Statewide	Residential Wastewater	Fully
Section 413 Waste Waste Discharge Licenses	Towns	DEP	EPA	Regulatory	Statewide	Commercial Residential Wastewater plus Nonpoint Source activities	Partially

STATE WATERS TARGETED FOR NONPOINT SOURCE MANAGEMENT IN THE NEXT FIVE YEARS

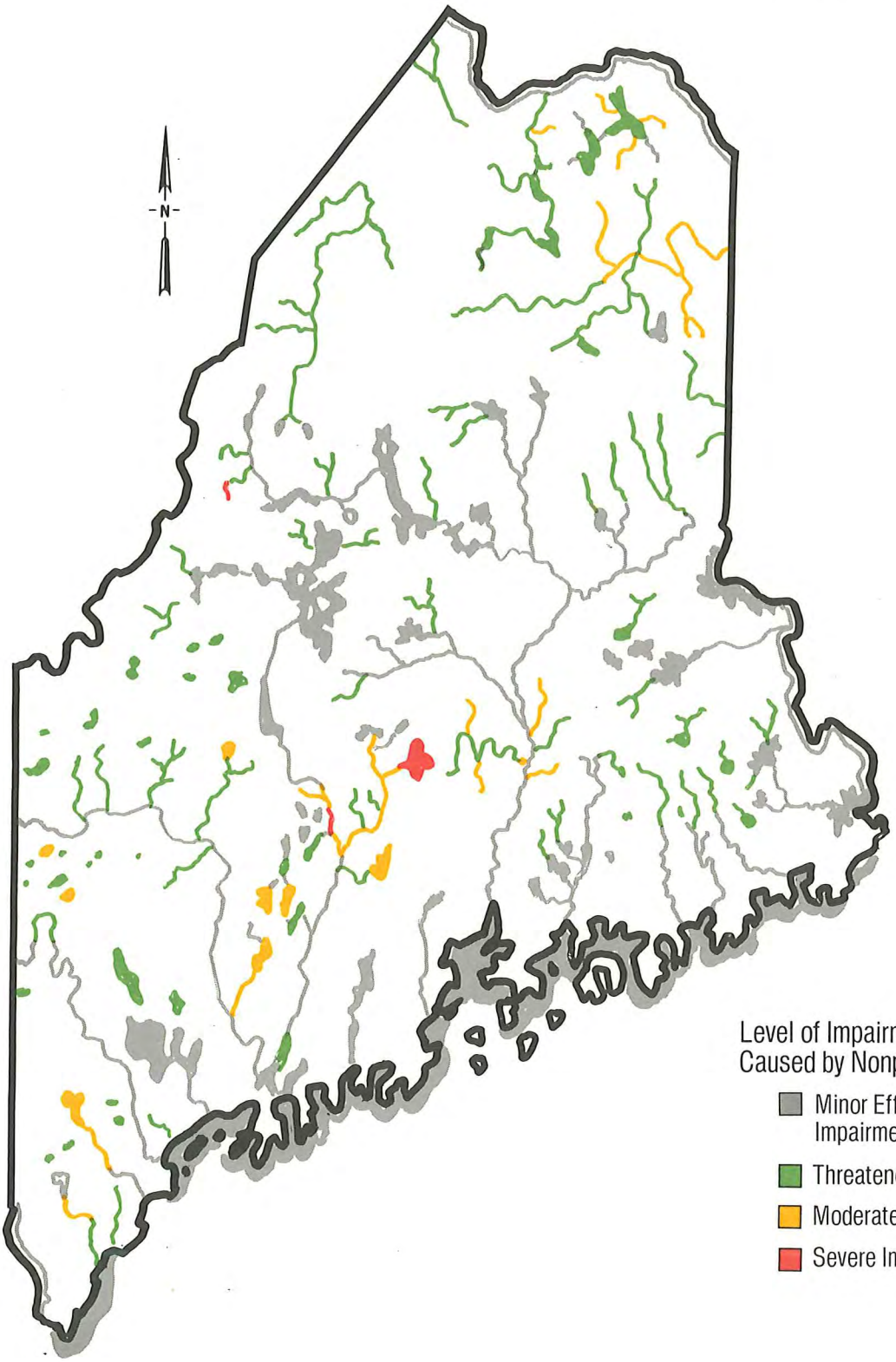
PURPOSE: To list the waters that are or will be managed for nonpoint source pollution by the State.

Watershed/Project		Water Bodies			Designated Use Impaired			Nonpoint Source Activity Management			
Name	Area	Name	Type	Size	Type	Intensity	Pollutant	Activity	Magnitude	Plan Status	Funding
Chickawaukie Lake	300 acres	Same	Lake/Pond		Drinking Water	Moderate	Nutrients	Residential	200 Homes	Development	$ 7,500
Kenduskeag Stream		Same	Stream		Recreation	Moderate	Sediment Nutrients	Agriculture	50 Farms	Development	$ 6,000
Cochnewagon Lake		Same	Lake		Recreation Fishing	Moderate	Nutrients	Agriculture		Development	$100,000
Messalonskee Stream		Same	Stream		Recreation Fishing	Severe Moderate	Bacteria Nutrients	CSO's Agriculture	Unknown 8 Farms	Expected	N/A
Annabessacook Lake		Same	Lake		Recreation Fishing	Moderate Unknown	Nutrients Potential Toxins	Agriculture Waste Disposal		Completed Expected	
Sebasticook Lake		Same	Lake		Recreation	Severe	Nutrients	Agriculture	28 Farms	Implementation	
Webber Pond		Same	Pond		Recreation	Moderate	Nutrients	Residential Agriculture		Implementation	
Toothaker Pond		Same	Pond		Recreation	Moderate	Nutrients	Fish Hatchery Waste	1 Hatchery	Expected	
Cross Lake		Same	Lake		Recreation	Moderate	Nutrients	Agriculture		Expected	
Sabattus Pond		Same	Pond		Recreation	Moderate	Nutrients	Agriculture		Implementation	
Salmon Lake		Same	Lake		Recreation	Moderate	Nutrients	Agriculture	2 Farms	Completed	

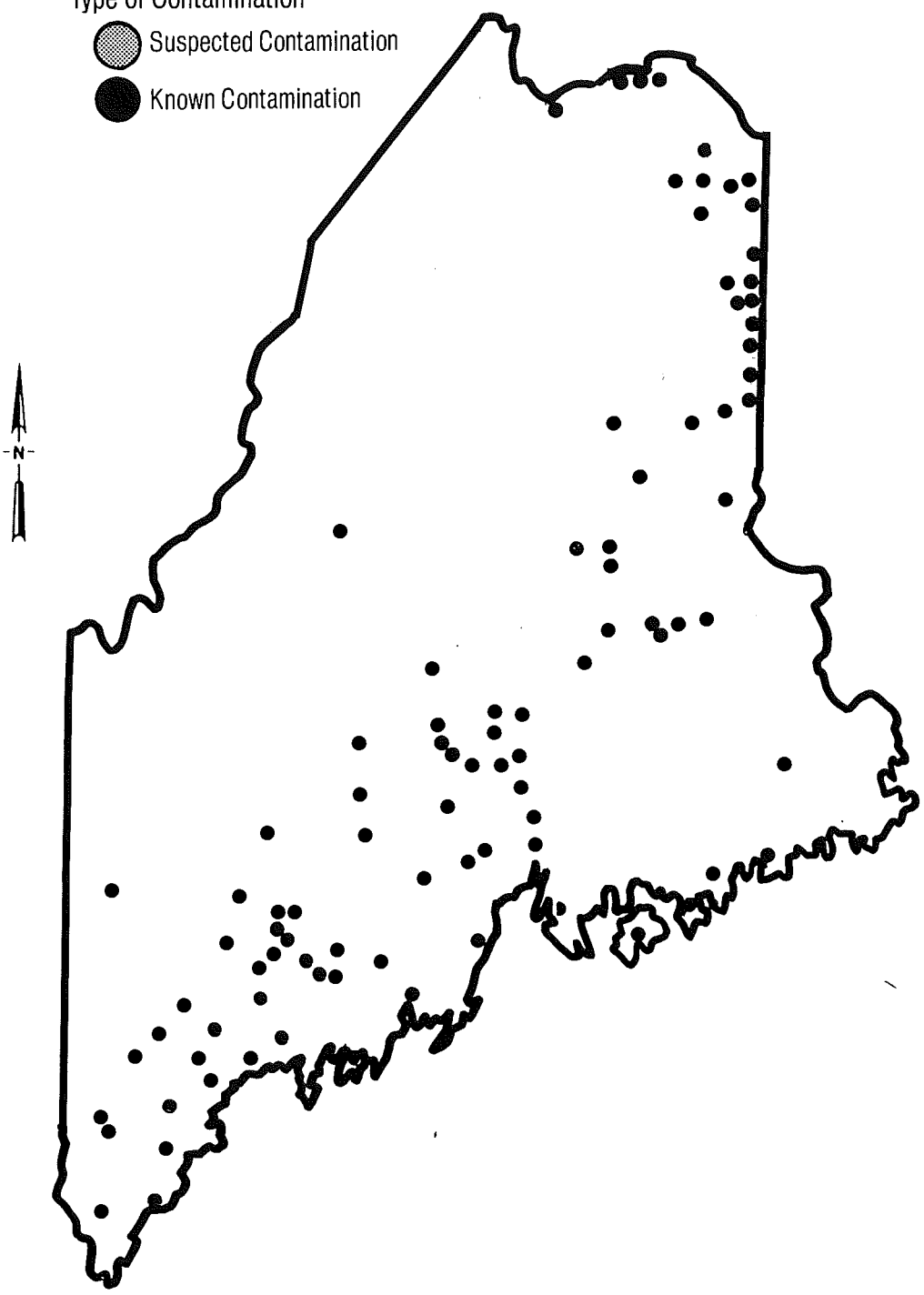
MAINE

1985

Nonpoint Source Surface Water
Designated Use Impairments.



MAINE
1985
Groundwater Contamination



STATE OF MAINE

IN THE YEAR OF OUR LORD
NINETEEN HUNDRED AND EIGHTY-SIX

S.P. 915 - L.D. 2283

AN ACT to Amend the Classification System for Maine Waters and Change the Classifications of Certain Waters

Be it enacted by the People of the State of Maine as follows:

Sec. 15. 38 MRSA c. 3, sub-c. I, art. 4-A is enacted to read:

ARTICLE 4-A. WATER CLASSIFICATION PROGRAM

§464. **Classification of Maine waters**

The waters of the State shall be classified in accordance with this article.

1. **Findings; objectives; purpose.** The Legislature finds that the proper management of the State's water resources is of great public interest and concern to the State in promoting the general welfare; in preventing disease; in promoting health; in providing habitat for fish, shellfish and wildlife; as a source of recreational opportunity; and as a resource for commerce and industry.

The Legislature declares that it is the State's objective to restore and maintain the chemical, physical and biological integrity of the State's waters and to preserve certain pristine state waters. The Legislature further declares that in order to achieve this objective the State's goals are:

A. That the discharge of pollutants into the waters of the State be eliminated where appropriate;

B. That no pollutants be discharged into any waters of the State without first being given the degree of treatment necessary to allow those waters to attain their classification; and

C. That water quality be sufficient to provide for the protection and propagation of fish, shellfish and wildlife and provide for recreation in and on the water.

The Legislature intends by passage of this article to establish a water quality classification system which will allow the State to manage its surface waters so as to protect the quality of those waters and, where water quality standards are not being achieved, to enhance water quality. This classification system shall be based on water quality standards which designate the uses and related characteristics of those uses for each class of water and which also establish water quality criteria necessary to protect those uses and related characteristics. The Legislature further intends by passage of this article to assign to each of the State's surface water bodies the water quality classification which shall designate the minimum level of quality which the Legislature intends for the body of water. This designation is intended to direct the State's management of that water body in order to achieve at least that minimum level of water quality.

2. **Procedures for reclassification.** Reclassification of state waters shall be governed by the following provisions.

A. Upon petition by any person or on its own motion, the board, following public notice, may conduct classification studies and investigations. Information collected during these studies and investigations shall be made available to the public in an expeditious manner. After consultation with other state agencies and, where appropriate, individuals, citizen groups, industries, municipalities and federal and interstate water pollution control agencies, the board may propose changes in water reclassification.

B. The board shall call public hearings in the affected area, or reasonably adjacent to the affected area, for the purposes of presenting to all interested persons the proposed classification for each particular water body and obtaining public input.

C. The board may recommend changes in classification it deems necessary to the Legislature.

D. The Legislature shall have sole authority to make any changes in the classification of the waters of the State.

3. **Reports to the Legislature.** The board and the department shall periodically report to the Legislature as governed by the following provisions.

A. The board shall submit to the first regular session of each Legislature a report on the quality of the State's waters which describes existing water quality, identifies

waters which are not attaining their classification and states what measures are necessary for the attainment of the standards of their classification.

B. The board shall, from time to time, but at least once every 3 years, hold public hearings for the purpose of reviewing the water quality classification system and related standards and, as appropriate, recommending changes in the standards to the Legislature.

C. The department shall report annually to each regular session of the Legislature on the status of licensed discharges.

D. The department, in cooperation with the Land Use Regulation Commission, shall conduct a study of indirect discharges and the problems posed by those discharges to the waters of the State. The study shall incorporate the results of previous investigations conducted pursuant to the United State Water Pollution Control Act, Section 208. The study shall include recommendations for land use management and other related techniques designed to mitigate the effects of indirect discharges. The study shall commence on July 1, 1987. The study shall be submitted to the joint standing committee of the Legislature having jurisdiction over natural resources on or before January 1, 1988.

4. **General provisions.** The classification system for surface waters established by this article shall be subject to the following provisions.

A. Notwithstanding section 414-A, the board shall not issue a water discharge license for any of the following discharges:

(1) Direct discharge of pollutants to waters having a drainage area of less than 10 square miles, except that discharges into these waters which were licensed prior to January 1, 1986, shall be allowed to continue only until practical alternatives exist;

(2) New direct discharge of domestic pollutants to tributaries of Class-GPA waters;

(3) Any discharge into a tributary of GPA waters which, by itself or in combination with other activities, causes water quality degradation which would impair the characteristics and designated uses of downstream GPA waters or causes an increase in the trophic state of those GPA waters;

(4) Discharge of pollutants to waters of the State which imparts color, taste, turbidity, toxicity, radioactivity or other properties which cause those waters to be unsuitable for the designated uses and characteristics ascribed to their class; and

(5) Discharge of pollutants to any water of the State which violates sections 465, 465-A and 465-B, except as provided in section 451; causes the "pH" of fresh waters to fall outside of the 6.0 to 8.5 range; causes the "pH" of estuarine and marine waters to fall outside of the 7.0 to 8.5 range; or causes fish for human consumption to be injurious to human health as determined by the United States Food and Drug Administration under the procedures established by United States Code, Title 21, section 342 or as determined by the Department of Human Services. The Department of Human Services shall establish a protocol for determining risk in these situations. The protocol shall be promulgated as a rule in accordance with the Maine Administrative Procedure Act, Title 5, chapter 375.

B. All surface waters of the State shall be free of settled substances which alter the physical or chemical nature of bottom material and of floating substances, except as naturally occur, which impair the characteristics and designated uses ascribed to their class.

C. Where natural conditions, including, but not limited to, marshes, bogs and abnormal concentrations of wildlife cause the dissolved oxygen or other water quality criteria to fall below the minimum standards specified in sections 465, 465-A and 465-B, those waters shall not be considered to be failing to attain their classification because of those natural conditions.

D. For the purpose of computing whether a discharge will violate the classification of any river or stream, the assimilative capacity of the river or stream shall be computed using the minimum 7-day low flow which can be expected to occur with a frequency of once in 10 years.

E. The waters contained in excavations approved by the board for waste water treatment purposes shall be unclassified waters.

F. The anti-degradation policy of the State shall be governed by the following provisions.

(1) Existing in-stream water uses and the level of water quality necessary to protect those existing uses shall be maintained and protected. As used in this paragraph, "existing in-stream water uses" means significant, well-established uses that have actually

occurred on a water body on or after November 28, 1975. Factual determinations of what constitutes an existing in-stream water use on a particular water body and the extent of allowable impact on the existing use shall be made on a case-by-case basis by the board.

(2) Where high quality waters of the State constitute an outstanding national resource, that water quality shall be maintained and protected. For purposes of this paragraph, the term "high quality waters" means those water bodies in national and state parks and wildlife refuges, public reserved lands and those river segments listed in Title 12, section 403.

(3) The board may only issue a discharge license pursuant to section 414-A or approve water quality certification pursuant to the United States Clean Water Act, Section 401, Public Law 92-500, as amended, if the standards of classification of the water body and the requirements of this paragraph will be met.

(4) Where the actual quality of any classified water exceeds the minimum standards of the next highest classification, that higher water quality shall be maintained and protected. The board shall recommend to the Legislature that that water be reclassified in the next higher classification.

(5) The board may only issue a discharge license pursuant to section 414-A or approve water quality certification pursuant to the United State Clean Water Act, Section 401, Public Law 92-500, as amended, which would result in lowering the existing quality of any water body after making a finding, following opportunity for public participation, that the action is necessary to achieve important economic or social benefits to the State and when the action is in conformance with subparagraph 3. That finding must be made following procedures established by rule of the board.

5. **Rulemaking.** In accordance with the Maine Administrative Procedure Act, the board shall promulgate rules necessary to implement the water quality classification system established by this article. In promulgating rules, the board shall solicit and consider, in addition to any other materials, information on the economic and environmental impact of those rules.

Rules shall be promulgated by January 1, 1987, and as necessary thereafter, and shall include, but are not limited to, sampling and analytical methods, protocols and procedures for satisfying the water quality criteria, including evaluation of the impact of any discharge on the resident biological community.

Rules adopted pursuant to this subsection shall become effective upon adoption. Rules adopted pursuant to this subsection shall be submitted to the joint standing committee of the Legislature having jurisdiction over natural resources for review during the next regular session of the Legislature following adoption. This committee may submit legislation it deems necessary to clarify legislative intent regarding rules adopted pursuant to this subsection. If the committee takes no action, the rules shall continue in effect.

6. **Implementation of biological water quality criteria.** The implementation of water quality criteria pertaining to the protection of the resident biological community shall be governed by the provisions of this subsection.

A. At any time during the term of a valid waste water discharge license which was issued prior to the effective date of this article, the board may modify that license in accordance with section 347, subsection 3 if the discharger is not in compliance with the water quality criteria pertaining to the protection of the resident biological community. When a discharge license is modified under this subsection, the board shall establish a reasonable schedule to bring the discharge into compliance with the water quality criteria pertaining to the protection of the resident biological community.

B. When a discharge license is issued after the effective date of this article and before the effective date of the rules adopted pursuant to subsection 5, the board shall establish a reasonable schedule to bring the discharge into compliance with the water quality criteria pertaining to the protection of the resident biological community.

C. A discharger seeking a new discharge license following the effective date of the rules adopted under subsection 5 shall comply with the water quality criteria of this article.

§465. Standards for classification of fresh surface waters

The board shall have 4 standards for the classification of fresh surface waters which are not classified as great ponds.

1. **Class AA waters.** Class AA shall be the highest classification and shall be applied to waters which are outstanding natural resources and which should be preserved because of their ecological, social, scenic or recreational importance.

A. Class AA waters shall be of such quality that they are suitable for the designated uses of drinking water after

disinfection, fishing, recreation in and on the water and navigation and as habitat for fish and other aquatic life. The habitat shall be characterized as free flowing and natural.

B. The aquatic life, dissolved oxygen and bacteria content of Class AA waters shall be as naturally occurs.

C. There shall be no direct discharge of pollutants to Class AA waters.

2. **Class A waters.** Class A shall be the 2nd highest classification.

A. Class A waters shall be of such quality that they are suitable for the designated uses of drinking water after disinfection; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; and navigation; and as habitat for fish and other aquatic life. The habitat shall be characterized as natural.

B. The dissolved oxygen content of Class A waters shall be not less than 7 parts per million or 75% of saturation, whichever is higher. The aquatic life and bacteria content of Class A waters shall be as naturally occurs.

C. Direct discharges to these waters licensed after January 1, 1986, shall be permitted only if, in addition to satisfying all the requirements of this article, the discharged effluent will be equal to or better than the existing water quality of the receiving waters. Prior to issuing a discharge license, the board shall require the applicant to objectively demonstrate to the board's satisfaction that the discharge is necessary and that there are no other reasonable alternatives available. Discharges into waters of this classification which were licensed prior to January 1, 1986, shall be allowed to continue only until practical alternatives exist. There shall be no deposits of any material on the banks of these waters in any manner so that transfer of pollutants into the waters is likely.

3. **Class B waters.** Class B shall be the 3rd highest classification.

A. Class B waters shall be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; and navigation; and as habitat for fish and other aquatic life. The habitat shall be characterized as unimpaired.

B. The dissolved oxygen content of Class B waters shall be not less than 7 parts per million or 75% of saturation, whichever is higher, except that for the period from October 1st to May 14th, in order to ensure spawning and egg incubation of indigenous fish species, the 7-day mean dissolved oxygen concentration shall not be less than 9.5 parts per million and the 1-day minimum dissolved oxygen concentration shall not be less than 8.0 parts per million in identified fish spawning areas. Between May 15th and September 30th, the number of Escherichia coli bacteria of human origin in these waters may not exceed a geometric mean of 64 per 100 milliliters or an instantaneous level of 427 per 100 milliliters.

C. Discharges to Class B waters shall not cause adverse impact to aquatic life in that the receiving waters shall be of sufficient quality to support all aquatic species indigenous to the receiving water without detrimental changes in the resident biological community.

4. **Class C waters.** Class C shall be the 4th highest classification.

A. Class C waters shall be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; and navigation; and as a habitat for fish and other aquatic life.

B. The dissolved oxygen content of Class C water shall be not less than 5 parts per million or 60% of saturation, whichever is higher, except that in identified salmonid spawning areas where water quality is sufficient to ensure spawning, egg incubation and survival of early life stages, that water quality sufficient for these purposes shall be maintained. Between May 15th and September 30th, the number of Escherichia coli bacteria of human origin in these waters may not exceed a geometric mean of 142 per 100 milliliters or an instantaneous level of 949 per 100 milliliters. The department shall promulgate rules governing the procedure for designation of spawning areas. Those rules shall include provision for periodic review of designated spawning areas and consultation with affected persons prior to designation of a stretch of water as a spawning area.

C. Discharges to Class C waters may cause some changes to aquatic life, provided that the receiving waters shall be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.

§465-A. Standards for classification of lakes and ponds

The board shall have one standard for the classification of great ponds and natural lakes and ponds less than 10 acres in size. Impoundments of rivers that are defined as great ponds pursuant to section 392 shall be classified as GPA or as specifically provided in sections 467 and 468.

1. **Class GPA waters.** Class GPA shall be the sole classification of great ponds and natural ponds and lakes less than 10 acres in size.

A. Class GPA waters shall be of such quality that they are suitable for the designated uses of drinking water after disinfection, recreation in and on the water, fishing, industrial process and cooling water supply, hydroelectric power generation and navigation and as habitat for fish and other aquatic life. The habitat shall be characterized as natural.

B. Class GPA waters shall be described by their trophic state based on measures of the chlorophyll "a" content, Secchi disk transparency, total phosphorus content and other appropriate criteria. Class GPA waters shall have a stable or decreasing trophic state, subject only to natural fluctuations and shall be free of culturally induced algal blooms which impair their use and enjoyment. The number of Escherichia coli bacteria of human origin in these waters may not exceed a geometric mean of 29 per 100 milliliters or an instantaneous level of 194 per 100 milliliters.

C. There shall be no new direct discharge of pollutants into Class GPA waters. Aquatic pesticide treatments or chemical treatments for the purpose of restoring water quality approved by the board shall be exempt from the no-discharge provision. Discharges into these waters which were licensed prior to January 1, 1986, shall be allowed to continue only until practical alternatives exist. No materials may be placed on or removed from the shores or banks of a Class GPA water body in such a manner that materials may fall or be washed into the water or that contaminated drainage therefrom may flow or leach into those waters, except as permitted pursuant to section 391. No change of land use in the watershed of a Class GPA water body may, by itself or in combination with other activities, cause water quality degradation which would impair the characteristics and designated uses of downstream GPA waters or cause an increase in the trophic state of those GPA waters.

§465-B. **Standards for classification of estuarine and marine waters**

The board shall have 3 standards for the classification of estuarine and marine waters.

1. **Class SA waters.** Class SA shall be the highest classification and shall be applied to waters which are outstanding natural resources and which should be preserved because of their ecological, social, scenic, economic or recreational importance.

A. Class SA waters shall be of such quality that they are suitable for the designated uses of recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish and navigation and as habitat for fish and other estuarine and marine life. The habitat shall be characterized as free-flowing and natural.

B. The estuarine and marine life, dissolved oxygen and bacteria content of Class SA waters shall be as naturally occurs.

C. There shall be no direct discharge of pollutants to Class SA waters.

2. **Class SB waters.** Class SB waters shall be the 2nd highest classification.

A. Class SB waters shall be of such quality that they are suitable for the designated uses of recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish, industrial process and cooling water supply, hyroelectric power generation and navigation and as habitat for fish and other estuarine and marine life. The habitat shall be characterized as unimpaired.

B. The dissolved oxygen content of Class SB waters shall be not less than 85% of saturation. Between May 15th and September 30th, the numbers of enterococcus bacteria of human origin in these waters may not exceed a geometric mean of 8 per 100 milliliters or an instantaneous level of 54 per 100 milliliters. The numbers of total coliform bacteria or other specified indicator organisms in samples representative of the waters in shellfish harvesting areas may not exceed the criteria recommended under the National Shellfish Sanitation Program Manual of Operations, Part I, Sanitation of Shellfish Growing Areas, United State Department of Food and Drug Administration.

C. Discharges to Class SB waters shall not cause adverse impact to estuarine and marine life in that the receiving waters shall be of sufficient quality to support all estuarine and marine species indigenous to the receiving water without detrimental changes in the resident

biological community. There shall be no new discharge to Class SB waters which would cause closure of open shellfish areas by the Department of Marine Resources.

3. **Class SC waters.** Class SC waters shall be the 3rd highest classification.

A. Class SC waters shall be of such quality that they are suitable for recreation in and on the water, fishing, aquaculture, propagation and restricted harvesting of shellfish, industrial process and cooling water supply, hydroelectric power generation and navigation and as a habitat for fish and other estuarine and marine life.

B. The dissolved oxygen content of Class SC waters shall be not less than 70% of saturation. Between May 15th and September 30th, the numbers of enterococcus bacteria of human origin in these waters may not exceed a geometric mean of 14 per 100 milliliters or an instantaneous level of 94 per 100 milliliters. The numbers of total coliform bacteria or other specified indicator organisms in samples representative of the waters in restricted shellfish harvesting areas may not exceed the criteria recommended under the National Shellfish Sanitation Program Manual of Operations, Part I, Sanitation of Shellfish Growing Areas, United States Food and Drug Administration.

C. Discharges to Class SC waters may cause some changes to estuarine and marine life provided that the receiving waters are of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.

§465-C. **Standards of classification of ground water**

The board shall have 2 standards for the classification of ground water.

1. **Class GW-A.** Class GW-A shall be the highest classification and shall be of such quality that it can be used for public water supplies. These waters shall be free of radioactive matter or any matter that imparts color, turbidity, taste or odor which would impair usage of these waters, other than that occurring from natural phenomena.

2. **Class GW-B.** Class GW-B, the 2nd highest classification, shall be suitable for all usages other than public water supplies.

§466. **Definitions**

As used in this article, unless the context otherwise indicates, the following terms have the following meanings.

1. **Aquatic life.** "Aquatic life" means any plants or animals which live at least part of their life cycle in fresh water.

2. **As naturally occurs.** "As naturally occurs" means conditions with essentially the same physical, chemical and biological characteristics as found in situations with similar habitats free of measurable effects of human activity.

3. **Community function.** "Community function" means mechanisms of uptake, storage and transfer of life-sustaining materials available to a biological community which determines the efficiency of use and the amount of export of the materials from the community.

4. **Community structure.** "Community structure" means the organization of a biological community based on numbers of individuals within different taxonomic groups and the proportion each taxonomic group represents of the total community.

5. **Direct discharge.** "Direct discharge" means any discernible, confined and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation or vessel or other floating craft, from which pollutants are or may be discharged.

6. **Domestic pollutants.** "Domestic pollutants" means any material, including, without limitation, sanitary wastes, waste water from household activities or waste waters with similar chemical characteristics, which are generated at residential or commercial locations.

7. **Estuarine and marine life.** "Estuarine and marine life" means any plants or animals which live at least part of their life cycle in salt water.

8. **Indigenous.** "Indigenous" means supported in a reach of water or known to have been supported according to historical records compiled by State and Federal agencies or published scientific literature.

9. **Natural.** "Natural" means living in, or as if in, a state of nature not measurably affected by human activity.

10. **Resident biological community.** "Resident biological community" means aquatic life expected to exist in a habitat which is free from the influence of the discharge of any pollutant. This shall be established by accepted biomonitoring techniques.

11. **Unimpaired.** "Unimpaired" means without a diminished capacity to support aquatic life.

12. **Without detrimental changes in the resident biological community.** "Without detrimental changes in the resident biological community" means no significant loss of species or excessive dominance by any species or group of species attributable to human activity.

§§468 through 470 provide the classifications for specific stretches and bodies of Maine waters.

STATEMENT OF FACT

Section 1 of the new draft repeals an obsolete definition of the term "coastal stream." Sections 2 and 3 are technical corrections of definitions taken directly from the original bill with adjustments of the appropriate cross references. Sections 4 to 14 repeal portions of existing water quality law that will be replaced by this new draft. Section 15 of the new draft enacts a new article 4-A, in the Maine Revised Statutes, Title 38, chapter 3, subchapter I. This article contains the main body of the new water quality classification system. Its individual sections are described in the following paragraphs. The study report of the Joint Standing Committee on Energy and Natural Resources provides additional material describing the intent of the new language.

Title 38, section 464 provides the general goals and objectives of the water classification system, along with a set of general regulatory and administrative provisions. Procedures for reclassification, departmental reports to the Legislature, general provisions governing discharges and rule-making requirements are all included in this section.

Title 38, section 465 describes the requirements of each of the 4 classifications for fresh surface water, not including great ponds. The classes are AA, A, B and C. Class AA is the highest classification and is applied to waters which are outstanding resources for reasons of ecological, social, scenic or recreational importance. The discharge to Class AA waters of domestic or industrial waste waters is prohibited. Activities which would cause Class AA waters to be other than a free flowing and natural habitat for fish and other aquatic life are prohibited. Class A waters have water quality and discharge provisions which are essentially unchanged from present law. Class B is the most frequently applied classification for the State's rivers, streams and brooks. Discharges to Class B waters are allowed, provided that they cause no substantial harm to aquatic life and meet bacteriological standards necessary to protect swimmers. Class C is applied to rivers and streams which presently receive major discharges. Discharges to Class C waters are allowed,

provided they meet bacteriological standards necessary to protect swimmers and are of sufficient quality that all indigenous species of fish and a diverse community of aquatic life are supported.

Title 38, section 465-A establishes one class, GPA, for lakes and ponds. To protect and improve lakes and ponds, there are restrictions established for discharges and changes of land use in the watersheds of lakes and ponds.

Title 38, section 465-B establishes 3 classes of estuarine and marine waters. Class SA is the highest classification and is applied to waters which are outstanding resources for reasons of ecological, social, economic, scenic or recreational importance. The discharge to Class SA waters of domestic or industrial waste waters is prohibited. Activities which would cause Class SA waters to be other than a natural and free flowing habitat for fish and other estuarine and marine life are prohibited. Class SB is the most frequently applied classification for the State's estuarine and marine waters. Discharges to Class SB waters are allowed, provided that they cause no substantial harm to estuarine and marine life, meet bacteriological standards necessary to protect swimmers and do not adversely affect the State's shellfish resources. Class SC is applied to estuarine and marine waters which presently receive major discharges or which may receive such discharges as a result of the State's economic development policy. Discharges to Class SC waters are allowed, provided they meet bacteriological criteria necessary to protect swimmers and are of sufficient quality to support all indigenous species of fish and a diverse community of estuarine and marine life.

Title 38, section 465-C is taken verbatim from existing law, Title 38, section 363-B.

Title 38, section 466 provides definitions for 12 terms which are used in the new water quality classification system.

Title 38, section 467 revises the description of classifications of major river basins, currently located in Title 38, section 368. It describes the classification of all rivers, streams and brooks which are in drainages with an area greater than 100 square miles. Several of these river basins are presently contained in Title 38, section 369. Unlike the present law, Title 38, section 467 describes classifications in standardized outline form to aid readability and subsequent revision. Title 38, section 467 also differs from the present law by describing the classification of all segments of the main stems of major river basins as well as the main stems of major tributaries. Since most minor drainages described in that section are Class B, the section is headed by an overall classification of Class B for waters which are not otherwise classified. This aspect of the revision results in a shorter,

more understandable text and will aid subsequent revision. The section also corrects a few geographical inconsistencies and errors in the present law.

Title 38, section 467 changes the classification of certain waters of the State. The following waters are upgraded to Class AA:

1. All rivers, streams, brooks or segments thereof within the boundaries of Baxter State Park; and

2. Outstanding river and stream segments which merit special protection as specified in the Maine Revised Statutes, Title 12, section 403, which are currently Class A in the water classification system and which also do not presently receive licensed discharges.

All waters currently classified as B-1 or B-2 are reclassified as "B" except for a few which are upgraded to Class AA and a stretch of the lower Kennebec which is classified as "C," reflecting its existing quality and the major discharges it receives. All waters currently classified as "C" remain assigned to that classification except for a short stretch of the Kennebec above the Shawmut Dam. This stretch is classified as "B." All waters currently classified as "D" are upgraded to Class C.

Title 38, section 468 revises the description of classifications of minor drainages. Like those of Title 38, section 467, these revisions are intended to aid public participation in the procedures for reclassification by describing classifications in a shorter, more understandable form.

Title 38, section 468 also changes the classification of certain waters of the State. All streams, brooks or segments thereof within the boundaries of Acadia National Park are upgraded to Class AA. All waters currently classified as "B-1" or "B-2," except for those in Acadia National Park, are reclassified as "B."

Title 38, section 469 revises the classification of all estuarine and marine waters of the State. This complete revision is necessary for implementation of the standards for classification established in Title 38, section 465-B. Title 38, section 469 is headed by an overall classification of "SB" for estuarine and marine waters which are not otherwise classified. This section classifies certain areas of the estuarine and marine waters of the State as Class SC waters. These Class SC areas presently receive major discharges or are likely to receive major discharges as a result of the State's economic development policy. The section also classifies certain areas of the estuarine and marine waters as Class SA.

Waters classified as Class SA comprise much of the estuarine and marine waters adjacent to lands owned by the State Government or Federal Government.

Title 38, section 470 is taken verbatim from existing law, Title 38, section 371-B.

Section 16 of the new draft includes a provision requiring legislative review of hydroelectric licensing rules prior to their adoption.

APPENDIX IV. THE SCIENTIFIC BASIS OF MAINE'S REVISED WATER QUALITY STANDARDS

BIOLOGICAL STANDARDS

Classification of the State's waters began in the mid 1950's. The quality of the State's waters at that time was probably the poorest in history with little treatment. Little changed until the late 1960's and our knowledge of water pollution was astonishingly small. With the enactment of the Federal Clean Water Act and especially the amendments of 1972, water pollution control escalated at a rapid pace. By the late 1970's most industries and major municipalities were providing treatment for their wastes. The consequence was a dramatic improvement in the quality of the State's water, an improvement well beyond the expectations of most people. As a result these waters are being used in ways and to an extent which were previously not imagined.

In this same period, a large body of scientific knowledge about water quality management had been developed. Twenty years ago, oxygen demanding waste was the overwhelming concern. As this was reduced, water quality improved, but we also found many instances where the magnitude of oxygen demanding wastes had only masked other underlying water quality problems. Hence, the DEP is now attentive not only to oxygen demand but also to problems such as toxic substances, complex effluents, synergism, bioaccumulation, biomagnification, etc.

The present quality of our waters, the improved scientific basis of DEP policies, the greatly expanded public use of our waters, and the expanded realization of all the intricacies of 'water quality' led the department to create a new classification system for our waters. A major revision was necessary at this time to bring our laws into conformance with federal laws,

with newly enacted state laws such as the Maine Rivers Act, and with the policies of other state agencies such as the Office of Energy Resources, Inland Fisheries and Wildlife, and Marine Resources. The State has made use of the best available knowledge and recognizes the present quality and uses to develop improved policies and programs for protection and improvement of the State's waters.

The Federal Clean Water Act in Section 101 states that "it is the objective of this Act to restore and maintain the chemical, physical and biological integrity of the Nations waters." Of those three characteristics, biological integrity is the most important since the physical and chemical characteristics have their greatest relevance as they relate to the well being of the biological community. The biological community establishes the foundation for many of the uses made of our waters and where we realize our own well being. Title 38 Section 341 of Maine Statutes state the Department "shall protect and improve the quality of our natural environment and resources which constitute it, by directing growth which will preserve for all time an ecologically sound and aesthetically pleasing environment." Techniques of biological evaluation are obviously the most direct means for measuring the ecological soundness of the environment. Biological evaluation has proven itself to be too valuable a tool in our water quality program to be ignored. It is the best means to integrate all the factors which encompass the term water quality.

Environmental biology has evolved during this period and now provides a sound theoretical foundation to make these evaluations. Bioassay methodology has now become a very standardized science and is routinely performed by state and federal laboratories as well as a large number of private laboratories. Likewise, the ecology of aquatic communities is now well

described especially as it relates to the benthic invertebrates. The river continuum theory (Vannote et al 1980) has become a central theme in this new understanding and encompassess other concepts such as materials spiraling (Wallace et al, 1977) and functional feeding strategy (Cummins, 1973, 1974), such that we now have a good understanding of how these ecosystems operate. Taxonomy, that bug-a-boo of early studies is well established for most groups now. These ideas have been incorporated into numerous water quality studies including works by Rabeni and Gibbs (1977) and Rabeni and Davies (1985) here in Maine. The Europeans have used biomonitoring since the early 1900s with the advent of the Saprobian index and numerous techniques have evolved since that time (Hellawell, 1977). Therefore the time is right to take the initiative of previous legislatures and turn this into a workable framework of standards applicable to the present status of our waters and with a sound ecological basis.

The D.E.P.'s new classification and the rationale for it is as follows:

It has been assumed that the public wants waters of different quality available, both high quality recreation oriented waters as well as waters of lesser quality for economic and social needs. The Legislature has established four classes for Maine's rivers and streams.

Class AA is a new class with the highest degree of protection. It is for free-flowing rivers and all discharges are be prohibited. This class is intended for waters of special value to the state. Consequently no change should be expected or observed in the biological community. Thus, the standard is that aquatic life shall be as naturally occurs. The definition of these terms is explained in more detail elsewhere but essentially the same species and numbers should be found as in similar habitats free of human influence.

Class A waters are managed much as they are presently. While hydropower projects and certain highly treated effluents are permitted, this class has very high quality water similar to Class AA. Because of the expected high level of treatment and the restrictive clause for effluents of "equal to or better than," the same standard as Class AA is appropriate: that aquatic life shall be as naturally occurs.

The standards for Class B waters have been revised substantially. The portion of the law about aquatic life states that discharges "shall not cause adverse impact to aquatic life in that the receiving waters shall be of sufficient quality to support all species indigenous to the receiving water without detrimental changes in the resident biological community." This standard has two distinct parts or tests. The first is that the receiving water will be of sufficient quality to support all indigenous species. This will be determined through use of an effluent bioassay test, but this does not mean that a species has to exist in the river or stream, only that water quality cannot be the limiting factor.

The second test is that the resident community can change but this must not be a detrimental change such as a significant loss of species. We know for a fact that discharges, even the best treated ones with ample dilution invariably cause significant change in community composition. Maine waters are typically low in nutrients and great shifts in communities commonly occur below wastewater outfalls because of new food resources. Generally, these shifts are not indicative of any harmful effects of an effluent and should be differentiated from detrimental changes. Maintenance of species and the integrity of the community provides the aquatic system with high stability and resilience during stress periods and thus insures a sound basis for the propagation of fish and higher organisms.

Class C is the lowest standard in the system. That portion of the law regarding aquatic life states that discharges may cause some changes to aquatic life, provided that the receiving water shall be of sufficient quality to support all indigenous species of fish and maintain the structure and function of the aquatic community.

Like Class B, this standard has two parts or tests. The first is that the receiving water must be of sufficient quality to support all indigenous species of fish. Since Class C is Maine's lowest class it must at least be consistent with minimum federal requirements which require that the quality of waters necessary for fish propagation will be maintained. This will be established through an effluent bioassay test.

The second part of the standard is that community structure and function must be maintained. These are the two essential ecological components of a community. Briefly stated structure is the richness of species and numbers of individuals within a community while function is the means by which they interact to utilize food and other resources. Within Class C waters, significant losses and shifts in species will be allowed. One would expect to see some pollution intolerant species disappear,but it is essential that there is some replacement by more tolerant species and that these tolerant species fulfill all vital functional roles in the community. This ecological condition is typical where communities are exposed to reduced D.O. near 5 ppm, where settleable solids are at tolerable levels and where no toxicity is measured. Maintenance of structure is one means by which stability of the community is protected, and both sound structure and function are necessary to support the higher and lower trophic levels of a balanced community. Preservation of all the functional units within the community assures there is a progressive transfer of energy to support higher trophic levels such as fish and prevents either excessive accumulation or pass-through of nutrient resources.

REFERENCES

Cummins, K.W. 1973. Trophic relations of aquatic insects. Ann. Rev. Ent. 18:183-206.

Cummins, K.W. 1974. Structure and function of stream ecosystems. Bioscience 24: 631-641.

Hellawell, J.M. 1977. Change in natural and managed ecosystems: detection measurement and assessment. Proc. R. Soc. Lond. B 197: 31-57.

Rabeni, C.F. and K.E. Gibbs 1977. Benthic invertebrates as water quality indicators in the Penobscot River, Maine Land and Water Resources Inst. Orono, ME.

Rabeni, C.F., S.P. Davies, K.E. Gibbs 1985. Benthic invertebrate response to pollution abatement: Structural changes and functional implications. Wat. Res. Bull. 21: 489-498.

Vannote, R. et al, 1980. The river continuum concept. Can. J. Fish Aq. Sci. 37: 130-137.

Wallace,, J.B. et al 1977. The role of filter feeders in flowing waters. Arch. Hydrobiol. 79: 506-532.

LAKE CLASSIFICATION SYSTEM AND DISCHARGE POLICY FOR LAKES

Maine has a wide variety of lakes with varying quality. The trophic state, or level of algal production, of these lakes ranges from very low to high, with at least some lakes representing all levels of trophic state between these two extremes. A lake with a low trophic state, called oligotrophic, is characterized by very clear water with little algal production. Such lakes maintain high oxygen levels throughout the water column and hence support cold water fishing although the amount of fish production is usually limited by the low levels of algal production. Lakes with high trophic states, called eutrophic, have cloudier water because of the higher densities of free floating algae. Though these lakes do not usually support trout and salmon because of reduced oxygen levels in the deep water, they do support large numbers of warm water fish.

This diversity of water quality makes a wide range of lake experiences available to the people of Maine. Those who place a high priority on water clarity or who prefer to fish only for trout and salmon can be satisfied with an oligotrophic lake. Eutrophic lakes, on the other hand provide opportunities for those fisherman who wish to catch lots of large bass and pickerel.

Some highly eutrophic lakes have such high levels of algae in the summer months that they develop a condition known as an algal bloom. During an algal bloom water transparency drops to less than 2.0 m(an arbitary break point used by D.E.P.) and may drop as low as 0.5m. Scums and clumps of dying algae often form on the surface. Along the downwind shore concentrations of decaying algae may cause obnoxious odors. Unlike the lower levels of trophic state, an algal bloom is a condition which nearly everyone agrees is unacceptable for Maine lakes.

It is the D.E.P.'s goal to maintain the water quality of Maine's lakes in as close to their natural state as possible so that the diversity of lake experiences available to the public can be preserved. This goal also prescribes the elimination of culturally induced (caused by man's activities) algal blooms since they are by definition not natural and create a condition unacceptable to most Maine lake users. Since the goals are the same for all lakes, and hence discharge policies are also the same it is more appropriate to have a single class than a number of classes wich attempt to define every level of water quality and trophic state which we wish to maintain. Such a system would either require an unreasonably large number of classes, or, if only a few arbitrary levels of trophic state were selected, would allow significant eutrophication of many lakes.

The amount of algae in a lake at a given time is dependent on many factors. Climatic conditions such as water temperature, the timing and intensity of rainfall and the duration and intensity of sunlight and cloud cover are all very important. Other factors include the size and shape of the lake basin itself as well as the size and shape of its watershed. The interaction of animals and plants within the lake also plays a role. We have little or no control over these factors.

One very important factor for algal growth which we do have some control of is the concentration of nutrients in the lake water. Algae need many nutrients to grow. If any nutrient is in short supply relative to the algae's need for it, that nutrient will control the growth of the algae. Many researchers, particularly Schindler (1975), Vollenweider (1976) and Carlson (1977) have determined that, at least in the Northern U.S. and Canada, the nutrient most likely to limit algal growth is phosphorus. This means that if other nutrients are added to a lake but phosphorus is not, algal growth will probably not

change. If phosphorus is added to the lake, however, algal growth will increase. Conversely, if phosphorus is removed from a lake, algae growth should decrease. Experience with Maine lakes (Haley Pond, Bailey et al, 1979) generally supports this theory.

Under natural conditions the concentration of phosphorus in a lake is determined by the phosphorus content and weatherability of the bedrock and soils in the lake's watershed and the dilutional capacity of the lake. Man can change this dramatically. By developing a watershed he changes runoff patterns so that more of the "natural" phosphorus in the watershed reaches the lake. The most dramatic changes in phosphorus concentration occur when man discharges the wastes he has produced into a lake or into the lake's tributaries. Sewage and many industrial wastes contain large amounts of phosphorus, usually at 1000 or more times the concentration in the lake water.

There are treatment systems available to remove much of the phosphorus from most of these wastes, but they are expensive and, like any treatment system, subject to a risk of malfunction. Occasional treatment plant malfunctions in a river or stream discharge may have a drastic short term effect on water quality and stream biota but the stream usually recovers relatively quickly because of its constant flushing. Lakes on the other hand, have comparatively slow flushing rates, and the effect of a short term discharge of phosphorus can last for years. Discharges to lakes and their tributaries must therefore be treated more conservatively than discharges to rivers and streams.

Since the primary use of Maine lakes is recreational, discharges directly to lakes are inappropriate not only because of the potential effect on the lake's trophic state but also because of health and aesthetic considerations. Discharge of any sanitary or toxic waste creates an unacceptable localized health risk to these waters which are routinely used for both swimming and

water supply. Also, the location of an industrial discharge pipe with its associated development on a lakeshore is aesthetically incompatible with the environment of most Maine lakes.

There are, however, some circumstances where non-sanitary discharge to a lake's tributary could be allowed without risk to the lake's water quality or aesthetic quality. Discharges containing only insignificant amounts of phosphorus could be allowed provided that the discharge did not reply on a phosphorus removal system which had any risk of malfunction (i.e., untreated discharge from a fish or bait rearing operation, industrial cooling-water). Since so many of the state's streams are also lake tributaries, it is inappropriate to ban all discharges from lake tributaries if it is possible that some types of discharges might be allowed with no risk to the lakes involved. The statute therefore allows discharge to lake tributaries provided they do not, "by themselves or in combination with other activities cause water quality degradation which would impair the characteristics and designated uses of the downstream GP-A waters or cause an increase in the trophic state of those GP-A waters." It should be noted that this discharge policy does not differ from, but only clarifies, the department's current interpretation of the existing statute.

REFERENCES

Bailey, J.H., M. Scott, D. Courtemanch, and J. Dennis. 1979 Response of Haley Pond, Maine, to changes in effluent load. Journal WPCF 51:728-734.

Carlson, R.E. 1977. A trophic state index for lakes. Limnol. Oceanog. 22:361-369.

Schindler, D.W. 1974. Eutrophication and recovery in experimental lakes: Implications for lake management. Science 184-897.

Vollenweider, R.A. 1976. Advances in defining critical loading levels for phosphorus in lake eutrophication Mem. Ist. Ital. Idrobiol 33:53-83.

BACTERIA STANDARDS FOR RECREATIONAL WATERS

The bacteria standards used to decide if waters are safe for swimming have undergone numerous transformations in the past twenty years. These changes have occurred due to two factors: 1) advances in microbiology have provided new tests for bacteria which are quicker, easier and can now enumerate groups and species which had previously required advanced research capabilities and 2) advances in epidemiology have provided a factual basis for evaluating potential risks to the health of swimmers.

The bacteria standards for recreational water quality previously used in Maine's Water Classification Statutes were first based on Total Coliforms, then based on Fecal Coliforms and are now based on the indicators Escherichia coli (E. coli) and Enterococci. A defense of the Fecal Coliform standard was made by Geldreich (1970) in which he characterizes the goal of early efforts as "to develop the 'magic number' of organisms that will denote no health risk to the people using the water." As with many other activities, it is now known that swimming is not risk-free as regards illness. There is no "magic number." Thus, early attempts to establish "safe" swimming standards were conceptually defective. Maine's present standard of 200 Fecal Coliforms per 100 ml provides little more than an illusion of safety. This history and an account of the development of modern, health effects-related guidelines is presented by Cabelli et. al (1983).

The paper by Cabelli et. al. (1983) and publications on Health Effect Criteria for Marine (Cabelli and EPA, 1983) and Fresh (Dufour and EPA, 1984) Recreational Waters were the result of over ten years of research on the epidemiology of swimmer illness which was funded by U.S.E.P.A. at a cost of over $1,500,000.

The results of this research can be summarized as follows:

1) Although early researchers speculated that ear infections, hepatitis or salmonellosis were the illnesses of concern, modern research has shown that the illness of primary concern for swimmer health is gastroenteritis a relatively mild, short-term disorder characterized by vomiting, diarrhea, nausea and/or stomachache.
2) Gastroenteritis is caused by human enteric viruses.
3) There is no technology available to count human enteric viruses.
4) Swimmers contracted gastroenteritis in relatively unpolluted water where Fecal Coliform levels were much less than 200 per 100 ml.
5) Fecal Coliform levels have virtually no correlation with swimmer illness.
6) For marine waters, Enterococci have a high correlation with swimmer illness.
7) For fresh waters, both Enterococci and E. coli have a high correlation with swimmer illness.

Because the epidemiological research on which this effort was based showed a high correlation between swimmer illness and the proposed bacterial indicators Enterococci and E. coli but showed no correlation between swimmer illness and the fecal coliform bacteria on which the present standards are based, determining the present risk to swimmers is difficult. It can be estimated, however, through use of a model of waters which are impacted solely by human feces. In such water, one would expect to find E. coli levels to be between 80 and 85 percent of the fecal coliform levels. Thus, in this model, an E. coli standard of 160/100 ml is at least as protective of the public health as a fecal coliform standard of 200/100 ml. Since an average E. coli level of 160/100 ml corresponds to a risk level of 9 to 11 illnesses/1000 swimmers, a risk level of 10/1000 (1/100) is recommended as the maximum risk level appropriate for Maine waters. Because it is likely that a Class C river which is attaining its classification would have bacteria levels at the maximum allowed this standard would result in a situation where someone swimming in a Class C river meeting its classification would have less than 1 chance in 100 of contracting a mild illness and virtually no chance of contacting a severe illness.

The E. coli standard for Class C is, thus, based on a risk level of 1/100. Use of the U.S.E.P.A. health effects regression equations for a risk level of 1/100 results in an E. coli standard of 142 per 100 ml. Because this standard must be administered through the statistical process of 90% confidence limits, and the bacteria level on which attainment is assessed is based on the number of samples collected, an instantaneous Class C bacteria standard of 949 E. coli per 100 ml is included to provide an indirect mandate to administer the standard through use of 90% confidence limits. After considerable study and discussion, it was decided that the risk level for Class B waters should be half (1/200) of that for Class C waters. For Maine's lakes and ponds (Class GPA waters), the decision to establish a theoretical risk level of zero (29 E. coli per 100 ml) was made possible by the State no-discharge policy for GPA waters. The risk levels on which the bacteria standards for marine recreational waters are based (1/100 for Class SC; 1/200 for Class SB) parallel those for Class C and Class B rivers. The indicator bacteria, enterococci is used for marine waters, however, because E. coli is unsuitable for that purpose.

The establishment by the State of acceptable risk levels, even for a mild illness, is not a trivial matter. Although many would agree that any swimming standard should be at least as protective as the present standard, the topic of how much more protective it should be could generate considerable debate. The relative protectiveness of a swimming standard is linked to varying levels of public spending to attain these standards. Studies conducted during 1984 and 1985 by D.E.P. have determined that there is a high degree of attainment by the State's rivers of the proposed bacteria standards. Where the proposed standards are violated, it is generally due to known problems which are already scheduled for correction.

A more protective swimming standard for Maine's rivers could be astonishingly expensive. If an alternative risk level of 1/1000 for all Maine rivers were to be established, the resulting standard would be an average of 34 E. coli /100 ml. It has been estimated that the attainment of such a low level of bacteria might be 1.25 billion dollars higher than for the bacteria standards in L.D. 2283 (McGovern, 1984). The cost of attaining those bacteria standards is estimated to be 250 million dollars in Maine. Expenditures for wastewater treatment in Canada and New Hampshire would also be necessary.

Another attractive feature of the bacteria standards for Maine rivers is the seasonal (May 15 to September 30) nature of the standards. Since the bacteria standards are for the protection of swimmers and swimming out-of-season in Maine rivers is an extremely rare event, bacteria standards during the out-of-season periods are unnecessary. The toxic nature of chlorine makes unnecessary disinfection also undesirable from a water quality management perspective. Chlorinated wastewater can cause an adverse impact on the aquatic life that wastewater treatment is supposed to protect. Seasonal chlorination minimizes that impact while still protecting swimmer health. Additional advantages of a seasonal chlorination policy are decreased transport of a hazardous material (chlorine) and lower costs for the operation of municipal wastewater treatment facilites.

Although the bacteria standards are not perfect, they are a great improvement over the present standards for the purposes of protecting public health and managing water quality. Because their scientific basis cannot be improved upon without the development of new technology for indicator species and the expenditure of at least two million federal dollars to establish a more precise epidemiological relationship, it is unlikely that, if approved, they would be changed within the next ten or twenty years.

REFERENCES

Cabelli, V.J., A.P.D. Dufour, L.J. McCabe and M.A. Levin (1983) A marine recreational water quality criterion consistent with indicator concepts and risk analysis. J. Water Polut. Control Fed. 55:1306-1313.

Cabelli, V.J. and EPA (1983) Health effects criteria for marine recreational waters. EPA-600/1-80-031.

Dufour, A.P. and EPA (1984) Health effects criteria for fresh recreational waters. EPA-600/1-84-004.

Geldreich, E.E. (1970) Applying bacteriological parameters to recreational water quality. J. Am. Water Works Assoc. 62:113-119.

McGovern, T.A. (1984) An analysis of the impact on the State of Maine of proposed bacteriological standards for recreatonal water quality. Maine Department of Environmental Protection.

APPENDIX V. SUMMARY OF ATTAINMENT UNDER MAINE'S OLD AND NEW WATER QUALITY STANDARDS

The information contained in this Appendix was assembled as supportring documentation for the Maine Legislature during its consideration of LD 2283. That bill was enacted by the Legislature and signed by the Governor and is therefore Maine law. The reader is cautioned to bear in mind that when used in these reports the term "OLD" refers to the classification system that existed prior to passage of LD 2283 and the term "NEW" refers to the classification system now in effect as a result of enactment of LD 2283. The reader should also be aware that LD 1503 was an earlier though substantively identical version of LD 2283.

APPENDIX V Summary of Attainment under Maine's Present and Revised Water Quality Standards

TABLE 1. Old and New Water Quality Standards for Maine

Present clasifications - 38 MRSA § 363, 363-A and 364		New Classifications-L.D.2283	
Class	Dissolved Oxygen Standard	Class	Dissolved Oxygen Standard
A	75% of saturation or as naturally occurs	AA	As naturally occurs.
B-1	75% of saturation or 5ppm	A	75% of saturation or 7ppm
B-2	60% of saturation or 5ppm	B	75% of saturation or 7ppm
C	5ppm	C	60% of saturation or 5ppm
D	2ppm		
SA	6ppm	SA	As naturally occurs.
SB-1	6ppm	SB	85% of saturation
SB-2	6ppm	SC	70% of saturation
SC	5ppm		
SD	3ppm		
Class	Bacteria Standard	Class	Bacteria Standard
A	20 fecal coliforms per 100 ml.	AA	As naturally occurs
B-1	60 fecal colofirms per 100 ml.	A	As naturally occurs
B-2	200 fecal coliforms per 100 ml.	B	Average of 64 E.coli per 100 ml.
C	1000 fecal coliforms per 100 ml.	C	Average of 142 E.coli per 100 ml.
D	Not harm public health		
GP-A	20 fecal coliforms per 100 ml.	GPA	Average of 29 E.coli per 100 ml.
GP-B	60 fecal coliforms per 100 ml.		
SA	Numerical criteria for general shellfish harvesting	SA	As naturally occurs
SB-1	Numerical criteria for general shellfish harvesting; plus an average of 50 coliforms per 100 ml. in swimming areas	SB	No bacteria levels which would cause the closure of open shellfish areas are allowed; plus an average of 8 enterococci per 100 ml. for swimming areas.
SB-2	Numerical criteria for general shellfish harvesting; plus an average of 100 fecal coliforms per 100 ml. in swimming areas		

Table 1. (Continued)

Old Classifications - 38 MRSA § 363, 363-A and 364		New Classification - L.D.2283	
SC	Numerical criteria for depuration shellfish harvesting plus an average of 300 fecal coliforms per 100 ml. in swimming areas.	SC	No bacteria levels which would prevent the propagation of shellfish are allowed; plus an average of 14 enterococci per 100 ml. for swimming areas.
SD	Not harm public health.		
Class	**Biotic Standard**	**Class**	**Biotic Standard**
A	No harm to aquatic life.	AA	As naturally occurs.
B-1	No harm or injury to aquatic life.	A	As naturally occurs.
B-2	No harm or injury to aquatic life.	B	No detrimental change.
C	No harm or injury to aquatic life.	C	Maintain structure and function.
D	No standard.		
GP-A	No harm to aquatic life.	GPA	As naturally occurs.
GP-B	No harm or injury to aquatic life.		
SA	No harm or injury to aquatic life.	SA	As naturally occurs.
SB-1	No harm to aquatic life.	SB	No detrimental change.
SB-2	No harm or injury to aquatic life.	SC	Maintain structure and function.
SC	No harm or injury to aquatic life.		
SD	No standard.		

TABLE 2. An Estimation of the Dissolved Oxygen Levels Which Would Occur in Various River Reaches Under Conditions of 7Q10 and 24°C[1]

River Reach	Class	DO Levels	Attainment[2] Old	Attainment[2] New
**********	Androscoggin River	**********		
NH Border to Canton	C	6.0 - 7.0	B2 or B1	C or B
Canton to Livermore Falls	C	5.5 - 6.0	B2	C
Livermore Falls to Route 219	C	5.0 - 5.5	C or B2	C
Route 219 to Turner Bridge	C	4.7 - 5.2	D or C	X or C
Turner Bridge to Upper Narrows	C	4.2 - 4.7 [4.0 - 4.5]	D D	X X
Upper Narrows to Lower Narrows	C	4.0 - 4.5 [4.0 - 0.0]	D X or D	X X
Lower Narows to Gulf Island Dam	C	3.0 - 4.0 [0.0]	D X	X X
Gulf Island Dam to Lewiston Falls Dam	C	3.0 - 3.5	D	X
Lewiston Falls Dam to Dresser Rips	C	6.5 - 7.0	B1	B
Dresser Rips to Merrymeeting Bay	C	7.0 - 7.5	B1	B or A
**********	Aroostook River	**********		
Ashland to New Brunswick	B2	above 7.0	B1	B&A
**********	Kennebec River	**********		
Moosehead Lake to Hinkley	B1, C&B2	above 7.5	A	B&A
Hinckley to 1 mile above Shawmut Dam	B2	7.5 - 7.0	A	B&A
1 mile above Shawmut Dam to Waterville	B2&C	6.3 - 6.8	B2, B1&A	C
Waterville to Richmond	C	5.5 - 6.0	B2 or B1	C
Richmond to The Chops	C&B2	6.0 - 6.5	B2 or B1	C

[1]Because this assessment is based on limited data and computer modeling studies, it should be regarded as no more than a "best professional judgement". Where there are significant differences in the DO levels between the surface and bottom of a river impoundment, the DO levels for the deeper water are given in brackets ([ ]).

[2] Attainment Criteria: "Old" = 38 MRSA § 363; "New" = L.D. 2283.
"X = "nonattainment of the DO standard of the lowest class in Old or New.

Table 2. (Continued)

River Reach	Class	DO Levels	Attainment[2] Old	Attainment[2] New
********** Little Androscoggin River **********				
Above South Paris	B1,B2&C	above 7.5	A	A
South Paris to outlet of Pennesseewassee Lake	D	7.5 - 2.0	D	X
Near Pennesseewassee Lake Outlet (sag point)	D	1.8 - 2.2	X or D	X
Pennesseewassee Lake Outlet to Lower Rt. 26 bridge	D	2.0 - 4.5	D	X
Lower Rt. 26 bridge to 3 miles above Oxford	D	4.5 - 6.5	D,C,B2&B1	X&C
3 miles above Oxford to Thompson Lake Outlet	D	6.5 - 7.5	A	C,B&A
Thompson Lake Outlet to Welchville Impoundment	C	7.5 - 6.0	A,B1,B2	A,B&C
Welchville Impoundment	C	5.0 - 6.0	C&B2	C
Welchville Dam to Mechanic Falls	C	6.0 - 7.0	B2,B1,A	C,B&A
Mechanic Falls to Androscoggin R.	C	7.0 - 7.5	A	A
********** Penobscot River **********				
West Branch from Millinocket to Dolby Dam	D	7.2 - 6.5	A	C,B&A
Dolby Dam to East Millinocket	D	6.5 - 5.5	B2,B1&A	C
East Millinocket to Mattaseunk Dam	D&C	5.5 - 4.5	D,C&B2	X or C
Mattaseunk Dam to Mattawamkeag	C	5.5 - 7.2	B2,B1&A	C,B&A
Mattawamkeag to Veazie Dam	C	7.2 - 7.7	A	B&A
Veazie Dam to Bangor Dam	C	7.6 - 7.8	A	B&A
Bangor Dam to South Brewer	C	7.2 - 7.7	A	B&A
South Brewer to Hampden	C	6.4 - 7.2	A	C,B&A
********** Presumpscot River**********				
Sebago Lake to Westbrook	A,B1&C	above 7.0	A	A
Westbrook to Tidewater	C	5.0 - 5.5	C	C

Table 2. (Continued)

River Reach	Class	DO Levels	Attainment[2] Old	Attainment[2] New
********** St. Croix River **********				
Vanceboro to Woodland Lake	B2,C	above 7.0	A	A
Woodland Lake	GP-A	above 6.0	GP-A	GPA
Woodland Dam to Milltown Dam	C	5.5 - 4.5	D,C or B2	X or C
Milltown Dam to Tidewater	C	5.5 - 6.5	B2,B1 &A	C
********** St. John River **********				
Above Fort Kent	B1	above 7.0	A	A
Fort Kent to Madawaska	B2	6.5 - 7.0	B1	C or B
Madawaska to Thibodeau Island	C	5.5 - 6.0	C or B1	C
Thibodeau Island to Hamlin	C	6.0 - 7.0	B2 or B1	C or B

NOTE: There are countless areas in Maine where dissolved oxygen levels in water draining bogs and swamps are below the standards of the old classification system. Although these naturally low D.O. waters violate classification under old law, they would attain their classification under the new system.

Table 3. An Assessment of the Attainment of Proposed (L.D. 2283) Bacteria Standards for Various River Reaches[1].

River Reach	Class	Classification[2] Attained
********** Androscoggin River **********		
From NH-Maine boundary to Gilead-Bethel boundary	C	X[3]
From Gilead-Bethel boundary to confluence of Sunday River	C	C
From confluence of Sunday River to Lewiston	C	B
From Lewiston to I-95 bridge	C	C[4]
From I-95 bridge to Merrymeeting Bay	C	C
********** Aroostook River **********		
Ashland to Presque Isle	B2	B
Presque Isle to McGraw	C	X[5]
McGraw to Fort Fairfield	B1&C	C&B
Fort Fairfield to New Brunswick	C	X[6]
********** Kennebec River **********		
Above Bingham	B1	A
Bingham to Skowhegan	B1&C	B
Skowhegan to Kennebec-Somerset County boundary	B2	X&C[6]
Kennebec-Somerset County boundary to Waterville	B2&C	B
Waterville to Sidney-Augusta boundary	C	C
Sidney-Augusta boundary to Edwards Dam	C	B
Edwards Dam to South Gardiner	C	C
South Gardiner to The Chops	C&B2	B

[1] Because the old bacteria standards are based on an absolute limit instead of an average, it is absolutely certain that under present law, no Maine rivers attain bacteria levels higher than Class D.

[2] "X" = nonattainment of the new Class C standard.

[3] Bacteria from Berlin, New Hampshire. <.

[4] Borderline attainment.

[5] 1986 cleanup. <..

[6] 1986 cleanup.

Table 3. (Continued)

River Reach	Class	Classification[1] Attained
********** Little Androscoggin River **********		
Above West Paris Village	B1	B
West Paris Village to West Paris-Paris boundary	B1&B2	C
West Paris-Paris boundary to South Paris/Norway	B2&D	B
South Paris/Norway to Oxford	D	X
Oxford to Welchville Dam	C	C
Welchville to Auburn	C	B
Auburn to Androscoggin River	C	X
********** Penobscot River **********		
Probably entire main stem	C	B
Possibly limited areas	C	C
********** Presumpscot River **********		
Above Westbrook	A,B1&C	A&B
Westbrook and below	C	C
********** St. Croix River **********		
Above Woodland Lake	A&C	A
Woodland and below	C	C or B
********** St. John River **********		
Above Fort Kent	B1	A
Fort Kent to Frenchville	B2	X
Frenchville to Madawaska	B2	C&B
Madawaska to La Grande Isle	C	X
Le Grande Isle to Hamlin	C	C

Table 4. Preliminary Estimation of Attainment for Biotic Water Quality Standards

Waterbody	Class	NO DETRIMENTAL CHANGES (Attains old standard for B1,B2&C and new standard for B)	MAINTAIN STRUCTURE & FUNCTION (Does not attain old standard for C but does attain new standard for C)	UNACCEPTABLE DEGRADATION (does not attain old or new standards for Class C)
********** Major Rivers **********				
Androscoggin River	C	Above Rumford		
Androscoggin River	C		Below Rumford	Limited areas only
Arrostook River		Ashland to New Brunswick	Limited areas only	
Kennebec River	C	Madison to Skowhegan		
Kennebec River	B2	Skowhegan to Shawmut	Limited areas only	
Kennebec River	C	Shawmut to Merrymeeting Bay	Limited areas only	
Penobscot River	C	Almost all of main stem	Limited areas only	
Presumscot	A,B-1&C	Above Westbrook		
Presumscot	C		Below Westbrook (usually)	Below Westbrook (occasionally)
St. Croix	C		Woodland to Baring	
St. Croix	C	Below Baring		
St. John	B2	Fort Kent to Madawaska	Limited areas only	
St. John	C		Madawaska to Grand Isle	Limited areas possible
St. John	C	Grand Isle to Hamlin		

* This table should be viewed as a preliminary "best professional judgement" of expected attainment of classification. It is subject to change because it is based on an incomplete analysis of the biological data.

Table 4 (Continued)

Waterbody	Class	NO DETRIMENTAL CHANGES (Attains old standard for B1, B2&C and new standard for B)	MAINTAIN STRUCTURE & FUNCTION (Does not attain old standard for C but does attain new standard for C)	UNACCEPTABLE DEGRADATION (does not attain old or new standards for Class C)
********** Minor Watercourses **********				
Cooks Brook	B1			Upper Rt. 5 bridge to Waterboro-Lyman boundary
Cooks Brook	B1		Waterboro-Lyman boundary to lower Rt. 5 bridge	
Cooks Brook	B1	Below lower Rt. 5 bridge		
Goosefare Brook	C			Saco and below
Little Androscoggin R.	D			S. Paris to Oxford
Little Androscoggin R.			Oxford to Welchville	
Little Androscoggin R.	C	Below Welchville		
Piscataquis River	C			Guilford to Dover-Foxcroft (1986 cleanup)
Piscataquis River	B2&C	Dover-Foxcroft to Howland	Limited areas only	
Presque Isle Stream	B2			Below Presque Isle (1985 cleanup)
Sebasticook River (East Branch)	C		Dexter to Corinna (1986 cleanup)	
Sebasticook River (East Branch)	C			Corinna to Sebasticook Lake
Sebasticook River (East Branch)	C			Newport to main stem (1985 cleanup)
Sebasticook River (Main Stem)	B2&C	Portions of main stem	Most of main stem	

Table 5. Attainment Summary for Various River Reaches[1].

River Reach	Class	Attainment[2] Old	New
********** Androscoggin River **********			
From NH-Maine boundary to Gilead-Bethel boundary	C	D	X
From Gilead-Bethel boundary to confluence of Sunday River	C	D	C
From confluence of Sunday River to Rumford	C	D	C
From Rumford to Gulf Island Pond	C	D	C
Gulf Island Pond	C	X	X
From Gulf Island Pond to Lewiston	C	D	X
From Lewiston to Merrymeeting Bay	C	D	C
********** Aroostook River **********			
Ashland to Presque Isle	B2	D	B
Presque Isle to McGraw	C	D	X
McGraw to Fort Fairfield	B1&C	D	C&B
Fort Fairfield to New Brunswick	C	D	X
********** Kennebec River **********			
Above Bingham	B1	D	A
From Bingham to Skowhegan	B1&C	D	B
From Skowhegan to Somerset-Kennebec County boundary	B2	D	X&C
From Somerset-Kennebec boundary to 1 mile above Shawmut Dam	B2	D	B
From 1 mile above Shawmut Dam to The Chops	B2&C	D	C

1 This table is a summary of the descriptions of attainment presented in Tables 2, 3 and 4. Overall attainment is based on the lowest level of attainment for any of the three classification standards (e.g. a river reach which atttains Class B for dissolved oxygen, Class D for bacteria and Class B for biological standards has an overall attainment of Class D).

2 "X" = nonattainment of the lowest classification under the old (Class D) and new (Class C) systems.

Table 5. (Continued)

River Reach	Class	Attainment[2] Old	New
********** Little Androscoggin River **********			
Above West Paris Village	B1	D	B
From West Paris Village to West Paris-Paris boundary	B1&B2	D	C
From West Paris-Paris boundary to South Paris	B2&D	D	B
From South Paris to Outlet of Pennesseewassee Lake	D	D	X
Near Pennesseewassee Lake Outlet (sag point)	D	X	X
From Pennesseewassee Lake Outlet to Oxford	D	D	X
From Oxford to Welchville Dam	C	D	C
From Welchville Dam to Auburn	C	D	B
From Auburn to Androscoggin River	C	D	X
********** Penobscot River **********			
Mattaseunk Impoundment	D&C	D	X&C
From Mattaseunk Dam to Mattawamkeag	C	D	C
From Mattawamkeag to South Brewer	C	D	B
From South Brewer to Hampden	C	D	C
********** Presumpscot River **********			
Above Westbrook	A,B1&C	D	B
Westbrook and below	C	D (usually)C (occasionally)X	
********** St. Croix River **********			
Above Woodland Lake	B2&C	D	A
From Woodland Dam to Milltown Dam	C	D	X or C
From Milltown Dam to Tidewater	C	D	C

Table 5. (Continued)

River Reach	Class	Attainment[2] Old	New
********** St. John River **********			
Above Fort Kent	B1	D	A
Fort Kent to Frenchville	B2	D	X
Frenchville to Madawaska	B2	D	C&B
Madawaska to Le Grande Isle	C	D	X
Le Grande Isle to Hamlin	C	D	C

Table 6. An Assessment of the Attainment of Old and New Trophic State Standards for Maine's Lakes and Ponds.

********** Old Classification System **********

I. Lakes and Ponds Currently Classified as GP-B

All GP-B waters attain the trophic state standards of their classification. None of them attain GP-A.

II. Lakes and Ponds Currently Classified as GP-A

A. Those With Algae Blooms (Do not attain old GP-A)

Arnold Brook Pond (Presque Isle)
Basil Pond (Fort Kent)
Black Lake (Fort Kent)
Chickawaukie Pond (Rockland & Rockport)
China Lake (China & Vassalboro)
Clary Lake (Jefferson & Whitefield)
Cochnewagon Lake (Monmouth)
Cross Lake (T.16,R.5 W.E.L.S. & T.17,R.5 W.E.L.S.)
Daigle Pond (New Canada Plt.)
Ell Pond (Sanford & Wells)
Etna Pond (Carmel, Etna & Stetson)
Fairbanks Pond (Manchester)
Fischer Lake (Fort Fairfield)
Fitzgerald Pond (Big Squaw Twp)
Halfmoon Pond (St. Albans)
Haley Pond (Rangeley, blooms when STP malfunctions)
Hammond Pond (Hampden; natural blooms?)
Hanson Brook Lake (Mapleton & Presque Isle)
Hermon Pond (Hermon)
Hobbs Pond (Norway)
Leighs Mill Pond (South Berwick)
Lilly Pond (Rockport)
Long Lake (St. Agatha, etc.)
Quimby Pond (Rangeley)
Sewall Pond (Arrowsic)
Three-cornered Pond (Augusta)
Threemile Pond (China, Vassalboro & Windsor)
Toothaker Pond (Phillips)

B. Those Without Algae Blooms (Attain old GP-A)

All other Class GP-A lakes and ponds in Maine (about 2900) attain the trophic standard for class GP-A waters.

Table 6 (Continued)

********** New Classification System **********

I. Lakes and Ponds Currently Classified as GP-B

A. Those With Culturally-induced Algae Blooms (Do not attain GPA as proposed).

1. Those With a Stable or Decreasing Trophic State

Annabessacook Lake (Monmouth & Winthrop)
Cobbosseecontee Lake (Litchfield, etc.)
Douglas Pond (Palmyra & Pittsfield)
Estes Lake (Alfred & Sanford)
Little Cobbosseeconte Lake (Winthrop)
Lovejoy Pond (Albion)
Monson Pond (Fort Fairfield)
Pattee Pond (Winslow)
Pleasant Pond (Litchfield)
Sabattus Pond (Greene, Sabattus & Wales)
Salmon Lake (Belgrade & Oakland)
Sebasticook Lake (Newport)
Spaulding Pond (Lebanon & NH)
Togus Pond (Augusta)
Webber Pond (Vassalboro)

B. Those Without Culturally-induced Algae Blooms

1. Those With a Stable or Decreasing Trophic State (Attain GPA as proposed).

Nubble Pond (Raymond; natural blooms)

II. Lakes and Ponds Currently Classified as GP-A

A. Those With Culturally-induced Algae Blooms (Do not attain GPA as proposed).

1. Those With an Unstable or Increasing Trophic State

Black Lake (Fort Kent)
Chickawaukie Pond (Rockland & Rockport)
China Lake (China & Vassalboro)
Cochenwagon Lake (Monmouth)
Cross Lake (T1,R5 W.E.L.S. & T17,R.5 W.E.L.S.)
Ell Pond (Sanford & Wells)
Haley Pond (Rangeley; blooms when STP malfunctions)
Hermon Pond (Hermon)
Hobbs Pond (Norway)
Three-cornered Pond (Augusta)
Threemile Pond (China, Vassalboro & Windsor)
Toothaker Pond (Phillips)

Table 6. (Continued)-

II. Lakes and Ponds currently classified as GP-A (Continued)

A. Those With Culturally-induced Algae Blooms (Do not attain GPA as proposed)(Continued).

2. Those With a Stable or Decreasing Trophic State

Arnold Brook Pond (Presque Isle)
Basil Pond (Fort Kent)
Clary Lake (Jefferson & Whitefield)
Daigle Pond (New Canada Plt.)
Etna Pond (Carmel, Etna & Stetson)
Fischer Lake (Fort Fairfield)
Fitzgerald Pond (Big Squaw Twp.)
Halfmoon Pond (St. Albans)
Hanson Brook Lake (Mapleton & Presque Isle)
Leighs Mill Pond (South Berwick)
Lilly Pond (Rockport, etc.)
Long Lake (St. Agatha, etc.)

B. Those Without Culturally-induced Algae Blooms

1. Those With an Unstable or Increasing Trophic State (Do not attain GPA as proposed)

Caribou Pond (Lincoln)
Crystal Pond (Turner)
Deer Pond (Hollis)
Echo Lake (Presque Isle)
Long Pond (Lincoln)
McGrath Pond (Belgrade & Oakland)
Narrows (Lower) Pond (Winthrop)
Narrows (Upper) Pond (Winthrop)
Notched Pond (Gray & Raymond)
Pettingill Pond (Windham)
Sebago Lake (Casco, etc.)
Watchic Lake (Standish)

2. Those With a Stable or Decreasing Trophic State (Attain GPA as proposed).

All other Class GP-A lakes and ponds in Maine (about 2900) attain the proposed trophic standards for Class GPA waters.

TABLE 7. Areas Closed to Shellfish Harvesting Due to Bacterial Pollution. For pollution assessment purposes only; not to be used for identifying areas open to harvesting.

Area #	Description
C-1	Piscataqua River above Wood Island (Kittery, etc.)
C-3	Cape Neddick Harbor (York)
C-4	Ogunquit Beach (Ogunquit)
C-4A	Perkins Cove (Ogunquit)
C-5	Webhannet River Estuary (Wells)
C-6	Parsons Beach to Vaughn Island (Kennebunk & Kennebunkport)
C-8	Cape Porpoise Harbor (Kennebunkport)
C-9	Saco River Estuary and the Pool (Biddeford & Saco)
C-10	Ferry Beach to Old Orchard Pier (Saco & Old Orchard Beach)
C-11	Scarborough River Estuary (Scarborough)
C-13	Spurwink River Estuary (Scarborough & Cape Elizabeth)
C-14	Portland Harbor (Portland, etc.)
C-14B	Chandler Cove (Cumberland)
C-15	Waites Landing to Wildwood Park (Falmouth & Cumberland)
C-16	Royal River Estuary (Yarmouth & Freeport)
C-16B	Prince Point (Yarmouth)
C-17	Haraseeket River (Freeport)
C-17A	Bunganuc Landing (Brunswick)
C-18	Thrumbcap to Harpswell Neck (Harpswell)
C-18A	Gurnet Strait (Brunswick & Harpswell)
C-18B	New Meadows River (West Bath)
C-18C	Merepoint Neck to Birch Island (Brunswick & Harpswell)
C-18D	Bailey Island (Harpswell)
C-18E	Cundys Harbor (Harpswell)
C-18F	Card Cove (Harpswell)
C-18I	Northwest shore of Harpswell Neck (Harpswell)
C-18K	Harpswell Neck to West Harpswell (Harpswell)
C-19	Sebasco Harbor (Phippsburg)
C-19A	Winnegance Bay (West Bath & Phippsburg)
C-19B	West Point (Phippsburg)
C-19C	Sabino Harbor (Phippsburg)
C-20	Kennebec River Estuary (Phippsburg, Georgetown, etc.)
C-20A	South end of Robinhood Cove (Georgetown)
C-20B	Bailey Point (Wiscasset)
C-21	Five Islands Harbor (Georgetown)
C-21A	Macmahan Island (Georgetown)

1. The closed areas described herein are more extensive in area than the areas where the bacteria standards setforth in 38 MRSA § 364 and L.D. 2283 are violated. Where there are nearby pockets of pollution with low-value shellfish resources between them, DMR has often closed the entire area to aid the enforcement of closure orders. Another factor which makes the designation of closed areas very conservative is the closure of areas which receive treated, disinfected discharges; such areas being presumed as unsuitable for shellfish harvesting due to Federal regulations. Some of these closed areas are harvested under special conditions such as winter harvesting only. Thus, the extent of estuarine and marine waters which do not attain the bacteria standards for shellfish (contained in (old standard) SA, SB-1 & SB-2 and (new standard) SB) is best described as an undefined subset of this listing.

Table 7. (Continued)

Area #	Description
C-22	Sheepscot River Estuary near Rt. 1 (Wiscasset & Edgecomb)
C-23	Boothbay Harbor and Linekin Bay (Boothbay, etc.)
C-23A	Pratts Island to Dogfish Head (Southport)
C-24	Farnham Point to Montgomery Point (Boothbay)
C-25	North end of Damariscotta River Estuary (Newcastle & Damariscotta)
C-25A	Turnip Island to the Gut (South Bristol)
C-25B	Pemaquid River Estuary (Bristol)
C-25C	New Harbor to Chamberlain (Bristol)
C-25D	Round Pond (Bristol)
C-26	North end of Medomak River Estuary (Waldoboro)
C-26A	Monhegan Island (Monhegan Plt.)
C-26B	Hatchet Cove and Friendship Harbor (Friendship)
C-26C	Pleasant River Gut (Cushing)
C-26D	Hawthorne Point (Cushing)
C-26E	Delano Cove at Lawry (Friendship)
C-26F	Delano Cove off Forest Pond (Friendship)
C-27	St. George River Estuary (Thomaston, etc.)
C-27A	Wheeler Bay near Calf Island (St. George)
C-28	Tennants Harbor (St. George)
C-28A	Port Clyde Harbor (St. George)
C-28B	Seal Harbor off Sprucehead Island (S. Thomaston)
C-28C	Long Cove near Tenants Harbor (St. George)
C-29	Rockland Harbor (Rockland & Owls Head)
C-29A	Ginn Point to Owls Head Harbor (Owls Head)
C-29B	Matinicus Island (Matinicus Island Plt)
C-30	Rockland Harbor to Oiger Point (Rockport & Camden)
C-30A	Carvers Harbor (Vinalhaven)
C-30C	Pulpit Harbor (North Haven)
C-30D	Fox Islands Thorofare (North Haven & Vinalhaven)
C-31	Camden Harbor & Sherman Cove (Camden)
C-31A	Lincolville Harbor (Lincolnville)
C-32	Belfast Bay (Belfast, etc.)
C-32A	Saturday Cove (Northport)
C-33	Belfast Bay to Fort Point (Searsport & Stockton Springs)
C-35	Penobscot River Estuary above Fort Point (Stockton Springs, etc.)
C-35A	Northern Bay (Penobscot)
C-36	Morse Cove To Hatch Cove (Castine & Penobscot)
C-36C	East Penobscot Bay off Harborside (Brooksville)
C-36D	Dark Harbor area (Isleboro)
C-36E	Sabbathday Harbor (Isleboro)
C-36F	Ames Cove to Long Ledge Cove (Isleboro)
C-37	Buck Harbor (Brooksville)
C-37A	Northwest Harbor (Deer Isle)
C-38	Deer Island Trorofare (Stonington)
C-38A	Inner Harbor (Deer Isle and Stonington)
C-39	Blue Hill Harbor (Blue Hill)
C-39A	Center Harbor (Brooklin)
C-39B	Billings Cove (Sedgewick)
C-39C	McHeard Cove (Blue Hill)
C-40	Union River Bay (Surry, Trenton, etc.)

Table 7. (Continued)

Area #	Description
C-42	Bass Harbor (Tremont)
C-43	Southwest Harbor (Southwest Harbor)
C-44	Soames Harbor (Mount Desert)
C-45	Northeast Harbor (Mount Desert)
C-46	Seal Harbor (Mount Desert)
C-46A	Otter Cove (Mount Desert & Bar Harbor)
C-47	Compass Harbor to Lookout Point (Bar Harbor)
C-48A	Desert Narrows off Thompson Island (Trenton)
C-49	Lookout Point to Salisbury Cove (Bar Harbor)
C-49A	Jellison Cove (Hancock)
C-49B	Skillings River off Hancock Point (Hancock)
C-50	Back Cove to Eastern Point Harbor (Sorrento)
C-50A	North end of Sullivan Harbor (Sullivan)
C-51	North end of Winter Harbor (Winter Harbor)
C-51A	Arey Cove (Winter Harbor)
C-52	Inner Harbor (Gouldsboro)
C-52A	Corea Harbor (Gouldsboro)
C-52B	Pidgeon Hill Bay off Pidgeon Hill (Steuben)
C-53	Narraguagus River Estuary (Millbridge)
C-54	Moosabec Reach (Jonesport)
C-54A	Moosabec Reach (Beals)
C-55	Machias Bay (Machias & Machiasport)
C-55A	Little River (Cutler)
C-55B	Howard Cove (Machiasport)
C-55C	Northeast end of Holmes Bay (Cutler and Whiting)
C-55D	Crane Mill Brook Estuary (Edmunds Twp.)
C-56	Dennys River (Dennysville and Edmunds Twp.)
C-56A	North end of Pennamaquan River (Pembroke)
C-56B	Duck Harbor West of Rt. 1 (Edmunds Twp.)
C-57	Shackford Head to Fort Sullivan (Eastport)
C-57A	Western Passage off Pleasant Point (Perry)
C-58	Johnson Bay off Lubec Neck (Lubec)
C-58C	Johnson Bay off Seward Neck (Lubec)
C-59	Carrying Place Cove (Eastport)
C-62	St. Croix River Estuary above Liberty Point (Calais & Robbinston)

APPENDIX VI: MAINE'S QUESTIONNAIRE ON WATER QUALITY

REGIONAL WATER QUALITY ADVISORY COMMITTEE DISCUSSION TOPICS
FEBRUARY 4, 1986

#1 Do the four proposed classifications AA, A, B and C provide an appropriate series of choices for management of the State's various river, stream and brook resources?
If not, why not?

#2 What should be the primary consideration for water quality classification decisions? Available options include:

1) To maintain/restore to as close to pristine as possible
2) To encourage economic development
3) To further resource conservation
4) To balance needs for economic development and conservation
5) Your option _____

#3 A new industry wants to locate in your region, on the banks of the Restless River. The new plant would create about 250 jobs. The Restless River is currently a Class B river. In order to build and operate the new industry, the river must first be downgraded to Class C. This means that the river would not be as clean as it is now, but would still be clean enough for swimming and fishing. Should the river be downgraded to Class C?

#4 If all of the circumstances in Topic #3 were the same except that the Restless River is currently classified as Class A instead of Class B, should the river be downgraded to Class C?

#5 If all of the circumstances in Topic #3 were the same except that the Restless River is currently classified as Class AA instead of Class B, should the river be downgraded to Class C?

#6 The City of Cupcake, Maine is located on the banks of the Wet River. The Wet River is currently a Class C river. Samples taken from the river show that it is cleaner than most Class C rivers, but is not clean enough for Class B. The Cupcake Sportsman Association wants to change the Wet River to Class B in order to improve the river's fishing and recreational value. This change would require that major industried along the river improve that quality of their wastewater discharges. Mr. Smith, President of the Wet River Paper Company, says that the upgrade would force him to cut back production and lay off 10% of his workers (about 120 people) in order to meet the new standards. It would also, he says, stop any possibility of expanding his plant in the future. Mr. Smith's assertions are disputed by those favoring the upgrade. As residents of the Cupcake region, do you think the river should be upgraded to Class B?

#7 The Quick River is currently classified as Class C. The river is cleaner than it has to be for Class C, but is not clean enough for Class B. Sportsmen in the area want to see the river changed to Class B to increase it's recreational value. This proposed upgrade to Class B means that a goal of reducing discharges to the river would be established. A DEP study has found that if the discharge from the ABC starch Co. were reduced, the Quick River would meet Class B standards. The ABC Starch Company has already planned to make changes in its manufacturing process over the next 8 years which will, as a side benefit, clean up much of its wastewater. The DEP study states that an upgrade to Class B would not affect ABC Starch Company, provided that they make the planned process changes. This means that for several years the river would be classified as Class B before it actually reaches that standard. Any new industries discharging to the Quick River would have to meet the Class B requirements. The Quick River Valley Chamber of Commerce is against the change to Class B because it may prevent other industries from locating there. As a resident of the Quick River Valley, would you support upgrading the river to Class B?

#8 The Rambling River is a very large river with many towns, cities, and industries along its banks. It is currently classified as Class C. Due to its large size and high flow rates, the river actually exceeds the standards for Class B. Sports and recreation groups favor changing the river to Class B to protect the water's quality from future pollution. Economic development groups fear that the change may hurt future growth in the region. A DEP study shows that an upgrade would not requires any additional expenses for treatment of existing discharges. In fact, a few minor industrial discharges could be added to the river without violating the Class B standards. As a resident of the Rambling River region, would you favor upgrading the river to Class B?

#9 The Winding River has many industries, towns, and cities along its banks. It is currently a Class C river, and barely meets the requirements for that classification. Some people want to upgrade the river to Class B as a way to improve its quality. Municipal and industry officials say that an upgrade would have dire economic and social consequences for the entire region because of the costs of compliance. As a resident of the Winding River region, would you favor upgrading the river to Class B?

#10 For rivers, streams, and books which are in areas which are almost completed forested, the classification which should be most frequently applied is (AA, A, B or C).

#11 For brooks and streams which are located in areas with extensive agriculture, the classification which should be most frequently applied is (AA, A, B or C).

#12 For rivers, brooks and streams which flow through areas which are a mix of woodlots, farms, towns centers and scattered houses, the classification which should be most frequently applied is (AA, A, B, or C).

#13 For rivers, streams and brooks which are lake tributaries, the classification which should be most frequently applied is (AA, A, B, or C).

#14 Do the three proposed classifications SA, SB and SC provide an appropriate series of choices for the State's various estuarine and marine water resources? If not, why not?

#15 The Town of East Overshoe is on the coast of Big Bay. The Biobag Corporation wants to build a plant in East Overshoe which would create 250 jobs. Big Bay is currently Class SB; in order to build and operate the new plant, a part of the Bay would have to be downgraded to SC. The part of the Bay that would be downgraded does not currently support any commercial shelfish harvesting. However, some local residents harvest mussels and clams there for their personal consumption. The wastewater discharge from Biobag would mean that some of the new SC zone would be closed to all shellfish harvesting. As a resident of the region, would you support downgrading a portion of the Big Bay to SC so that Biobag corporation can build and run the new plant?

16 If all of the circumstances in Topic #15 were the same except that Big Bay is currently Class SA, would you support a downgrade to SC?

#17 The Town of Placid Harbor is located on a salt water river estuary that is currently classified as SC. It is closed to all shellfish harvesting. A group of local clamdiggers wants the estuary upgraded to SB. This would eventually allow for commercial clam digging. This upgrade would cost the town an additional $500,000 to improve wastewater and storm water treatment. If the river were cleaned up, about $50,000 worth of clams could be harvested from it each year. As a resident of Placid Harnor do you think the river should be upgraded to SB?

#18 Suppose the cleanup of Placid Harbor would cost the Town $1,000,000 instead of $500,000 to open up clam flats yielding a yearly harvest worth $50,000. Would you then support upgrading the river estuary to SB?

#19 The Town of Saltspray has received some support from the State to establish an industrial park on the shorefront. The site chosen for the park is next to an area of Class SB waters. The Town has been unable to attract any businesses into the industrial park. Town officials have asked local lawmakers to propose a bill that would change the classification of the waters off the park to Class SC. They are not sure that this will convince any businesses to locate there, but Town officials think it is worth a try. The change will not immediately affect shellfishing in those waters, but future growth in the park could cause closure or restrict the area. The establishment of an industrial park in Saltspray is part of the State's overall plan for economic development. In light of this fact, would you, as a resident of Maine, support downgrading some of the waters off Saltspray to SC?

#20 The mud flats of Carry Cove are a prime clamming area. The waters of Carry Cove are currently classified as Class SB. Two people who own most of the shoreline along the cove want to sell their land as house lots. They have made separate applications to the Town Planning Board for subdivisions. The soil in the area is not right for septic systems, so houses built there would need individual sandfilter treatment systems. These would disinfect wastewater, then discharge it into the cove. The landowners say that this can be done without harming the clam flats. However, a State Marine Biologist has doubts, because poor system maintenance or a change in federal regulations could result in closing the cove to shellfishing. Many people in the area, including nearly all the clamdiggers, want to change the classification of the Carry Cove waters to SA. This new classification would prevent all discharges. The two landowners say an upgrade to the SA classification would reduce the value of their property, since houses couldn't be built there, without any compensation to them. As a resident of the Carry Cove area would you be in favor of upgrading the waters of Carry Cove to Class SA?

#21 For marine waters which are in commercially important harbors, the classification which should be most frequently applied is (SA, SB or SC).

#22 For marine waters located off swimming beaches, the classification which should be most frequently applied is (SA, SB or SC).

#23 For marine waters which are in commercial shellfishing areas, the classification which should be most frequently applied is (SA, SB or SC).

#24 For marine waters located off rocky shores the classification which should be most frequently applied is (SA, SB or SC).

#25 The following seven statements describe a series of goals which, taken together, are one option for the "big picture" of water quality management in Maine. For each of these goals, do you agree that they are the best way to serve the public's interest regarding water quality management?

1. Maine's waters should be managed so that eventually all the State's surface waters shall be of at least that quality necessary to attain the interim goals (fishable/swimmable) of the Federal Clean Water Act.

2. Maine's water quality management policy should be structured to maintain maximum State authority over water quality management rather than letting the Federal government establish policy in areas where jurisdiction is unclear.

3. Maine's water quality management should not be a "one-way street" of ever-increasing water quality at an ever-increasing social cost. The Legislature's classification of a water body should provide guidance to the Board of Environmental Protection as to whether a particular water body needs its quality improved, whether it should be maintained at its present quality or whether limited degradation of water quality can be allowed.

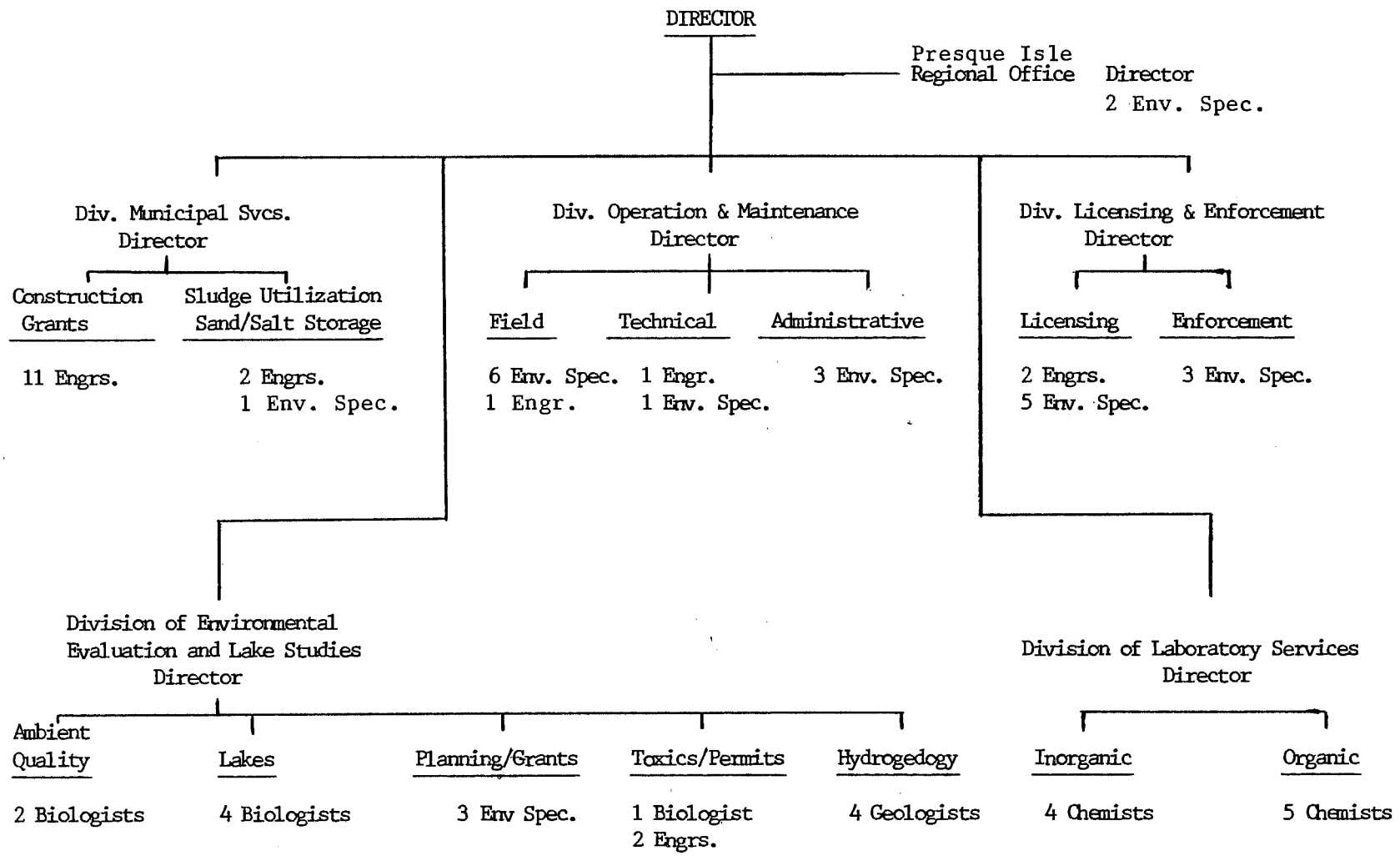
4. Increments of water quality which exceed those levels necessary to attain fishable/swimmable constitute a vital resource to the people of the State and should be available for important socioeconomic purposes which may be unforseen at this time.

5. An important socioeconomic need, now and in the future, is maintaining our heritage by preserving the pristine qualities of some State waters.

6. The Legislature should be able to assign a classification of AA, A, B or C to any Maine river and change that classification upwards or downwards at its discretion.

7. The Board of Environmental Protection should be able to grant permits for wastewater discharges or dams which degrade water quality toward the minimum standards of classification only if it finds that such lowering is necessary for important socioeconomic purposes.

APPENDIX VII: Organizational Chart of Maine's Bureau of Water Quality Control



The Second Great Kennebec Whatever Race : July 5, 1980. Ten years earlier, the Kennebec River was so polluted that the fumes it emitted made people nauseous. Now, thousands enjoy this annual event of recreation in and on the water.