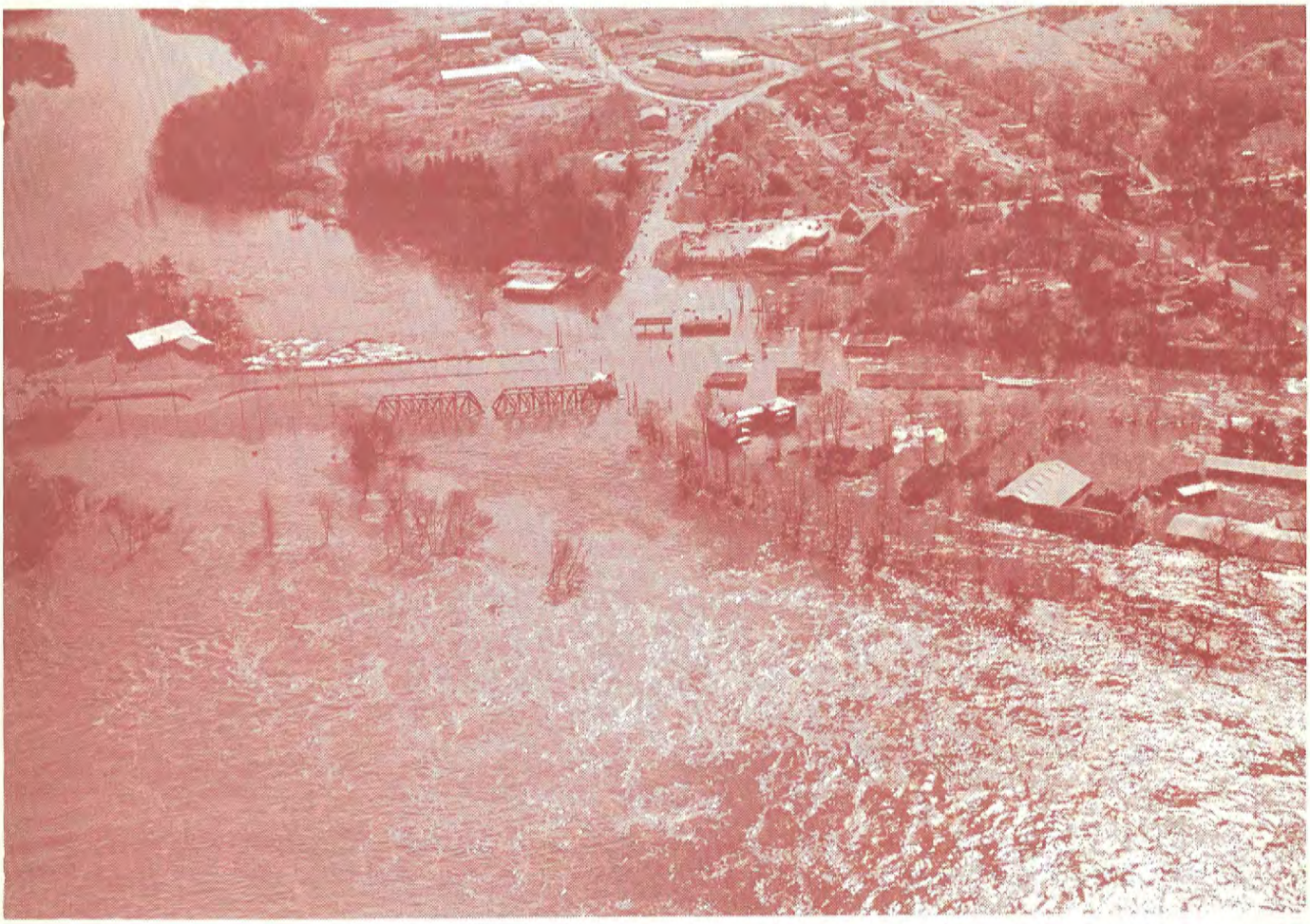
STATE OF MAINE
1988 WATER QUALITY ASSESSMENT



The April Fools Flood

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

1988 WATER QUALITY ASSESSMENT

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

Prepared by the
Maine Department of Environmental Protection
Bureau of Water Quality Control

Cover Photograph - The Sebasticook River on April 2, 1987. Maine's water quality took a short but severe downturn during the April Fools Flood. The intensity of that flood was a 1 in 250 year event in some parts of the State. Flooding caused the release of hundreds of thousands of gallons of petroleum distillates, extensive erosion and sedimentation, deposits of debris and serious damage to ten wastewater treatment facilities. Dick Maxwell photograph provided by the Waterville Morning Sentinel.

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EXECUTIVE SUMMARY

The quality of many Maine waters is now much improved from what it was just fifteen 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 increased greatly in value. Major celebrations take place annually to recognize Maine's accomplishments in cleaning up its waters. While progress has been substantial, there are still many outstanding needs requiring future commitments of Federal, State and local resources.

Maine has a wealth of water resources due to its large size and abundant precipitation. Because of the localized distribution of Maine's relatively small population, almost 90% of the State's land is forested, thereby minimizing human impacts on water quality. Attainment in Maine of the interim goals of the Clean Water Act are as follows:

(1) River, stream and brook miles - 99.1%,
(2) Lake and pond acres - 96.3%, and
(3) Marine water acres - 97%.

Management of Maine's surface waters will continue to change as program needs change. Maine has made substantial progress in eliminating problems due to toxics and oxygen demanding wastes. Treatment of these problems, however, has revealed other needs which were previously masked by untreated point source discharges. Control of nonpoint sources of pollution will become an important new initiative for the Department requiring new control techniques and basin-by-basin planning strategies. Maine has also started a new initiative to look at control of aesthetic problems. While the State has been largely successful at restoring the quality of its waters, the public still finds uses impaired on at least one river because of excessive turbidity, foam, color, and odor. Planning is in progress to alleviate these concerns so that the public can maximize use of its restored waters.

Lakes management has always has a prominent focus in Maine's water quality program. In the early years of the program, much of the emphasis was on assessment and restoration. While this work will continue, emphasis will increasingly be placed on preventive resource protection through development of State and local controls and expanded public awareness.

Groundwater management has evolved into an increasingly important program. As estimated in this report, about 1% of Maine's groundwater resources are seriously contaminated. Groundwater protection and restoration programs need to be expanded and enhanced in Maine. The importance of groundwater for drinking water supplies will increase in future years. Because of the limited dilution capacity and slow recharge time of groundwater, preventative protection programs are regarded as the most cost effective management strategy.

The Federal Water Quality Act amendments of 1987 made significant changes in the way water quality is managed. Greater emphasis is now being placed on assessment which will move management policies more in the direction of water quality based management rather than an approach based on effluent quality. New programs such as toxics control and nonpoint source control will require reallocations of the State's resources. Other changes such as reductions in Federal Construction Grants will require innovative approaches to complete needed facilities and to provide for improvements and renovations to existing facilities. Maine's water quality managers will continue to respond to new water quality problems as they arise.

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.

The objective of the 305(b) information transfer process is to provide the information needed to:

(1) determine the status of water quality in Maine,
(2) identify water quality problems and trends,
(3) evaluate the causes of poor water quality and the relative contributions of pollution sources,
(4) report on the activities underway to assess and restore water quality,
(5) determine the effectiveness of control programs,
(6) ensure that pollution control programs are focused on achieving environmental results in an efficient manner, and
(7) determine the workload remaining in restoring waters with poor quality as well as protecting threatened waters.

This 305(b) report is 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 water quality conditions, the quality and completeness of water quality data, 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 1988 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 knowledge of Maine's overall water quality and water quality management programs. 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 (1986) 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 1988 Water Quality Assessment contains a revised section on groundwater. State programs and our understanding of the nature of groundwater problems are in an early stage when compared to surface water management. The section on groundwater reflects this and provides more answers as the State's groundwater program progresses. Maine's 1988 water quality assessment contains an expanded section on groundwater problems and programs. Also included are recommendations for additional pollution control measures and a description of the nature and extent of nonpoint sources (NPS) of pollution and recommendations for their control.

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 - 1,189,000 (Mid-1987 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 estuarine and marine waters - 1633 mi^2	
Total length of coastline - 3,500 miles	
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 (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	

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 enactment of the U.S. Clean Water Act in 1972. Most of the eastern and northern portions of Maine contain waters that are relatively pristine; being affected, primarily by timber-harvesting activities and natural disasters such as forest fires and floods.

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, construction-related runoff, and waste disposal practices. Maine's priority system for dealing with problems caused by these pollution sources is presented in Appendix I. 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 in the past.

This report includes an assessment of water quality conditions for all of Maine's water resources. This assessment has been made based upon a combination of physical, chemical and biological data for waters which were actually monitored and on the considered judgment of the Department's water quality evaluation staff for waters which were not monitored. Monitoring data exists for about 19% of Maine's river, stream and brook miles, 36% of lake and pond acreage and 5% of marine water acreage.

Maine has a wealth of water resources due to its large size and abundant precipitation. Because of the localized distribution of Maine's relatively small population, almost 90% of the State's land is forested, thereby minimizing human impacts on water quality. Attainment in Maine of the interim goals of the Clean Water Act are as follows:

(1) River, stream and brook miles - 99.1%
(2) Lake and pond acres - 96.3%
(3) Marine water acres - 97%

Assessment of groundwater quality is more difficult than assessing surface waters but it seems that almost 1% of Maine's land area is underlain by groundwater unsafe for drinking water supplies.

A significant (1%) portion of assessed rivervine 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 do not attain their bacteria standard due to a combination of factors such as urban stormwater, combined sewer overflows, and untreated or inadequately-treated domestic wastewater discharges.

During the second part of 1987 the Department conducted 4 public hearings as part of the water quality classification process. One major finding of these hearings was that the public is reluctant to swim or fish in at least one of Maine's rivers, despite significant water quality improvements, due to aesthetic problems such color, odor and foam. As a result of these findings, the Governor has directed the Board of Environmental Protection to investigate the situation and make recommendations to reduce the problem. The study is underway with an expected completion date of October, 1988.

Figure 1. River Basins and Drainage Areas

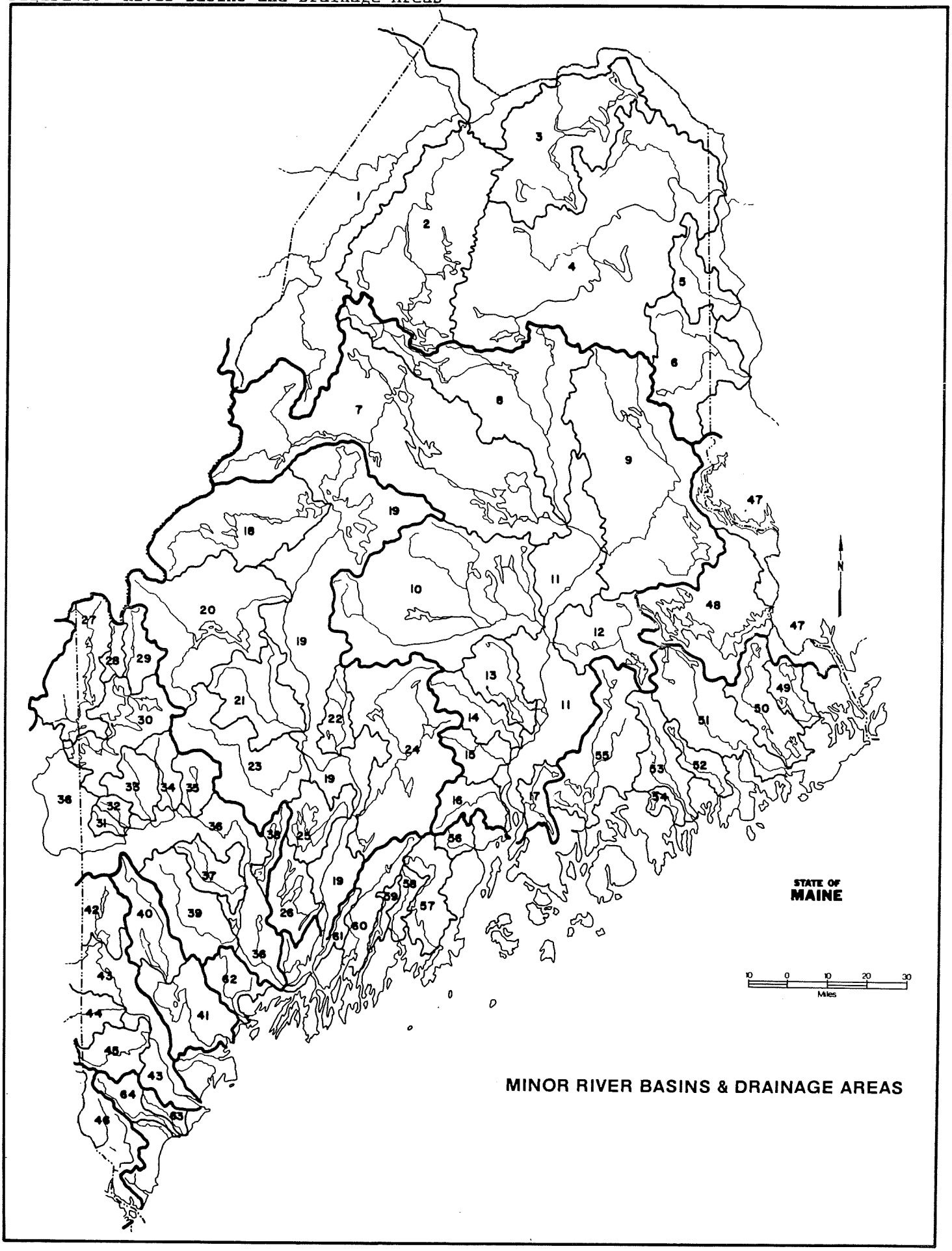


Figure 1. (Continued) River Basins and Drainage Areas

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

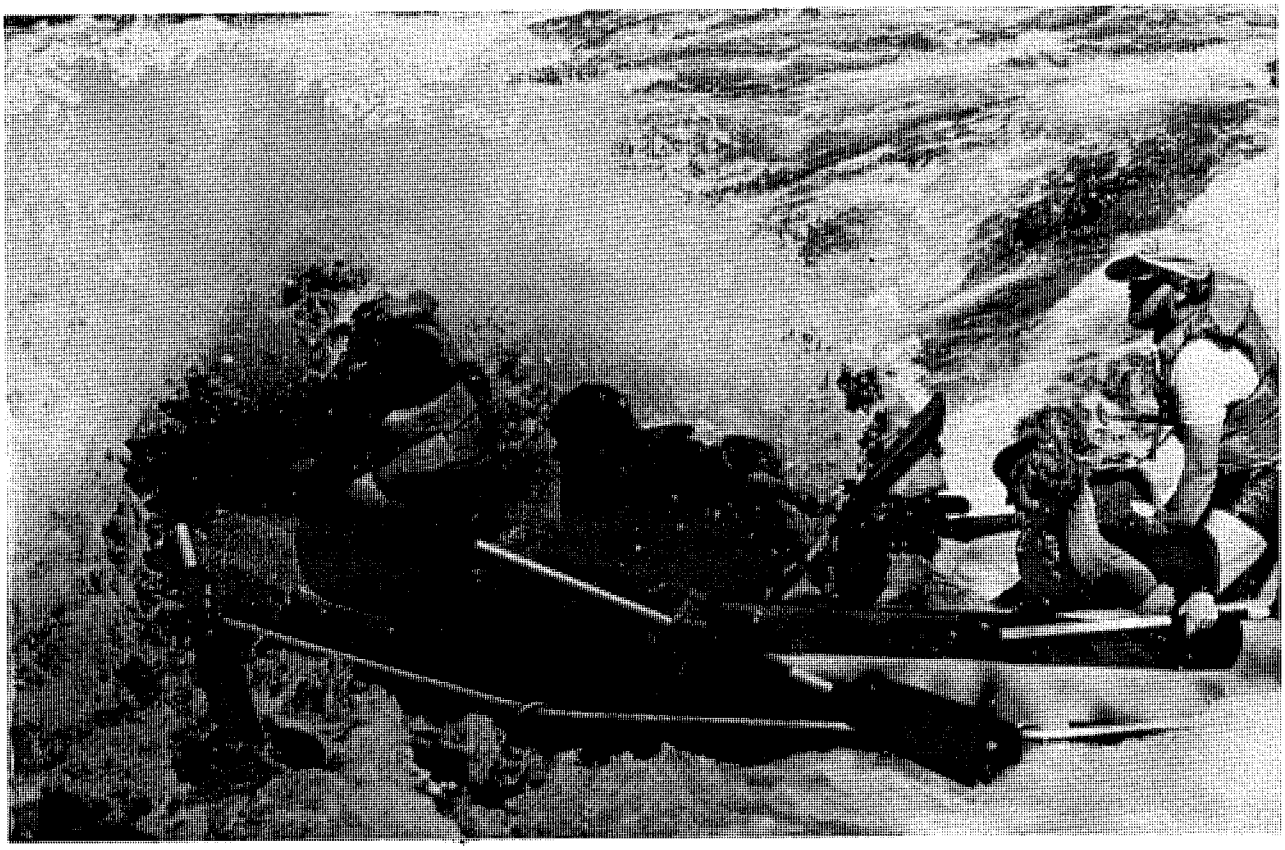
Piscataqua River System
46. Main Stem

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

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 uses. Thus, to answer a question 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". Prior to 1986, Maine's classification system contained some classifications which had designated uses lower than those specified by the CWA as the nation's interim goals. Maine's present water classification system contains no classifications with designated uses lower than the nation's interim goals. The revision of Maine's classification system was only the first step of a two step process. Since 1986, the Department of Environmental Protection of Maine has been examining the appropriateness of the interim classifications assigned to State waters and preparing to make many changes in the assignments of classification. Hopefully, this effort will result in Legislative action during 1989 to update the classifications assigned to Maine's waters.

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 were not scientifically valid. Indeed, making the standards defensible is the primary reason that Maine's classification system was revised. 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 Water Quality Act. This 1988 report is the first in which Maine's waters have been described in both ways.

To assess what portion of Maine's lakes, rivers, streams and brooks meet the Federal goal of being suitable for recreation in and on the water, this report uses the new maximum bacteriological criteria contained in Maine's water

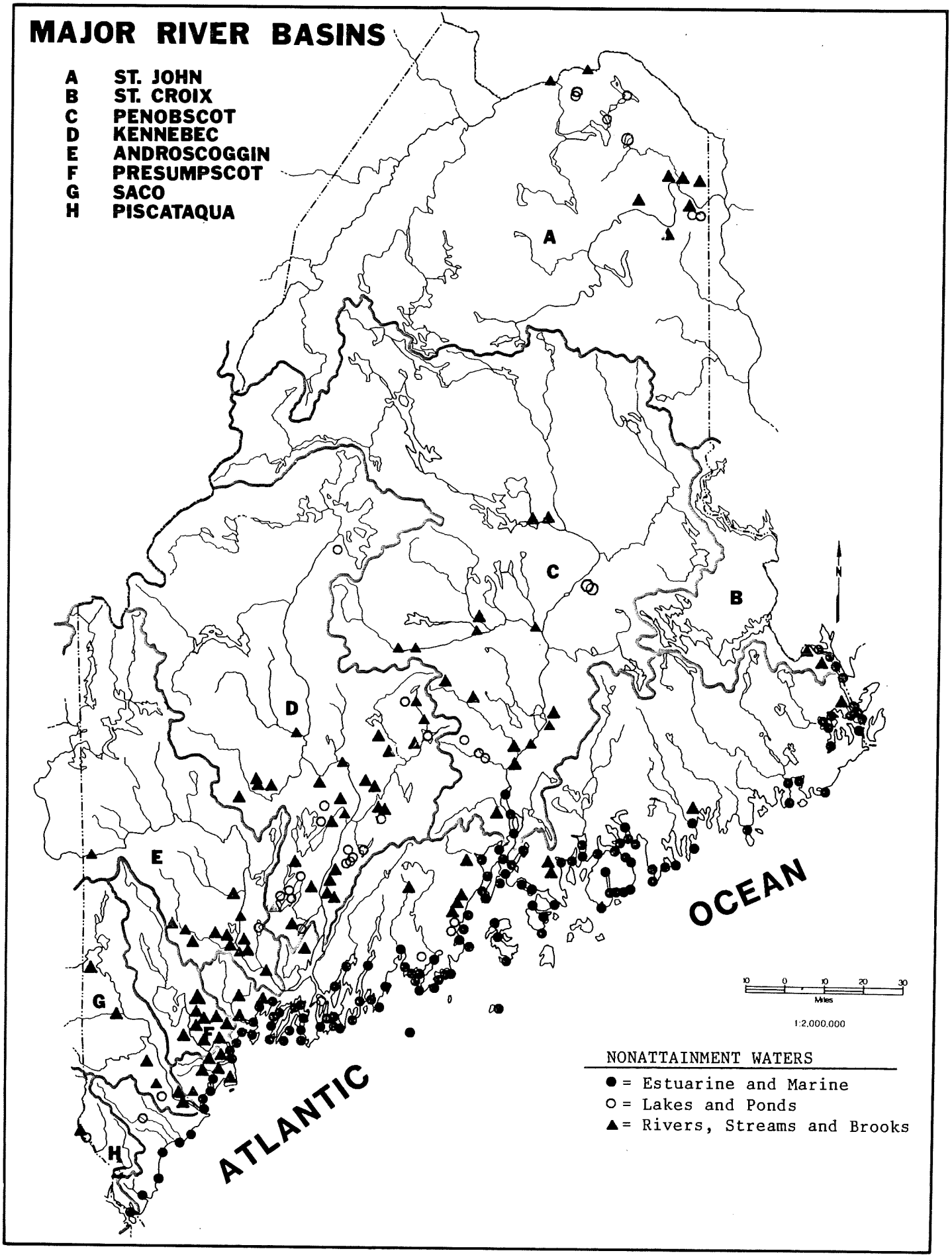
quality standards and approved by USEPA of an average of 142 Escherichia coli/100 ml. For estuarine and marine waters, Maine's bacteriological criteria of an average of 14 enterococci/100 ml is used in this report to assess suitability for recreation in and on the water. Analysis of E. coli and enterococci levels in Maine waters began in 1984. With the State's 1986 enactment of a classification system useing these health effects-based bacteriological standards, the State of Maine has led 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 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 benthic 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 many 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 causes of these nonattainment areas is presented in Appendix II.

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:

(1) 17 river gorges, 61 waterfalls, and 38 white water rapids identified as being outstanding geological or hydrological features with statewide significance.

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

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

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

(5) 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.

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

(7) 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.

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

(9) 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 potentially 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. For one of these rivers, the Piscataquis, wastewater treatment facilities are still being planned or are under construction. The lateness of the water cleanup on this river is due to a higher priority having been placed on more severe pollution problems, such as existed on the Androscoggin River. The present status of Maine's major rivers is presented in Table 2. Since all of the segments of Maine's major rivers which receive significant wastewater discharges are Class C waters under the State classification system there is no difference in the extent of attainment whether evaluated under the State or Federal Criteria.

As shown in Table 2, 1055 of Maine's 1184 miles of major river main stems attain the interim goals of the Clean Water Act. This represents an increase in attainment of 6 river miles over that mileage reported in 1988. This improvement in water quality is the result of completion of wastewater treatment facilities in the municipalities of Jackman and Newport. Of the 129 miles which still do not attain classification standards, only 14 nonattainment miles are the result of discharges of industrial wastewater. For the other 115 nonattainment miles, their problems are caused by discharges of untreated municipal wastewater, inadequate sewers or treatment facilities not yet built. Each river segment in Maine which does not attain classification standards is identified in Appendix II along with a description of cause(s) of nonattainment.

Building wastewater treatment facilities will not solve all of the water quality problems on Maine's major rivers. 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

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[4]	3,542	2,817	121	107	98	84(69%)
Kennebec	5,893	5,893	128	128	123	123(96%)
Dead	874	874	23	23	23	23(100%)
Moose	722	722	52	52	52	52(100%)
Sandy	596	596	70	70	70	70(100%)
Sebasticook	946	946	30	30	30	30(100%)
Penobscot	8,207	8,207	75	75	65	65(87%)
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	30	30 (48%)
West Branch	2,131	2,131	49	48	49	48(98%)
Presumpscot	641	641	24	24	16	16(67%)
Saco	1,700	815	85	85	84	84 (99%)
Saint Croix	1,631	994	56	56	56	56(100%)
Saint John[5]	8,275	4,266	146	146	114	114 (78%)
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			1184	1161	1070	1055
PERCENTAGE			(100%)	(98%)	(90%)	(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 The entire 121 mile length of the Androscoggin River does not fully attain its designated use of "fishing" due to the presence of dioxin in fish tissues. Although the dioxin levels are lower than those specified as federal action levels, the State toxicologist has issued an advisory on limiting consumption of fish caught in this river.
5 That portion of the basin upstream of the Hamlin, Maine - Grand Falls, New Brunswick boundary.

system. As part of Maine's present initiative to correct aesthetic problems, the State is planning a rehabilitation program for CSO's which will identify and treat those most objectionable to the public. This will probably be funded by state and local sources. A priority system is presently in design.

Although Federal assistance for construction of wastewater treatment facilities is scheduled to end in 1992, it is hoped that all municipalities needing treatment facilities will have received funding by then. Maine is presently designing a revolving load fund to assist with future construction. Facility needs such as upgrading wastewater collection and treatment systems will require a continuing Federal financial commitment to the infrastructure upon which clean water is dependent.

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).

The percentage of watercourse miles suitable for fishing and swimming in Maine is highest for small watercourses and lowest for major rivers (Table 3). 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. Because of the greater power generation potential of Maine's major rivers, water pollution problems eventually became most severe there.

The 31,377 miles of rivers, streams, etc. reported in Table 3 as meeting the interim goals of the Clean Water Act represents an increase of 682 miles over the statistic reported in Maine's 1986 Water Quality Assessment. Most of this increase in attainment is due to a more intensive and accurate assessment of water quality rather than being due to actual changes in riverine water quality. One major change over the assessment method used in 1986 is that these 1988 statistics are based on use of the USEPA Waterbody System (WBS). Use of WBS requires a very thorough and critical examination of water quality conditions on a segment-by-segment basis. By contrast, the 1986 assessment was based largely on estimates and generalizations, especially in evaluating the effects of nonpoint source pollution. The 1988 assessment found that far fewer miles of small watercourses were not attaining dissolved oxygen standards due to nonpoint source pollution than were thought to be nonattainment waters in 1986. As presented in Table 4, there are 31,278 miles of rivers, streams, etc. which are attaining the standards of their State classification. This is 99 miles less than the mileage reported attaining the interim CWA goals because Maine's classifications of B, A and AA have more stringent requirements than the interim CWA goals. As can be seen in the Miles Monitored column of Table 4, Maine's monitoring program is focused on those waters most seriously impacted by pollution.

Since over 99% 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 decades

Table 3. Maine Attainment Status: Rivers, Streams and Brooks Evaluated in Terms of the Interim Goals of the Clean Water Act.

Waterbody Type	Miles in Maine	Miles Monitored	Miles Assessed	Miles Fish/Swim [1]	Miles Not Fish/Swim	Miles Where Eventual Fish/Swim Attainment Is Likely	Miles Where Eventual Fish/Swim Attainment Is Unlikely
Major Rivers	1,184	780	1,184	1,055(89.1%)	129(10.9%)	1,184	-0-
Minor Rivers	2,520	1,150	2,520	2,462(97.7%)	58(2.3%)	2,520	-0-
Streams	3,909	1,040	3,909	3,885(99.4%)	24(0.6%)	3,909	-0-
Brooks	22,829	3,020	22,829	22,749(99.6%)	80(0.4%)	22,829	-0-
Other	1,230	150	1,230	1,226(99.7%)	3(0.3%)	1,230	-0-
	31,672	6,140	31,672	31,377(99.1%)	294(0.9%)	31,672	-0-

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

Table 4. Maine Attainment Status: Rivers, Streams and Brooks Evaluated in Terms of the Standards of Their State Classification (38 MRSA, Article 4-A).

Waterbody Type	Miles in Maine	Miles Monitored	Miles Assessed	Miles Fish[1]	Miles Swim[2]	Miles Fish/Swim[3]
Major Rivers	1,184	780(65.9%)	1,184	1,161(98.1%)	1,070(90.5%)	1,055(89.3%)
Minor Rivers	2,520	1,150(45.6%)	2,520	2,464(97.8%)	2,471(98.1%)	2,419(96.0%)
Streams	3,909	1,040(26.6%)	3,909	3,881(99.3%)	3,896(99.7%)	3,868(99.0%)
Brooks	22,829	3,020(13.2%)	22,829	22,731(99.6%)	22,808(99.9%)	22,710(99.5%)
Other	1,230	150(12.2%)	1,230	1,226(99.7%)	1,229(99.9%)	1,226(99.7%)
	31,672	6,140(19.4%)	31,672	31,463(99.4%)	31,474(99.4%)	31,278(98.8%)

1 Miles which attain dissolved oxygen and aquatic life criteria for protection and propagation of fish and wildlife.

2 Miles which attain bacteria criteria for recreation in and on the water.

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

for all the State's watercourses to become fully 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 such as nonpoint source pollution and combined sewer overflows must still be corrected. It will cost much more to increase the percentage of Fish/Swim miles from 99% to 100% that it did to increase it from 89% to 90%.

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. It is expected that the "color, odor, foam study mentioned earlier in this report will result in specific recommendations to carry out such upgrades. 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 II 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.

Lakes and Ponds

As detailed in Table 5, 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, 3.7% 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 as presented in Table 6 are the statistic of greatest importance in managing the quality of a lake or pond. Refer to Appendix II for more information on lakes and ponds not attaining their classification and summarized by type in Table 6.

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 (cultural) activity. A trend of increasing trophic state in a Maine lake is used as justification for more intensive 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 (Appendix III). 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.

Table 5. Maine Attainment Status: Lakes and Ponds Evaluated in Terms of the Interim Goals of the Clean Water Act.

Type & (#)	Acres in Maine	Acres Monitored	Acres Asssessed	Acres Fish/Swim	Acres Partial Swim	Acres Partial Fish/Swim	Acres Where Fish/Swim Can't Be Attained
Those > 5,000 Acres (36)	421,022	184,810	421,022	409,479(97.3%)	6,000(1.4%)	5,543(1.3%)	-0-
Those < 5,000 Acres (5,743)	573,538	178,174	573,538	548,601(95.7%)	15,478(2.7%)	9,459(1.6%)	-0-
	994,560	362,984	994,560	958,080(96.3%)	21,478(2.2%)	15,002(1.5%)	-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. This category includes 1,731 acres of lakes and ponds which although attaining the interim goals of the Clean Water Act, are considered threatened due to an increasing trophic state trend and, thus, do not attain Maine's Class GPA requirements.

3 Although all lakes and ponds in Maine attain the bacteriological criterion for recreation in and on the water, there are lakes and ponds (total acreage = 36,480) which experience periodic algal blooms. Although these lakes and 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. The 21,478 acres of lakes and ponds included in this category do not have impaired fisheries due to one of two reasons: (1) the affected waters did not historically support a salmonid fishery and the warm-water fishery currently present is not impaired by algal blooms and resultant low dissolved oxygen levels or (2) the affected waters have algal blooms which are of moderate rather than severe intensity, which in combination with the waterbody's location in the cooler, northern part of the State, do not cause impairment of the existing salmonid fishery.

4 These waters experience algal blooms which besides impairing water contact recreation have also impaired a salmonid fishery or caused it to be replaced by a warm-water fishery.

Table 6. Maine Attainment Status: Lakes and Ponds Evaluated in Terms of their State Classification and Water Quality Trends.

Category	#	Acreage	% of Total Acreage
Those with deteriorating water quality but which do not yet have culturally-induced algal blooms:	5	1,731	0.2%
Those with deteriorating water quality and culturally-induced algal blooms:	5	9,579	1.0%
Those with stable water quality and culturally induced algal blooms:	17	11,698	1.2%
Those with improving water quality but which still have culturally induced algal blooms:	6	13,476	1.4%
Those with culturally-induced algal blooms and unknown water quality trend:	3	1,727	0.2%
Totals for lakes and ponds not attaining the standard of their GPA classification:	36	38,211	3.9%
Totals for lakes and ponds attaining the standards of their GPA classification:	5,738	956,349	96.1%
Totals for lakes and ponds in Maine:	5,774	994,560	100.0%

The Vulnerability index is a predictive model which equates a lake or pond's hydrologic characteristics and rate of watershed development (from 1984 to 1986) with how long it will take for phosphorus concentrations in the lake or pond to increase by 1 part per billion (ppb). The major limitation of this model is that the rates and patterns of development in lake watersheds may be quite different over the next 10 or 50 years then they were from 1984 to 1986. Another significant limitation on its validity is that the applicability of the phosphorus input-output model used may vary from lake to lake.

Depending upon a lake or pond's current water quality status, a 1 ppb increase in phosphorus level may or may not cause a noticeable decline in the lake's water quality. For extremely vulnerable lakes and ponds, a 1 ppb phosphorus increase is predicted to occur within 10 years. For Highly Vulnerable Lakes and Ponds, a 1 ppb increase in phosphorus is predicted to occur within 50 years. On a Statewide basis, 0.7% of the surface area of Maine's lakes and ponds fall into the Extremely Vulnerable category and 11.2% into the Highly Vulnerable category.

Generally, the water quality of Maine lakes and ponds is good. Most lakes fall into an oligotrophic to mesotrophic classification. The majority of lakes in the Volunteer Monitoring Program (assumed to be representative of those Maine lakes with residential development in the watershed) have average transparencies between 4.5 and 7 meters. Only 31 of the 5,779 lakes and ponds in Maine support sustained and repeated blue-green algal blooms. Twelve of these 31 have federally funded restoration projects, 5 others are involved in local and state projects to improve water quality, and 1 is undergoing state diagnostic studies to determine the source of the problem.

Monitoring data for 1986 through 1987 on approximately 250 lakes indicates stable water quality for all but a handful of lakes. Six lakes show a trend of improving quality due to restoration projects. Three lakes showed signs of deterioration for the first time during this period. For one of these three deteriorating lakes, the trend was to more intense and sustained blooms. For the other two deteriorating lakes, green algal blooms were documented for the first time. Additional time and study are needed to determine whether these latter two blooms were a one-time phenomenon or a trend of deteriorating water quality. Two new blooming lakes in one year is unusual, the norm over the past several years is one per year to one per 2 years. Of these recent blooming lakes, some have not bloomed since while others have bloomed repeatedly.

The Department of Environmental Protection and the Maine Legislature, through statutes, regulations, permit review, and lake restoration projects have removed virtually all the major or easily located sources of pollution to Maine lakes. The major threat to maintaining the present high water quality of lakes is changing land use, the greatest change being the transition from predominantly forested, undeveloped land to low density residential development (4 units/hectare). In Maine, it has been found that there is a 5-10 fold increase in phosphorus export from a low density developed watershed (2.1 unit/hectare) as compared with an adjacent undeveloped watershed of similar size, topography, and soils. Agriculture, however, frequently continues to be a major source of enrichment to lakes, but agriculture in Maine is a declining sector of Maine's economy and is not the catalyst of new lake water quality problems.

The greatest task confronting Maine's lake managers is developing and implementing an effective program to minimize phosphorus export from new development in lake watersheds. During a bloom there is a significant reduction in the number of swimmers and, in some cases, boaters as well. Fishing can be either negatively or positively affected; cold water fisheries are generally eliminated or severely reduced over time but a warm water fishery is often improved. If a lake continues to experience severe algal blooms over a period of several years, shoreline property values decline. A 30% decline in property values has been documented in 2 cases.

In cases where a lake is a public water supply, an increase in the algal population, short of a bloom, does impact its use by causing taste problems, odor problems and by increasing particulates, thereby increasing treatment expenses. Though humans may not change their uses of a lake or pond until a bloom occurs, the aquatic community is far more sensitive. Dissolved oxygen levels in the hypoliminion of a lake are very sensitive to increased algae production which consequently impacts salmonids and the benthic invertebrate community. The invertebrate community also appears to be directly sensitive to changes in the nutrient loading.

In Maine, only one lake is known to be affected by toxic waste and the level of contamination is such that a UEPA official has recommended that pregnant women not swim in the contaminated area. The Center for Disease Control has recommended against any swimming in an additional lake located downstream of a toxic waste site even though the presence of significant amounts of toxics in that lake's water have not been documented.

Except in the case of a degraded cold water fishery, there is no significant loss of opportunity to use a lake by humans until the impact is sufficient to cause a algal bloom. However, the quality of use may be affected by only a slight increase in trophic state. Reduced clarity and/or reduced cold water habitat will affect both the aesthetics of the lake experience as well as the type and quality of fishing available. There is also the risk of enhanced internal recycling of phosphorus eventually resulting in more severe declines in water quality. The effects of algal blooms, however, are much more dramatic.

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 might be faulted for emphasizing the correction of problems rather than prevention of water quality problems, elimination of the program would severely impair Maine's goal of eliminating culturally-induced algal blooms from our lakes and ponds.

If the Federal Water Quality Act's Section 319 Nonpoint Source Control Programs are funded and 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..

Acid Mine Drainage to Lakes

Only two lakes in Maine are known to be chemically influenced by mine drainage or tailings discharge. Both are located near or downstream from the former Kerr-American mine in Blue Hill. This mine closed in the late 1970's, and has been dismantled. Both lakes have sulfate concentrations that are several times higher than the normal range of concentrations for Maine, but neither is acidic. The influence of possible high concentrations of trace metals in the lakes on aquatic biota is unknown.

Acidic Deposition

The number of chronically acidic lakes in Maine is small. The results from the 1984 Eastern Lake Survey projected that between 8 and 21 Great Ponds in Maine were acidic (those with an acid neutralizing capacity less than 0). Based on all known data for Maine (nearly 1000 lakes sampled), we are aware of 18 acidic lakes at least 4 hectares in size. Thirteen of these lakes had a pH less than 5.0 at the time of sampling). Four of the 18 are High Elevation Lakes in western Maine. Two-thirds (12) are seepage lakes. If lakes as small as 1 acre (0.4 hectare) in size are included, 55 are known to be acidic (37 had a pH less than 5.0 at the time of sampling).

Sixty percent of the acidic lakes are seepage lakes. However, this type of lake is transitional into bog lakes, and it is apparent that many darkwater acidic systems exist. The darkwater lakes are thought to be, at least in part, naturally acidic.

Twenty percent of the acidic lakes are small (<4 ha.) drainage lakes, and it is possible that significant numbers of these lakes that are unsampled, are acidic. However, sampling has largely focused on the lakes expected to be most sensitive, such as high elevation lakes in chemically resistant bedrock. Therefore, fewer than three percent of the general population of small lakes are expected to be acidic. In a probable worst-case scenario, fewer than 100 small acidic drainage lakes (less than 3% of approximately 3000) are undiscovered. The number is likely much less than that, due to past sampling programs which were biased toward sampling those lakes thought to be most stressed or sensitive.

There are probably only a few unsampled acidic lakes in the 4 hectare and greater size, based on the Eastern Lakes Survey. Similarly, it is unlikely that a significant number of unknown acidic lakes exists in the seepage lake class, excluding bog waters. Some uncertain number of unsampled small drainage lakes may be acidic, although the number is probably much less than 100, and probably less than 50. Thus, including the 55 acidic lakes known to exist in Maine, there are a total of 100 or fewer non-dystrophic acidic lakes larger than 1 acre. Although 55 acidic lakes have been identified, the number acidified to an acid neutralizing capacity of less than zero by acidic deposition is less than 55. Many of these lakes are acidic due to natural factors.

Paleolimnological investigations in New England have concluded that some lakes apparently have become acidified in the past 20 to 50 years. However, most are inferred to have had a pH of less than 6 in pre-historical times. Therefore, only lakes that currently have a pH less than 6 are considered to be at risk. Utilizing the same database from which the number of acid lakes was inferred, 45 Maine lakes are identified with pH between 5.0 and 6.0, and an acid neutralizing capacity of less than 20 ug/l. The actual number may be considerably higher, especially if small unsampled lakes are included. However, the only available long term data from lakes with pH or about 6.0 (EPA Long Term Monitoring lakes at the University of Maine/DEP Tunk Mountain Watershed Site) suggest that their acid neutralizing capacity has increased since 1982. While 5 years is much too short a period to indicate trends, it is apparent that even these very sensitive lakes are not immediately at risk to acidification.

No direct data are available that indicate temporal pH trends. Paleolimnological diatom analyses of sediment cores from 8 low pH Maine lakes has suggested that only Mud Pond (T 10 SD, 5 acres), and Unnamed Pond (T 3 ND, 15 acres) have a lower pH now than they did 100+ years ago. Both ponds have a pH of 4.8, and a diatom-inferred historical pH of less than 5.5. No evidence exists that any adverse biological effects have occurred in these two ponds due to inferred acidification but this is probably due to a lack of data.

Lake Summary

Maine's statutory goal for the management of lakes and ponds is a stable or decreasing trophic state and that they 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. 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 warm water species.

Estuarine and Marine Waters

As presented in Table 7, the area of estuarine and marine waters lying within 3 miles of the Maine coast is 1,633 square miles. This estimate is a considerably smaller area than the 3600 mi^2 reported as the area of estuarine and marine waters in Maine's 1986 Water Quality Assessment. This is due to the 1988 assessment being based on the statistics of the USDA Food and Drug Administration's 1985 National Register of Classified Estuarine Waters. That study estimated Maine's total area of estuarine and marine waters to be 1,633 square miles which were divided among four categories used in the National Shellfish Sanitation Program: Approved - 1,460.6 mi^2, Prohibited - 135.3 mi^2, Restricted - 17.1 mi^2, and Conditional - 20.0 mi^2. As presented in Table 7, the Department of Environmental Protection's estimate of the extent of waters not meeting the bacteria standards of the National Shellfish Sanitation Program is 38 mi^2, considerably less than the 172 mi^2 in USDA's nonapproved categories. There are numerous reasons justifying a reduced estimate of the area of nonattainment. The USDA estimate is based on areas closed to shellfish harvesting by Maine's Department of Marine Resources (DMR). These closings are based on water samples collected in shallow water along the shore since Maine's program is largely focused on regulation of shellfish harvesting in the intertidal zone. As such, offshore waters where there is great capacity for dilution may often attain bacteria standards even though they are in a closed zone. Further, the closed areas are intended to be more extensive in area than the areas where the bacteria standards 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 is best described as an undefined subset of those waters not approved for shellfish harvesting.

The estimate of 38 mi^2 of estuarine and marine waters is based on the extent of intertidal areas which are prime habitat for softshell clams (Mya arenria) and which are also not approved for shellfish harvesting. There are about 71 square miles of intertidal mudflats which are productive enough for commercial harvesting of softshell clams. About 19 square miles (27%) of these mudflats are closed to shellfish harvesting due to discharges of untreated or inadequately treated wastewater. The area of estuarine and marine waters in Maine not attaining bacteria standards for shellfish harvesting is estimated to be 38 square miles; twice the area of clam flats closed to harvesting.

As presented in Table 7, almost 98% of Maine's estuaries, bays and near shore waters fully support the uses of recreation in and on the water and the protection and propagation of fish, shellfish and wildlife. There are 38

Table 7. Maine Attainment Status: Estuarine and Marine Waters.

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 Partial Fish/Swim Is Likely	Area (mi^2) Where Eventual Fish/Swim Is Unlikely
1,633	88	1,633	1,595(97%)	28	3,600	-0-
			Intertidal Areas Which Are Prime clam Habitat			
71	71	71	52(73%)	15(21%)	71	-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 (19 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.

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 II for more information on estuarine and marine waters with impaired uses.

Although it can be argued that some closed areas may never support shellfish harvesting, the Maine Legislature has 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. 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 clam flats where a cleanup is most feasible, prioritize their cleanup and develop action plans to improve water quality so that shellfish harvesting can be reestablished.

The State of Maine's assessment of its near coastal waters is both weak and fragmented. While four separate State agencies conduct work in the marine environment, there is presently no comprehensive program to evaluate levels and effects of contamination in Maine's marine waters. The Maine Department of Marine Resources, with responsbilities lying primarily in resource management, monitors shellfish beds for bacterial contamination and paralytic shellfish poisoning (red tide). The Maine Department of Environmental Protection, the agency responsible for water quality management, conducts a limited water monitoring program in near coastal waters.

Recent findings by researchers outside of State government strongly suggest that more research needs to be done. Past assumptions that Maine's coast is largely free from contamination have been shown to be questionable. Penobscot Bay, Casco Bay, and Boothbay Harbor contain levels of contaminants comparable to estuaries thought to be the most polluted on the east coast. Polynuclear aromatic hydrocarbons in Casco Bay ranked fifth highest and PCB's ranked 11th highest in a national NOAA survey. Winter flounder livers in Casco Bay contained the highest level of lead, third highest level of silver, fifth highest level of zinc, and 10th highest level of copper. In Boothbay Harbor, which the National Maine Fisheries Service selected as a "control" site, for an East coast metals survey,crabs ranked second highest in lead levels.

Case Study

Partly in recognition of the lack of a comprehensive program to assess Maine's near coastal environment, the Department of Environmental Protection began a pilot study in 1986 in Boothbay Harbor. The plan was to design a project which would be useful in assessing attainment of Maine's recently revised water quality standards as well as to suggest sources of the lead contamination found by National Marine Fisheries Service. Three environmental factors were studied.

(1) Sediment Chemistry - to determine contaminant presence and concentration.

(2) Tissue Chemistry - to determine biological availability. In this case the blue mussel (Mytilis edulis) was selected as a water quality indicator.

(3) Benthic Community Structure - to identify anomalous communities which suggest nonattainment of water quality standards based on community structure and function.

Results of this pilot study suggest that even small coastal communities free of "heavy industry" may not attain even the lowest classification for marine and estuarine waters. In this case, lead levels in the sediments and blue mussels suggest that the problem has existed for many years and continues to be a problem. Lead from automobile emissions in the urbanized watershed has been implicated. Follow up work must be done, however, to determine if this nonpoint source hypothesis is valid.

Problems and Challenges

The primary challenge for Maine is to recognize the need for a comprehensive marine monitoring program before serious problems develop. Without doing so, efforts in one direction may be negated by neglect in another. For example, in Boothbay Harbor shellfish harvesting is prohibited due to bacterial pollution. Efforts are ongoing to open such closed areas. Yet due to the lead levels found in mussels, the Maine Department of Humans Services has issued a statement recommending against consuming shellfish which might be harvested there. Other towns face a similar contradiction.

Six problem areas exist:

(1) Nonpoint source pollution due to increased rates of development may to threaten near coastal waters with bacterial contamination, lead and other metals, pesticides, and polyaromatic hydrocarbons. An assessment of these potential problems should be a high priority for the State's water quality monitoring program.

(2) Waste load allocations for Maine's freshwaters are based on treatment and dilution to reach contaminant concentrations low enough to protect aquatic life. When these low concentrations of contaminants reach the saline interface, many precipitate. Near shore coastal waters, especially estuaries, can become loading zones for contaminants instead of zones of further dilution. Almost no work is being done to assess either the historical or present impacts associated with freshwater waste discharges.

(3) Present monitoring does not fully incorporate the Federal Water Quality Act concept of "fishable-swimmable." Fish tissue analyses are spotty and inconclusive. A program is needed to allow a more reasoned and targeted perspective of Maine's fish resources. Similarly, Maine's program to assess swimmability of marine bathing beaches should be expanded.

(4) Coastal eutrophication has not generally been considered a potential problem in Maine. Recently, however, public concern has pointed to this area as one in need of attention. In Casco Bay, for example, where three large POTW's discharge wastes from about 160,000 people, concern is growing that the bay may be overloaded.

(5) Aquaculture activities, such as salmon net pen farms, require the addition of feed and have the potential to overload small embayments with nutrients. In other parts of the world, severe impacts from net pen operations have been documented. Despite the current public controversy on aquaculture siting, no study on the water quality impacts of net pen operations is planned.

(6) The biological information on marine waters needed to fully implement Maine's Water Classification Program must yet be gathered. The establishment of a marine biomonitoring program will be required if this is to be done.

It is clear that the State of Maine must become more involved in monitoring and managing its near coastal waters. A program to inventory, assess, and correct problems is in the process of being developed.

Habitat Modification

Permitted modifications to marine habitats through the Coastal Wetlands Act and Coastal Sand Dune Rules are summarized as follows:

	1986		1987	
Coastal Wetlands*	#	Extent	#	Extent
Shoreline Stabilization	70	7000 feet	77	7700 feet
Piers and Wharves**	146		160	
Dredging	8	25 acres	9	30 acres
Fill	11	5 acres	12	6 acres
Others	35	--	38	--
TOTAL	270	--	296	--
Sand Dunes	155	75 acres	178	90 acres
TOTAL NUMBER	425		474	

* The totals for coastal wetlands are accurate, but the break-down by type is approximate and is based on percentages calculated for a four month tally during April-July 1986.

**"Piers and wharves" includes maintenance and repair projects.

Very little water quality monitoring has been conducted in Maine's offshore marine waters in part 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 of little concern. 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 these may also be 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.

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, water quality trends should be evaluated in terms of attaining the interim goals of the Federal Water Quality 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 Tables 3, 5 and 7. The trend projected to occur over the next two years is that there will be a 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 or fecal coliforms in terms of methods such as E.coli MF determinations which are now used.

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. It is hoped that a meaningful analysis of water quality trends in the State will be ready for inclusion in Maine's 1990 305(b) report.

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. Congress reauthorized the Clean Water Act in 1987 but it is uncertain when the capital-intensive projects needed to complete Maine's water cleanup can commence. Although the 1987 CWA amendments authorized $70,000,000 in fiscal year 1988 for state programs for control of nonpoint source pollution, none of those funds were appropriated. If Congress continues funding Maine's cleanup at authorized levels, complete attainment of the goals of the Clean Water Act as they pertain to point source pollution can be expected to occur within the next six to ten years. It may take twenty years or more to correct pollution problems due to nonpoint source pollution. Without continuation of the Federal financial role in water quality management, long-term water quality trends in Maine and the nation will be towards degradation rather than protection and improvement.

CAUSES OF NONATTAINMENT

As shown in Table 8, the causes of nonattainment of water quality standards vary significantly depending on the type of water resource considered. Major rivers and marine waters are not affected much by nonpoint source pollution due to their large sizes and high assimilative capacities. Lakes and ponds, because they act as sinks for phosphorus, are greatly impacted by land uses causing nonpoint source pollution. For small watercourses such as streams, localized nonpoint source pollution problems can arise from a high percentage of particular watershed being non-forested as well as from undesirable land use practices.

The second and third parts of Table 8 break out by source type the point source/nonpoint source statistics presented in the first part of the table. When considering a statistic such as 23.4% of point source problems in lakes and ponds being caused by untreated municipal or residential wastewater, it should be realized that this statistic means that 0.5% [(2.2%)(23.4%) = 0.5%] of the acreage of lakes and ponds in Maine not attaining the standards of their GPA classification are caused by that source.

For major rivers, untreated municipal or residential wastewater is responsible for 79.5% of the nonattainment. Treatment facility construction currently underway on the Penobscot and Piscataquis Rivers will significantly reduce the extent of this problem. The effects of combined sewer overflows (CSO's) on Maine's major rivers is a more intractable problem. A commercial operation on the Kennebec River will begin pretreating for flow in 1988 and hopefully, reduce the discharge from a CSO enough to attain bacteria standards on a 5 mile segment of that river. Lessening the effects of CSO's in Maine's largest urban areas, however, will remain a long-term goal unless a significant

Table 8. Causes of Surface Water Nonattainment[1] in Maine

	Major Rivers	Minor Rivers, Streams & Brooks	Lakes & Ponds	Marine Waters
Evaluated on Basis of Point Source/Nonpoint Source Causes				
Point Source	100.0%	34.3%	2.2%	97%
Nonpoint Source	0.0%	65.7%	97.8%	3%
	100.0%	100.0%	100.0%	100%
Evaluated on Basis of Point Source Type				
Untreated Municipal or Residential Wastewater	79.5%	60.8%	23.4%	10%
Combined Sewer Overflows	9.4%	10.7%	0.0%	10%
Inadequately Treated Municipal/Residential Wastewater	0.0%	28.3%	76.6%	70%
Inadequately Treated Industrial Wastewater	11.1%	0.2%	0.0%	10%
	100.0%	100.0%	100.0%	100%
Evaluated on Basis of Nonpoint Source Type				
Agricultural	0.0%	85.9%	68.3%	0%
Agricultural & Residential	0.0%	0.0%	11.3%	0%
Agricultural & Urban	0.0%	0.0%	3.8%	0%
Logging	0.0%	0.0%	4.0%	0%
Mining	0.0%	0.8%	0.0%	100%
Rural Residential	0.0%	0.0%	2.5%	0%
Urban Runoff	0.0%	9.3%	0.0%	0%
Other	0.0%	4.0%	1.5%	0%
Unknown	0.0%	0.0%	8.6%	0%
	0.0%	100.0%	100.0%	100%

[1] Those which do not attain their State standards for recreation in and on the water and protection and propagation of fish, shellfish and wildlife.

financial commitment is made to correct the problem The 11.1% of major river nonattainment miles ascribed to inadequately treated industrial wastewater refers to problems on the Androscoggin River and the West Branch of the Penobscot River where discharges of effluents receiving Best Practical Treatment, in combination with impoundments cause water quality-limited segments to occur.

The break out of point source effects on marine waters is less accurate than that given for other types of surface water and, consequently, is only reported to one significant figure. That 70% of point source nonattainment in marine waters is due to inadequately treated municipal/residential wastewater must be examined in the context of treatment technology and the requirements of the National Shellfish Sanitation Program. Although treated wastewaters are disinfected through chlorination, they are not sterile and the closure of nearby shellfish beds is still required to protect public health. Malfunctioning septic systems, although regarded as nonpoint sources by some, are also included in this category of point sources.

The 10% of point source nonattainment in marine waters due to untreated municipal wasatewater is addressed by Maine's continuing construction of wastewater treatment facilities along the coast. The 10% of point source nonattainment in marine waters due to combined sewer overflows is evidenced by shellfish closure zones around the discharge points of treated municipal wastewater being larger than they would be if the CSO's were eliminated. The 10% of point source nonattainment in marine waters due to inadequately treated industrial discharge is associated with elevated radionuclide levels in sediments adjacent to a naval base and a nuclear power plant.

As shown in the third section of Table 8, nonpoint source pollution in lakes, ponds and small watercourses is largely due to agricultural activities. Two of the nonpoint source types included in Table 8 group agriculture with other sources because of the difficulty often encountered in apportioning relative nonpoint source loading. Conservation plans aimed at reducing nonpoint agricultural pollution have had limited success because nutrient runoff is much more difficult to control than is soil erosion. Maine's management program for the control of nonpoint source pollution is oriented towards research on improving the effectiveness of Best Management Practices as well as towards implementing them.

PUBLIC HEALTH CONCERNS

Nontoxic Pollutants

The safety of swimming and consumption of fish and shellfish are the two major public health concerns about surface waters in Maine. The revision of Maine's water quality standards in 1986 included 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 fully 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 still 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.

Maine has experienced only a few areas where conventional pollutants have caused prohibition of use:

(1) Closures of public bathing areas.

- Sebec Lake , August 1986, coliform contamination, source unknown

- Old Orchard Beach/Goosefare Brook, occasional 1986-87, coliform contamination, poorly treated municipal wastewater.

(2) Closures of surface drinking water supplies.
- None.

(3) Incidences of waterborne diseases

1986 - 1 Gastroenteritis	Water contact recreation
1987 - 1 Giardiasis	Public water supply
2 Gastroenteritis	Private water supply

One public health concern associated with surface waters are the health-effects of shellfish consumption. 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 tributyltin in paints used on boat bottoms. In 1987, the Maine Legislature banned the sale of boat bottom paints contaning tributyltin in compounds for use on craft less than 25 meters in length.

Design or operating 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.

Toxic Pollutants

The most important concern regarding toxic pollutants in surface waters is their possible presence in public drinking water supplies. In 1987, Maine had its first closure due to toxics of a surface water supply. During low-flow conditions, the Town of Howland's Piscataquis River water supply was closed following a fish kill. Chemical analysis of the river water determined that levels of TRIS (1,3-dichloroisopropanol) exeeded drinking water standards. During 1988, Howland plans to finally discontinue all use of Piscataquis River water and rely on groundwater supplies for the town.

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 sampling.

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. Since sludge is produced as a result of wastewater treatment; public health concerns related to sludge landspreading are included in this section. The major public health concerns, however, related to landspreading of sludge are contamination of groundwater and food products rather than of surface water. Last year, Maine adopted dioxin standards for sludge landspreading.

None of the consumption advisories listed in Table 9 other than that for the Androscoggin River are based on fish tissue analysis; but rather are based on water analysis. Occasional samples of other fish have had levels of mercury in excess of FDA standards. These have been reported for older lake trout (Salvelinus namaycush) and since some of these lake trout were collected from watersheds without point source discharges, the source of the mercury is presumed to be natural. Mercury in two chain pickerel from Annabessacook Lake, a NPL site, did exceed the FDA level, but as sample size was small this was not considered sufficient for an advisory. Occasionally, a fish collected from other sites has had mercury levels exceeding FDA action levels, but mean values were always less (Androscoggin River, Kennebec River, Little Androscoggin River, Moosehead Lake, Sebasticook River). More sampling will be conducted to document the extent and severity of mercury contamination in fish tissue. PCB's levels in 1 of 3 bluefish sampled in 1983 from the New Meadows River exceeded FDA limits but the mean value was below the FDA level.

Table 9. Waterbodies in Maine with Fish Consumption Advisories.

Date	Waterbody	Extent	Restriction/Pollutant	Source
1988	Annabessacook Lake	1391 Acres	ATSDR[1]/ Organics	Winthrop Landfill (Superfund site)
7/87	Androscoggin River[2]	121 Miles	0-12 meals per year/ 2,3,7-8 TCDD (dioxin)	Kraft process pulp manufacturing
1987	Cooks Brook[3]	1 Mile	Complete ban/cadmium	Metal finishing and plating facility
1988	Crawford Pond	585 Acres	ATSDR/Xylene	"Recycling" facility (Superfund site)
1988	Quiggle Brook	6 Miles	ATSDR/Chlorinated solvents	"Recycling" facility (Superfund site)

1. Agency of Toxic Substances Disease Registry (ATSDR) recommended ban on consumption of fish.
2. Maximum of 12 meals/yr. for general public and 0 meals/yr. for pregnant women and nursing mothers - Maine Dept. of Human Services.
3. Town of Waterboro ban.

Waterbodies in Maine thought to be not meeting state water quality standards due to point source discharge of toxics listed pursuant to Section 307(a) of the Clean Water Act are as follows:

(1) Salmon Falls River (Class B; Berwick). A manufacturing facility discharging to this river (Reach #01060003008) has a license, which it is believed, if utilized fully, would result in ambient lead levels sufficient to impair the resident biological community.

(2) Wilson Stream (Class C; Wilton). A manufacturing facility, temporarily closed, which is licensed to discharge to this stream (Reach #01030003165) has a license, which it is believed, if utilized fully, would result in ambient chromium and lead levels sufficient to cause the resident biological community to lose its structure and function.

The extent of waters in Maine thought to be affected by toxics is presented in Table 10. Waterbodies in Maine with sediments known to be contaminated by toxics are listed in Table 11.

Table 10. Extent of Surface Waters Affected by Toxics in Maine.

Waterbody Type	Extent of Waters Monitored for Toxics	Extent of Waters With Elevated Levels of Toxics
Rivers (miles)	865	435
Lakes (acres)	38,106	400
Estuaries (miles^2)	10	10
Coastal waters (miles)	0	0
Great Lakes (miles)	N/A	N/A
Freshwater wetlands (acres)	3	0
Tidal wetlands (acres)	0	0

Table 11. Waterbodies in Maine with Sediments Contaminated by Toxics

Date	Waterbody	Extent	Pollutant	Source
1988	Annabessacook Lake	400 Acres	Dimenthyl formamide Toluene & TCE	Winthrop Landfill (Superfund site)
1987	Dennys River	0.1 Mile	PCB's	Salvage yard
1987	Cooks Brook	2 Miles	Cadmium	Metal finishing and plating facility
1988	Quiggle Brook	6 Miles	Chlorinated solvents	"Recycling" facility (Superfund site)
1985	Riggs Brook	0.5 Mile	PCB's	Salvage yard

HABITAT FOR AQUATIC, ESTUARINE AND MARINE ORGANISMS

There are many places in Maine where the habitats of aquatic, estuarine and marine organisms are 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 II.

Twenty years ago, impairment of aquatic, estuarine and marine habitats in Maine was thought to be almost entirely the result of oxygen demand from untreated wastewatr. Since the toxic effects of DDT and other toxic 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 many questions remain unanswered. The development of methods to determine: (1) effluent toxicity, (2) concentrations, (3) impacts on aquatic species and (4) biological community effects, is an area where much additional effort is needed.

Impairments of aquatic, estuarine and marine habitats in Maine are caused by four categories of pollutants: 1)untreated wastewater, 2) toxic wastewater which is inadequately treated, 3) wastewater treatment malfunctions and 4) discharges like oil and chemical wastes.

Table 12 provides a report of catastrophic fish kills and their causes for the period 1984-1986.

Table 12. Pollution Related Fish Kills in Maine: 1986 and 1987

Waterbody	Town	Date	Species	Estimated Number	Cause
Mattanawcook Stream	Lincoln	6/23/86	mixed	200	Bypass of pulp/paper mill wastewater
Mattanawcook Stream	Lincoln	6/30/86	mixed	50	Bypass of pulp/paper mill wastewater
Taylor Brook	Auburn	7/28/86	mixed	1000	Spill of gasoline and fire suffocant
Mattanawcook Stream	Lincoln	7/8/87	mixed	100	Overflow of heated process water
Piscataquis River	Guilford	8/28/87	mixed	2000-5000	Untreated wastwater from textile mill
Mattanawcook Stream	Lincoln	9/24/87	mixed	<100	Bypass of pulp/paper mill wastewater

AMBIENT WATER QUALITY

During the past ten years, many wells in Maine have been abandoned due to contamination from nonpoint source pollution. These contaminated wells should be regarded as less than the tip of an iceburg in assessing the extent of polluted groundwater. Based on present knowledge of pollution sources affecting groundwater, it is safe to assume that there are thousands of pollution sites in Maine with unpotable groundwater. The State is currently formulating a Groundwater Strategy to deal with the alarming degradation of this critical resource. Preventive rather than reactive measures will form the basis of this strategy since once groundwater is polluted, centuries may be required for natural processes to restore the groundwater to drinkable quality. The susceptibility of the resource to degradation can be illustrated by the fact that one gallon of gasoline has the potential to make one million gallons of groundwater unfit for human consumption.

Major impediments to the formulation of policy for the protection of groundwater are (1) a lack of knowledge as to the extent of the problem and (2) the unknown relative impact of the various types of nonpoint sources. In an attempt to bridge this critical information gap, this report includes an estimation of the extent and relative impact of NPS groundwater contamination. This estimation has some scientific basis but required so many assumptions to extrapolate limited information into Statewide statistics that it should be regarded as speculative rather than scientific.

Things as diverse as golf courses to dry cleaners to cemeteries have been advanced as possible threats to groundwater but the estimation presented in this report was limited to eight major sources which seem likely to be responsible for the vast majority of groundwater contamination in the State - agriculture, hazardous substances, land fills, leaking underground storage tanks, salt application on roads, sand-salt storage sites, septic systems and waste lagoons. The methodology used for this estimation is presented in Appendix IV. Hopefully, subsequent estimations of the extent of polluted groundwater in Maine will be based on increased understanding of the nature of groundwater pollution as well as an improved data base.

Table 13 presents the estimated land areas in each county and in the State which overlie polluted groundwater. The statistic that 0.9% of the State's groundwater is polluted becomes more significant when one considers that groundwater pollution occurs almost entirely in the 11% of the State which is not forested. Accounting for that factor indicates that about 8% of the State's settled area may overlie contaminated groundwater. A worrisome aspect of the spatial distribution of polluted groundwater is that much of it occurs in settled areas which are sparsely populated areas and may be discovered only after new residential development occurs.turned out to be the largest single source causing polluted groundwater in the State (Table 15). Aroostook County ranks 13th in population density but 9th in relative extent of groundwater contamination due to the historical use of nitrogen-containing fertilizers for the cultivation of row crops. Reference is again made here to Appendix IV here since it explains why the estimated affects of agriculture are more uncertain than are estimates for the other seven major nonpoint sources affecting groundwater.

Table 13. Estimated Total Areas of Maine Which Overlie Groundwater Not Attaining Water Quality Standards Due to Nonpoint Source Pollution.[1]

Locale	Area (Miles)	1984 Population	Ave. Pop. Per mi	Estimated Contaminated Area (mi)	% of Land Area
State of Maine	30,995	1,156,485	37.3	291.7	0.9%
Androscoggin Cty.	476	100,007	210.1	13.5	2.8%
Aroostook Cty.	6,721	88,949	13.2	79.6	1.2%
Cumberland Cty.	877	223,246	254.6	34.5	3.9%
Franklin Cty.	1,699	29,029	17.1	8.3	0.5%
Hancock Cty.	1,537	43,433	28.3	11.0	0.7%
Kennebec Cty.	876	112,184	128.1	19.9	2.3%
Knox Cty	370	34,155	92.3	6.6	1.8%
Lincoln Cty.	458	27,525	60.1	6.8	1.5%
Oxford Cty.	2,053	49,656	24.2	13.4	0.7%
Penobscot Cty.	3,430	138,429	40.4	27.1	0.8%
Piscataquis Cty.	3,986	17,998	4.5	5.4	0.1%
Sagadahoc Cty.	257	30,327	118.0	5.2	2.0%
Somerset Cty.	3,931	46,481	11.8	14.6	0.4%
Waldo Cty.	730	29,451	40.3	9.0	1.2%
Washington Cty.	2,586	34,115	13.2	11.0	0.4%
York Cty.	1,008	151,500	150.3	25.8	2.6%

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[1] Only contamination severe enough to cause groundwater to be unsuitable for drinking water supply is included in this table. Estimates are based on methodology presented in Appendix IV.

The estimates presented in Table 15 indicate that groundwater contamination is largely a function of population density with Cumberland County having the highest population density and the highest percentage of its land area overlying polluted groundwater. Piscataquis County has the least relative extent of groundwater contamination and the lowest population density. For the six most densely populated counties, their rankings for percent of total land area overlying polluted groundwater are identical to their rankings for population density. Only for one of the eight categories of nonpont sources which were assessed in this study (septic systems) was the assessment derived from population statistics. Septic systems, however, turned out to be the largest single source causing polluted groundwater in the State (Table 15). Aroostook County ranks 13th in population density but 9th in relative extent of groundwater contamination due to the historical use of nitrogen-containing fertilizers for the cultivation of row crops. Reference is again made here to Appendix IV since it explains why the estimated affects of agriculture are more uncertain than are estimates for the other seven major nonpoint sources affecting groundwater. Some groundwater problems being seen today may be relics of agricultural practices of decades ago when chemical fertilizers and pesticides were much less expensive and were often applied to the soil in excessive amounts.

CAUSES OF NONATTAINMENT

Table 14 lists what types of substances are contaminating Maine's groundwater and the sources of these contaminants. Almost all groundwater contamination in Maine originates from nonpoint source pollution rather than point source pollution. This section of Maine's 1988 Water Quality Assessment provides information on the causes of groundwater contamination as well as some of the public health concerns associated with this type of pollution.

Many chemicals are used in agricultural fertilization, pest control and weed eradication in Maine. Much of the chemicals applied are used on the potato fields of Aroostook County, blueberry barrens of Hancock and Washington Counties, and the apple orchards and other croplands of Central Maine. In addition to manufactured chemicals, many farmers utilize manure for fertilizers. The impact of these chemicals have on groundwater quality and human health, is not completely understood. The agricultural chemicals currently used have a comparatively low toxicity. Pesticides analyses generally indicate that either farmers are following recommended application practices or the chemicals are readily adsorbed by soil particles within the first few feet of the vadose zone and break down rapidly.

Nitrate contamination seems to be the most significant impact of agricultural activities on groundwater in Maine due to its mobility in the soil. Based on what limited data exists, the incidence of nitrate contamination seems to be limited to the cultivation of row crops. It is estimated that agricultural activities are responsible for 29% (85 square miles) of Maine's total groundwater nonattainment area. Some groundwater problems being seen today may be relics of agricultural practices of decades ago when chemical fertilizers and pesticides were much less expensive and were often applied to the soil in excessive amounts.

Table 15 presents an assessment of that portion of the total groundwater problem in each county and in the State caused by the nonpoint sources estimated in this report. On a Statewide basis, septic systems seem to be the largest single cause of unpotable groundwater. Contamination from septic systems can be a significant threat to groundwater quality if those systems are not installed according to the rules for subsurface disposal of wastewater. The septic systems of commercial operations can also pose a localized threat to groundwater due to the inability of septic systems to treat substances such as solvents. Septic systems can also have a cumulative impact on groundwater quality when there are too many of them in a given area or when they are clustered by design. Domestic wastewater entering a septic system leach field has a nitrate concentration of about 30 mg/l. If there is inadequate opportunity for denitrification in the soil or inadequate opportunity for dilution, poorly designed or densely sited systems can cause groundwater to exceed the drinking water standard for nitrates of 10 mg/l. From a health standpoint, nitrates are among the most serious threat since they may be converted to nitrite in the intestinal tracts of infants and bring on methemoglobinemia or Blue Baby Syndrome. The State Plumbing Code offers some protection of private and public wells by requiring minimum setback distances of 100 and 300 feet respectively.

Normally, nitrates in groundwater will be reduced to safe levels within 30 to 50 feet from the edge of a leach field. Nevertheless, these hundreds of thousands of small contaminated areas account for about 31% (91 square miles) of all polluted groundwater in Maine (Table 15). Extensive research would be required to determine whether approximately the 230,000 septic systems in the State pose a significant long-term threat to groundwater. It is in densely

Table 14. Contaminants of Maine Groundwater and Their Sources

MAJOR SOURCES OF GROUND-WATER CONTAMINATION IN MAINE

SOURCE	CONTAMINATION PRESENT	RANK
Septic Tanks	X	5
Municipal Landfills	X	3
On-site industrial landfills (excluding pits, lagoons, surface impoundments)	X	
Other Landfills	X	
Surface Impoundments (excluding oil and gas brine pits)	X	
Oil and gas brine pits		
Underground storage tanks	X	1
Injection Wells (floor drains)	X	
Abandoned hazardous waste sites	X	
Regulated hazardous waste sites		
Salt water intrusion	X	
Land Application/treatment	X	
Agricultural activities	X	2
Road salting (and salt storage)	X	4
Other - Radon from geologic sources	X	

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SUBSTANCES CONTAMINATING GROUND WATER IN MAINE

Organic chemicals		Metals	X
Volatile	X		
Synthetic	X	Radioactive material	X
Inorganic chemicals:		Pesticides	X
Nitrates	X		
Fluorides		Other Agrichemicals	X
Arsenic	X		
Brine/salinity	X	Petroleum products	X
Other			

Table 15. Estimated Relative Extent of Nonattainment Groundwater Polluted By Various Types of Nonpoint Source Pollution.[1]

Locale	Percent Nonattainment Caused By							
	Agri-culture	Hazardous Substances	Land Fills	LUST[2]	Road Sides	Sand-Salt Storage	Septic Systems	Waste Lagoons
State of Maine	29.0%	1.4%	2.2%	17.5%	14.1%	3.8%	31.3%	0.7%
Androscoggin Cty.	21.0%	0.2%	1.6%	27.7%	15.3%	2.4%	31.8%	--
Aroostook Cty.	73.4%	0.1%	0.7%	9.0%	5.7%	1.8%	8.8%	0.5%
Cumberland Cty.	3.7%	9.1%	3.6%	24.1%	11.5%	2.2%	45.8%	--
Franklin Cty.	7.2%	--	2.5%	22.5%	20.6%	5.7%	39.7%	1.8%
Hancock Cty.	13.3%	0.1%	2.9%	17.2%	20.6%	6.1%	39.7%	0.1%
Kennebec Cty.	11.3%	0.6%	1.6%	23.2%	15.1%	3.3%	44.5%	0.4%
Knox Cty.	9.5%	0.7%	1.9%	22.4%	19.3%	5.9%	40.3%	--
Lincoln Cty.	7.1%	--	2.1%	14.7%	21.6%	5.2%	49.1%	0.2%
Oxford Cty.	17.1%	0.1%	4.6%	20.2%	23.4%	5.1%	29.1%	0.4%
Penobscot Cty.	20.2%	0.3%	2.0%	23.3%	16.0%	5.6%	31.8%	0.8%
Piscataquis Cty.	14.1%	0.3%	2.6%	20.7%	26.9%	8.7%	26.6%	0.1%
Sagadahoc Cty.	3.5%	0.6%	4.9%	13.8%	16.6%	3.9%	56.8%	--
Somerset Cty.	21.0%	0.1%	2.1%	18.8%	18.6%	5.0%	32.2%	2.2%
Waldo Cty.	18.1%	--	1.9%	13.4%	23.1%	6.0%	37.4%	0.1%
Washington Cty.	16.1%	0.1%	3.6%	14.2%	20.6%	9.1%	34.0%	2.3%
York Cty.	5.1%	2.0%	3.8%	18.4%	15.2%	3.0%	50.8%	1.7%

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. See Appendix II.

2 Leaking Underground Storage Tanks.

settled, largely unsewered counties like Sagadahoc and York that the greatest potential for cumulative impact exists but densely settled, unsewered areas of all counties are susceptable to groundwater contamination from septic systems.

Hazardous substances are not a large percentage (1.4%) of the total groundwater problem but because of the extreme health hazard they present, they will continue to be allocated a large portion of groundwater protection resources. There are 42 sites in Maine where hazardous substances have caused groundwater contamination. Another source of groundwater contamination results from improper storage and disposal of hazardous substances. Presently there are six sites in Maine that have been designated as Superfund sites. These include the Winthrop land fill, McKin disposal site, O'Connor Salvage, Saco Tannery P.T., Pinnetter land fill and the Union Chemical site have been proposed as Superfund sites, but have not been officially designated as such. Cumberland County ranks highest in the relative extent of its groundwater problems due to hazardous substances because of the presence there of two very extensive contamination areas - the Brunswick Naval Air Station and the McKin site in Gray.

Another threat to groundwater is that of leachate migration from land fills. Presently, there are 277 active land fills and 108 known inactive sites. According to a 1986 estimate, Maine disposes of 725,000 tons of solid waste per year. This waste may include refuse generated by homeowners, municipal activities, and commercial operations. Therefore, myriad contaminants may be present at a given land fill. Although land fills located on sand and gravel aquifers are considered to be the worst polluters of groundwater, all land fills which don't have synthetic liners and leachate collection systems should be assumed to be polluting groundwater.

In 1987, the Maine Legislature mandated that the Department of Environmental Protection, Bureau of Land Quality Control undertake a prioritization of land fill sites for closure. This prioritization will examine land fill sizes, proximity to water supplies, impact on groundwater, impact on surface water, open burning, disease threats, and the disposal of special or non-conventional wastes. New sites must not be sited in geologically sensitive areas such as sand and gravel aquifers. It is estimated that land fills account for 2.2% (6.4 square miles) of Maine's total groundwater nonattainment area. Refer to Table for the relative proportion of groundwater contamination caused in each county by land fills.

Land fills are a significant problem in the State but leaking underground storage tanks (LUST) are estimated to have polluted eight times as much groundwater. The alarming aspect of pollution due to underground tanks is that there are an estimated 6500 sites in the State that have polluted by leaking tanks while only about 1000 of these sites have been discovered yet. At 155 of these sites, a total of over 200 private wells have been polluted. It is estimated that LUST is responsible for 17.5% (51 square miles) of Maine's total groundwater nonattainment area.

A common petroleum product stored in underground tanks is gasoline. Gasoline contains a host of very hazardous and carcinogenic chemicals such as benzene, toluene and m-xylene which are soluble in water to varying degrees. Another common constituent of gasoline is MTBE (methyl tertiary butyl ether) which is used as an octane enhancer. This chemical, at 25^{o}C, is 80 times as water soluble as toluene and 240 times as soluble as m-xylene. Although it is believed that this chemical is less toxic than some of the other constituents, it probably acts as a nervous system depressant at high concentrations. However, MBTE seems to increase the solubility of other, more hazardous components of gasoline. Concentrations of gasoline containing MTBE can be very

high within contamination plumes in comparison to gasoline plumes which do not have this additive. In fact, concentrations of gasoline in household wells have reached 600,000 ppb which contrasts with similar scenarios of well contamination of gasoline (without MTBE) in the range of 10 to 30,000 ppb. Since there is concern over human toxicity in connection with MBTE, the State toxicologist has set a recommended maximum concentration of 50 ppb. Likewise, gasoline and fuel oil also have recommended maximum concentration levels of 50 ppb.

The spreading of salt and sand-salt mixtures on Maine's roads may save many lives each winter but has a detrimental effect on groundwater quality. Each year 50,000 - 60,000 tons of salt are used for the de-icing of roads during the winter months. Some of this salt is spread on roads in pure form while much of it is mixed with sand and spread for traction as well as de-icing. Road salt application affects highly localized areas, is attenuated rapidly by natural processes and poses little long term threat to groundwater outside the road's right-of-way. Maine already uses the lowest salt spreading rate in New England. Improvements in roadside drainage could lessen the extent of the problem but roadside groundwater contamination is going to be a problem so long as sodium chloride is used to clear the roads. Alternative deicing compounds could be used but the cost is currently prohibitive. Although roadsides account for 14% of groundwater contamination in Maine, they present a rather localized, minor problem.

Uncovered sand-salt storage areas, although estimated to be polluting only a quarter of the area that sand-salt spreading does, are a much more serious problem. Each sand-salt storage site is estimated to pollute an average of 10 acres of groundwater. The concentrations of salt in groundwater associated with these sites is usually much higher than along road sides. The salinity of groundwater polluted by uncovered sand-salt piles sometimes exceeds that of sea water.

In 1985, the Maine Legislature directed the Department of Environmental Protection to register and prioritize all known salt-sand storage areas according to the extent of their groundwater contamination problems. Of the over 700 sites visited, 41 were found to cause chloride contamination in 66 wells in excess of the drinking water standard (250 mg/l). Associated with these 41 top priority sites are an additional 84 wells with chloride over 20 mg/l. The estimated contamination plume areas vary from 2 to 36 acres and the average plume area is 10 acres. The program currently underway to cover sand-salt piles should eventually eliminate that source of contamination. It is estimated that uncovered sand-salt storage piles account for 3.8% (11.1 square miles) of Maine's total groundwater nonattainment area.

Lagoons used for wastewater treatment were estimated to be the least significant of the sources studied. One factor which minimizes the extent of contamination from lagoons is that they are usually located next to large water bodies which are groundwater discharge areas. Major lagoon sites number only 36 in the State with about 90 % of the lagoons having linings which minimize discharges to groundwater.

WATER QUALITY TRENDS

The present trends in the quality of Maine's groundwater is that more of it is becoming contaminated each year and almost none of those waters are being restored to minimum acceptable levels of quality. Even if all the nonpoint source pollution contaminating groundwater could be stopped immediately, the migration and expansion of existing contamination plumes would continue to cause serious problems.

As underground fuel tanks are removed and replaced with improved steel tanks and fiberglass tanks, there will be an eventual decline in the cases of fuel contamination. However, this will probably not occur until the next century. Groundwater contamination associated with agricultural activities may show declines as farmland is converted to residential uses and better farm practices are implemented. As landfills are closed and transfer stations are constructed for distribution of refuse to large centralized facilities, there will be an eventual decline in cases of groundwater contamination associated with this source.

Contamination from salt-sand piles will decline as storage buildings are erected. Contamination from road sandings and salting should show an eventual decline since much of the salt currently mixed in sand piles is necessary in keeping the uncovered pile from freezing. Problems with adequate treatment of wastewater through subsurface disposal systems as building density increases will likely require a great deal of research and monitoring effort. Largely unsewered and densely populated areas such as Sagadahoc and York counties have already showed an upward trend in this type of contamination.

Maine's involvement in the nonpoint source control programs mandated by Section 319 of the Clean Water Act combined with the preparation of a State groundwater strategy are crucial to any efforts to slow the trends leading to increased groundwater contamination. Although the State has already committed considerable resources to groundwater protection, continuing and expended Federal assistance for groundwater protection is urgently needed. At this time, the magnitude of financial commitment needed to implement comprehensive nonpoint source controls is similar to that needed in 1972 for the point source control program which began then.

Although considerable cleanup efforts are underway at sites where groundwater is unpotable, it must be recognized that the focus of these efforts is the limiting of migration and expansion of existing contamination plumes. Groundwater, once polluted, can usually be reclaimed by natural processes over an extended period of time.

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 Program (38 MRSA, Article 4-A). 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 revision of Maine's classification statutes in 1986 represented the first step of a two step process. Although this legislation revised the system for water quality classification, the classifications assigned to specific waterbodies are still being studied. Recommendations for changes in assignment of classification will be made to subsequent Legislatures. To determine the appropriate classifications for Maine's waters, the DEP is conducting water quality monitoring and facilitating public participation through a series of workshops and public hearings. Hearings for the Kennebec and Androscoggin basins were conducted in 1987. Hearings for the remaining basins will be conducted during 1988.

The State is also preparing a major revision of its administrative rules related to water quality management. A draft proposal is presently available with hearings scheduled for May of 1988. Noteworthy additions to the rules will include sections on implementation of the antidegradation provisions of the law, criteria for discharges to Class A waters, criteria for toxic substances, protection for fish spawning, part of the biomonitoring regulations and various minor revisions.

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 are malfunctioning 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 require that discharges from municipal sewage collection systems receive secondary treatment (providing approximately 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 Federal Water Quality Act or more stringent State requirements.

For septic systems, Maine's 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 Water Quality Act 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) Lakes Protection, 3) Shellfishery Protection, 4) Water Quality Concerns, and 5) (Other) Facility Needs. Within each of these priority categories, 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 Program; 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).

During the period between 1986 and early 1988, 16 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.

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 by Maine voters. The Small Community Facilities Program was last refunded by a bond issue which was approved in November of 1987.

This program fills a need which is largely 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 6-year period during which the Small Community Facilities Program has been in existence, a total of 1137 small systems in 70 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.

The period between 1972 and 1977 witnessed an intensive effort by industries to provide best practical treatment for, what were then untreated, discharges. By 1977, all major industries with individual discharges were providing secondary treatment or its equivalent. Since then, additional treatment of small industrial-source discharges has occurred as municipal treatment facilities have been constructed and as additional untreated industrial discharges 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 has 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. Licenses must satisfy both requirements.

The Federal Water Quality Act 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 pollutant 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 all cases, the effluent reduction required by the Maine license for a particular manufacturer is equal to or more stringent than the level of effluent reduction required of that manufacturer by NPDES permit.

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 currently establishing the terms under which the Maine DEP would take over the Pretreatment Program, 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. The term of these licenses is for up to five 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. The Maine DEP presently employs seven staff members to coordinate wastewater discharge licensing: one for municipal discharges, two for industrial discharges and six for residential/commercial discharges.

Elimination of Overboard Discharges

In 1987, the Maine legislature passed an act which prohibited new discharges from single family dwellings and required that relicensing of existing facilities only occur where it was shown that there was no other practical alternative. This law has great significance for the future management of Maine's coastal waters where near shore property typically has no capacity for underground wastewater treatment ststems (septic tanks with leach fields). Implementation of the law, particularly the removal of existing discharges, has created considerable debate. Proposed regulations were given strong negative comment at hearings and will require substantial revision. Much of the debate centers around what constitutes available alternatives and whether the law should be implemented where there is little or no conflict with the designated use of shellfishing.

MONITORING AND MAINTENANCE OF WASTEWATER TREATMENT FACILITIES

The DEP's Division of Operation and Maintenance and the Presque Isle Regional Office employ sixteen 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 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 or exceedences of license limits. All significant 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 operator training. OME's are focused on operation and maintenance problems including process control, personnel and financial management. OME's result in recommendations for procedural changes as well as follow-up operator training targeted towards improving wastewater treatment. The Division conducts twelve OME's per year on a worst-first priority basis.

INVESTIGATIONS AND ENFORCEMENT

During the past two years, the Bureau of Water Quality Control has restructured its complaint investigation system. Due to the large number of citizen reports received by the Bureau regarding unlicensed discharges to the water, responsibility for investigation has been divided by type of complaint among the divisions of the Bureau rather than remain the task of a few individuals in the Operations and Maintenance Division (O&M). For example, the Division of Environmental Evaluation and Lake Studies now investigates all discharges related to agricultural activities, the Municipal Services Division responds to construction related discharges, the Licensing and Enforcement Division conducts investigations of straight pipe reports, and the O&M Division responds to discharges caused by logging operations. In effect, the new system helps to make up for the lack of staff time available to investigate and resolve complaints by making a larger pool of personnel available and reduces the burden on each individual.

The Bureau follows the procedures outlined by the Investigation Procedures Manual which was developed to assist each Division in conducting complaint investigations. The O&M Division maintains a record system for all complaints received by the Water Bureau, helps to route them to appropriate personnel and coordinates activities between the divisions.

The new system is now fully in place and has been successful over the past year in allowing personnel to concentrate on their regular assigned responsibilities without excessive demands on their time for complaint investigations. At the same time, response to citizen reports regarding unlicensed discharges to the water has been improved due to the larger number of available personnel who have the responsibility to respond. Since initiation of the new system, each Division has developed expertise in its assigned complaint type.

During the past year, the Water Bureau has investigated over three hundred citizen complaints concerning discharges to the water. Many of these required field investigations and extensive follow up work to achieve eventual compliance with discharge laws. A number of complaint investigations have led to lengthy enforcement actions and have resulted in Consent Agreements or Court action. Overall, a significant portion of Water Bureau staff time is devoted to responding to citizen concerns.

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), citizen complaints 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 the 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. The NCR process 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 slight 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 neglecting 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 has required special training and certification for the enforcement staff. To smooth the transition from investigation to prosecution, the Division of Licensing and Enforcement and the Division of Operations and Maintenance worked jointly during the past two years 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 1987, the enforcement section completed two municipal, six industrial and two residential/commercial 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 1987 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.

WATER QUALITY MONITORING

The sampling programs of the DEP's Bureau of Water Quality Control are conducted to administer two sections of environmental law; 1) the Water Classification Program (38 MRSA, Article 4-A) and 2) Wastewater Discharge (38 MRSA Sections 413 to 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 Water Classification Program 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/Wasteload Allocation Studies. Assess whether present and proposed discharges and/or impoundments would violate the classification standards for dissolved oxygen or toxics 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.
   3. Modeling to predict assimilative capacity (dilution for acute and chronic toxic criteria).

C. Tissue Monitoring. Assessment of contamination levels in fish flesh is made for bioaccumulable metals and organics.

D. 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 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 define 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 biennial report - 305(b) - to Congress and the Maine Legislature on what State waters are not attaining their classification.
(2) Recommendations on how wastewater dicharges should be licensed and not exceed the assimilative capacity established by the Water Classification Program.
(3) Special reports on what attainment impacts would result from proposed changes in classification standards and/or assignments of classification.
(4) 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 and analysis.

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 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 is 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.

Table 16 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.

Table 16. Priorities for Water Quality Sampling.

FRESH	MARINE
HIGH PRIORITY	
1. River mainstems which receive multiple major discharges.	1. Commercially harvested shellfish areas.
2. Streams and brooks which drain population centers.	2. Swimming areas.
3. 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.	4. Select pristine waters which are considered to be representative of similarly situated waters.
MEDIUM PRIORITY	
1. Agriculturally impacted waters.	1. Shellfish areas which are occasionally harvested.
2. Waters with threatened quality due to proposed discharges and/or activities.	2. Waters with threatened quality due to proposed discharges and/or activities
LOW PRIORITY	
1. Most pristine waters.	1. Most pristine waters.
2. Waters too small to be included on a 15' USGS topographic map.	
3. Annually intermittent streams.	

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. 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. Impoundments differ from free flowing rivers in many ways

but the most important consideration in locating sampling stations in impoundments is that they may stratify chemically as well as thermally.

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, streams and brooks 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 (DO) and temperature, DEP uses the following types of sampling programs for rivers, streams and brooks:

(1) 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.

(2) 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.

(3) 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. For waters impacted by point source discharges, the lower the flow, the lower the DO. For some waters impacted by nonpoint source discharges, however, record low DO's have been recorded during summers with normal precipitation patterns rather than during 7Q10 events. 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 nonpoint source discharges from activities such as agriculture, flows just above 7Q10 are a desired sampling period to complement a preliminary water quality assessment. 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 each of the 5 zones which are not dam-controlled, 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:

(a) data is collected from as many stations as possible,
(b) each station is sampled daily for three consecutive days,
(c) the routes are varied so that successive thirds of the stations are sampled first each day,

(d) sampling routes begin early enough in the day to result in each station being sampled before 0800 on one of the three days,
(e) where USGS staff gauges exist along the sampling route, river and stream stages are recorded, and
(f) 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:

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

The fresh water dissolved oxygen criteria recently adopted 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 no effect on the growth and reproduction of fish and other aquatic life. Maine's DO standard differs from USEPA's 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 1989, the DEP will be conducted continuous monitoring of DO and temperature on some Maine rivers and streams to complement similar data collected by the U.S. Geological Survey.

(4) 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 1 or 2 days per week of field work for 12-14 weeks for each of four DEP regions (4 to 8 days/week total). This results in 80 to 160 stations being sampled each year. Of these, about 20 to 25 are sampled each year and 60 to 140 are sampled once every five years (total number of stations is about 1000 including discontinued ones). 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 (2), 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 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.

Over 200 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 problem waters 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 as well as for control of nonpoint source pollution. 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. 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 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 has operated a mobile laboratory which was periodically taken on-site to 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 DEP also analyzes fish tissues for

priority pollutants as part of Maine's program for control of toxics.

The two engineers in the Division of Environmental Evaluation and Lake Studies are responsible for determining rivers' assimilative capacity for biochemical oxygen demand (BOD). 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-containing 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 to be 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 three situations specified above, 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 may 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 five 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 the 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 1987, just over 50 percent of the 241 monitors provided complete sets of data and about 25 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), Cochnewagon Lake (initiated in 1986) and Threemile Pond (initiated in 1987). Lakes where 314 projects have been completed but where monitoring continues include, Sabattus Pond, 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. Improvements in water quality have occurred on all lake restoration projects. The DEP has also secured a 314 grant for a lake protection project in the Long Lake (Bridgton) Watershed. This project will produce a 50 year management plan for the communities in the watershed.

(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) to determine the nature of their problems, significant external sources of nutrients, the extent of internal loading, and the feasibility of potential solutions. The vulnerability index, in combination with the volunteer monitoring program has identified 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 at Lake George in Canaan to determine if this stocking of efficient planktivores will encourage development of colonial blue green algal blooms through depletion of the zooplankton community.

(5) Acid Rain. In the northeastern corridor of states, Maine is further downwind from the major industrialized region of the U.S. than any other state This location leads to lower levels of acidic deposition than any other state north of the Ohio River. Nevertheless, the DEP has participated in and initiated a number of studies on the effects of acid rain on Maine lakes. The results of research performed since 1984 are summarized in the Ambient Water Quality section on Lakes and Ponds.

(6) 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 Monitoring

Much of Maine's sampling of salt waters is conducted by the Department of Marine Resources (DMR). The bulk of the 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 verify acceptable conditions at open shellfishing areas, some of the sampling is also done in connection with pollution abatement projects. Bacteria sampling at selected swimming beaches and other marine areas 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 most of Maine's near shore waters. Where DO depression has been documented (usually in harbors with restricted water circulation) monitoring for dissolved oxygen, salinity and temperature is conducted by DEP during the summer months.

Groundwater Monitoring

As elsewhere, Maine's monitoring of groundwater is either site specific or generalized. Monitoring at a particular site is generally done to gather data on water quality impacts of particular activities, and may or may not be research-related. Groundwater data in Maine is the result of permit conditions, enforcement agreements or impact assessments. This information is scattered in a number of state agencies including the DEP Bureaus of Water Quality Control, Land Quality Control and Oil and Hazardous Material Control, the Maine Department of Transportation Well Claims Unit, the Maine Department of Human Services (DHS) Division of Health Engineering, the DHS Environmental Health Unit and the Maine Department of Agriculture and Food and Rural Resources, Board of Pesticide Control. The data is stored on paper or in computer files. Much of this data is potentially useful for research purposes but not easily accessed by either the public or by other agencies. This problem is the subject of a three-phase study of groundwater data management in Maine, the first two parts of which are completed. Phase II resulted in specific and detailed recommendations for a more efficient and accessible system. This effort is concurrent with the USEPA-Maine data management pilot study aimed at improving data communication between the USEPA, Maine and other state or federal agencies.

The term "generalized monitoring" is intended here to refer to large area, long-term monitoring conducted to obtain trend information on groundwater quality or quantity. Such monitoring is generally carried out by the Maine Geological Survey and the U.S. Geological Survey (USGS) under one or another of several cooperative agreements. USGS maintains a statewide network of groundwater observation wells to track changes in water quality and quantity. The data thus derived is incorporated into the maps and reports generated by the program and have proven invaluable to town planning boards and other State efforts such as the registration of underground oil storage tanks and site reviews of various land use proposals.

Within the DEP, groundwater data is obtained by sampling done either by Department staff, permit-holders or as the result of enforcement agreements. The Bureau of Land Quality Control generally requires operators of landfills to sample groundwater and report their findings to the DEP on a periodic basis. Similarly the DEP Bureau of Oil and Hazardous Materials (BOHMC) requires periodic sampling and reporting various businesses or industries classified as hazardous waste storage facilities or under the terms of enforcement agreements. This data is generally conducted in commercial laboratories according to USEPA standards. BOHMC field staff sample groundwater to determine groundwater quality impacts associated with uncontrolled hazardous waste sites, oil or fuel spills from stationary or mobile sources and approved hazardous waste or hazardous materials storage facilities. Some BOHMC groundwater monitoring is intended to help locate new water supplies to replace those polluted by gasoline.

COST/BENEFIT ASSESSMENT

The costs and benefits of Mane's water pollution control programs is difficult to assess. During 1987, the Bureau of Water Quality Control converted historical expenditures for municipal wastewater treatment facilities into 1987 dolars to better guage the cost of that one component of water pollution control. Through use of Gross National Product Implicit Price Deflaters it was found that actual expenditures of $455,540,418 made between 1960 and 1986 for wastewater treatment facility construction is the equivalent of $991,594,528 in 1987 dollars. For the 1990 305(b) report, it is hoped that private sector expenditures for water pollution control can also be provided in a similar format. Together with the water quality trend information to be provided in the 1990 report these statistics will facilitate a meaningful assessment of the costs and benefits of Maine's water pollution control programs.

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

Guidance issued by the U.S. Environmental Protection Agency in July of 1987 states that "nonpoint source pollution is caused by diffuse sources that are not regulated as point sources and normally is associated with agricultural, silvicultural and urban runoff, runoff from construction activities, etc." Additional sources of nonpoint pollution in Maine can be considered to include leaking underground storage tanks, landfills, accidental chemical spills, snow dumps, sand/salt piles and septic systems.

Because of the widely varying activities which produce nonpoint source (NPS) pollution, it is difficult to develop a single comprehensive plan for its control. The State of Maine has enacted numerous laws over the past 18 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 pollution any series of laws enacted for its control will be inherently uneven in their effectiveness at controlling a particular type of nonpoint source pollution.

Maine's future role in controlling nonpoint source pollution must be examined in the context of Section 319 of the Clean Water Act (part of the 1987 amendments). The Federal "Nonpoint Source Management Programs" require:

(1) An identification of Maine waters which do not meet the requirements of their classification (38 MRSA, Article 4-A) due to nonpoint source pollution,

(2) A description of the types of nonpoint pollution sources affecting water quality in Maine,

(3) A description of current State, Regional and Local programs for the control of nonpoint source pollution,

(4) A description of Maine's process for identifying Best Management Practices (BMP's),

(5) A description of what actions for the control of nonpoint source pollution constitute BMP's in the State of Maine,

(6) A schedule containing annual milestones for initiation of new programs and implementation of BMP's,

(7) A certification by the attorney general of the State that the laws of the State provide adequate authority to implement such management program or, if there is not adequate authority, a list of such additional authorities as will be necessary to implement such management program and a schedule and commitment by the State to seek such additional authorities as expeditiously as practicable,

(8) Itemization of Federal, State and other funding sources (other than assistance provided under Section 319) which will be available for supporting implementation of BMP's, and

(9) Additional administrative items.

Preparation of the Maine Nonpoint Source Pollution Assessment and Management Program began in March of 1987. To aid preparation of this report to the USEPA, it was decided to form a broad-based working group. The NPS Study Committee which was formed has representatives of the Maine Department of Agriculture, Food and Rural Resources; Maine Department of Conservation; Maine Department of Environmental Protection; Maine Department of Human Services, Maine Department of Transportation; Maine Department of Marine Resources; Maine State Planning Office; Maine Soil and Water Conservation Commission; Maine Association of Conservation Districts; Maine Association of Regional Councils; the U.S. Geological Survey and the USDA Soil Conservation Service. The due date for the Federal report is August 4, 1988. It is the consensus of the NPS study committee that the immensity of developing a comprehensive strategy for the control of nonpoint source pollution makes uncertain the completion of the Federal report by the August 4, 1988 deadline.

Thus far, the NPS study committee has completed most of the assessment components of the "Nonpoint Source Management Programs." Summary statistics on what portions of Maine waters do not attain water quality standards due to nonpoint source pollution are contained in this report's sections on Surface Waters and Groundwater. The inventory of Current State and Local Programs for Control of Nonpoint Source Pollution which the NPS study committee completed is presented in Appendix V. One of the most important accomplishments of the NPS study committee has been the establishment of the following process for identifying best management practices:

PROCESS FOR IDENTIFICATION OF BEST MANAGEMENT PRACTICES FOR CONTROL OF NONPOINT SOURCE POLLUTION

GOALS

The identification of Best Management Practices (BMP's) has two principal goals:

(1) To specify minimum standards of performance for activities which generate nonpoint source water pollution. These minimum standards are oriented towards general protection and improvement of the State's waters. These minimum standards will have statewide applicability except in especially sensitive or vulnerable watersheds or areas where application of the minimum standards would result in a violation of Maine's Water Classification Program.

(2) To specify supplemental standards of performance to be applied in especially sensitive or vulnerable watersheds or areas where application of the minimum standards would result in a violation of Maine's Water Classification Program.

PROCEDURES

The procedures for identification of BMP's are to incorporate them into Maine's Nonpoint Source Pollution Assessment and Management Program in accordance with the requirements of Section 319 of the Clean Water Act and such additional requirements which are in the best interests of the people of Maine. These requirements include the following:

(1) BMP's shall be identified after consultation, where appropriate, with State agencies, municipalities, councils of government, soil and water conservation districts, interest groups representing commercial activities, citizen groups, individuals, and federal and interstate water pollution control agencies.

(2) Public notice of the availability of copies of any proposed BMP's shall be published by the Department of Environmental Protection, Bureau of Water Quality Control at least 30 days prior to a public hearing on the proposal.

(3) The Department of Environmental Protection, Bureau of Water Quality Control shall hold a public hearing or hearings to obtain comments on any proposed BMP's from all interested persons.

(4) Approval by the Governor of Maine of any proposed BMP's.

(5) Approval by the Administrator of the U.S. Environmental Protection Agency of any proposed BMP's.

(6) BMP's approved by the Administrator of the U.S. Environmental Protection Agency shall be submitted to the joint standing committee of the Legislature having jurisdiction over natural resources within 30 days of said approval.

Once the BMP's contained in the Maine Nonpoint Source Pollution Assessment and Management Program are approved by the Administrator of the U.S. Environmental Protection Agency, subsequent proposals to change BMP's shall also be subject to the aforementioned requirements and shall be treated as addendums to the Maine Nonpoint Source Assessment and Management Program.

The single most important action Maine can take at this time for the control of nonpoint source pollution is to maintain the quality of existing control programs. Maine already has an extensive body of law relating to the control of nonpoint source pollution (Table 17). A description of the nonpoint source control programs in Maine which have developed as a consequence of this legislation and related program priorities is contained in Appendix V. Although there are already many programs for NPS control in Maine, there is little coordination of effort between organizations conducting NPS control programs. Enhanced coordination of NPS control programs is essential for improvement of land use management in Maine.

The committee has recommended that the State's involvement in this new Federal program should be a cautious one if the State's overall interests are to be protected. The specifics of what constitute Best Management Practices in Maine have the potential to significantly increase the costs of conducting a wide range of activities. Farming, logging, construction, highway maintenance and other vital components of Maine's economy could be seriously impaired if excessively stringent BMP's are adopted. It should be recognized, however, that NPS pollution is passed on as a social cost through loss of habitat, recreational opportunities, etc. Although the economic benefits of clean water are difficult to quantify, Maine's NPS control program should be designed to produce more benefits than costs. To avoid major costs for water quality restoration in the future, the emphasis of Maine's NPS control program should be a preventative one rather than a reactive one. It is the goal of the NPS study committee to develop a NPS Pollution Management Program which is in the best interests of both the waters and the people of Maine.

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. The USEPA Office of Groundwater Protection has placed emphasis on four major areas of coordination for the State's groundwater programs.

(1) State interagency coordination of groundwater program.s
(2) Completion of the state's groundwater strategy.
(3) Joint USEPA/State assessment of groundwater protection problems and needed activities for risk reduction.
(4) Implementation of state groundwater strategy programs.

State Interagency Coordination of Groundwater Programs

Unlike the management of surface waters which is centered in the Department of Environmental Protection's Bureau of Water Quality Control, the management of groundwater quality in Maine is distributed among eight state agencies and 495 municipalities. A description of current state and local programs for the control of nonpoint source pollution, with many of these programs having a groundwater protection component, is presented in Appendix V. To effectively coordinate these diverse interests in groundwater management, an Executive Order was issued in 1985 which established a Groundwater Standing Committee under the State's Land and Water Resources Council. The Standing Committee is composed of the Commissioners of the Maine Departments of Environmental Protection; Conservation; Human Services; Transportation; and Agriculture, Food and Rural Resources; the Director of the State Planning Office; and

Table 17. State Laws Used for Control of Nonpoint Source Pollution

Reference	Law/Enforcer	Requirements
12 MRSA §1 et seq.	Soil and Water Conservation Districts	Establishes voluntary program for soil and water conservation.
12 MRSA §681 et seq.	Land Use Regulation Commission/LURC	Establishes land use classification districts and standards for Maine's plantations, unorganized townships, and coastal islands.
12 MRSA §4807	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 §42	Plumbing Code/DHS	Specifies system design for subsurface disposal of waste water.
22 MRSA §2642	Municipal Authority in Public Water Supplies/ Municipalities	Authorizes regulations governing the surface uses of sources of a public water supply, portions thereof or land overlying groundwater aquifers.
30 MRSA §3221	Soil Suitability/DHS	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 §386 et seq.	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 §405 et seq.	The Freshwater Wet Land Statute/DEP	Permit required for alteration of a freshwater wetland ten or more acres in size.
38 MRSA §413	Waste Discharge Licenses/ DEP	License required for discharge to public waters.

Table 17. (Continued) State Laws Used for Control of Nonpoint Source Pollution

Reference	Law/Enforcer	Requirements
38 MRSA §417 or	Certain Discharges Prohibited/DEP	Prohibit forest products refuse from being deposited discharged into State waters.
38 MRSA §425 et seq.	Stream Alteration/DEP	Permit required for major alterations of rivers, streams, etc.
38 MRSA §435 et seq.	Mandatory Shoreland Zoning/ DEP and Municipalities	Protects shoreland areas from erosion, etc.
38 MRSA §471 et seq.	Alteration of Coastal Wetlands/DEP	Restricts activities which harm coastal wetlands and sand dunes such as building, dredging and filling.
38 MRSA §481 et seq.	Site Location of Development/ DEP	1. No adverse effect on natural envionment 2. Development must be built on suitable soils.
38 MRSA §541 et seq.	Oil Discharge Prevention and Pollution Control/DEP	Provides procedures to be followed during transfer of petroleum and petroleum products.
38 MRSA §561 et seq.	Underground Storage Tanks/DEP	Owners of unprotected tanks must replace them according to time schedule.
38 MRSA §451-A	Sand-Salt Pile Regulation/DEP	Owners of salt storage areas must cover them according to time schedule.
38 MRSA §465-A	Water Quality Standards/DEP	No change of land use in the watershed of a lake or pond may cause water quality degradation in the lake or pond.
38 MRSA §1301 et seq.	Solid Waste Management Act/DEP	Protection of the health, safety and welfare of the State's citizens through the prevention of pollution.
38 MRSA §1319 et seq.	Hazardous Matter Control/DEP	Protection of the health, safety and welfare of the State's citizens through the prevention of 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.

representatives of the Maine Association of Regional Councils and the University of Maine Land and Water Resources Center. The Commissioner of the Department of Environmental Protection, is Chairman of the Standing Committee.

The Committee's Policy Subcommittee prioritizes groundwater management program requirements each year and schedules key activities that provide for increased protection and better management. The Policy Subcommittee develops and prioritizes draft groundwater legislation for each legislative session. The Standing Committee meets as necessary (at least quarterly) to discuss mechanisms for better interagency coordination of groundwater management programs.

Completion of the State's Groundwater Strategy

Recognizing the multi-agency effort required to fulfill the requirements of USEPA's State Groundwater Strategy development program, Maine's Groundwater Standing Committee is well suited to overall coordination of strategy development. The Standing Committee represents all Maine agencies active in groundwater management and directs the activities of the State Groundwater Coordinator The Standing Committee's Policy Subcommittee has broadened the representation on the Standing Committee by including the director of the Maine Field Office of the USGS Water Resource Division, and the directors of the DEP Bureaus of Water Quality Control, Land Quality Control, and Oil and Hazardous Materials Control. The Standing Committee has been working towards development of a Maine groundwater management strategy for the past two years. The State Groundwater Coordinator has tracked program requirements through liaison with USEPA Region I from the inception of USEPA's Groundwater Strategy program.

Maine has made significant progress but still has much to accomplish regarding USEPA groundwater strategy guidance. Maine's aquifer mapping program, groundwater standards, and enforcement provisions are established but poorly funded. Maine's proposed classification system,, monitoring, data collection and analysis, groundwater use, source control, and groundwater/surface water/natural resource coordination programs all require further development. The Standing Committee's Policy Subcommittee will be meeting frequently to develop the Maine groundwater strategy by September 30, 1988.

Joint USEPA/State Assessment of Groundwater Protection Problems and Needed Activities for Risk Reduction

Maine's State Groundwater coordinator keeps USEPA's Groundwater Program Administrator for Maine fully informed of the progess of groundwater strategy development. The USEPA's Groundwater Program Administrator for Maine is invited to all State Groundwater Policy Subcommittee meetings on strategy development and receives written reports on each strategy development meeting. The USEPA directs suggestions and comments on the State Groundwater strategy or related groundwater protection programs to the Standing Committee directly or through the State Groundwater Coordinator. The State Groundwater Coordinator schedules any meetings that the USEPA feels are necessary for assessment purposes. The USEPA's Groundwater Program Administrator for Maine receives The Water Tap monthly, detailing State program progress and State groundwater problems as well as State Legislative updates during Legislative sessions.

Implementation of State Groundwater Strategy Programs

Following a full review of Maine's Groundwater Strategy elements by the USEPA, the State Groundwater Policy Subcommittee will evaluate the completeness with which Maine's groundwater programs address those elements, the Policy Subcommittee will recommend to the Groundwater Standing Committee, those additional programs necessary to implement a comprehensive State Groundwater Strategy. The Groundwater Standing Committee will present its recommendations to the Governor and request an executive order directing the Standing Committee to:

(1) implement those programs directly implementable, and
(2) seek Legislative authority and resources to implement those programs requiring such action.

The Policy Subcommittee will recommend program priorities and implementation milestones to the Standing Committee. The Standing Committee will include its estimation of individual program implementation dates in the State Groundwater Strategy.

Point Source Control (Underground Injection Control Program)

Underground injection wells are in reality a specialized form of subsurface wastewater disposal. They are being discussed separately, however, because they are the object of a specific regulatory program established by the Federal Safe Drinking Water Act. The Federal program groups underground injection wells into five classes as described below:

Class I - wells which discharge fluid waste, including hazardous and radioactive wastes, beneath an aquifer;
Class II - wells used to inject fluids associated with enhanced recovery from oil and gas wells;
Class III wells used for solution mining of minerals;
Class IV - wells used to discharge hazardous or radioactive fluid wastes into or above an aquifer; and
Class V - all other wastewater disposal wells.

Both the Safe Drinking Water Act and USEPA regulations include provisions for delegation of primary enforcement authority (primacy) over the Underground Injection Control (UIC) program to states that demonstrate the necessary legal authority and technical and management capability. The DEP demonstrated the necessary authorities and capabilities and was awarded UIC Primacy effective September 26, 1983. The State UIC Program is established in rules of the Board of Environmental Protection, Chapter 543. The rules provide for review and, if appropriate, permitting of proposed Class I, II, and III wells using the procedures set forth in the Federal regulations cited previously. Class IV wells are prohibited based on statutory authority granted the Board by 38 MRSA 420, subsections 2 and 3. Class V wells , depending upon what USEPA finally decides constitutes a Class V well, will be handled in accordance with the Department's wastewater discharge licensing authorities as established by 38 MRSA, Sec. 413 and 414.

An inventory of injection wells conducted in 1981 found no wells of Classes I, II, III, or IV and only fourteen Class V wells. A 1986 reassessment of those fourteeen Class V wells indicated that none are still discharging pollutants, although monitoring continues to be required for some of these sites. Two new Class V wells were discovered in 1987 and actions are being

taken to eventually eliminate the discharge of pollutants at these sites. During 1988, the Bureau of Water Quality Control is, evaluating what threat service station floor drains are to groundwater quality. On-site inspections at selected service stations have been conducted concurrently with a survey-by-mail of Maine's motor vehicle inspection stations.

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. 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.

Acidic Precipitation

Maine's precipitation is 2 to 4 times more acidic than normal. This acidity is largely due to excess sulfate and nitrate. Integration of water chemistry data for several projects in the past year has provided a clearer picture of the extent of acidic lakes and streams, and allowed estimates of dry deposition loading, and chemical mass-balance flux.

Regional dry deposition inputs of acid precursors are generally assumed to be significant relative to wet inputs. Available data suggest that dry deposition of sulfate adds at least an additional 50 percent to wet inputs especially at higher elevation, and decreases in importance in northern sections. Dry deposition of NO_x is apparently less than that of SO_4.

Available data indicate that the sulfate from acidic precipitation passes through Maine watersheds into surface waters or groundwater and eventually is transported to the ocean. The sulfate concentrations of surface waters are probably at least double those of prehistoric times, due to polluted precipitation. In contrast to sulfate, more than 90 percent of the nitrate is biologically utilized, and does not enter surface or groundwaters.

During 1988, it is anticipated that significant re-evaluation of the status of Maine surface waters relative to the effects of acidic deposition will be possible. DEP personnel will continue to work closely with both USEPA Corvallis staff and researchers from the University of Maine in evaluating the effects of acidic deposition. Utilizing data from the USEPA Eastern Lake Survey, several University of Maine projects and projects conducted by the Department of Environmental Protection, an updated overview of potential problems will be prepared.

Growth Management

Maine is presently experiencing a dramatic increase in residential/ recreational related development. Much of this development is focused towards its water resources - ocean, lake, and river frontage. A significant challenge to the State will be management of this growth such that the water resources of the State are protected. Growth management statutes have been recently enacted to deal with this problem. The Department of Environmental Protection has entered into several projects related to effects of growth in lake watersheds. One is a cooperative 314 project on the Long Lake (Bridgton) Watershed between the Lakes Environmental Association, the DEP and the USEPA to develop a 50 year Watershed Management Plan. A second project involves a growth management plan

for Moosehead Lake. This is being done with the cooperation of the State Planning Office, Departments of Economic and Community Development, Inland Fisheries and Wildlife, Conservation and Environmental Protection and the local community. The plan will be used as a prototype to be used in other large recreation-oriented watersheds.

Dioxin

Sampling in 1984 as part of the National Dioxin Survey detected significant levels of dioxin in several Maine rivers. Subsequent sampling has identified numerous sources including the pulp and paper industry as generators. Fish tissue sampling on the Androscoggin River has established that a significant level of contamination exists and an advisory on consumption is in effect for that river. A similar effort of study needs to be made on other rivers to establish the level of contamination and risk.

Control of Nuisance Insects

Biting flies are a historical and notorious nuisance in Maine. Considerable interest has evolved around the use of BTi, a new biological larvicide to control mosquitoes and blackflies. Studies have shown a limited direct effect on nontarget species. Further study will be required to determine the indirect effect of larvicide treatment. The Department has historically maintained a philosophy that biting insects, while a nuisance, are an integral part of the natural environs of the State and provide beneficial as well as nuisance attributes.

Aesthetic Quality Problems

In 1987, the Department conducted public hearings as part of the water classification process. At these hearings, substantial testimony was received that the State had achieved excellent improvements in water quality in recent years but that the public was still reluctant to use the Androscoggin River due to a variety of aesthetic problems. In particular, the public found the amount of color, foam, turbidity and odor in certain waters to be objectionable. The sources of these problems are pulp and paper manufacturing and combined sewer overflows. In January of 1988, the Governor directed the Board of Environmental Protection to investigate these issues and prepare recommendations to alleviate the problems so that uses are not impaired. This study is in progress and will be complete by October of 1988.

Redemption of Shellfish Areas

The entire coast of Maine has some value as a shellfishery. The Department of Marine Resources, which manages the fishery regularly closes areas where direct discharges of treated sewage occur. Because of the closures, these waters are not attaining all of their designated uses. If the closed areas are considered to be not attain classification, licensing and re-licensing of discharges becomes a serious permitting problem. The State should clarify the designation of shellfish areas so that prohibition and removal of discharges occurs in appropriate areas with sound ecologic and economic considerations.

Management Study of the Department

In 1987 the Legislature recognized that the Department of Environmental Protection was subject to substantial stress and management problems which seriously affected the performance of the Department. A study was made of the Department by an independent consultant. A summary of critical issues includes:

(1) establishment of more standard policies and procedures and establishment of priorities,
(2) better financial accounting and development of new or increased funding sources,
(3) additional staff training,
(4) strengthening enforcement capabilities and greater utilization of regional offices,
(5) the addition of 55 positions,
(6) various organizational changes including establishment of a Bureau of Solid Waste, and
(7) automation of various systems important to management functions.

While the Department was found to be substantially fulfilling its role, these changes were recommended to speed the efficiency and consistency of the permitting process and to enhance the Department's enforcement role. The report was studied by the Maine Legislature and necessary statutory changes were made. The DEP is now proceeding with the implementation of the study's recommendations.

Groundwater Contamination

Although much of the State's concerns regarding groundwater protection has been detailed in the section on Groundwater Protection Programs, some results of a questionnaire administered in 1986 to 163 citizen volunteers who made 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 its effects on 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. Hopefully, additional research in Maine will increase

understanding of 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 the 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.

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 6 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, the years following those changes 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 as well as additional supplies. This pressure comes at a time when it is being discovered that there is less water available than previously believed, mostly due 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.

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. The prospect of impending reductions in Federal financial support for water quality management necessitates the preparation of contingency plans. The senior managers of the Bureau of Water Quality Control have developed a priority system presented in Table 18 to facilitate program changes in response to funding cuts. Specific recommendations for water quality management in Maine are as follows:

(1) The Department of Environmental Protection has been operating under considerable stress in recent years due to expanded program requirements, increased license activities and reduced financial resources. The Department needs to implement the findings of the recent Management Study and make other program changes to maintain the quality of its programs and the State's waters.

(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 the 1989 session of the Maine Legislature. A high priority is for Maine to complete its mapping of sand and gravel aquifers.

(3) 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 hghly 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.

(4) 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 wastewater discharges in Maine to receive treatment. A revolving loan fund must be implemented to assist communities and to provide for the repair of older facilities.

(5) The continuation of Section 106 funding to continue water quality monitoring in Maine is necessary to ensure that classifications are being met.

(6) 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. Maine has over 5,000 lakes and a great deal of effort is going into protection programs in addition to restoration projects.

(7) Maine needs to expand its assessment of the discharge of trace organic pollutants to Maine's groundwater and surface waters and to continue its surveillance of fish tissue contamination.

(8) 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.

(9) The State should continue its program of assistance to wastewater treatment plants in the areas of facility operation, management and maintenance.

(10) The Bureau has recently been given a mandate by the Governor to study how control of aesthetic problems affecting water quality could be improved. Resources are being shifted to address these concerns.

Table 18. 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, programs, and administrative rules which meet the State's water quality needs, including preparation of Maine's Groundwater Strategy.

(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 State monitoring and self-monitoring programs at wastewater treatment facilities.
   c) Serve notices of license violations as followup to 4(b).

(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 health.
      i) Bacteria monitoring.
      ii) Fish tissue monitoring.

(7) Licensing new wastewater discharges.

(8) Improving the effectiveness of wastewater treatment by providing technical assistance to wastewater treatment facilities.

(9) Provide grants and loans for the construction, upgrading and renovation of wastewater treatment facilities (commercial and industrial facilities excepted) including the reduction or elimination of combined sewer overflows.

(10) Contribute to statewide growth management strategy.
   a) Lake protection.
   b) Groundwater protection.

(11) Develop and implement a comprehensive nonpoint source control program.

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Table 18. (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) Implementation of lake management strategy.
(3) Legislative affairs.
(4) Renew licenses of residential and commercial discharges.
(5) Monitoring and inspection of residential and commercial wastewater treatment facilities.
(6) Enforcement actions to address license violations by residential and commercial discharges.
(7) Maintain certification program for operators of wastewater treatment facilites.
(8) Investigate citizen reports of water quality violations.
(9) Maintain and improve program to make licensees pay for the cost of issuing licenses.
(10) Do field investigations to find remaining discharges of untreated wastewater.
(11) Provide support for protection of public drinking water supplies.
(12) Renew licenses of minor industrial and municipal discharges.
(13) Monitoring and inspection of minor industrial and municipal wastewater treatment facilities.
(14) Enforcement action to address license violations by minor industrial and municipal discharges.
(15) Training programs for DEP employees.
(16) Training programs for operators of wastewater treatment facilities.
(17) Restoration of water quality in overly productive lakes and ponds.
(18) Assimilative capacity studies/load allocation analysis.
(19) Special habitat studies utilizing bioassay and biomonitoring.
(20) Acid rain monitoring program.
(21) Travel necessary to obtain or disseminate technical information.
(22) Intergovernmental liaison.
(23) 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, that 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 improving water quality. Given limited resources, water quality problem priorities must be established. The following list describes types of 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, however, additional study and research are necessary to determine the appropriate cleanup or protection measures to be taken. This list is intended to be used in conjunction with the list of Maine Waterbodies Not Attaining Water Quality Standards to determine the priority status of a particular waterbody.

Maine's priority problem waters can be classified as one of three 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 of Maine's 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/or number of wastewater discharges overwhelm the assimilative capacity of the receiving water unless extraordinary expenditures for wastewater treatment are made. Often the only remedy for a WQLS is to remove the discharge from the waterbody. 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. Two WQLS's, Goosefare Brook and the East Branch of the Sebasticook River between Dexter and Corinna have recently had their WQLS designations dropped because of discharges being removed from those waterbodies.

The third type of priority problem water is a nonpoint source (NPS)-limited segment. Maine's principal NPS problems occur in groundwater, lakes and ponds. Maine's assessment of the effects of NPS pollution has accelerated in response to the Clean Water Act amendments of 1987. As Maine's water quality monitoring program becomes increasingly focused on NPS pollution, it is probable that many more NPS limited segments will be discovered.

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 programs. Toxic industrial discharges and lakes with water quality problems caused by nonpoint sources of pollution, are examples of high priority problems which are not usually included in Maine's facility grant programs.

Maine has a continuing priority of protecting and maintaining the high water quality of 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.

HIGH PRIORITY PROBLEM WATERS

Rivers, streams and brooks

(1) Those which are known to be unsuitable for their designated use of drinking water supply or habitat due to discharges of toxics.

(2) Those which are known to be unsuitable for their designated use of recreation in and on the water due to high bacteria levels and which also have a high potential for recreation due to depth, substrate, proximity to population centers, etc.

(3) Those where water quality will be improved by the completion of treatment facility construction within two years.

Lakes and ponds

(1) Those which are known to have an increasing trophic state although they may not yet have culturally-induced algal blooms.

(2) Those which are classified as extremely or highly vunerable and which are resources of outstanding significance due to their use as a water supply, as a habitat for fish and wildlife, for recreation or as an aesthetic amenity.

Marine waters

(1) Those which are known to be not providing suitable habitat due to discharges of toxics.

(2) Those which are known to be unsuitable for their designated use of recreation in and on the water due to high bacteria levels and which also have a high potential for recreation due to depth, substrate, proximity to population centers, etc.

(3) Those where water quality will be improved by the completion of treatment facility construction within two years.

Groundwater

(1) Those waters which are threatened with becoming unpotable (unsafe for human consumption) due to new discharge(s) of pollutants.

MEDIUM PRIORITY PROBLEM WATERS

Rivers, streams and brooks

(1) Those which are known to be not providing suitable habitat due to discharges of conventional pollutants.

(2) Those which are known to be unsuitable for their designated use of recreation in and on the water due to high bacteria levels but which have a low potential for recreation due to depth, substrate, proximity to population centers, etc.

(3) Those waters with an impaired appearance or other aesthetic problems which cause them to be considered unsuitable for their designated uses by a significant portion of the people who live nearby.

(4) Those where water quality improvement is expected to occur due to inclusion of planned treatment facilities on the extended list of the Construction Grants Program.

Lakes and ponds

(1) Those which are known to have culturally-induced algal blooms but which have a stable water quality trend as indicated by stable trophic state.

(2) Those which are classified as extremely or highly vunerable but which are not resources of outstanding significance.

Marine waters

(1) Those which are known to be unsuitable for their designated uses of shellfish harvesting and recreation in and on the water due to high bacteria levels.

(2) Those which are known to be not providing suitable habitat due to discharges of conventional pollutants.

(3) Those which are known to be unsuitable for their designated use of recreation in and on the water due to high bacteria levels but which have a low potential for recreation due to depth, substrate, proximity to population centers, etc.

(4) Those waters with an impaired appearance or other aesthetic problems which cause them to be considered unsuitable for their designated uses by a significant portion of the people who live nearby.

(5) Those where water quality improvement is expected to occur due to inclusion of planned treatment facilities on the extended list of the Construction Grants Program.

Groundwater

(1) Those waters which are threatened with becoming unpotable due to the migration and expansion of existing contamination plumes.

LOW PRIORITY PROBLEM WATERS

Rivers, streams and brooks

(1) Those waters which do not attain the standards of their classification but which have not yet been determined to be nonattainment waters. As these waters are identified through Maine's water quality monitoring program, they will be placed in either medium or high level priority categories.

(2) Those waters which are threatened with nonattainment of classification due to continuing or increased discharges of nonpoint source pollutants.

Lakes and ponds

(1) Those waters which are known to have culturally-induced algal blooms but which have an improving water quality trend as indicated by decreasing trophic state.

Marine waters

(1) Those waters which do not attain the standards of their classification but which have not yet been determined to be nonattainment waters. As these waters are identified through Maine's water quality monitoring program, they will be placed in either medium or high level priority categories.

(2) Those waters which are threatened with nonattainment of classification due to continuing or increased discharges of nonpoint source pollutants.

Groundwater

(1) Those waters which are presently unpotable. Although considerable cleanup efforts are underway at sites where groundwater is unpotable, it must be recognized that the focus of these efforts is the medium level priority of limiting the migration and expansion of existing contamination plumes. Groundwater, once polluted, can usually be reclaimed by natural processes over an extended period of time.

APPENDIX II. MAINE WATERBODIES NOT ATTAINING WATER QUALITY STANDARDS

A Subdivision of Maine's Surface Waters for Use with the USEPA Waterbody System

Water Quality Conditions As of May 1, 1988 Have Been Assessed by The Maine Department of Environmental Protection, Bureau of Water Quality Control

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Code numbers assigned to these waterbodies are provisional and will be changed during 1988.

Waterbody segments fully attaining Classes C, GPA or SC are considered to also be attaining the interim goals of the Clean Water Act.

Designated Uses Ascribed to Maine's Water Quality Classifications

Class AA - Drinking water supply, recreation in and on the water, fishing, navigation and a natural and free flowing habitat for fish and other aquatic life.

Class A - Drinking water supply, recreation in and on the water, fishing, industrial process and cooling water supply; hydroelectric power generation, navigation, and a natural habitat for fish and other aquatic life.

Class B -Drinking water supply, recreation in and on the water, fishing, industrial process and cooling water supply, hydroelectric power generation, navigation, and an unimpaired habitat for fish and other aquatic life.

Class C - Drinking water supply, recreation in and on the water, fishing, industrial process and cooling water supply; hydroelectric power generation, navigation, and a habitat for fish and other aquatic life.

Class GPA - Drinking water supply, recreation in and on the water, fishing, industrial process and cooling water supply, hydroelectric power generation, navigation and a natural habitat for fish and other aquatic life.

Class SA - Recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish, navigation, and a natural and free flowing habitat for fish and other estuarine and marine life.

Class SB - Recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish, navigation and an unimpaired habitat for fish and other estaurine and marine life.

Class SC - Recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish, navigation and a habitat for fish and other estaurine and marine life.

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MAINE WATERBODIES NOT ATTAINING WATER QUALITY STANDARDS

ANDROSCOGGIN RIVER BASIN

Code #	Waterbody
001	Magalloway River and its tributaries except for Sturtevant Pond Outlet, those waters lying in the State of Maine - Classes A, B, and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
002	Cupsuptic River and its tributaries - Classes A and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
003	Kennebago River and its tributaries - Classes A and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
004	Rapid River and its minor tributaries - Classes B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
005	Minor tributaries of Umbagog Lake including Sturtevant Pond Outlet, those waters lying in the State of Maine - Classes B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
006	Minor tributaries of the Androscoggin River entering between the New Hampshire border and the confluence of the Ellis River, those waters lying in Maine and those segments of minor tributaries lying in Maine which enter the main stem of the Androscoggin River in New Hampshire - Classes A, B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

ANDROSCOGGIN RIVER BASIN (Cont'd)

Code #	Waterbody

007 Ellis River and its tributaries - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

008 Swift River and its tributaries - Classes B, C and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

009 Webb River and its tributaries - Classes B, C and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

010 Minor tributaries of the Androscoggin River entering between the confluence of the Ellis River and Gulf Island dam.

Nonattainment Segments

Spears Stream (Class C; Peru; 1.5 miles)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

011 Dead River and its tributaries - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

012 Nezinscot River and its tributaries - Classes B and GPA.

Nonattainment Segments

Nezinscot River (Class B; Buckfield; 14 miles)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated and/or inadequately treated residential wastewater.

ANDROSCOGGIN RIVER BASIN (Cont'd)

Code #	Waterbody

013 Minor tributaries of the Androscoggin River entering between Gulf Island dam and the confluence of the Little Androscoggin River - Classes B, C and GPA.

Nonattainment Segments

Jepson Brook (Class B; Lewiston; 1 mile)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of the high bacteria levels is discharge of untreated municipal wastewater from combined sewer overflow(s).

Penley Brook (Class C; Auburn; 0.7 mile)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to urban runoff in the watershed.

Stetson Brook (Class B; Lewiston; 0.5 mile)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of the high bacteria levels is discharge of untreated municipal wastewater from combined sewer overflow(s).

014 Little Androscoggin River, main stem, above the Route 26 bridge in Paris and tributaries of the Little Androscoggin River entering above the river's confluence with Bog Brook in Minot - Classes B, C and GPA.

Nonattainment Segments

Pennesseewassee Lake Outlet (Class C; Norway; 1 mile)
Water quality sampling indicates that this waterbody segment does not attain the bacteria and dissolved oxygen standards of its classification. The cause of nonattainment is discharge(s) of untreated residential/municipal wastewater.

Thompson Lake Outlet (Class C; Oxford; 0.2 mile)
Water quality sampling indicates that this waterbody segment does not attain the aquatic life standard of its classification. Nonattainment in this water quality-limited segment is caused by the discharge of industrial wastewater which although receiving Best Practical Treatment, is still toxic when slightly diluted in this low-flow segment.

015 Bog Brook and other tributaries of the Little Androscoggin River which enter below the river's confluence with Bog Brook - Classes B, C and GPA.

Code #	Waterbody
015 Cont'd	Nonattainment Segments
	Morgan Brook (Class B; Minot; 2.3 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.
	Unnamed Brook (Class C; Auburn; 1 mile) Water quality sampling indicates that this brook (#658) does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.
016	Little Androscoggin River, main stem, from the Route 26 bridge in Paris to the Route 121 bridge in Oxford - Class C.
	Nonattainment Segments
	Little Androscoggin River (Class C; Norway, Oxford and Paris; 3 miles) Water quality sampling indicates that this waterbody segment does not attain the dissolved oxygen standard of its classification. Nonattainment in this water quality-limited segment is caused by two discharges of municipal wastewater which although receiving Best Practical Treatment, still cause dissolved oxygen problems in this low-flow segment.
017	Little Androscoggin River, main stem, below the Route 121 bridge in Oxford - Class C.
	Nonattainment Segments
	Little Androscoggin River (Class C; Auburn; 1 mile) Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of the high bacteria levels is discharge of untreated municipal wastewater from combined sewer overflow(s).
018	Sabattus River and its tributaries - Classes B, C and GPA.

ANDROSCOGGIN RIVER BASIN (Cont'd)

Code #	Waterbody
018 Cont'd	Nonattainment Segments

No Name Brook (Class C; Lewiston and Lisbon; 3 miles)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of the high bacteria levels is discharge of untreated municipal wastewater from combined sewer overflow(s).

Sabattus Pond (Class GPA; Greene, Sabattus and Wales; 1,962 acres)
This pond has culturally-induced algal blooms but has slightly improving water quality. Most of the phosphorus runoff in the watershed is due to agricultural sources. Internal recycling of phosphorus also contributes to nonattainment of classification. Restoration efforts have been implemented and water quality improvement is expected.

Sabattus River (Classes B and C; Lisbon and Sabattus; 10.8 miles)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classifications. The cause of nonattainment is inadequately treated municipal wastewater.

019 Minor tributaries of the Androscoggin River entering below the confluence of the Little Androscoggin River - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

020 Androscoggin River, main stem, from the New Hampshire border to Virginia bridge in Rumford - Class C.

Nonattainment Segments

This entire 34.9 mile segment of the Androscoggin River does not fully attain its designated use of "fishing" due to the presence of dioxin in fish tissues. Although the dioxin levels are lower than those specified as federal action levels, the State toxicologist has issued an advisory on limiting consumption of fish caught in this river.

The 16 mile segment of this waterbody between Bethel and the State boundary also does not attain the bacteria standard of its classification. The cause of the high bacteria levels is discharge of untreated municipal wastewater by Berlin, New Hampshire.

021 Androscoggin River, main stem, from Virginia bridge in Rumford to the upstream end of Bean Island in Jay - Class C.

Code #	Waterbody
021 Cont'd	Nonattainment Segments

This entire 22.5 mile segment of the Androscoggin River does not fully attain its designated use of "fishing" due to the presence of dioxin in fish tissues. Although the dioxin levels are lower than those specified as federal action levels, the State toxicologist has issued an advisory on limiting consumption of fish caught in this river.

022 Androscoggin River , main stem, from the upstream end of Bean Island in Jay to the confluence of the Nezinscot River - Class C.

Nonattainment Segments

This entire 21.1 mile segment of the Androscoggin River does not fully attain its designated use of "fishing" due to the presence of dioxin in fish tissues. Although the dioxin levels are lower than those specified as federal action levels, the State toxicologist has issued an advisory on limiting consumption of fish caught in this river.

023 Androscoggin River, main stem, from the confluence of the Nezinscot River to Great Falls in Lewiston - Class C.

Nonattainment Segments

This entire 13.6 mile segment of the Androscoggin River does not fully attain its designated use of "fishing" due to the presence of dioxin in fish tissues. Although the dioxin levels are lower than those specified as federal action levels, the State toxicologist has issued an advisory on limiting consumption of fish caught in this river.

This waterbody also does not attain the Class C dissolved oxygen standard. The causes of low dissolved oxygen levels in this water quality-limited segment are discharges of industrial wastewater which are receiving Best Practical Treatment as well as the existence of three impoundments used for hydroelectric power generation.

Further, during classification hearings conducted during November of 1987, testimony was received that this waterbody is unsuitable for its designated uses of recreation in and on the water due to excessive color, odor, foam and turbidity.

024 Androscoggin River, main stem, from Great Falls in Lewiston to the Brunswick dam - Class C.

Nonattainment Segments

This entire 22.8 mile segment of the Androscoggin River does not fully attain its designated use of "fishing" due to the presence of dioxin in fish tissues. Although the dioxin levels are lower than those specified as federal action levels, the State toxicologist has issued an advisory on limiting consumption of fish caught in this river.

ANDROSCOGGIN RIVER BASIN (Cont'd)

Code #	Waterbody
024 Cont'd	Water quality sampling indicates that a 7 mile segment of this waterbody downstream of Lewiston-Auburn also does not attain the bacteria standard of its classification. The cause of high bacteria levels is the discharge of untreated municipal wastewater from combined sewer overflows. Further, during classification hearings conducted during November of 1987, testimony was received that this waterbody is unsuitable for its designated uses of recreation in and on the water due to excessive color, odor, foam and turbidity.
	Nonattainment Segments
025	Androscoggin River, main stem, from the Brunswick dam to Merrymeeting Bay - Class C. This entire 6.0 mile segment of the Androscoggin River does not fully attain its designated use of "fishing" due to the presence of dioxin in fish tissues. Although the dioxin levels are lower than those specified as federal action levels, the State toxicologist has issued an advisory on limiting consumption of fish caught in this river.
	KENNEBEC RIVER BASIN
026	Moose River and its tributaries above the Route 201 bridge in Jackman - Classes AA, A, B, and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
027	Moose River tributaries entering below the Route 201 bridge in Jackman - Classes B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
028	Moose River, main stem, below the Route 201 bridge in Jackman - Classes B, C and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
029	Minor tributaries of Moosehead Lake - Classes B and GPA.

Code #	Waterbody
029 Cont'd	Nonattainment Segments
	Fitzgerald Pond (Class GPA; Big Squaw Twp.; 550 acres) This pond has culturally-induced algal blooms but has slightly improving water quality. A past point source discharge of sanitary wastewater was the major cause of this pond's nonattainment of classification. Internal recycling of phosphorus is impeding restoration of water quality.
030	Minor tributaries of the Kennebec River entering above Wyman dam - Classes B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
031	North Branch of the Dead River and its tributaries - Classes A and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
032	South Branch of the Dead River and its tributaries - Classes B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
033	Minor tributaries of Flagstaff Lake - Classes B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
034	Tributaries of the Dead river entering below Flagstaff Lake - Classes B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
035	Dead River, main stem - Class B.

Code #	Waterbody
035 Cont'd	Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

036 Carrabassett River and its tributaries - Classes A, B, C and GPA.

Nonattainment Segments

Carrabassett River (Class C; Anson; 1 mile)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

Mill Stream (Class C; Anson; 0.5 mile)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

037 Minor tributaries of the Kennebec River entering below Wyman dam - Class A, B, C and GPA.

Nonattainment Segments

Abagadasset River (Class B; Richmond; 9 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Carrabassett Stream (Class B; Canaan; 11 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Kimball Brook (Class B; Pittston; 3 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Code #	Waterbody
037 Cont'd	Mill Stream (Classes B and C; Norridgewock; 1 mile) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classifications. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed. Other factors contributing to low dissolved oxygen levels in the stream's lower reach are an impoundment and residential discharges of treated wastewater.
	Mill Stream (Class B; Norridgewock; 0.7 mile) Water quality sampling indicates that a segment of the main stem of this stream and the entire length of an unnamed tributary do not attain the aquatic life standard of their classification. Nonattainment is caused by the discharge of leachate from a landfill.
	Riggs Brook (Class C; Augusta; 0.2 mile) Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of the high bacteria levels is discharge of untreated municipal wastewater from combined sewer overflow(s).
	Threemile Pond (Class GPA; China, Vassalboro and Windsor; 1,162 acres) This pond has culturally-induced algal blooms and deteriorating water quality. Most of the phosphorus runoff in the watershed is due to agricultural sources. Internal recycling of phosphorus also contributes to nonattainment of classification. Restoration efforts have been initiated and water quality improvement is expected.
	Togus Pond (Class GPA; Augusta; 660 acres) This pond has culturally-induced algal blooms and a stable water quality trend. Most of the phosphorus runoff in the watershed is due to residential sources. Internal recycling of phosphorus also contributes to nonattainment of classification. Restoration efforts have been implemented but long-term water quality improvement may require further land use controls as well as control of internal recycling of phosphorus.
	Togus Stream (Class B; Chelsea; 2 miles) Water quality sampling and modeling indicate that this waterbody segment does not attain the Class B dissolved oxygen standard but does attain the Class C standard. Nonattainment in this water quality-limited segment is caused by a discharge of institutional wastewater which although receiving Best Practical Treatment, still causes dissolved oxygen problems in this low-flow segment.
	Vaughn Brook (Class B; Hallowell; 5 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Code #	Waterbody
037 Cont'd	Webber Pond (Class GPA; Vassalboro; 1,201 acres) This pond has culturally-induced algal blooms and has a stable or slightly improving water quality trend. Most of the phosphorus runoff in the watershed is due to agricultural sources. Internal recycling of phosphorus also contributes to nonattainment of classification. Restoration efforts have been implemented and water quality improvement is expected.
	Whitney Brook (Class C; Augusta; 0.5 mile) Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.
038	Tributaries of Messalonskee Stream entering above the Messalonskee Lake dam - Classes B and GPA.
	Nonattainment Segments
	East Pond (Class GPA; Oakland & Smithfield; 1705 acres) This pond had its first algal bloom in 1987 and seems to have deteriorating water quality. More study of this pond is planned for 1988.
	Salmon Lake (Class GPA; Belgrade & Oakland; 666 acres) This lake has culturally-induced algal blooms and a stable water quality trend. Most of the phosphorus runoff in the watershed is due to agricultural sources. Internal recycling of phosphorus also contributes to nonattainment of classification. Restoration efforts have been implemented and water quality improvement is expected.
039	Tributaries of Messalonskee Stream entering below the Messalonskee Lake dam - Class C.
	Nonattainment Segments
	Fish Brook (Class C; Fairfield; 7 miles Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.
040	Messalonskee Stream, main stem - Class C.
	Nonattainment Segments
	Messalonskee Stream (Class C; Oakland; 1.5 miles) Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

Code #	Waterbody

040 Cont'd Messalonskee Stream (Class C; Waterville; 2.5 miles)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of the high bacteria levels is discharge of untreated municipal wastewater from combined sewer overflow(s).

041 Sandy River, main stem, and Sandy River tributaries entering above the Route 145 bridge in Strong - Classes A, B, C and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

042 Sandy River, main stem, between the Route 145 bridge in Strong and the Route 2 bridge in Farmington and Sandy River tributaries entering below the Route 145 bridge in Strong except for Wilson Stream and its tributaries - Classes B, C and GPA.

Nonattainment Segments

Baker Stream (Class B; Farmington; 4 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to urban runoff in the watershed.

Tannery Brook (Class C; Farmington; 1.5 miles)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

Unnamed Brook (Class C; New Sharon 0.2 miles)
This brook (#226) has an impoundment which received wastes from a vegetable canning facility prior to 1960. Currently, the impoundment has marsh-like characteristics which contribute to low dissolved oxygen levels. Water quality sampling, however, indicates that nearly anaerobic conditions occur below the impoundment. Deposits of organic wastes still remaining in the impoundment are thought to be responsible for the brook's nonattainment of its assigned dissolved oxygen standard.

043 Tributaries of Wilson Stream entering above the outlet of Wilson Pond and Wilson Stream, main stem, above of Wilson Pond - Classes B and GPA.

Code #	Waterbody
043 Cont'd	Nonattainment Segments
	Meadow Brook (Class C; Wilton, 1 mile) Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.
044	Wilson Stream, main stem, below Wilson Pond - Class C.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
045	Sandy River, main stem, below the Route 2 bridge in Farmington - Class C.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
046	West Branch of the Sebasticook and its tributaries except for the main stem of the West Branch of the Sebasticook River below the Route 23 bridge in Hartland - Classes B, C and GPA.
	Nonattainment Segments
	Thompson Brook (Class B; Hartland; 4 miles Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.
047	West Branch of the Sebasticook River, main stem, below the Route 23 bridge in Hartland - Class C.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
048	East Branch of the Sebasticook River and its tributaries except for the main stem of the East Branch of the Sebasticook River below the Sebasticook Lake dam - Classes B, C and GPA.

Code #	Waterbody

048 Cont'd

Nonattainment Segments

East Branch of the Sebasticook River (Class C; Corinna; 1 mile)
Water quality sampling indicates that this waterbody segment does not attain the aquatic life standard of its classification. Nonattainment in this water quality-limited segment is caused by the discharge of municipal wastewater which although receiving Best Practical Treatment, still causes toxicity problems in this low-flow segment.

Halfmoon Pond (Class GPA; St. Albans; 36 acres)
This pond has culturally-induced algal blooms and a stable water quality trend. Most of the phosphorus runoff in the watershed is due to agricultural sources.

Sebasticook Lake (Class GPA; Newport; 4,288 acres)
This Lake has culturally-induced algal blooms but has improving water quality Historic and current point source discharges have contributed to nonattainment of classification but agriculture remains the principal external source of phosphorus. Internal recycling of phosphorus also contributes to nonattainment of classification. Restoration efforts have been implemented and further water quality improvement is expected.

049 East Branch of the Sebasticook River, main stem, below the Sebasticook Lake dam - Class C.

Nonattainment Segments

Brackett Brook (Class C; Palmyra; 2 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed. Highway runoff also may be contributing to low dissolved oxygen levels in this brook.

050 Minor tributaries of the Sebasticook River - Classes B, C and GPA.

Nonattainment Segments

China Lake (Class GPA; China & Vassalboro; 3,845 acres)
This lake has culturally-induced algal blooms and deteriorating water quality. Internal recycling of phosphorus also contributes to nonattainment of classification. Most of the phosphorus runoff in the watershed is due to agricultural and residential sources. Restoration efforts are being initiated.

Code #	Waterbody
050 Cont'd	Farnham Brook (Class C; Pittsfield; 3 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed. Lovejoy Pond (Class GPA; Albion; 324 acres) This pond has culturally-induced algal blooms and a stable water quality trend. Most of the phosphorus runoff in the watershed is due to agricultural sources. A PL-566 watershed project has been completed. Preliminary results indicate that nonpoint source phosphorus loading remains adequate to produce algae blooms and nonattainment of classification. Internal recycling of phosphorus also contributes to nonattainment of classification. Mill Stream (Class C; Albion; 2.5 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed. This stream is the outlet of Lovejoy Pond. Low dissolved oxygen levels in this stream are largely a result of the algal blooms which occur in Lovejoy Pond. Twelvemile Brook (Class C; Clinton; 7 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed. Unnamed Brook (Class C; Benton; 2 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this brook (#310) does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.
051	Sebasticook River, main stem - Class C. Nonattainment Segments Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

Code #	Waterbody
052	Cobbosseecontee Stream and its tributaries - Classes B, C and GPA.

Nonattainment Segments

Annabessacook Lake (Class GPA; Monmouth & Winthrop; 1,420 acres)
This lake has culturally-induced algal blooms and a stable water quality trend. Restoration efforts have been initiated and water quality improvement has occurred. Despite these efforts, the lake still supports algal blooms each summer, albeit shorter and less intense ones. This is due both to nonpoint sources of pollution (principally agriculture and urban runoff) in the lake's watershed which have not been adequately controlled and continuing, though much reduced, internal recycling of phosphorus from the lake's sediments.

Cobbosseecontee Lake (Class GPA; Litchfield, Manchester, Monmouth, West Gardiner & Winthrop; 5,543 acres)
This lake has culturally-induced algal blooms but has improving water quality. Water received from Annabessacook Lake and agriculture in the watershed are the major sources of phosphorus causing nonattainment of classification. Restoration efforts have been implemented and further water quality improvement is expected.

Little Cobbosseecontee Lake (Class GPA; Winthrop; 74 acres)
This lake has culturally-induced algal blooms and a stable water quality trend. Most of the phosphorus runoff in the watershed is due to agricultural and residential sources.

Mud Mills Stream (Class B; Monmouth; 5 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Potters Brook (Class B; Litchfield; 2.5 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does not attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Pleasant Pond (Class GPA; Litchfield; 746 acres)
This pond has culturally-induced algal blooms but has improving water quality. Most of the phosphorus runoff in the watershed is due to agricultural sources. Restoration efforts have been implemented and further water quality improvement is expected.

Code #	Waterbody
052 Cont'd	Tingley Brook (Class C; Readfield; 2 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed. Upper Narrows Pond (Class GPA; Winthrop; 279 acres) This pond does not yet have culturally-induced algal blooms but seems to have deteriorating water quality. Most of the phosphorus runoff in the watershed is due to residential sources.
053	Kennebec River, main stem, above Wyman dam in Bingham - Classes B and GPA. Nonattainment Segments Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
054	Kennebec River, main stem, from Wyman dam in Bingham to the Route 43 bridge in Anson-Madison - Class B. Nonattainment Segments Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
055	Kennebec River, main stem, from the Route 43 bridge in Anson-Madison to the Fairfield-Skowhegan boundary - Classes B and C. Nonattainment Segments Water quality sampling indicates that a 5 mile segment of this waterbody downstream of Skowhegan does not attain the bacteria standard of its classification. The cause of high bacteria levels is the discharge of untreated municipal wastewater from combined sewer overflow(s).
056	Kennebec River, main stem, from the Fairfield-Skowhegan boundary to Edwards dam in Augusta - Class C. Nonattainment Segments Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
057	Kennebec River, main stem, from Edwards dam in Augusta to The Chops - Class C.

KENNEBEC RIVER BASIN (Cont'd)

Code #	Waterbody
057 Cont'd	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

MINOR COASTAL BASINS

135	Dennys River and its tributaries - Classes AA, A, B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
136	East Machias River and its tributaries - Classes AA, A, B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
137	Machias River and its tributaries - Classes AA, A, B, C, and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
138	Pleasant River and its tributaries - Classes B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
139	Narraguagus River and its tributaries - Classes AA, A, B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
140	Minor drainages entering tidewater in Washington County including Whitten Parrin Stream on the Washington County-Hancock County boundary - Classes A, B, C and GPA

Code #	Waterbody
140 Cont'd	Nonattainment Segments

Eastern Stream (Class B; Robbinston; 0.5 mile)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

Pottle Brook (Class B; Perry; 0.5 mile)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

Unnamed Brook (Class C; Calais; 1 mile)
Water quality sampling indicates that this brook (#S16) does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

Unnamed Brooks (Class B; Cherryfield; 1.5 miles)
Water quality sampling indicates that four brooks (N23, N24, N25 & N26) running through the town center have segments which do not attain the bacteria standard of their classification. The cause of nonattainment is discharges of untreated residential wastewater.

141 Narramissic River and its tributaries - Classes A, B, and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

142 Minor drainages entering tidewater in Hancock and Penobscot Counties between Whitten Parrin Stream and the confluence of Reed Brook with the Penobscot River Estuary - Classes AA, B, C and GPA.

Nonattainment Segments

Carleton Stream (Class C; Blue Hill, 1.4 miles)
This stream does not attain the aquatic life standard of its classification due to runoff from tailings piles which contain heavy metals. The copper mining operations which produced the tailings were discontinued in 1981.

Unnamed Brook (Class C; Blue Hill; 1 mile)
Water quality sampling indicates that this brook (#020-1) does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

143 Minor Drainages entering tidewater between the confluence of Reed Brook with the Penobscot River Estuary and the Waldo County-Lincoln County boundary - Classes B, C and GPA.

Code #	Waterbody
143 Cont'd	Nonattainment Segments

Warren Brook (Class B; Belfast; 2 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does not attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Unnamed Brook (Class B; Frankfort; 1 mile)
Water quality sampling indicates that this brook (#MR5) does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

144 St. George River and its tributaries - Classes B, C and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

145 Minor drainages entering tidewater in Knox County including the Goose River - Classes B, C and GPA.

Chickawaukie Pond (Class GPA; Rockland & Rockport; 352 acres)
This pond has culturally-induced algal blooms and deteriorating water quality. Most of the phosphorus runoff in the watershed is due to agricultural and residential/commercial sources. Restoration efforts are being initiated.

Havener Pond (Class GPA; Friendship & Warren; 83 acres)
Past studies indicate that this pond has culturally-induced algal blooms but more study is needed.

Lilly Pond (Class GPA; Rockport; 29 acres)
This pond has culturally-induced algal blooms and a stable water quality trend. Most of the phosphorus runoff in the watershed is due to leachate from a landfill.

Megunticook River (Class B; Camden; 0.1 mile)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

Unnamed Brook (Class B; Camden; 0.7 mile)
Water quality sampling indicates that this brook (#A13) does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

Code #	Waterbody
145 Cont'd	Unnamed Brook (Class C; Rockland; 0.5 mile) Water quality sampling indicates that this brook (#A10) does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater. Unnamed Brook (Class C; Rockport; 0.5 mile) Water quality sampling indicates that this brook (#A12) does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.
146	Medomak River and its tributaries - Classes B and GPA. Nonattainment Segments Medomak River (Class B; Liberty, Union and Washington; 12 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.
147	Sheepscot River and its tributaries - Classes B and GPA. Nonattainment Segments Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
148	Minor drainages entering tidewater in Lincoln County - Classes B, C and GPA. Nonattainment Segments Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
149	Minor drainages entering tidewater in Sagadahoc County - Classes C and GPA. Nonattainment Segments Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
150	Royal River and its tributaries - Classes B, C and GPA.

Code #	Waterbody

150 Cont'd

Nonattainment Segments

Chandler River (Class B; North Yarmouth & Pownal; 13 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does not attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Royal River (Class B; Yarmouth; 1 mile)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

Unnamed Brook (Class C; North Yarmouth & Yarmouth; 2 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this brook (#R310) does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Notched Pond (Class GPA; Gray and Raymond; 77 acres)
This pond does not yet have culturally-induced algal blooms but seems to have deteriorating water quality. More study is needed.

151 Minor drainages entering tidewater in Cumberland County - Classes A, B, C and GPA.

Nonattainment Segments

Alewife Brook (Class A; Cape Elizabeth; 1 mile)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the bacteria and dissolved oxygen standard of its classification. Nonattainment seems to be due to agricultural activities in the watershed.

Capisic Brook (Class C; Portland; 3 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to residential/commercial development in the watershed.

Code #	Waterbody
151 Cont'd	Clark Brook (Class C; Westbrook; 1 mile) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to residential/commercial development in the watershed. Frost Gully Brook (Class A; Freeport; 3 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the bacteria and dissolved oxygen standard of its classification but does not attain the Class C standard. Nonattainment seems to be due to runoff from roads and residential development as well as the presence of two small impoundments. Long Creek (Class C; South Portland & Westbrook; 3 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to residential/commercial development in the watershed. Phillips Brook (Class C; Scarborough; 1.5 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to residential/commercial development in the watershed. Red Brook (Class B; Scarborough & South Portland; 3 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does not attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to residential/commercial development in the watershed. Stroudwater River (Class B; Gorham; 4 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does not attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to residential/commercial development in the watershed.
162	Minor drainages entering tidewater in York County - Classes B, C and GPA.

Code #	Waterbody
162 Cont'd	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
163	Kennebunk River and its tributaries - Classes B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
164	Mousam River, main stem, above the Route 224 bridge in Sanford and all tributaries of the Mousam River - Classes B, C and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
165	Mousam River, main stem, below the Route 224 bridge in Sanford - Classes B, C and GPA.
	Nonattainment Segments
	Estes Lake (Class GPA; Sanford and Alford; 387 acres) This lake has occasional culturally-induced algal blooms but has slightly improving water quality. Most of the phosphorus entering this lake is due to a discharge of municipal wastewater which is receiving tertiary treatment for phosphorus removal. Estes Lake's water quality improved significantly after the wastewater treatment facility began providing tertiary treatment in 1982 but in recent years, the rate of water quality improvement has lessened. Nevertheless, Estes Lake is nearly meeting the standards of its GPA classification.
166	Great Works River, main stem, above the Route 9 bridge in North Berwick and all tributaries of the Great Works River - Classes B and GPA.

Code #	Waterbody
166 Cont'd	Nonattainment Segments

Adams Brook (Class B; Berwick; 1.5 miles
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Lovers Brook (Class B; South Berwick; 2 miles
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Nonattainment Segments

167 Great Works River, main stem below the Route 9 bridge in North Berwick - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

168 Tributaries of the Salmon Falls River, those waters lying in Maine - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

169 Salmon Falls River, main stem, those waters lying in Maine - Classes B and GPA.

Nonattainment Segments

Water quality sampling indicates that a 4 mile segment of the Salmon Falls River just above tidewater does not attain the baccteria standard of its classification. The cause of high bacteria levels seems to be discharge(s) of untreated and/or inadequately treated wastewater originating in New Hampshire. Further, analysis of an existing discharge indicates that the aquatic life standard may also not be attained in this segment due to high lead levels.

Spaulding Pond (Class GPA; Lebanon ME, Milton NH and Rochester NH; 118 acres)
Limited data indicates that this pond has culturally-induced algal blooms. Most of the phosphorus entering this lake is thought to be due to wastewater originating in New Hampshire. More study is needed.

PENOBSCOT RIVER BASIN

Code #	Waterbody

058 The West Branch of the Penobsot River and its tributaries above Ripogenus dam - Classes A, B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

059 Tributaries of the West Branch of the Penobscot River entering below Ripogenus dam - Classes AA, B, C and GPA.

Nonattainment Segments

Millinocket Stream (Class C; Millinocket; 3 miles)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

060 West Branch of the Penobscot River, main stem, from Ripogenus dam to the outlet of Quakish Lake - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

061 West Branch of the Penobscot River, main stem, below the outlet of Quakish Lake - Class C.

Nonattainment Segments

A 0.5 mile segment (located in a backwater of Dolby Pond) of this waterbody does not attain the Class C dissolved oxygen standard.. The causes of low dissolved oxygen levels in this water quality-limited segment is discharge of industrial wastewater which receives Best Practical Treatment as well as the existence of an impoundment used for hydroelectric power generation.

062 Tributaries of the East Branch of the Penobscot River - Classes AA, A B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

063 East Branch of the Penobscot River, main stem - Class B.

Code #	Waterbody
063 Cont'd	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
064	West Branch of the Mattawamkeag River and its tributaries - Classes B, C and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
065	East Branch of the Mattawamkeag River and its tributaries - Classes B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
066	Baskahegan Stream and its tributaries - Classes B, C and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
067	Molunkus Stream and its tributaries - Classes B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
068	Minor tributaries of the Mattawamkeag River - Classes B, C and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
069	Mattawamkeag River, main stem - Class B.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

Code # | Waterbody

070 Piscataquis River, main stem, and Piscataquis River tributaries entering above the Route 6 bridge in Guilford - Classes A, B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

071 Sebec River and its tributaries - Classes B, C and GPA.

Nonattainment Segments

Sebec River (Class C; Milo; 2 miles)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

072 Pleasant River and its tributaries - Classes AA, A, B, C and GPA.

Nonattainment Segments

Pleasant River (Class C; Brownville & Milo; 9 miles)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

073 Minor tributaries of the Piscataquis River entering below the Route 6 bridge in Guilford - Classes B, C and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

074 Piscataquis River, main stem, below the Route 6 bridge in Guilford - Classes B and C.

Nonattainment Segments

A 34 mile segment of this river between Guilford and Medford Center does not attain Class C bacteria standards. Further, 8 of those 34 river miles (just below Guilford) do not attain Class C aquatic life standards. Nonattainment is caused by discharges of untreated municipal and industrial wastewater.

A 0.5 mile segment of the Piscataquis River just above its confluence with the Penobscot River in Howland does not attain Class C bacteria standards. Nonattainment is caused by discharge(s) of untreated municipal wastewater.

075 Passadumkeag River and its tributaries - Classes A, B and GPA.

Code #	Waterbody
075 Cont'd	Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

076 Pushaw Stream and its tributaries - Classes B, C and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

077 Kenduskeag Stream and its tributaries - Classes B, C and GPA.

Nonattainment Segments

Burnham Brook (Class B; Garland; 3 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does not attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Kenduskeag Stream (Class C; Bangor; 1.5 miles)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of the high bacteria levels is discharge of untreated municipal wastewater from combined sewer overflow(s).

Unnamed Brook (Class B; Corinth; 2 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this brook (#K16) does not attain the dissolved oxygen standard of its classification but does not attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

078 Souadabscook Stream and its tributaries - Classes A and GPA.

Nonattainment Segments

Etna Pond (Class GPA; Carmel, Etna & Stetson; 361 acres)
This pond has culturally-induced algal blooms and a stable water quality trend. Most of the phosphorus runoff in the watershed is due to agricultural sources.

Hammond Pond (Class GPA; Hampden; 96 acres)
This pond has culturally-induced algal blooms and a stable water quality trend. Most of the phosphorus runoff in the watershed is due to agricultural sources.

Code #	Waterbody
078 Cont'd	Hermon Pond (Class GPA; Hermon; 461 acres) This pond has culturally-induced algal blooms and a stable water quality trend. Most of the phosphorus runoff in the watershed is due to agricultural sources.
079	Minor tributaries of the Penobscot River entering above the confluence of Sunkhaze Stream - Classes A, B, C and GPA.
	Nonattainment Segments
	Caribou Pond (Class GPA; Lincoln; 825 acres) This pond does not yet have culturally-induced algal blooms but has had deteriorating water quality in recent years. Data collected in 1987, however, indicated an improvement in water quality. More study is needed.
	Long Pond (Class GPA; Lincoln; 523 acres) This pond does not yet have culturally-induced algal blooms but has had an deteriorating water quality in recent years. Data collected in 1987, however, indicated an improvement in water quality. More study is needed.
080	Sunkhaze Stream, Reed Brook and other minor tributaries of the Penobscot River entering between the river's confluence with Sunkhaze Stream and its confluence with Reed Brook - Classes A, B, C and GPA.
	Nonattainment Segments
	Boynton Brook (Class B; Bradley; 1 mile) Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.
	Otter Brook (Class B; Bradley; 0.5 mile) Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.
081	Penobscot River, main stem, above its confluence with the Mattawamkeag River - Class C.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
082	Penobscot River, main stem, from its confluence with the Mattawamkeag River to the Lincoln Center bridge - Class C.

PENOBSCOT RIVER BASIN (Cont'd)

Code #	Waterbody
082 Cont'd	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
083	Penobscot River, main stem, from the Lincoln Center bridge to the Route 6 bridge in Enfield-Howland - Class C.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
084	Penobscot River, main stem, from the Route 6 bridge in Enfield-Howland to the Bangor Hydro dam in Milford - Class C.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
085	Penobscot River, main stem, from the Bangor Hydro dam in Milford to the Veazie dam - Class C.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
086	Penobscot River, main stem, from the Veazie dam to the river's confluence with Reed Brook in Hampden - Class C.
	Nonattainment Segments
	Water quality sampling indicates that this entire 10.1 mile segment of the Penobscot River does not attain the bacteria standard of its classification. The causes of nonattainment are discharges of untreated municipal wastewater from Veazie (treatment plant under construction) as well as discharges of untreated municipal wastewater from combined sewer overflows in Bangor and Brewer.
	PRESUMPSCOT RIVER BASIN
152	Tributaries of the Presumpscot River located above Sebago Lake outlet - Classes B, C and GPA.

Code #	Waterbody
152 Cont'd	Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

153 Tributaries of the Presumpscot River entering below Sebago Lake outlet - Classes B, C and GPA.

Nonattainment Segments

Black Brook (Class B; Windham; 5 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Colley Wright Brook (Class B; Windham; 5 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does not attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

East Branch of the Piscataquis River (Class B; Falmouth; 10 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does not attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Hobbs Brook (Class B; Cumberland; 1.5 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does not attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Inkhorn Brook (Class B; Westbrook; 4 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.

Code #	Waterbody
153 Cont'd	Mosher Brook (Class B; Gorham; 2 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed. Otter Brook (Class B; Windham; 2 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification but does not attain the Class C standard. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed. Thayer Brook (Class B; Gray; 3 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.
154	Presumpscot River, main stem, above the outlet of Dundee Pond - Classes A, and GPA. Nonattainment Segments Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
155	Presumpscot River, main stem, from the outlet of Dundee Pond to Sacarappa Dam - Classes B and C. Nonattainment Segments Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
176	Presumpscot River, main stem, below Sacarappa Dam - Class C. Nonattainment Segments Water quality sampling indicates that this entire 7.9 mile segment of the Presumpscot River does not attain the Class C bacteria standard. The cause of nonattainment seems to be dicharge(s) of untreated residential/municipal wastewater.

SACO RIVER BASIN

Code #	Waterbody

156 Minor tributaries of the Saco River entering above the confluence of the Little Ossippee River, those waters lying in Maine - Classes B, C and GPA.

Nonattainment Segments

Wards Brook (Class C; Fryeburg; 1.5 miles)
This brook has an impoundment which was formerly used as a log holding pond. Water quality sampling indicates that this highly colored brook does not attain the dissolved oxygen standard of its classification due to bark deposits in the impoundment.

157 Ossippee River and its tributaries, those waters lying in Maine - Classes B, C and GPA.

Nonattainment Segments

Little River (Class C; Cornish; 1 mile)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

Ossippee River (Class C; Cornish and Hiram; 1 mile)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

158 Little Ossippee River and its tributaries, those waters lying in Maine - Classes B, C and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

159 Minor tributaries of the Saco River entering below the confluence of the Little Ossippee River - Classes B and GPA.

Nonattainment Segments

Cooks Brook (Class B; Waterboro; 1.5 miles)
This brook has not attained the aquatic life standard of its classification in recent years due to the discharge of contaminated groundwater into it. The contaminated groundwater originated from subsurface disposal of wastewater containing heavy metals from a metal finishing operation which was discontinued in 1986.

Deer Pond (Class GPA; Hollis; 27 acres)
This pond body does not yet have culturally-induced algal blooms but has deteriorating water quality. More study is needed.

Code #	Waterbody
159 Cont'd	Deep Brook (Class C; Saco; 2.5 miles) Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed.
160	Saco River, main stem, above the confluence of the Little Ossippee River - Class B. Nonattainment Segments Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
161	Saco River, main stem, below the confluence of the Little Ossippee River - Classes B and C. Nonattainment Segments Water quality sampling indicates that a 0.5 mile segment of the Saco River just above tidewater does not attain the Class C bacteria standard. The cause of high bacteria levels is discharge(s) of untreated municipal wastewater.

SAINT CROIX RIVER BASIN

131	Tributaries of the St. Croix River entering above the outlet of Spednik Lake, those waters lying in Maine - Classes A, B and GPA. Nonattainment Segments Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
132	St. Croix River, main stem, from the outlet of Spednik Lake to its confluence with Woodland Lake and its tributaries entering between those two points, those waters lying in Maine - Classes A, B, C and GPA. Nonattainment Segments Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
133	Minor tributaries of the St. Croix River entering below the river's confluence with Woodland Lake, those waters lying in Maine - Class

Code #	Waterbody
133 Cont'd	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
134	St. Croix River, main stem, from its confluence with Woodland Lake to head of tide, those waters lying in Maine - Class C
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
	SAINT JOHN RIVER BASIN
087	Southwest Branch of the St. John River and its tributaries, those waters lying in Maine - Classes A, B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
088	Northwest Branch of the St. John River and its tributaries, those waters lying in Maine - Classes A, B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
089	Big Black River and its tributaries, those waters lying in Maine - Classes A, B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
090	Chimenticook Stream and its tributaries, those waters lying in Maine - Classes A, B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
091	Pocwock Stream and its tributaries, those waters lying in Maine - Classes A, B and GPA.

Code #	Waterbody
091 Cont'd	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
092	Little Black River and its tributaries, those water lying in Maine - Classes A, B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
093	Allagash River tributaries - Classes AA, A and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
094	Allagash River, main stem - Classes AA, A and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
095	St. Francis River and its tributaries, those waters lying in Maine - Classes A, B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
096	Minor tributaries of the St. John River entering above the confluence of the Fish River - Classes A, B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
097	Fish River, main stem, and its tributaries above the outlet of Portage Lake - Classes A and GPA.

Code #	Waterbody
097 Cont'd	Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

098 Fish River, main stem, and its tributaries between the outlet of Portage Lake and the outlet of St. Froid Lake - Classes A and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

099 Tributaries of the Fish River entering above the outlet of Mud Lake - Classes B and GPA.

Nonattainment Segments

Long Lake (Class GPA; St. Agatha, T17.,R3.,W.E.L.S. & T17.,R4.,W.E.L.S.; 6,000 acres)
This lake has occasional culturally-induced algal blooms and a stable or slightly improving water quality trend. Most of the phosphorus runoff in the watershed is due to agricultural sources. A point source discharge of treated municipal wastewater also contributes to nonattainment of classification

100 Tributaries of the Fish River entering between the outlet of Mud Lake and the outlet of Cross Lake - Classes B and GPA.

Nonattainment Segments

Black Lake (Class GPA; Fort Kent; 51 acres)
This lake has culturally-induced algal blooms and a stable water quality trend. Most of the phosphorus runoff in the watershed is due to agricultural sources.

Cross Lake (Class GPA; T16.,R5.,W.E.L.S. & T17,R5.,W.E.L.S.; 2,515 acres)
This lake has culturally-induced algal blooms and deteriorating water quality. Most of the phosphorus runoff in the watershed is due to agricultural sources.

Daigle Pond (Class GPA; New Canada; 36 acres)
This pond has culturally-induced algal blooms and a stable water quality trend. Most of the phosphorus runoff in the watershed is due to agricultural sources.

101 Tributaries of the Fish River entering between the outlet of Cross Lake and the outlet of Square Lake - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

Code #	Waterbody
102	Fish River, main stem and its tributaries entering between the outlet of St. Froid Lake and the outlet of Eagle Lake except for those tributaries entering above the outlet of Square Lake - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

103	Tributaries of the Fish River entering below the outlet of Eagle Lake - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

104	Fish River, main stem, below the outlet of Eagle Lake - Classes B and C.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

105	Minor tributaries of the St. John River entering between the confluence of the Fish River and the confluence of Violette Stream, those waters lying in Maine - Classes B, C and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

106	Violette Stream and its tributaries - Classes B, C and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

107	Minor tributaries of the St. John River entering between the confluence of Violette Stream and where the international boundary leaves the river in Hamlin, those waters lying in Maine and those segments of minor tributaries lying in Maine which enter the main stem of the St. John River in Canada - Classes B and GPA.

Code #	Waterbody
107 Cont'd	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
108	Limestone Stream and its tributaries, those waters lying in Maine - Classes B, C and GPA.
	Nonattainment Segments
	Webster Brook (Class B; Fort Fairfield and Limestone; 2.5 miles) Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.
109	Aroostook River, main stem, and its tributaries above the confluence of St. Croix Stream - Classes AA, A and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
110	St. Croix Stream and its tributaries - Classes AA, A and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
111	Squapan Stream and its tributaries - Classes A, B and GPA.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
112	Beaver Brook and its tributaries - Class B.
	Nonattainment Segments
	Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.
113	Salmon Brook and its tributaries - Classes B, C and GPA.

Code #	Waterbody

113 Cont'd

Nonattainment Segments

Salmon Brook (Class C; Washburn; 2 miles)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

114 Presque Isle Stream, main stem, and its tributaries entering above the confluence of Alder Brook and Alder Brook and its tributaries - Classes A and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

115 Presque Isle Stream, main stem, and its tributaries entering below the confluence with Alder Brook - Classes A, B and GPA.

Nonattainment Segments

Hanson Brook Lake (Class GPA; Mapleton & Presque Isle, 118 acres)
This lake has culturally-induced algal blooms and a stable water quality trend. Most of the phosphorus runoff in the watershed is due to agricultural sources

Presque Isle Stream (Class B; Presque Isle; 1 mile)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of the high bacteria levels is the discharge of inadequately treated municipal wastewater.

116 Caribou Stream and its tributaries - Classes B and GPA.

Nonattainment Segments

Caribou Stream (Class B; Caribou; 1.5 miles)
Water quality sampling indicates that this waterbody segment does not attain the bacteria standard of its classification. The cause of nonattainment is discharge(s) of untreated residential wastewater.

117 Otter Brook and its tributaries - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

Code # | Waterbody

118 Minor tributaries of the Aroostook River entering between the confluence of St. Croix Stream and the international boundary and those segments of minor tributaries lying in Maine which enter the main stem of the Aroostook River in Canada - Classes A, B, C and GPA.

Nonattainment Segments

Everett Brook (Class B; Fort Fairfield; 4 miles)
Water quality sampling and an analysis of watershed characteristics including land use, the effects of point source discharges (if present) and the extent of marshes and bogs indicate that this waterbody segment does not attain the dissolved oxygen standard of its classification. Most of the dissolved oxygen deficit seems to be due to agricultural activities in the watershed. This brook is the outlet of Fisher Lake. Algal blooms in Fisher Lake also contribute to the dissolved oxygen deficit in this brook.

Fischer Lake (Class GPA; Fort Fairfield; 5 acres)
This lake has culturally-induced algal blooms and a stable water quality trend. Most of the phosphorus runoff in the watershed is due to agricultural sources.

Monson Pond (Class GPA; Fort Fairfield; 160 acres)
This pond has culturally-induced algal blooms and a stable water quality trend. Most of the phosphorus runoff in the watershed is due to agricultural sources.

119 Aroostook River, main stem, between the confluence of St. Croix Stream and the confluence of Salmon Brook - Classes AA and B.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

120 Aroostook River, main stem, between the confluence of Salmon Brook and the international boundary - Classes B and C.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

121 Prestile Stream and its tributaries, those waters lying in Maine and those segments of the drainages of Gizoquit Brook and River de Chute lying in Maine - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

Code #	Waterbody

122 North Branch of the Meduxnekeag River and its tributaries, those waters lying in Maine - Classes A, B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

123 Meduxnekeag River and its tributaries except the North Branch and the South Branch, those waters lying in Maine - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

124 South Branch of the Meduxnekeag River and its tributaries - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

125 St. John River, main stem, above the confluence of the St. Francis River - Class B..

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

126 St. John main stem, from the confluence of the St. Francis River to the confluence of the Fish River, those waters lying in Maine - Class B.

Nonattainment Segments

Water quality sampling indicates that the lower part of this river segment (4 miles in length?) does not attain the bacteria standard of its classification. The cause of high bacteria levels is discharges of untreated and/or inadequately treated wastewater originating in New Brunswick.

127 St. John River, main stem, from the confluence of the Fish River to the international bridge in Madawaska, those waters lying in Maine - Classes B and C.

Code #	Waterbody

127 Cont'd

Nonattainment Segments

Water quality sampling indicates that the upper part of this river segment (12 miles in length?) does not attain the bacteria standard of its classification. The cause of high bacteria levels is discharges of untreated and/or inadequately treated wastewater originating in New Brunswick.

128 St. John River, main stem, from the international bridge in Madawaska to the downstream end of Le Grande Isle, those waters lying in Maine - Class C.

Nonattainment Segments

Water quality sampling indicates that this entire 16 mile segment of the St. John River does not attain the bacteria standard of its classification. The cause of high bacteria levels is discharges of untreated and/or inadequately treated dischargs originating in New Brunswick.

129 St. John River, main stem, from the downstream end of Le Grande Isle to where the international boundary leaves the river in Hamlin, those waters lying in Maine - Class C.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

130 Machias River and its tributaries - Classes AA, A, B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

175 Little Madawaska River and its tributaries - Classes A and GPA.

Nonattainment Segments

Little Madawaska River (Class B; Caribou; 4 miles)
Water quality sampling indicates that this waterbody segment does not attain the Class B bacteria standard. The cause of nonattainment is the discharge of inadequately treated institutional wastewater.

Madawaska Lake (Class GPA; Westmanland Twp. & Twp. & T16., R4., W.E.L.S.; 1,526 acres). This lake had its first algal bloom in 1987 and seems to have deteriorating water quality. Forest practices seem to be the principal source of phosphorus runoff in the watershed. More study is needed.

MAINE WATERBODIES NOT ATTAINING WATER QUALITY STANDARDS

UNION RIVER BASIN

Code #	Waterbody

170 West Branch of the Union River and its tributaries - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

171 East Branch of the Union River and its tributaries - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

172 Minor Tributaries of Graham Lake - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

173 Tributaries of the Union River entering below the outlet of Graham Lake - Classes B and GPA.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

174 Union River, main stem - Classes B and C.

Nonattainment Segments

Available information indicates that all segments of this waterbody are attaining the standards of their assigned classification.

MAINE WATERBODIES NOT ATTAINING WATER QUALITY STANDARDS

Code #	Waterbody
200	Estuarine and marine waters lying within three miles of the coast of Maine.

NONATTAINMENT SEGMENTS

All the following areas are closed to shellfish harvesting due to bacterial pollution. Where nonattainment of classification standards for recreation in and on the water or for dissolved oxygen levels have also been documented, it is noted under the area description.

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) The upper reaches of the Saco River Estuary also do not attain the Class SC bacteria standard for recreation in and on the water.
C-10	Ferry Beach to Old Orchard Pier (Saco & Old Orchard Beach) The Goosefare Brook Estuary is a water quality-limited segment which also does not meet the Class SC standards for dissolved oxygen and recreation in and on the water.
C-11	Scarborough River Estuary (Scarborough)
C-13	Spurwink River Estuary (Scarborough & Cape Elizabeth)
C-14	Portland Harbor (Portland, etc.) Much of Portland Harbor and the Presumpscot River Estuary also do not attain the Class SC bacteria standards for recreation in and on the water. One portion of Portland Harbor (the upper reaches of the Fore River Estuary) also does not attain the dissolved oxygen standard for Class SC waters.
C-14B	Chandler Cove (Cumberland)
C-15	Waites Landing to Wildwood Park (Falmouth & Cumberland)
C-16	Royal River Estuary (Yarmouth & Freeport) The upper reaches of the Royal River Estuary also do not meet the Class SC standard for recreation in and on the water.
C-16B	Prince Point (Yarmouth)
C-17	Haraseeket River (Freeport)

1. The closed areas described herein are more extensive in area than the areas where the bacteria standards set forth in Maine's water quality standards are violated. Where there are nearby pockets of pollution with low-value shellfish resources between them, the Maine Department of Marine Resources 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 harvesting is best described as an undefined subset of this listing.

MAINE WATERBODIES NOT ATTAINING WATER QUALITY STANDARDS

Area #	Description
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)
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)

MAINE WATERBODIES NOT ATTAINING WATER QUALITY STANDARDS

Area #	Description
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.)
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 III. LAKE VULNERABILITY INDEX

Lake and Pond Vulnerabilities as of May 1, 1988 have been assessed by the Division of Environmental Evaluation and Lake Studies of the DEP's Bureau of Water Quality Control.

This index is a predictive model which equates a lake or pond's hydrologic characteristics and rate of watershed development (from 1984 to 1986) with how long it will take for phosphorus concentrations in the lake or pond to increase by 1 part per billion (ppb). The major limitation of this model is that the rates and patterns of development in lake watersheds may be quite different over the next 10 or 50 years then they were from 1984 to 1986. Another significant limitation on its validity is that the applicability of the phosphorus input-output model used may vary from lake to lake. Depending upon a lake or pond's current water quality status, a 1 ppb increase in phosphorus level may or may not cause a noticeable decline in the lake's water quality. For extremely vulnerable lakes and ponds, a 1 ppb phosphorus increase is predicted to occur within 10 years. For Highly Vulnerable Lakes and Ponds, a 1 ppb increase in phosphorus is predicted to occur within 50 years. On a Statewide basis, 0.7% of the surface area of Maine's lakes and ponds fall into the Extremely Vulnerable category and 11.2% into the Highly Vulnerable category.

Often a lake will have distinct basins with varying levels of vulnerability. To make this distinction among lake basins, abbreviations (B#1), (B#2), etc. are used in this index.

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ANDROSCOGGIN RIVER BASIN

EXTREMELY VULNERABLE LAKES AND PONDS

Little Sabattus Pond	Greene	10 hectares
Loon Pond	Webster Plt	24 hectares
No Name Pond	Lewiston	58 hectares
Taylor Pond	Auburn	259 hectares
TOTAL		351 hectares

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ANDROSCOGGIN RIVER BASIN

HIGHLY VULNERABLE LAKES AND PONDS

Allen Pond	Greene	76 hectares
Androscoggin Lake	Leeds	1616 hectares
Bartlett Pond	Livermore	11 hectares
Brettuns Pond	Livermore	62 hectares
Caesar Pond	Bowdoin	20 hectares

ANDROSCOGGIN RIVER BASIN

HIGHLY VULNERABLE LAKES AND PONDS(Cont'd)

Crystal Pond	Turner	14 hectares
Green Pond	Oxford	16 hectares
Hales Pond	Fayette	29 hectares
Hogan Pond	Oxford	66 hectares
Howard Pond	Hanover	52 hectares
Labrador Pond	Sumner	42 hectares
Lake Auburn	Auburn	897 hectares
Little Labrador Pond	Sumner	6 hectares
Little Penneesseewas	Norway	39 hectares
Little Wilson Pond	Turner	44 hectares
Lower Range Pond	Poland	118 hectares
Marshall Pond	Oxford	57 hectares
Middle Range Pond	Poland	156 hectares
Moose Pond	Paris	35 hectares
Moose Pond	Otisfield	62 hectares
Nelson Pond	Livermore	5 hectares
North Pond	Norway	67 hectares
Number 9 Pond	Livermore	82. hectares
Pennesseewassee Lake	Norway	384 hectares
Pleasant Pond	Turner	77 hectares
Round Pond	Livermore	64 hectares
Sabattus Pond	Webster Plt	796 hectares
Sand Pond	Norway	55 hectares
Saturday Pond	Otisfield	69 hectares
Thompson Lake	Oxford	1710 hectares
Tripp Pond	Poland	296 hectares
Upper Range Pond	Poland	136 hectares
Whitney Pond	Oxford	65 hectares
Worthly Pond	Poland	20 hectares
TOTAL		7,244 hectares

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KENNEBEC RIVER BASIN

EXTREMELY VULNERABLE LAKES AND PONDS

Anderson Pond	Augusta	8 hectares
Austin Pond	Bald Mtn. TWP T2R3	264 hectares
Berry Pond	Winthrop	68 hectares
Dam Pond	Augusta	39 hectares
Greely Pond	Augusta	19 hectares
Hutchinson Pond	Manchester	37 hectares
Jamies Pond	Manchester	38 hectares
Lily Pond	Bath	5 hectares
Little Togus Pond	Augusta	15 hectares
Pattee Pond	Winslow	202 hectares
Threecornered Pond	Augusta	72 hectares
Togus Pond	Augusta	260 hectares
Tolman Pond	Augusta	23 hectares
TOTAL		1,050 hectares

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KENNEBEC RIVER BASIN

HIGHLY VULNERABLE LAKES AND PONDS

Annabessacook Lake	Winthrop	563 hectares
Ballard Pond	Farmington	3 hectares
Beech Pond	Palermo	24 hectares
Branch Pond	China	124 hectares
Buker Pond	Litchfield	31 hectares
Butler Pond	Lexington T	10 hectares
Center Pond	Phippsburg	31 hectares
China Lake	China	1584 hectares
Chisholm Pond	Palermo	17 hectares
Cobbosseecontee Lake	Winthrop	2120 hectares
Cochnewagon	Monmouth	156 hectares
Colby Pond	Liberty	11 hectares
Desert Pond	Mount Vernon	9 hectares
Dexter Pond	Winthrop	42 hectares
Dutton Pond	Albion	23 hectares
East Pond	Smithfield	698 hectares
Foster Pond	Palermo	13 hectares
Gardiner Pond	Wiscasset	30 hectares
Gould Pond	Dexter	3 hectares
Ingham	Mount Vernon	17 hectares
Jimmy Pond	Litchfield	19 hectares
Jump Pond	Palermo	13 hectares
Kezar Pond	Winthrop	8 hectares
Lake George	Skowhegan	123 hectares
Lake Wassookeag	Dexter	417 hectares
Lily Pond	Sidney	11 hectares
Little Cobbossee	Winthrop	32 hectares
Little Dyer Pond	Jefferson	40 hectares
Little Mud Pond	Greenville Junction	6 hectares
Lovejoy Pond	Albion	133 hectares
Lower Narrows Pond	Winthrop	84 hectares
Maranacook Lake(B#1)	Winthrop	473 hectares
Maranacook Lake(B#2)	Readfield	241 hectares
McGrath Pond	Oakland	197 hectares
Messalonskee	Sidney	1419 hectares
Moody Pond	Windsor	10 hectares
Moose Pond	Mount Desert	26 hectares
Morrill Pond	Hartland	58 hectares
Mosher Pond	Fayette	29 hectares
Mud Pond	Harmony	5 hectares
Mud Pond	Windsor	23 hectares
Nakomis Pond	Palmyra	80 hectares
Nehumleag Pond	Pittston	73 hectares
Nequasset Lake	Woolwich	172 hectares
Oakes Pond	Skowhegan	35 hectares
Pease Pond	Wilton	44 hectares
Pleasant Pond	Richmond	303 hectares
Puffer Pond	Dexter	36 hectares

KENNEBEC RIVER BASIN

HIGHLY VULNERABLE LAKES AND PONDS(Cont'd)

Roderique Pond	Rockwood Strip	15 hectares
Saban Pond	Palermo	5 hectares
Salmon Lake	Oakland	270 hectares
Sand Pond	Litchfield	106 hectares
Savade Pond	Windsor	22 hectares
Sewall Pond	Arrowsic	18 hectares
Shed Pond	Readfield	19 hectares
Sherman Lake	Newcastle	86 hectares
Spectacle Pond	Augusta	55 hectares
Stafford Pond	Hartland	50 hectares
Stratton Brook Pond	Wyman TWP	13 hectares
Three Mile Pond	China	458 hectares
Tinkham Pond	Chelsea	6 hectares
Torsey Lake	Readfield	230 hectares
Tufts Pond	Kingfield	21 hectares
Turner Pond	Palermo	79 hectares
Upper Narrows Pond	Winthrop	90 hectares
Ward Pond	Sidney	21 hectares
Watson Pond	Rome	27 hectares
Webber Pond	Vassalboro	485 hectares
Welhern Pond	Eustis	5 hectares
Wesserunsett Lake	Madison	572 hectares
Whittier Pond	Rome	9 hectares
Wilson Pond	Wayne	223 hectares
Woodbury Pond	Litchfield	176 hectares
TOTAL		12,680 hectares

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MINOR COASTAL BASINS

EXTREMELY VULNERABLE LAKES AND PONDS

Adams Pond	Boothbay	28 hectares
Bauneg Beg Pond	Sanford	76 hectares
Beaver Dam Pond	Berwick	4 hectares
Brimstone Pond	Arundel	4 hectares
Cox Pond	South Berwick	3 hectares
Ell Pond	Sanford	13 hectares
Estes Lake	Sanford	143 hectares
Grassy Pond	Rockport	5 hectares
Hosmer Pond	Camden	22 hectares
Houghton Pond	West Bath	5 hectares
Howard Pond	St. George	5 hectares
Knickerbocker Pond	Boothbay	38 hectares
Knights Pond	South Berwick	20 hectares

MINOR COASTAL BASINS

EXTREMELY VULNERABLE LAKES AND PONDS(Cont'd)

Leighs Mill Pond	South Berwick	16 hectares
Scituate Pond	York	17 hectares
Warren Pond	South Berwick	10 hectares
Wiley Pond	Boothbay	5 hectares
York Pond	Eliot	19 hectares
TOTAL		433 hectares

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MINOR COASTAL BASINS

HIGHLY VULNERABLE LAKES AND PONDS

Alewife Pond	Arundel	16 hectares
Aunt Betty Pond	Bar Harbor	12 hectares
Birch Harbor Pond	Winter Harbor	6 hectares
Biscay Pond	Damariscotta	145 hectares
Boyd Pond	Bristol	23 hectares
Branch Lake	Ellsworth	1094 hectares
Bubble Pond	Bar Harbor	13 hectares
Bunganut Pond	Lyman	116 hectares
Burntland Pond	Stonington	9 hectares
Cain Pond	Searsport	13 hectares
Cargill Pond	Liberty	23 hectares
Chickawaukie	Rockport	137 hectares
Chicken Mill Pond	Gouldsboro	5 hectares
Coleman Pond	Lincolnville	82 hectares
Crawford Pond	Warren	232 hectares
Crystal Pond	Washington	40 hectares
Damariscotta Lake	Nobleboro	1752 hectares
Duckpuddle Pond	Waldoboro	98 hectares
Eagle Lake	Bar Harbor	177 hectares
Echo Lake	Mount Desert	92 hectares
Ellis Pond	Brooks	34 hectares
Fish Pond	Hope	52 hectares
Forbes Pond	Gouldsboro	81 hectares
Forest Pond	Friendship	3 hectares
Fourth Pond	Blue Hill	16 hectares
Fresh Pond	North Haven	35 hectares
Goose Pond	Swans Island	5 hectares
Granny Kent Pond	Shapleigh	20 hectares
Hansen Pond	Acton	10 hectares
Hastings Pond	Bristol	4 hectares
Havener Pond	Waldoboro	32 hectares
Hobbs Pond	Hope	106 hectares
Hodgdon Pond	Tremont	17 hectares

MINOR COASTAL BASINS

HIGHLY VULNERABLE LAKES AND PONDS(Cont'd)

Iron Pond	Washington	6 hectares
Isinglass Pond	Waterboro	12 hectares
Jones Pond	Gouldsboro	183 hectares
Jordan Pond	Mount Desert	72 hectares
Kalers Pond	Waldoboro	29 hectares
Kennebunk Pond	Lyman	80 hectares
Knight Pond	Northport	44 hectares
Lake Wood	Bar Harbor	6 hectares
Levenseller Pond	Searsmont	15 hectares
Lilly Pond	Rockport	12 hectares
Lily Pond	Deer Isle	10 hectares
Lily Pond	Edgecomb	23 hectares
Little Medomak Pond	Waldoboro	30 hectares
Little Ossippee Flow	Waterboro	163 hectares
Little Pond	Damariscotta	28 hectares
Little Poverty Pond	Shapleigh	6 hectares
Little Round Pond	Mount Desert	6 hectares
Long Pond	Mount Desert	304 hectares
Long Pond	Mount Desert	12 hectares
Loon Lake	Acton	35 hectares
Lower Breakneck	Bar Harbor	2 hectares
Lower Hadlock Pond	Mount Desert	13 hectares
Lower Mason Pond	Belfast	13 hectares
Lower Patten Pond	Ellsworth	370 hectares
Lowry Pond	Searsmont	31 hectares
Maces Pond	Rockport	12 hectares
Marsfield Pond	Hope	11 hectares
McCurdy Pond	Bremen	83 hectares
Medomak Pond	Waldoboro	92 hectares
Meetinghouse Pond	Phippsburg	3 hectares
Megunticook Lake(B#1)	Lincolnville	339 hectares
Megunticook Lake(B#2)	Lincolville	126 hectares
Middle Branch Pond	Alfred	17 hectares
Mill Pond	Appleton	14 hectares
Milton Pond	Lebanon	90 hectares
Mirror Lake	Rockport	44 hectares
Moody Pond	Lincolnville	26 hectares
Moose Pond	Acton	10 hectares
Mousam Lake(B#1)	Shapleigh	260 hectares
Mousam Lake(B#2)	Shapleigh	89 hectares
Northeast Pond	Lebanon	317 hectares
Northwest Pond	Waterboro	14 hectares
Norton Pond	Lincolville	41 hectares
Noyes Pond	Blue Hill	8 hectares
Paradise Pond	Damariscotta	60 hectares
Passawaukeag Lake	Brooks	46 hectares
Pemaquid Pond	Waldoboro	583 hectares
Pitcher Pond	Northport	146 hectares
Roberts Pond	Lyman	85 hectares
Rocky Pond	Orland	63 hectares
Rocky Pond	Rockport	5 hectares

MINOR COASTAL BASINS

HIGHLY VULNERABLE LAKES AND PONDS(Cont'd)

Ross Pond	Bristol	7 hectares
Round Pond	Mount Desert	17 hectares
Round Pond	Lyman	1 hectare
Round Pond	Union	98 hectares
Seal Cove Pond	Tremont	96 hectares
Sennebec Pond	Union	215 hectares
Seven Tree Pond	Warren	212 hectares
Shaker Pond	Alfred	35 hectares
Shapleigh Lake	Shapleigh	32 hectares
Sidensparker Pond	Waldoboro	59 hectares
Silver Lake	Phippsburg	5 hectares
Somes Pond	Mount Desert	36 hectares
South Pond	Warren	212 hectares
Spaulding Pond	Lebanon	44 hectares
Sprague Pond	Phippsburg	3 hectares
Spring Pond	Washington	7 hectares
Square Pond	Acton	340 hectares
Stevens Pond	Liberty	114 hectares
Swan Pond	Lyman	52 hectares
Swan Pond	Acton	4 hectares
The Tarn	Bar Harbor	7 hectares
Tilden Pond	Belmont	140 hectares
Torrey Pond	Deer Isle	9 hectares
Town House Pond	Lebanon	42 hectares
Trues Pond	Montville	64 hectares
Upper Breakneck	Bar Harbor	2 hectares
Upper Hadlock Pond	Mount Desert	15 hectares
Upper Mason Pond	Belfast	31 hectares
Upper Patten Pond	Ellsworth	142 hectares
Washington Pond	Washington	226 hectares
Wattuh Lake	Phippsburg	10 hectares
Webber Pond	Bremen	93 hectares
Wilson Lake	Acton	119 hectares
Witch Hole Pond	Bar Harbor	9 hectares
TOTAL		11,078 hectares

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PENOBSCOT RIVER BASIN

EXTREMELY VULNERABLE LAKES AND PONDS

George Pond	Hermon	18 hectares
Tracy Pond	Hermon	19 hectares
TOTAL		37 hectares

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PENOBSCOT RIVER BASIN

HIGHLY VULNERABLE LAKES AND PONDS

Ben Annis Pond	Hermon	15 hectares
Branns Mill Pond	Dover-Foxcroft	110 hectares
Cambolasse Pond	Lincoln	86 hectares
Center Pond	Lincoln	82 hectares
Chemo Pond	Eddington	469 hectares
Crooked Pond	Lincoln	90 hectares
Davis Pond	Holden	156 hectares
Dow Pond	Sebec	6 hectares
Egg Caribou Long Pond	Lincoln	337 hectares
Folsom Pond	Lincoln	153 hectares
Garland Pond	Sebec	10 hectares
Garland Pond	Garland	35 hectares
Green Pond	Lee	48 hectares
Hammond Pond	Hampden	39 hectares
Hermon Pond	Hermon	179 hectares
Holbrook Pond	Holden	123 hectares
Holland Pond	Alton	33 hectares
House Pond	Lee	4 hectares
Jerry Pond	Millinocket	27 hectares
Little Madagascal Pd.	T 03 R01 NBP	15 hectares
Little Pushaw Pond	Hudson	165 hectares
Marr Pond	Sangerville	34 hectares
Mattekeunk Pond	Lee	216 hectares
Mattanawcook Pond	Lincoln	331 hectares
Mud Pond	Linneus	7 hectares
Patten Pond	Hampden	18 hectares
Pickerel Pond	Alton	31 hectares
Pug Pond	Alton	4 hectares
Pushaw Lake	Orono	2046 hectares
Snap Pond	Lincoln	78 hectares
Swetts Pond	Orrington	40 hectares
Thurston Pond	Bucksport	59 hectares
Upper Cold Stream Pd.	Lincoln	72 hectares
Upper Pond	Lincoln	297 hectares
Weir Pond	Lee	21 hectares
West Garland Pond	Garland	12 hectares
Williams Pond	Bucksport	31 hectares
TOTAL		5,479 hectares

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PRESUMPSCOT RIVER BASIN

EXTREMELY VULNERABLE LAKES AND PONDS

Cold Rain Pond	Naples	15 hectares
Forest Lake	Windham	82 hectares
Highland Lake	Windham	252 hectares
Lilly Pond	New Gloucester	9 hectares

PRESUMPSCOT RIVER BASIN

EXTREMELY VULNERABLE LAKES AND PONDS(Cont'd)

Little Duck Pond	Windham	13 hectares
Little Rattlesnake Pond	Raymond	140 hectares
Little Sebago Lake	Windham	78 hectares
Lower Mud Pond	Windham	2 hectares
Nubble Pond	Raymond	8 hectares
Owl Pond	Casco	4 hectares
Pettingill Pond	Windham	15 hectares
Upper Mud Pond	Windham	1 hectare
TOTAL		619 hectares

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PRESUMPSCOT RIVER BASIN

HIGHLY VULNERABLE LAKES AND PONDS

Adams Pond	Bridgton	17 hectares
Bay of Naples Lake	Naples	297 hectares
Beaver Pond	Bridgton	28 hectares
Coffee Pond	Casco	41 hectares
Collins Pond	Windham	15 hectares
Crystal Lake	Harrison	174 hectares
Crystal Pond	Gray	76 hectares
Dumpling Pond	Casco	11 hectares
Highland Lake	Bridgton	524 hectares
Holt Pond	Bridgton	12 hectares
Ingalls Pond	Bridgton	55 hectares
Island Pond	Waterford	42 hectares
Little Sebago Lake(B#2)	Windham	552 hectares
Little Sebago Lake(B#4)	Windham	125 hectares
Long Lake	Bridgton	2097 hectares
Notched Pond	Raymond	29 hectares
Otter Pond	Bridgton	35 hectares
Panther Pond	Raymond	571 hectares
Parker Pond	Casco	64 hectares
Peabody Pond	Sebago	284 hectares
Pleasant Lake	Otisfield	531 hectares
Rattlesnake Pond	Raymond	290 hectares
Sabathday Pond	New Gloucester	134 hectares
Thomas Pond	Casco	201 hectares
Trickey Pond	Naples	122 hectares
Wood Pond	Bridgton	183 hectares
TOTAL		6,510 hectares

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SACO RIVER BASIN

EXTREMELY VULNERABLE LAKES AND PONDS

Bonny Eagle Pond	Buxton	82 hectares
Killick Pond	Hollis Center	20 hectares
Little Watchic Pond	Standish	16 hectares
Rich Mill Pond	Standish	30 hectares
TOTAL		148 hectares

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SACO RIVER BASIN

HIGHLY VULNERABLE LAKES AND PONDS

Adams Pond	Newfield	82 hectares
Balch Pond	Newfield	210 hectares
Bartlett Pond	Waterboro	10 hectares
Bickford Pond	Porter	83 hectares
Black Pond	Porter	18 hectares
Boyd Pond	Limington	10 hectares
Burnt Meadow Pond	Brownfield	27 hectares
Chapman Pond	Porter	4 hectares
Clemons Pond	Hiram	34 hectares
Colcord Pond	Porter	89 hectares
Doles Pond	Limington	8 hectares
Farrington Pond	Lovell	23 hectares
Holland Lake	Limerick	72 hectares
Horne Pond	Limington	53 hectares
Ingalls Pond	Baldwin	10 hectares
Jaybird Pond	Porter	3 hectares
Little Clemons Pond	Hiram	12 hectares
Little Ossippee Pond	Waterboro	182 hectares
Mine Pond	Porter	20 hectares
Moose Pond (B#1)	Bridgton	131 hectares
Moose Pond (B#2)	Bridgton	345 hectares
Mud Pond	Newfield	4 hectares
Parker Pond	Lyman	9 hectares
Pequawket Pond	Brownfield	33 hectares
Pickerel Pond	Limerick	20 hectares
Pinkham Pond	Newfield	18 hectares
Plain Pond	Porter	6 hectares
Poverty Pond	Newfield	60 hectares
Round Pond	Newfield	1 hectare
Sand Pond	Baldwin	21 hectares
Smarts Pond	Newfield	5 hectares
Southeast Pond	Hiram	61 hectares

SACO RIVER BASIN

HIGHLY VULNERABLE LAKES AND PONDS(Cont'd)

Spectacle Pond (B#1)	Porter	16 hectare
Spectacle Pond (B#2)	Porter	14 hectares
Stanley Pond	Porter	55 hectares
Symmes Pond	Newfield	12 hectares
Trafton Pond	Porter	23 hectares
Turner Pond	Newfield	14 hectares
Unnamed Pond	Limington	10 hectares
Wards Pond	Limington	17 hectares
Watchic Pond	Standish	176 hectares
TOTAL		2,001 hectares

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ST. JOHN RIVER BASIN

HIGHLY VULNERABLE LAKES AND PONDS

Bennett Lake	Easton	6 hectares
Big Greenland Lake	Danforth	54 hectares
Black Lake	Fort Kent	18 hectares
County Road Lake	New Limerick	9 hectares
Easton Pond	Easton	4 hectares
Fischer Lake	Fairfield	2 hectares
Germain Lake	Madawaska	40 hectares
Glancy Lake	New Limerick	10 hectares
Gould Pond	New Limerick	20 hectares
Hannigan Pond	New Limerick	3 hectares
Lambert Pond	New Limerick	3 hectares
Lindsay Pond	Easton	4 hectares
Monson Pond	Fort Fairfield	37 hectares
TOTAL		210 hectares

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ALL BASINS

Extremely Vulnerable Lakes and Ponds - 2,638 hectares (5,518 acres; 0.7% total lake and pond acreage in Maine)

Highly Vulnerable Lakes and Ponds - 45,202 hectares (111,694 acres; 11.2% of total lake and pond acreage in Maine

METHODOLOGY USED FOR THE ESTIMATION OF THE EXTENT OF GROUNDWATER IN MAINE NOT ATTAINING WATER QUALITY STANDARDS.

Maine's GW-A groundwater classification includes a standard which requires groundwater to be of such quality that it can be used for public water supplies. The numerical standards used to assess potability are those of the Federal Safe Drinking Water Act. Although Class GW-B does not require that groundwater be suitable for drinking water supply, no groundwater in Maine has been classified as GW-B. Thus, any groundwater in Maine which is not suitable for public water supply due to pollution from human activities is not attaining its classification.

In Maine's 1986 Water Quality Assessment, the first attempt at estimating the extent of unpotable groundwater in Maine resulted in an estimated statistic of 760 of the 30,995 square miles of Maine's land area being underlain by unpotable groundwater. During the two years since that assessment was made, some limited advances have been made in understanding the nature of groundwater contamination in Maine. Most notable are (1) the registrations of underground storage tanks and sand-salt storage sites which are now available, (2) investigations of contamination plumes from those sources and (3) continuing studies on the impact of agriculture on groundwater quality. Use of the methodology described in this appendix has resulted in a 1988 estimate of 292 square miles of Maine being underlain by polluted groundwater, a 62% reduction in its estimated extent.

It cannot be overly emphasized that this 1988 assessment, although an improvement over that done in 1986, is an inexact estimation of the extent of groundwater contamination in Maine. The purpose of this appendix is to describe some of the difficulties inherent in such an assessment and to document the assumptions which made for the assessment. The major difficulty in assessing groundwater quality is inaccessability. By comparison, a person monitoring surface waters needs only to drive to a bridge or use a boat to get to the desired sampling site. Once there, samples can be collected with ease from any point in the water column. Conversely, knowledge of groundwater quality is derived largely from existing private wells. When dealing with contaminated domestic wells, there are two major problems inherent in estimating the extent of groundwater contamination: (1) there are usually too few existing wells and (2) those wells available for monitoring are not usually positioned at the optimum locations and depths to accurately define the spatial boundaries of contaminant plumes. Compounding the difficulty of assessment is the present difficulty of retrieving existing data on domestic water supplies. Groundwater monitoring wells in Maine installed specifically for assessment purposes number less than 1200 with the majority of these clustered around known contamination sites.

One major assumption used in this assessment is that the unpotable area around a pollution source is defined as that area where if monitoring wells were installed, a majority of those sampled at some depth in each portion of the area would yield unpotable water. This assumption was necessary to account for perched contaminant plumes as well as the channelized, erratic nature of contaminant plumes in bedrock aquifers.

Another major assumption is that average plume sizes for a particular pollution source can be developed to assess the statewide extent of groundwater pollution, including sites where pollution is present but has not yet been detected. Groundwater pollution is a highly site-specific phenomenon. Surficial geology, bedrock geology, hydrogeologic conditions, type of pollutants, concentration of pollutants and duration of pollutant discharge are the principal factors affecting the extent of contaminant plumes. Even at those few hazardous substance sites in Maine where intensive studies have been done, the influence of these factors on plume extent are not well understood.

While acknowledging the limitations inherent in this assessments, the potential benefits it can provide (for long-range planning and identifying regional differences) justify it. Hopefully, subsequent assessments will be based on increased understanding of the nature of groundwater pollution as well as an improved data base. Assumptions made for the extent of contamination associated with each type of pollution source are as follows:

Agricultural Areas - A recent study (Neil et al, 1987) found that 27% of domestic wells adjacent to and downgradient of fields used for row crops contained nitrate levels above drinking water standards (10 ppm). This study was based on sampling 70 wells, most of them in Aroostook County and should be regarded as a preliminary assessment of groundwater pollution associated with agriculture. The major limitation of this study is that it attempted no analysis of the extent of contamination plumes associated with particular fields. Without substantial expenditures devoted to a program of monitoring and assessment it is unlikely that the accuracy of this preliminary assessment can be improved. Although it seems likely that this assessment of agricultural areas is subject to more error than are the assessments for pollution due to other nonpoint sources, a statistic of 27% of the State's area devoted to cultivation of row crops has been used as an estimate of groundwater nonattainment due to agriculture. This does not account for regional differences in geology and agricultural practices or for the added dilution area which would be required for attenuation of nitrate levels above 10 ppm.

Landfills - Unpotable groundwater is assumed to underlie an area twice that which is filled with solid waste.

Leaking Underground Storage Tanks - The estimated total number of leaking underground storage tanks is based on both the number of tanks and tank sites registered. This statistic was adjusted by county to account for the following assumptions:

(1) Only 75% of all tanks are registered with all the unregistered tanks being 1-tank rather than multiple-tank sites.

(2) Of the tank sites registered since 1986, 10% have been discontinued or had their tanks replaced with ones of improved design.

(3) The USEPA estimate of a 30% failure rate for older types of tanks is applicable to tank sites in Maine.

(4) Plume size - DEP staff estimates the size of plumes associated with known leaks from underground storage tanks to range from 1.4 to 11.5 acres with most of the plumes tending to be in the low end of the range. Splitting the range 2/3 towards the low end yields an average plume size of 5 acres.

Sand-Salt Piles - An assessment of the extent of groundwater contamination at 41 uncovered sand-salt storage areas (Locke, 1988) used terrain conductivity, well water samples, etc. to estimate the extent of contamination plumes. The average plume size of 10 acres was used to estimate the extent of unpotable groundwater at the 659 sites not assessed. The assessment of contamination due to sand-salt piles may be the most accurate of any nonpoint sources estimated in this report but is still uncertain in its statistical validity.

Septic Systems - The number of unsewered year-round households in each county was estimated by dividing the unsewered population by Maine's average rural household size (2.53). This statistic was used for the estimated number of septic systems. Corrections were not made for population increases since 1984, septic systems in seasonal dwellings, commercial septic systems, homes without plumbing and homes discharging to surface waters. The average zone where groundwater was unpotable (primarily due to nitrate levels prior to dilution) was estimated at 0.25 acre per septic system. This is equal to a nonattainment zone extending 36 feet beyond the edges of a typical 20 x 45 foot leach field. Typical leach fields in Maine, however, are usually built into sloped ground where the area of unpotable groundwater beneath them would extend further from the edge of the field on the downslope side than on the upslope side.

Hazardous Substances - Where site-specific estimates derived from intensive studies could not be obtained, an estimated nonattainment zone of 10 acres per suspected site was used.

Roadsides - Groundwater contamination (even if chloride levels above 250 mg/l occur only seasonally) due to road salting seems to be linked to poor roadside drainage. An estimated nonattainment zone 50 feet in width has been applied to 20% of the centerline miles of State and Locally maintained year-round roads.

Wastewater Lagoons - Unpotable groundwater is assumed to underline an area twice that of the lagoon's surface area.

REFERENCES

Locke, D.B. (1988) An Assessment of the Extent of Ground Water Contamination in Maine Due to Uncovered Salt-Sand Storage Piles.

Neil, C.D., Williams, J.S. & Weddle, T.K. (1987) Second Annual Report - Pesticides in Ground Water Study. Maine Geological Survey Open File Report 87-20.

APPENDIX V
CURRENT STATE AND LOCAL PROGRAMS FOR CONTROL OF NONPOINT SOURCE POLLUTION

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MAINE DEPARTMENT OF AGRICULTURE, FOOD AND RURAL RESOURCES

PURPOSE: The Department of Agriculture, Food and Rural Resources was established to improve Maine agriculture through the conservation and improvement of the soil and cropland of the State; the development, compilation and dissemination of scientific and practical knowledge; the marketing and promotion of agricultural products; the detection, prevention and eradication of plant and animal diseases; the protection of the consuming public against harmful and unsanitary products and practices; and the sound development of the natural resources of the State.

ORGANIZATION: Although most programs in the Maine Department of Agriculture, Food and Rural Resources are not designed specifically to address nonpoint source pollution, the installation of conservation practices designed to keep soil, pesticides, animal waste, and fertilizer in place, also affect local sources of nonpoint source water pollution. Two of the Department's 23 organizational units, deal specifically with conservation practices and the control of nonpoint source pollution. These units are the State Soil and Water Conservation Commission and the Board of Pesticides Control.

STATE SOIL AND WATER CONSERVATION COMMISSION

PURPOSE: The State Soil and Water Conservation Commission was established to provide for the protection, proper use, maintenance and improvement of the soil, water and related natural resources of the State of Maine. The principal responsibilities of the Commission are to assist Soil and Water Conservation Districts in the preparation and implementation of their locally developed programs, accomplished through direct assistance, technical and financial assistance, and coordination with other State and Federal agencies; to develop and carry out public works projects for prevention of soil erosion, flood prevention, conservation, development, utilization and disposal of water; to assist in the completion of the National Cooperative Soil Survey; to conduct surveys, investigations, and research as necessary for implementation of other functions; to coordinate the floodplain studies of various Federal agencies; to coordinate the Small Watershed program statewide; and to coordinate the Resource Conservation and Development Programs.

ORGANIZATION: The Commission consists of eleven members, five of whom serve ex officio: Dean of the college of Life Sciences and Agriculture of the University of Maine, Commissioner of Agriculture, Commissioner of Conservation, Commissioner of Inland Fisheries and Wildlife, and Commissioner of Marine Resources; and six officio members who are Soil and Water Conservation District Supervisors. Professional staff for the Commission is comprised of an Executive Director and a Soil Scientist.

NONPOINT SOURCE CONTROL PROGRAMS:

Liaison Between State Government and Maine's Soil and Water Conservation Districts

Maine's 16 Soil and Water Conservation Districts are State entities but are not part of State government. The State Soil and Water Conservation Commission provides a critically-needed link between the Districts and State government as well as coordination among Districts. The Commission has the power to form and create Districts; to appoint two of the five supervisors managing each district; and to formulate policy for the Districts. Besides providing base-grants to the Districts, the Commission employs 9 full-time seasonal employees to assist the Districts with their heavy summer workload.

The accomplishments of the Soil and Water Conservation Commission (SWCC) are apparent in the conservation practices applied to the land of more than 11,874 private landowners that are cooperators with Maine's 16 Soil and Water Conservation Districts. During 'FY 1986, 4,410 groups and individuals applied some form of conservation practices to their land in an effort to control erosion and other soil and water problems. New conservation plans were formulated for 88,352 acres of land, raising the total State acreage covered by conservation plans to 2,010,426 acres.

Interagency Liaison

The Commission and Districts reviewed and evaluated over 552 resource alteration applications submitted to the Department of Environmental Protection (DEP), land Use Regulation Commission (LURC), State Planning Office (SPO) and the Department of Inland Fisheries and Wildlife (DIFW) during the past year. The recommendations proposed by the commission and Districts were often included as conditions of approval in the permits granted through these applications. Commission review involves the following considerations:

(1) Soil Suitability
(2) Erosion and Sediment Control
(3) Relation to Floodplains
(4) Stormwater Management and Drainage
(5) Protection of Prime Agricultural Lands where Appropriate

Challenge Grants

The Challenge Grant Program was authorized by the Legislature in 1983 to provide funding to Districts to address local problems in soil and water conservation. Districts compete annually for funding from a pool of $100,000. During the past 4 years, many projects have been funded that have had direct or indirect effects on water quality.

There have been several Challenge Grants dealing with the proper utilization of industrial waste. By using some of these waste products as a soil amendment, not only can the problem of their disposal be dealt with, but they may be turned into a valuable asset to the land-user.

In 1986, a challenge grant, obtained by the Cumberland County Soil and Water Conservation District, funded Runoff and Erosion Control Guidelines for Highway Crew Leaders, a booklet developed cooperatively by the Town of Falmouth, Maine, the Maine Department of Transportation, the Maine Soil and Water Conservation Commission, the USDA Soil Conservation Service, and the Threshold to Maine Resources Conservation and Development Area.

There is currently a Challenge Grant dealing with treatment of milkroom wastewater through the use of a barkbed filter. This experimental treatment system is being evaluated to determine if it effectively protects water quality. If this demonstration project proves effective and is readily adopted by other dairy farmers, it will be an effective BMP for this nonpoint source of pollutants.

Another Challenge Grant deals with manure sampling. This program determines the fertilizer value of a farmer's animal waste and when coupled with soil testing enables the spreading of manure in proper quantities that can be assimilated by the land. The adoption and use of this program by other farmers would address nonpoint source pollution problems caused by overspreading of animal waste.

Many demonstrations of conservation tillage have been conducted as Challenge Grants statewide. This type of tillage reduces the disturbance of the soil in crop raising and effectively limits the movement of sediment through erosion. As a result of these demonstrations, conservation tillage practices have been adopted by many Maine farmers.

Demonstrations of proper methods of reclaiming gravel pits, constructing and maintaining logging roads, shoreline erosion control, recreational field stabilization and drainage, blueberry land management, riverbank stabilization, and wastewater treatment with peat instead of gravel in coastal areas have all been carried out through the Challenge Grant Program. These practices when adopted by the land-user help to stabilize potential erosion and sedimentation situations.

BOARD OF PESTICIDES CONTROL

PURPOSE: The Board of Pesticides Control was established to protect the public health and safety and the public interest in the soils, water, forests, wildlife, agricultural and other resources of the State by assuring safe, scientific and proper use of chemical pesticides. The primary responsibilities of the Board are to register all pesticide products to be sold and used in Maine; to examine and license all persons involved in commercial application of pesticides and all dealers and private growers involved in the sale or application of restricted use pesticides; to promulgate regulations regarding pesticide use; to issue permits for limited-use pesticides; investigate use of pest control chemicals; to prosecute violations or initiate license-suspension actions; and to cooperate with other agencies in environmental monitoring and protection.

ORGANIZATION: The Board of Pesticides Control is a quasi-judicial body made up of seven members appointed by the Governor for four-year terms.

Qualifications for three of the members are prescribed by statute to include persons knowledgeable about pesticide use in agriculture, forestry and commercial application, while one person must have a medical background and another be either an agronomist or entomologist at the University of Maine. The remaining two public members are selected to represent different economic or geographic areas of the State. The Board is served by a professional staff of 8 people.

NONPOINT SOURCE CONTROL PROGRAMS:

Registration The Board registers all products that may be sold and used within the State. When problems are known or anticipated, additional restrictions may be placed upon the use of the product. In the case of aldicarb contamination of groundwater, the Board has approved a special local needs registration which prohibits Temik use within 500 feet of a well. In addition, future Temik registration is contingent on the manufacturer's continued sampling of wells to show residues are continuing to decline as a result of changes in product labeling.

Certification and Licensing Applicators applying restricted use pesticides must be initially examined and licensed. Study materials provided to prospective applicators discuss effects of environmental contamination and these topics are also stressed at ongoing recertification training sessions.

Enforcement The Board's inspectors routinely conduct use investigations of all types of spray applications. Special emphasis is placed on being sure that spray is not directly applied to public waters, that pesticides do not drift into bodies of water, that anti-siphon devices are installed and that the areas around sprayer fill holes are kept clean.

Returnable Containers This is a special program to ensure that restricted use containers made of glass, metal or plastic are triple-rinsed and returned for proper disposal. It was implemented after aerial surveillance of farms showed that many containers were being discarded into wet or marshy areas bordering back fields.

Obsolete Pesticide Collection On three occasions, the Board has collected old pesticides from homeowners, growers and small business and delivered them to a hazardous waste contractor for disposal at out of state facilities. Additional funding is being sought so that more of these potential pollutants may be removed from the usually dilapidated buildings in which they currently reside.

MAINE DEPARTMENT OF CONSERVATION

PURPOSE: The Department of Conservation was established to preserve, protect and enhance the land and water resources of the State of Maine; to encourage the wise use of the State's scenic, mineral and forest resources; to ensure that coordinated planning for the future allocation of lands for recreational, forest production, mining and other public and private uses is effectively accomplished; and to provide for the effective management of public reserved lands.

ORGANIZATION: Three of the Department's sixteen organizational units deal specifically with the control of nonpoint source pollution. These units are the Land Use Regulation Commission, the Division of Forest Management and Utilization Forest, Management Section and the Maine Geological Survey.

LAND USE REGULATION COMMISSION

PURPOSE: The Maine Land Use Regulation Commission was established in 1969 to serve as the planning and zoning board for the unorganized areas of Maine which lacked local governments empowered to exercise local and land use controls. It is responsible for promoting the health, safety and general welfare of the people of Maine by planning for the proper use of the resources within its jurisdiction and guiding land use activities to achieve this proper use. The Commission's jurisdiction includes over 10 million acres in the northern and western parts of the State which occur in townships, towns and plantations which would otherwise have no local land use controls. The major responsibilities of the Commission are to prepare a comprehensive land use plan for these areas, to determine the boundaries of areas within the unorganized areas of the State that fall into the various land use districts (zoning); to prepare land use standards for each district; to review applications for development in the unorganized areas of the State; and to carry out an enforcement/compliance program.

ORGANIZATION: The Maine Land Use Regulation Commission is a bureau in the Department of Conservation. The Commission itself is made up of 7 citizen members appointed by the Governor. The Commission is served by a professional staff of 17 people.

NONPOINT SOURCE CONTROL PROGRAMS:

Land Management Regulations Standards are established for forest and agricultural management activities in Protection Districts (e.g., timber harvesting in shoreland areas) and land management roads outside of Protection Districts; permits are required to exceed these standards.

Shoreland Development Regulations Permits are required for shoreland development. Conditions relating to building setbacks, clearing along shoreline, etc. are incorporated into the permits. For some situations where it is believed that cumulative impacts of development will violate water quality standards, additional protective standards are applied.

Enforcement The Commission has an investigative enforcement staff of three persons to respond to complaints within an area equal to approximately one-half of Maine. The number of complaints reported to the agency has been increasing in recent years. As a result, more violations are documented each year than can be investigated and resolved. In addition, compliance surveys throughout the commission's jurisdiction indicate that the number of land use violations occurring of all types is substantially higher than the number of complaints recorded. The commission must rely primarily on voluntary compliance with regulations on forestry, agriculture and other activities.

Aquifer Recharge Areas Identified aquifer recharge areas are appropriately zoned to protect them. Due to incomplete resource information for the Commission's jurisdiction, only one such recharge area has been identified and protectively zoned.

Research The Commission had completed two studies of nonpoint source pollution problems from forestry operations, has contracted with the University of Maine to prepare an annotated bibliography on "Logging and Sedimentation", and is developing a research agenda for actual field studies in the Commission's jurisdiction to derive meaningful allowable sediment values to be used in regulations.

Education Publications have been prepared to assist loggers in avoiding nonpoint source problems (Erosion Control on Logging Jobs, in French and English) and training sessions are periodically held for loggers and foresters working for major timber land owners.

DIVISION OF FOREST MANAGEMENT AND UTILIZATION, FOREST MANAGEMENT SECTION

PURPOSE: The primary function of the Forest Management Section is to motivate and technically assist forest owners to properly manage their woodlands.

ORGANIZATION: The Division's Forest Management Section employs 9 professional staff who are involved to a limited extent with the control of nonpoint source pollution.

NONPOINT SOURCE CONTROL PROGRAMS:

Technical and Educational Assistance The 8 field foresters of the Forest Management Section provide technical and educational assistance to over 700 private, non-industrial forest owners each year. Included are recommendations for timber harvesting; road layout; timber stand improvement; tree planting; insect, disease and forest fire control; pesticide use; Christmas tree management; fuelwood management and compliance with conservation laws. Other assistance is given to municipalities, civic organizations, the University of Maine, schools, and State and Federal agencies.

Participation in Federal Cost-share Programs Technical assistance was provided by staff foresters to forest land owners being cost-shared through the Federal Agricultural Conservation and Conservation Reserve Programs. These programs are designed to control erosion on marginal farm land by the planting of cover crops, including trees.

MAINE GEOLOGICAL SURVEY

PURPOSE: The Maine Geological Survey was established to map, interpret and publish geologic (physical resource) information and provide advisory assistance to the minerals industry and interpretive information for planning and regulatory agencies. The Survey is authorized to direct a

program of effective geologic inventory, employing professional geologists for mapping purposes; to support an active minerals industry; to publish and sell geologic literature; to provide geologic information to the public, industries and State agencies; to cooperate with other State and Federal agencies; and to manage the work of the Mapping Advisory Committee.

ORGANIZATION: The Maine Geological Survey is composed of five divisions, two of which are involved in hydrogeological research related to protection of groundwater from nonpoint source pollution. These units are the Hydrogeology Division and the Cartography and Publications Division. Sixteen professional staff members are employed by the Maine Geological Survey.

NONPOINT SOURCE CONTROL PROGRAMS:

Hydrogeology Division This Division inventories ground and surface water conditions, with emphasis on groundwater supply and prevention of groundwater pollution. Studies are conducted by the Division in cooperation with the U.S. Geological Survey and the Maine Department of Environmental Protection. Water well records are obtained on a voluntary basis from drillers throughout the State. Maps depicting groundwater flow, yield and depth have been prepared for sand and gravel aquifers in the inhabited portions of the State. The Division has completed a study of yield and water quality of significant aquifers in southern, central and eastern Maine. The mapping is now in progress for Aroostook County. The study includes evaluation of land use over aquifers and its effects on groundwater quality. Use of the sand and gravel aquifer map series continues to be widespread. The maps are used by municipalities and the Department of Environmental Protection as guidance for improved protection of groundwater quality more than as guidance on where to look for high-yield groundwater supplies. With funding provided by the Maine Legislature, the Hydrogeology Division, in cooperation with other State agencies and the U.S. Geological Survey planned and carried out a study of pesticides in groundwater in Maine. The first two years of work have been completed and published.

Cartography and Publications Division This Division prepares and publishes the results of the Survey's geologic field investigations and research projects. The Division operates a cartographic production facility which includes a drafting section, a photographic darkroom, and a diazo reproduction center. The Division produces maps ranging from single-color diazo prints to multi-color printed geologic quadrangles.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

PURPOSE: The Department of Environmental Protection is charged by statute with the protection and improvement of the quality of our natural environment and the resources which constitute it, and the enhancement of the public's opportunity to enjoy the environment by directing growth and development which preserves for all time an ecologically sound and aesthetically pleasing environment. The Department advocates programs and regulatory decisions that contribute to the achievement of this mission.

The Department, through authority vested in the Commissioner and the Board of Environmental Protection, exercises the police powers of the state to prevent the pollution of the natural environment. It recommends to the Legislature measures for elimination of environmental pollution; grant licenses, and initiates enforcement actions. Its staff negotiates agreements with Federal, State and municipal agencies, administers laws relating to the environment and exercises whatever other duties that may be delegated by the Board.

ORGANIZATION: The Department of Environmental Protection is descended from the Sanitary Water Board, created in 1941, to study, investigate and recommend means of eliminating pollution and to prevent pollution of waters used for recreational purposes in the State. In 1951, it was renamed the Water Improvement Commission. The Commission was renamed the Water and Air Environmental Improvement Commission in 1967 when its duties were expanded to include air pollution.

On July 1, 1972, the Commission became the Board of Environmental Protection (BEP) and a new Department of Environmental Protection (DEP) was created, consisting of the Bureaus of Air Quality Control, Land Quality Control and Water Quality Control. A Bureau of Oil and Hazardous Materials Control was added in 1980 and a Bureau of Administration was added in 1987. The Board consists of ten members appointed by the Governor. In addition to the Department's main office in Augusta, regional offices are maintained in Bangor, Presque Isle and Portland.

BUREAU OF WATER QUALITY CONTROL

PURPOSE: The Bureau of Water Quality Control is responsible for reviewing the quality of Maine's waterways and reporting their best uses and recommended classifications to the Board of Environmental Protection. The Bureau's primary operative functions are to protect and improve the State's waters and ensure that their classifications are attained. Many of the activities of the Bureau are mandated by Federal laws and are funded through the Federal Clean Water Act. Federal funds for fiscal year 1987 included approximately $1.8 million of program grant funds to aid the Bureau in carrying out its responsibilities under both State and Federal laws.

ORGANIZATION: The Bureau of Water Quality Control has five divisions, the Division of Environmental Evaluation and Lake Studies, The Division of Licensing and Enforcement, the Division of Municipal Services, The Division of Operation and Maintenance and the Division of the Presque Isle Regional Office.

NONPOINT SOURCE CONTROL PROGRAMS:

State Coordinator for Control of Nonpoint Source Pollution

On July 9, 1987, Maine's Commissioner for Environmental Protection designated the Director of the Bureau of Water Quality Control's Division of Environmental Evaluation and Lake Studies to be the State Coordinator for Control of Nonpoint Source Pollution. As can be seen in this section on Current State and Local Programs for Control of Nonpoint Source

Pollution, any effective NPS Management Program must be both interagency and intergovernmental in nature. At this time, this position's major task is to coordinate the preparation of Maine's Nonpoint Source Assessment and Management Program. Once the Nonpoint Source Assessment and Management Program is approved by the USEPA Administrator, the NPS Coordinator's responsibilities will be twofold: (1) to coordinate implementation of the NPS Management Program and (2) to prepare addendums to the NPS Assessment and Management Program as more is learned about the nature, extent and causes of NPS pollution as well as the effectiveness of present and proposed Best Management Practices.

Maine Clean Lakes Program

The Bureau of Water Quality Control's Division of Environmental Evaluation and Lake Studies conducts an extensive program to protect and improve the quality of Maine's lakes and ponds. Four professional staff members are presently assigned to this program. The majority of Maine lakes have good water quality and provide a diverse resource for a variety of uses. The Maine Clean Lakes Program's principal strategy is to maintain current water quality conditions in lakes and ponds presently attaining their classification. The gravest threat to lake quality presently comes from increased residential and commercial development in the watersheds of lakes, though agriculture frequently continues to be a major nonpoint source of lake and pond pollution. The strategy to protect and improve the water quality of Maine lakes involves five objectives.

The first objective is to identify which lakes are most at risk to future water quality degradation. The tools used to identify potential problems include the Maine Vulnerability Index which predicts impacts from increasing development, the Volunteer Monitoring Program which identifies water quality trends, and the Lake Benthic Invertebrate Index which is sensitive to subtle differences in water quality.

The second objective is to further implementation of land use practices which minimize the discharge of pollutants to lakes and ponds. This is accomplished through providing technical reviews for the DEP's permitting process and through limited provision of technical assistance to municipalities. To reduce adverse impacts from nonpoint source pollution due to agriculture, forestry and road and ditch erosion, the program cooperates with the USDA's Soil Conservation Service and Agricultural Stabilization and Conservation Service, the Maine Soil and Water Conservation Districts, Maine's Land Use Regulation Commission, the Maine Department of Transportation and municipal road commissioners.

The third objective is to develop a broad base of support for lake protection. This is provided through educational programs for schools as well as information and education programs for the general public.

The fourth objective is to restore the water quality of problem lakes. Maine has had restoration projects on 12 lakes, 8 of which were supported by the Clean Water Act's Section 314 grants. Two additional lake restoration projects (Webber Pond and Threemile Pond) supported by the 314 program are currently underway. It is anticipated that 3 more restoration projects (China Lake, Chickawaukie Lake and Cross Lake), will begin when new 314 funds become available.

The fifth objective is to coordinate lake related policies within DEP as well as with other agencies and to be a technical resource for proposed legislation.

Sludge Management

The Bureau of Water Quality Control's Division of Municipal Services has assigned four persons 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 seventy 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 land fill capacity of because they 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.

Sludges other than those which quality 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 land fills, sludges classified as hazardous are shipped out of State to approved hazardous material disposal facilities.

Sand-Salt Pile Management

As of May 1986, 135 wells were known to have been contaminated in Maine due to the uncovered storage of road salt in sand-salt piles. One of these was the Sabattus municipal well, which was replaced at a cost of $123.000. Some of the other sand-salt pile sites which have impacted groundwater (with a number of wells affected) include the Maine Department of Transportation (DOT) lots in Freeport (8), Gardiner (6), Hermon (5), Jefferson (9), Rockwood (11), Turner (3), Unity (4), West Gardiner (6), and Winthrop (9) and municipal lots in New Gloucester (10) and York (18). The York site cost the town $300,000 in a legal suit and an estimated $550,000 will eventually be spent to run municipal water lines to affected homeowners. Other costs not easily quantifiable are the time and effort spent by State staff to evaluate the claims of affected homeowners, and to advise on the provision of alternative water supplies. There is also the cost of the salt lost through leaching from the uncovered sand-salt piles.

All these costs, and the nuisance they represent, caused a change in the State law regarding salt storage. Public Law #479, enacted in 1985, mandated that all sand-salt piles be covered by 1996 to prevent the generation of salty leachate from them. Exceptions are allowed if the piles are to be located adjacent to water bodies of such size or quality that the classification of that water body would not be violated by the discharge of salty leachate.

A registration of all sand/salt piles was also ordered by Public Law 479, and was completed in 1986, with about 800 municipal, DOT and private sites documented. This list was then prioritized, following visits to all sites by staff geologists, so that those sand-salt piles for which there was documented groundwater contamination would be covered first.

About 25 towns have gone ahead on their own with the covering of sand-salt piles, and the DOT has initiated a program to evaluate the cost, utility, and ease of construction of different types of buildings at several of their high priority sites. Funding for these and future buildings will be forthcoming from a bond issue passed by the electorate in November of 1987.

Future activities at the State level are chiefly concerned with the construction of sand-salt storage buildings. The DOT is preparing generic specifications for the buildings, while the DEP Bureau of Water Quality Control is preparing siting criteria. Work is still proceeding on revisions of the priority list, evaluation of well claims, and advising on replacement water supplies.

Technical Assistance to Municipalities

Three geologists in the DEP Bureau of Water Quality Control offer technical assistance services to municipalities for groundwater-related nonpoint source pollution problems. The purpose of this program is to assist town planning boards in assessing the potential groundwater impacts of development proposals submitted to them.

Assistance can be handled either in-house, or passed to a private consultant on retainer to the program as a result of a $50,000 appropriation from the Maine Legislature.

About 25 projects have been served by the program since its inception in June of 1986. Projects vary greatly in complexity and style. Some examples are as follows:

(1) Helping a town to plan a groundwater monitoring system.
(2) Assessing the impact of car wash wastes discharged to a septic system.
(3) Helping a town develop a plan to deal with salt water intrusion.
(4) Working with a Regional Planning Commission to write model ordinances making the assessment of septic waste impacts on groundwater more straightforward.

The program has been advertised in the Maine Townsman and copies of that article have been sent to all planning boards in the State. In addition, the DEP staff are beginning work on a handbook of guidelines for groundwater review. It will help planning boards when they are faced with a new type of development proposal.

In addition to this generalized program of technical assistance, the State Groundwater Coordinator is coordinating a pilot project in Lamoine, Maine to evaluate the effectiveness of providing intensive technical assistance to a municipality for the purpose of quantifying the relative vulnerability of groundwater throughout the municipality. Hopefully, this type of detailed (and expensive) technical assistance will facilitate local resource protection planning and result in adoption of a local groundwater protection ordinance.

Water Quality Management Planning Grants

The Clean Water Act Amendments of 1987 provide for a pass-through to regional planning organizations of 40% of 205 (j)(1) grant monies received by Maine for water quality management planning. The Bureau of Water Quality Control and the Maine Association of Regional Councils have agreed that planning activities related to the control of nonpoint source pollution should be funded with the pass-through grants. A competitive grant process is currently underway which will result in additional planning for the control of nonpoint source pollution in Maine.

Atmospheric Deposition The Bureau of Water Quality Control conducts an ongoing program to evaluate the aquatic effects of acidic atmospheric deposition. There are currently three major components to this program:

(1) The High Elevation Lake Monitoring (HELM) project sampled all 90 lakes in Maine above 600 meters elevation in 1986 and 1987. At least one summer sample and one fall overturn "index" period sample, were taken. The latter sample was for comparability to the EPA Eastern Lake Survey (ELS). The HELM study was designed to complement the statistically-based ELS in Maine, by sampling the lakes assumed to be the most sensitive to acidic precipitation. More than 10 percent of the group was acidic in 1986-87, compared to less than 1 percent for ELS sites.

(2) The Aquifer Lakes Study project identified and sampled a majority of the lakes in Maine that are on, or hydrologically associated with, aquifers. All of the lakes are "seepage-input" lakes, although some have outlets and are therefore not defined classically as "seepage" lakes. Sampling was conducted in 1986 and 1987, and included at least one fall "index" sample for each lake, for comparability to the EPA Eastern Lake Survey. These lakes are often of the "mounded-seepage" type, and are the most dilute lakes in Maine. Nearly one quarter of the approximately 140 such lakes in the study are acidic.

(3) The Tunk Mountain Watershed Project is the EPA funded site for the Long Term Monitoring Program in Maine. The project is operated by the University of Maine, in co-operation with the Maine DEP. The site includes 5 lakes in an approximately 400 hectare watershed. Two lakes are circumneutral, two are approximately pH 6.0, and one is acidic. Water quality chemical records exist on a monthly to seasonal sampling schedule since May, 1982.

Enforcement Inspectors in all divisions of the Bureau of Water Quality Control routinely conduct investigations in response to citizen reports on NPS pollution. Members of the Sludge management unit also conduct inspections to check compliance with permit conditions. The Bureau's resolves problems at the lowest level which is appropriate and to maximize the spirit of cooperation between the Bureau and the regulated community. By fostering voluntary compliance with statutes and regulations, unnecessary litigation is avoided and the overall effectiveness of the enforcement program is enhanced.

BUREAU OF OIL AND HAZARDOUS MATERIALS CONTROL

PURPOSE: This Bureau administers the State's oil and hazardous materials control programs, which include the following areas of responsibility.

(1) Emergency response for oil and hazardous materials spills;
(2) Regulation of all underground oil storage facilities;
(3) Licensing and inspection of hazardous waste facilities and transporters;
(4) Licensing and inspection of oil terminals;
(5) Investigation and clean-up of all uncontrolled hazardous substances sites;
(6) Enforcement of all oil and hazardous materials control laws;
(7) Management of the Maine Coastal and Inland Surface Oil Clean-Up Fund, the Ground Water Oil Clean-Up Fund, the Hazardous Waste Fund and the Uncontrolled Hazardous Waste Site and Underground Oil Tanks Bonds.

In addition, this Bureau provides staff support to the Advisory Commission on Radioactive Waste and the Board of Underground Oil Storage Tank Installers.

ORGANIZATION: In 1980 the Bureau was created by combining the Bureau of Water Quality Control's Division of Oil Conveyance Services and the Bureau of Land Quality Control's Hazardous Waste Unit. The Bureau has three divisions, the Division of Response Services, the Division of Licensing and Enforcement and the Division of Remedial Planning and Technical Services.

NONPOINT SOURCE CONTROL PROGRAMS

Division of Licensing and Enforcement

The Division maintains continuous oversight of the State's hazardous waste and waste oil facilities through the licensing, enforcement, and cleanup of sites.

The Division licenses over 100 hazardous waste and waste oil transporters. The Division maintains a close working relationship with its State Police counterpart to ensure compliance with State laws and rules by those who transport hazardous waste and waste oil in Maine. Joint DEP/State Police roadside checks are conducted to ensure that transporters are operating in compliance with applicable state requirements. In addition, over 7500 hazardous waste manifest shipping forms are received per year. Closure plans and licenses are also reviewed by Division staff to ensure that facilities are closed, sited, and operated only in acceptable manners. The Division coordinates with the USEPA to run a consolidated Federal/State permitting program.

The Division enforces the laws and rules administered by the Bureau and conducts inspections of hazardous waste, waste oil facilities, and underground oil storage facilities. The Division is responsible for the development and revision of hazardous waste and waste oil programs.

The Division conducts the cleanup of uncontrolled hazardous substance sites. Activities conducted at uncontrolled sites include preliminary assessments, investigations, remedial planning for cleanup, and remedial action. Sometimes circumstances require accelerated remedial measures at uncontrolled hazardous substance sites. This can result in the Division contracting for the removal of wastes from the site and the implementation of

emergency measures to protect the public health. The Division acts as the coordinating agency between the USEPA and communities involved in uncontrolled sites. This program is an on-going high priority effort to eliminate or reduce any danger posed by these uncontrolled sites to citizens of the State. To assess the effectiveness of uncontrolled hazardous waste site cleanups and the design and operational features of licensed facilities and closed facilities, the Division conducts a program of groundwater monitoring.

Division of Response Services

This division performs a critical function in Maine's nonpoint source control program. By providing emergency response to incidents of oil or hazardous material spills, prompt cleanup is initiated. In some cases, removal of contaminated soil is necessary to prevent water pollution. This division responds to nearly 1000 reports of spills each year. Integral to the division's ability to respond to sometimes life-threatening situations, comprehensive employee training is an ongoing activity. The division also sponsors a limited research program to improve procedures and clean-up techniques.

Division of Remedial Planning and Technical Services

A major function of this division is to provide technical support to groundwater cleanup projects at uncontrolled hazardous waste sites and sites of underground tank leaks. The division also reviews license applications for facilities where hazardous waste is stored prior to transport to a treatment or disposal facility. The division provides technical support to the Maine Radioactive Waste Commission and the Board of Underground Oil Storage Tank Installers and also develops regulatory programs for underground oil and hazardous material storage tanks.

Board of Underground Oil Storage Tank Installers

The Board of Underground Tank Installers was established to safeguard the public health, safety and welfare; to protect the public from incompetent and unauthorized persons who might otherwise make faulty installations of underground tanks; and to assure the availability of underground oil storage tank installations of high quality to persons in need of these services. The Board of Underground Oil Storage Tank Installers has established installation and certification procedures. Examinations are held which have resulted in the certification of over 200 tank installers. In addition, the Board conducts informational workshops throughout the state in conjunction with the Department of Environmental Protection.

BUREAU OF LAND QUALITY CONTROL

PURPOSE: The Bureau of Land Quality Control is responsible for administering seven environmental laws designed to protect and improve the quality of the natural environment and resources of the state. The state laws include: Site Location of Development Act; Great Ponds Act; Maine Waterway Development and Conservation Act; Maine Dam Inspection; Registration, and Abandonment Act; Coastal Wetlands Act and Sand Dunes Act; Mandatory Shoreland Zoning Act (administered jointly with the Land Use Regulation Commission); and the Solid Waste Management Act (includes non-hazardous solid waste, septage and sludge disposal).

ORGANIZATION: The Bureau has three division, the Division of Licensing and Review, the Division of Enforcement and Field Services and the Division of Technical Services. In addition, a Secretarial Services Unit exists which provides clerical services to the entire Bureau.

NONPOINT SOURCE CONTROL PROGRAMS:

Division of Licensing and Review The division prepares recommendations to the Board of Environmental Protection for; permit applications pertaining to the Site Location of Development Act, Alteration of Coastal Wetlands, Great Ponds Act, Freshwater Wetlands Act, Stream Alteration Act, Solid Waste Management Act, Statement of Consistency with Maine's Coastal Zone plan.

Division of Enforcement & Field Services This division is responsible for complaint resolution, compliance inspections, enforcement actions and public information. As Land Bureau representatives in the field, they also assist with application procedures, explain laws and regulations and serve as a general environmental information resource for the various regions. The Special Projects Unit provides support to the Bureau in various areas, particularly solid waste management issues. This unit is able to provide information to municipalities on disposal options and costs.

The recently formed Shoreland Zoning Unit is responsible for the oversight and administration of the Shoreland Zoning program on a state-wide basis. The unit is able to provide assistance to municipalities on shoreland zoning issues.

Division of Technical Services This Division provides geological, soils, and engineering support to the Bureau through application review and technical assistance. The Division consists of three geologists and three engineers in the Augusta office. The technical services staff reviews over 400 projects or applications per year, primarily in the areas of solid waste management and site location of development.

BUREAU OF AIR QUALITY CONTROL

PURPOSE: The Air Quality Control Bureau exists to carry out Maine air pollution law and the Federal Clean Air Act Amendments of 1977.

ORGANIZATION: Three divisions compose the Air Quality Control Bureau: the Division of Air Quality Services, the Division of Technical Services, and the Division of Licensing and Enforcement.

NONPOINT SOURCE CONTROL PROGRAMS:

Through its licensing, inspection and enforcement programs, the Bureau of Air Quality Control seeks to minimize the discharge of pollutants to Maine's air. These activities also serve to minimize the nonpoint source pollution of Maine's waters through atmospheric deposition from in-state sources. The bureau's participation in the National Acid Precipitation Program with its requirements for inventory of pollution sources is important for control of in-state sources. To evaluate the impact of long-range air pollution transport, the bureau participates in the National Atmospheric Deposition Program. This program monitors atmospheric deposition at three sites in Maine. All sites are monitored for pH and sulfate deposition. One site is also monitored for deposition of trace metals.

DEPARTMENT OF HUMAN SERVICES, DIVISION OF HEALTH ENGINEERING

PURPOSE: The Division of Health Engineering serves the State's resident and visitor population through a regulatory program which seeks to minimize environmental health hazards related to drinking water, bathing waters, food and radiation.

ORGANIZATION: Two of the division's five units, the drinking water program and the wastewater and plumbing control program, deal specifically with the control of nonpoint source pollution.

NONPOINT SOURCE CONTROL PROGRAMS:

Drinking Water Program

The Drinking Water Program provides surveillance of water quality and renders technical assistance to Maine's public water utilities. In 1976, the Department of Human Services accepted primacy for regulating community and non-community water supplies, as defined in the Federal Safe Drinking Water Act of 1974. Rules were adopted for the first time in 1977, and more frequent sampling of many additional water supplies is now required. The program's focus is primarily on water served to the general public for consumption. A secondary role is the interpretation of water analyses for the private sector.

In the public sector, the Drinking Water Program staff monitors the water quality of approximately 400 community supplies which serve residential users, and approximately 2,500 non-community supplies which serve transient populations throughout the year. The Drinking Water Program is also responsible for overseeing local programs to protect both groundwater and surface water public water supplies from nonpoint pollution sources in their watersheds.

New surface water supplies must include plans for the protection of their watershed and the identification and location of all potential sources of nonpoint source pollution which could impact the quality of the water supply. These include but are not limited to sanitary land fills, dumps, oil storage facilities, chemical storage facilities, septage disposal areas, spray irrigation areas, farming operations which utilize large amounts of pesticides, all enterprises which require hazardous waste permits, major industries, highway commonly used in the transport of hazardous materials, and any appropriate zoning delineations.

Areas within 200 feet of the intake of a surface water supply must be land-use restricted by means of deed, easement, or other legal document. A sanitary survey of the watershed is conducted at reasonable intervals to monitor potential threats to the water supply.

For groundwater sources, the local water utility is charged with the responsibility of determining the appropriate protection zone, based on the well's cone of influence and aquifer recharge area. The utility must then control the land uses within that area. In the case of a bedrock well, the protection zone shall be no less than a three hundred (300) feet radius with the well at the center of the circle.

Initial development of the State's Wellhead Protection Program as authorized by the 1986 Amendments to the Safe Drinking Water Act (SWDA) is currently underway. This effort is designed to further protect wellhead areas supplying public water supply systems from contaminants that may have any adverse effect on human health. The Groundwater Standing Committee, currently has lead agency responsibility for the development phase of the Wellhead Protection Program. The Department of Human Services' Drinking Water Program will assume lead agency status beginning with the implementation phase in FY 1989.

Wastewater and Plumbing Control Program

The Wastewater and Plumbing Control Program dates back to 1933 with the adoption of the first plumbing code for interior plumbing. Septic tanks, cesspools, and direct discharges were first addressed in the Maine Plumbing Code in 1941. Today, under legislation adopted in 1973, the program (1) promulgates rules to establish minimum statewide standards for subsurface wastewater disposal and internal plumbing; (2) assists each town in Maine to administer a municipal plumbing control program providing technical assistance and record-keeping services; and (3) reviews all subsurface wastewater disposal systems designed to treat more than 2000 gallons of wastewater per day. All municipal plumbing inspectors are examined and certified under program auspices. The program staff also examines and licenses professionals who design subsurface wastewater disposal systems. In cooperation with the Plumber's Examining Board and municipal plumbing inspectors, the staff is responsible for assuring that all plumbing and subsurface wastewater disposal systems in Maine do not create a public health, safety, or environmental hazard.

MAINE DEPARTMENT OF TRANSPORTATION

PURPOSE: The Department of Transportation (DOT) was established to plan and develop adequate, safe and efficient transportation facilities and services which will contribute to the economic growth of the State of Maine and the well-being of its people. Maine has 22,000 miles of public roadway, of which the DOT is responsible for about 8,700 miles. The DOT maintains 2800 out of 4735 public bridges.

ORGANIZATION: Units of two of the Department's five bureaus deal specifically with the control of nonpoint source pollution. These Bureaus are the Bureau of Project Development and the Bureau of Maintenance and Operations.

BUREAU OF PROJECT DEVELOPMENT

PURPOSE: The primary responsibility of the Bureau of Project Development is to develop the Department's capital improvement projects, once funding has been approved, through to construction completion. Certain Divisions within the Bureau; primarily Location and Environment, Technical Services, and Right-of-Way. also serve the Department and the public in non-project-related activities according to their particular expertise.

ORGANIZATION: Four of the bureau's six divisions deal specifically with the control of nonpoint source pollution. These are the Divisions of Location and Environment, Design, Construction and Technical Services. Each serves the major goals and responsibilities of the Bureau with some activities directly in support of the other Project Development Divisions. Also, demands are placed upon these divisions for services by other units of the Department, other State agencies and the public.

NONPOINT SOURCE CONTROL PROGRAMS:

Construction Division

This division is responsible for constructing projects as they are developed including appropriate measures to minimize adverse environmental effects. This responsibility includes avoidance of excessive erosion and siltation, damage to adjacent property, and the reestablishment of vegetation in disturbed areas. Contracts for construction projects contain Special Provisions which may require the Contractor to include steps or considerations in his work schedule to minimize potential environmental impacts. On such projects, representatives of both the Design Division and the Location and Environment Divisions and appropriate Federal and State agency representatives are invited to a project preconstruction conference. As work progresses, such representatives may periodically visit the construction site to evaluate the success of mitigation measures and procedures applied. Reviews may be made of other projects when there is a particular interest in environmental concerns such as erosion control, stream alteration, borrow pit rehabilitation, etc.

Design Division

This division is responsible for the actual design of highway and bridge projects. The Design Office Engineer is responsible for specifications, permits, contracts, and project bid advertisements. The DOT's Standard Specifications and Standard Detail Plan Sheets address routine environmental concerns. Special conditions are added, when necessary, to address special environmental situations. The Highway Section develops design plans, quantities, and estimates for highway projects. The Bridge Design Section develops the design plans, quantities, and estimates for bridge projects. Following the approval of the design concept, the Design Division completes final design of the project. Refinements are made including incorporation of additional measures to minimize environmental effects and to respond to concerns expressed by abutting property owners, Federal and State agencies, and the public. Designers review available documentation of all identified environmental issues and concerns related to the project. The Location and Environment Division advises the Design Division in regard to environmental resources and associated concerns. The Design Division then addresses these issues and obtains necessary Federal and State permits. Projects that require Great Pond, Stream Alteration, or Wetland permits from the Maine Department of Environmental Protection are reviewed for their potential effects on water quality and receive a Water Quality Certification as part of the same permit application process.

Location and Environment Division

This division is responsible for conducting field surveys, location and environmental studies, air quality and noise analyses, well claims, landscape design, and providing information required by other divisions for the project development process. Specifically, the Environmental Services Section, initially through its Environmental Planning Unit and Environmental Studies Group, is responsible for evaluation of potential environmental impacts and for developing recommendations concerning environmental protection and mitigation measures as well as for environmental monitoring when appropriate.

In 1980, the Environmental Services Section started a four-year project to conduct an environmental survey of each of its sand-salt storage sites. The DOT has about 147 such sites located throughout the State. Examples of data collected include surface and groundwater quality, site setting, drainage patterns, vegetation damage, development trends, possible sources of water contaminants, aesthetic impacts, condition of salt storage buildings, land use conflicts and erosion and sedimentation. From this data, recommendations were developed for each existing site concerning its management for appropriate environmental protection, mitigation, and improvement measures. Input as solicited from a variety of sources and disciplines in addition to DOT's Bureau of Maintenance and Operations personnel. This survey and its recommendations allow development of site criteria for new facilities and enable managers to gain a statewide perspective of the sand-salt storage situation and set priorities.

The Well Claims Group supports transportation investment and maintenance programs by investigating claims of damage to private water supplies. Pursuant to Public Law 479, enacted in 1985, which mandates that all sand-salt piles be covered the DOT began prioritizing its 147 salt storage locations. This effort coincided with the DEP program to prioritize all municipal, State, and private stockpiles. DOT was able to supply DEP with detailed information for each State facility and is currently working in conjunction with DEP to update and modify the priority list as new information is reported. In addition, the DOT priority system allows its engineers to focus on the most severe cases which are treated equally along with less severe cases under the DEP priority system. A similar priority list is being developed by the DOT for replacement of its underground storage tanks at maintenance lots. Such a list will help identify tanks in the most environmental sensitive locations. The DOT also has a program that has been in place since 1969 for compensating homeowners whose wells are contaminated by sand-salt piles and road salt application. In the past 4 years, the Department has received 50 claims alleging salt contamination. About half of these claims were found valid and the homeowners were compensated for their loss. The Department continues to monitor ground and surface water at many of the maintenance lots where problems have occurred or are suspected. This monitoring program is being expanded and will eventually include all Priority I sites with new sand-salt storage buildings. In addition, the Well Claims Groups is responsible for monitoring surface waters that may be affected by highway construction activities.

The Landscape Architective Group has a shared management role with the Bureau of Maintenance and Operations for the Department's vegetation management program. This involves a targeted chemical spray program which advocates the application of a cost effective and safe dilute spray mix (a maximum of 1/5 gallon of herbicide applied per roadside mile; one of the lowest herbicide application rates in the U.S.) applied selectively to specific roadside plants. Trained, licensed applicators protect environmentally sensitive areas, such as dooryards, gardens, livestock areas, and drinking water supplies, by leaving no-spray buffer zones. The Department is receptive to public concerns over roadside spraying and attempts to aggressively manage its spray program with those concerns in mind. Pre-application public notification is made via the media. The DOT has instituted an ongoing health safety surveillance program for its spray crews. Risk assessments are performed under contract by a Maine health data analysis and research firm. The findings are utilized in selecting safer materials, improving risk management, and in efforts to avoid creation of any long-term environmental hazards. Residue monitoring is routinely conducted for all types of spray pesticide applications. Special emphasis is placed on being sure that spray is not directly applied to public waters and that pesticides do not drift into bodies of water. Additionally, the Landscape Architective Group makes project loaming and seeding recommendations, designs and inspects landscape plantings, conducts agronomic research, provides erosion control training and reviews erosion and sedimentation specifications and plans for the Department.

Technical Services Division

The Technical Services Division is responsible for providing support services to the operating divisions of the Department. The primary services are research and development, geotechnical investigations and design, field and laboratory testing, and technology transfer activities. The Division evaluates and investigates new products and procedures and has the responsibility of introducing innovative techniques to the operations of the Department. The seven different sections of the Division conduct research studies, perform field, physical and chemical laboratory testing of various materials including hazardous materials and waste. They also provide geotechnical services, such as soils reports, drainage studies, acceptance control and quality assurance services for practically all products used in constructing projects for the Department. The Division administers the Department's pavement management process and provides design, construction, and maintenance support for items such as bituminous asphalt and concrete. It also conducts problem solving and research studies including studies relating to environmental issues such as the pilot study on "Soil and Water Monitoring of Herbicide Residues", "Evaluation of Both Traffic and Bridge Paints" to provide enhanced environmental features, and the "Determination of Levels of Free Cyanide in Surface and in Ground Waters Affected by DOT Salt Storage Facilities".

BUREAU OF MAINTENANCE AND OPERATIONS

PURPOSE: The responsibilities of the Bureau of Maintenance and Operations are the summer maintenance of 15,931 lane miles of State and State-aid highways, the winter maintenance of 8,527 lane miles of State highways, the maintenance of 2,800 bridges on State, State-aid and town

highways; the coordination of the State-aid highway construction program; the maintenance and installation of traffic control devices and State and State-aid highways; the management of an equipment fleet for the Department of Transportation; the Overlimit Permit Statute; management of the Department's communication system; and the maintenance of safety rest areas.

ORGANIZATION: Three of the bureau's four divisions deal specifically with the control of nonpoint source pollution. These are the Division of Highway Maintenance, the Division of Bridge Maintenance, and the Division of Traffic Engineering.

NONPOINT SOURCE CONTROL PROGRAMS:

The bureau's maintenance forces monitor all State-maintained highways for flooding or erosion problems. Any required corrective action is usually performed as a maintenance activity, but may be included in a subsequent construction project.

Bridge Maintenance Division

This division is responsible for the maintenance and operation of approximately 2800 bridges. Routine maintenance includes the removal of winter sand, bridge flushing, touch-up painting, steel and concrete repair, and channel maintenance. In particular, bridge painting has been a major focus on several structures. Maintaining the paint system on major structures is considered a high priority and is essential to extend their service lives. Measures have been implemented on sensitive projects to control atmospheric and aquatic deposition of silica, paint, and solvents. Major bridge repair or replacement efforts involve the implementation and maintenance of appropriate soil erosion and sedimentation controls.

Highway Maintenance Division

This division is responsible for summer maintenance, winter maintenance, and safety rest area programs. Road resurfacing is this division's major summer maintenance activity. During a recent summer, 269,134 tons of asphalt mix resurfaced 605 miles of roadway. Roadside summer maintenance activities such as ditching involve the implementation of appropriate soil erosion and sedimentation control devices and methods. Each maintenance division now has a hydroseeder available for vegetative establishment and long-term erosion control. The Department's roadside vegetation management program includes annually applying EPA-approved herbicides to over 11,000 roadside miles. The quality elements of the spray program include: 1) no-spray agreements, 2) public notification, 3) chemical risk assessments, 4) employee health monitoring, 5) buffer zones, 6) identification of environmentally sensitive areas, 7) applicator training and monitoring, and 8) low dose application of herbicides. During the past 9 years, spray complaints have declined from a high of 20 complaints per day to 2 per month.

For winter maintenance, approximately 3600 centerline miles of highways were plowed and sanded by State forces. Approximately 40,000-60,000 tons of pure salt are used by the DOT annually. A portion of this is applied

to the highways as pure salt and the rest is used to prepare approximately 400,000 cubic yards of sand-salt mixture (80-120 pounds pure salt per cubic yard sand). The pure salt mixture is applied at a per application rate less than 1/5 ton per centerline mile and the sand-salt mixture is applied at a per storm rate of 1 cubic yard per centerline mile. These rates of salt application are the lowest of any State Highway Agency in New England. In order to limit salt runoff, pure salt is stored in salt sheds and sand-salt piles are being covered throughout the State as money is made available. The Department has initiated a prioritized program to evaluate the cost, utility, and ease of construction of different types of sand-salt storage buildings at all of the various DOT sites. In addition, the Department is preparing generic specifications for the construction of sand-salt storage buildings by local communities. Funding of these future buildings will be forthcoming from a bond issue passed by the voters in November 1987.

The Highway Maintenance Division and the Motor Transport Service are presently in a joint effort to test and/or replace approximately 550 underground fuel storage tanks to comply with recent regulations governing the underground storage of petroleum products.

Traffic Engineering Division

This division designs, installs, and maintains traffic control devices. As such, this division is responsible for the proper storage, use, and application of paints and solvents. In a recent year, 140,000 gallons of paint were used to apply centerline and edgeline pavement markings on the Interstate System and approximately 6000 miles of conventional highways.

MAINE STATE PLANNING OFFICE

PURPOSE: The State Planning Office was established to strengthen the planning and management capability at all levels of government by assisting in identifying current problems and opportunities, providing guidance for economic, social and physical development of the State, providing a framework for and assisting regional and metropolitan planning, and reviewing and coordinating federal, State, regional and local planning activities.

Responsibilities of the State Planning Office include providing assistance to the Governor and the Legislature in identifying long-range goals and policies for the State and coordinating the preparation and revision of development and conservation goals for the State.

ORGANIZATION: The State Planning Office was established by statute in 1968 as an agency of the Executive Department. The office's present internal organization was established administratively in 1987 and consists of three divisions: Natural Resources Policy, Economics and Management.

NONPOINT SOURCE CONTROL PROGRAMS

The State Planning Office's efforts to control nonpoint source pollution are coordinated by the Council on Maine's Environment.

The fundamental task of the Council is to advise the Governor, the Legislature, and State agencies in the formulation of policies to direct the planning for management of Maine's land and water resources to achieve State environmental, economic, and social goals. The current council membership is twelve: The Commissioners of the Departments of Conservation, Environmental Protection, Marine Resources, Inland Fisheries and Wildlife, agriculture, Human Services, and Transportation, The Directors of the State Planning Office, the State Development Office, and the Office of Energy Resources, the Maine Association of Regional Councils, and the Vice-President for President for Research and Public Service of the University of Maine.

State, Federal, regional and local agencies as well as private organizations are invited to interact and cooperate with the council in fulfilling its mission. Representatives from the United State Geological Survey, the Legislative Office of Policy and Legal Analysis, and the Natural Resources Council of Maine participate regularly. The current work program of the Council on Maine's Environment includes the following activities:

Growth Management New England as a whole, Maine included, has been blessed with a resurgent economy in the 1980's. Economic growth is necessarily accompanied by land development - residential, commercial, and industrial. There is developing a general consensus that the pace of growth has outstripped the capacity of our State and local laws and institutions to effectively manage this development to assure the health, safety and welfare of the public. The cumulative impacts of incremental development, including impacts on surface water and groundwater, seem to be not adequately addressed by our current State laws. Local resources and existing local ordinances are also proving inadequate. The problem is most acute in York and Cumberland Counties and along the coast. In total, this rapid growth is impacting the State's valuable natural resources. It is changing the character of the State and, in some cases, negatively affecting the very quality of life that draws people and businesses to the State.

In 1986, the Council funded a State Planning Office study on the cumulative impacts of growth. The study was completed in September 1986, and resulted in a State Growth Management Proposal. This proposal is still being studied by the Executive Department and the Maine Legislature with the goal of developing statutory remedies for the cumulative impacts of growth.

Groundwater Issues of land use controls for groundwater protection are interlocked with the larger growth management issue. Because the programs and activities of so many Council agencies involve groundwater - either through impacts, such as the activities of Department of Transportation and Department of Agriculture Food and Rural Resources, or through regulations such as at Department of Environmental Protection and Department of Humans Services - it is a natural issue for Council attention and has been the focus of the Council's committee and coordination efforts for the past six years. It is clearly a high priority issue for the people of the State, many of whom rely on groundwater for drinking water supplies.

In 1985, a State Groundwater Coordinator was hired to staff the Council's Groundwater Standing Committee, which is charged with implementing the State Groundwater Policy. The Groundwater Standing Committee represents the State Planning Office, the Departments of Environmental Protection, Conservation, Human Services, Agriculture, and Transportation, the University of Maine Land and Water Resources Center, and the Maine Association of Regional Councils. The Groundwater Standing Committee tasks include:

(1) assessing priorities in the groundwater management program;
(2) assuring the cost-effective allocation of funding and staffing resources within State agencies involved in groundwater management; and
(3) advising the Governor, the Legislature, and State agencies on sound groundwater protection and management policies and programs.

The Groundwater Standing Committee meets at least quarterly to address proposals and new developments and to provide direction for the groundwater management effort. The day-to-day activities of the Committee are carried out by the State Groundwater Coordinator. The Coordinator assists in the implementation of groundwater programs and ensures program coordination among State agencies. He provides a statewide focus for communication and education efforts for a rapidly increasing number of organizations and citizens seeking information and assistance regarding groundwater issues. The Coordinator also tracks Federal groundwater legislation and programs and provides a consistent State voice in Federal decision-making procedures. He acts as Maine's representative to national and regional groundwater management conferences.

Data management Natural resources data management has been a Council concern since its formation. The Executive Orders establishing the Council charge it to "define information needs, standards, and relative priorities for data collection, and investigate the increased use of data processing systems to expedite information storage and retrieval."

Since the original Executive Order was issued, the Council has sponsored several data management studies and computerization and data gathering have grown at a rapid pace among the natural resources agencies. In the midst of the information age, the State's natural resources data management capability remains woefully inadequately.

In the past year the Council's Data Management Committee has contracted for data management studies in the Natural Areas Management and the Groundwater Management programs. These studies will serve as guides for data management programs in other natural resources areas. The Groundwater Data Management Study is a three-phase project. The first phase identified the State's current capabilities and current and anticipated needs. The second phase identified feasible data management systems that would address these needs. The third phase will involve system selection, financing, and implementation.

MUNICIPAL CODE ENFORCEMENT OFFICERS:

PURPOSE: Code enforcement officers are appointed by municipalities to enforce municipal ordinances.

ORGANIZATION: Most Maine towns employ one person, often on a part-time basis, to perform the duties of Code Enforcement Officer (CEO). In some towns, the CEO is aided by a Licensed Plumbing Inspector and/or Assistant CEO. In Maine's cities, a CEO may supervise the activities of a number of specialists (e.g. Electrical Inspector). Two programs that control nonpoint sources of pollution - septic system permitting and shoreland zoning - are generally administered by local code enforcement officers. Septic system permitting is explained in detail in the Maine Department of Human Services, Division of Health Engineering section.

NONPOINT SOURCE CONTROL PROGRAMS:

Shoreland Zoning

A shoreland zoning program specifying minimum performance standards is mandated by the State and administered as such by 143 Maine communities. The remainder of Maine's 491 municipalities administer self-designed shoreland zoning ordinances which are as strict or stricter than the State-designed program. The purposes of shoreland zoning are to further the maintenance of safe and healthful conditions; to prevent and control water pollution; protect spawning grounds, fish, aquatic life, bird and other wildlife habitat; control building sites, placement of structures and land uses; and conserve shore cover, visual aesthetics and natural beauty.

Base shoreland zoning provides for construction setback and clearing and filling restrictions within 250 feet of certain bodies of water. Although pre-existing, non-conforming uses are allowed to remain in use, no expansion or replacement is allowed without a permit. Many communities have expanded their shoreland zoning ordinance to address septic systems, surface water runoff, density of development, and other water quality concerns in a comprehensive manner.

Some Maine towns have extended the water protection concept embodied in shoreland zoning to other parts or the whole of the town. Protection regulations regarding chemical storage, underground tank siting, and other potential sources of contamination may be addressed in this way. Most often, it is the Code Enforcement Officer and/or planning board who oversees these efforts in the community.

MUNICIPAL CONSERVATION COMMISSIONS

PURPOSE: A conservation commission is a municipal advisory board which may be created by a town, city or plantation through its legislative body (i.e. town meeting or city council). The commission has certain statutory duties, but it may also undertake a variety of other environmental, recreational and land use planning functions. Some have called conservation commissions "the environmental conscience of the community". In many municipalities it may be this role more than any other that can provide commission members with a continued sense of purpose.

ORGANIZATION: Maine's Municipal Conservation Commissions are established at the option of the municipality. About 130 of Maine's 491 municipalities currently have active conservation commissions. The commissions consist of 3 to 7 members appointed by the municipal officers.

NONPOINT SOURCE CONTROL PROGRAMS:

Each Commission conducts research and gives advice (often to the Municipal Planning Board) as to the protection, development and use of the natural resources located within the territorial limits of the town. It seeks to coordinate its activities with existing municipal agencies, commissions, departments, and conservation bodies organized for similar purposes. It prepares and keeps an index of all open areas, publicly or privately owned, within the municipality including, but not limited to, open marsh lands, swamps, and other wetlands for the purpose of assimilating and retaining information pertinent to the proper utilization, protection and potential development or use of such open areas and may recommend to the municipal officers or others, a program for the better utilization, protection, development or use of such areas.

Surface Water Protection

Depending upon the interest and energy of those who serve on the conservation commission, they can be a potent force in the control of nonpoint source pollution. A Conservation Commission member's involvement in nonpoint source control may be as simple as calling the Municipal Code Enforcement Officer's attention to what he or she believes is unacceptable erosion on a construction site. One Conservation Commission in Maine recently conducted a water quality monitoring project to identify sources of soil erosion which were muddying an otherwise scenic river.

Groundwater Protection

The Maine Association of Conservation Commissions (MACC) believes that groundwater protection is one of the most pressing environmental and public health concerns facing Maine today. Discoveries of polluted groundwater supplies are growing at an alarming rate, as is the realization that a wide diversity of pollutants are involved. Heightened concern has led to a growing awareness that Maine and much of the nation lacks the data to determine what groundwater is polluted or at risk of becoming polluted. This lack of information frustrates preventative action.

MACC has addressed this information gap and assisted the State in confronting groundwater contamination in a comprehensive and directed manner. A program has been implemented to increase public awareness on groundwater protection through education and provision of technical assistance to selected municipalities to support municipal inventories of existing and potential threats to groundwater supplies. The inventories focused primarily on the identification of abandoned underground fuel tanks as well as potential sources of hazardous waste contamination.

The project represented the third phase of MACC's groundwater protection effort. The first phase was the publication of several educational booklets and articles and a series of seminars conducted in the early 1980's. The second phase, financed by the Fund for New England, was the preparation of a handbook entitled "Groundwater Quality: A Handbook for Community Action". This publication outlines a process by which a

community can conduct an inventory of sites to identify those that may contain substances that threaten groundwater quality. In the third phase, MACC used its handbook to encourage and guide detection and prevention activities at the local level.

MUNICIPAL PLANNING BOARDS

PURPOSE: A planning board may be created by a town city or plantation through its legislative body (i.e. town meeting or city council. Its primary function is to undertake planning tasks which would otherwise be the responsibility of the municipality's principal officers (i.e. selectmen or councilors).

ORGANIZATION: Maine's Municipal Planning Boards are established at the option of the municipality. About 400 of Maine's 491 municipalities currently have active planning boards. The boards consist of 5 to 12 members who are either elected or appointed.

NONPOINT SOURCE CONTROL PROGRAMS:

Actions range from review of subdivisions, commercial and industrial construction, erosion control plans and chemical storage, to implementation of zoning, inspection, land acquisition, and other protection programs. As planning boards expand their activities, demands for technical assistance from State, regional and private consultative services also grows. The roles of all those involved are evolving and far from clear at present.

Specific laws apply to review and regulation of subdivisions (30 MRSA, Sec. 4956), the development of comprehensive plans (30 MRSA, Sec. 4961) and zoning ordinances (30 MRSA, Sec. 4962). The extent to which these powers are employed is limited only by the technical abilities and time available of members of the board and the resolve of the town to defend its efforts before judicial challenge. Many Maine planning boards are only now beginning to realize what potential functions they may provide. This realization has led to a wide diversity in planning board attempts to control water pollution across the State. Some planning boards do no more than hope that the State's water protection programs will protect their resources. Many now conduct a much more active and in-depth review of actions potentially dangerous to their water resources.

REGIONAL PLANNING ORGANIZATIONS

PURPOSE: Regional Planning Organizations in Maine have various types of names (e.g. Councils of Governments, Regional Planning Commissions, etc.) but are collectively known as Regional Councils. Maine's Regional Councils have been established to:

(1) Provide technical assistance for municipal planning projects including the preparation of draft ordinances.

(2) Provide a forum for local officials to exchange ideas, express views, and work with State and Federal officials to improve intergovernmental responsibilities and set priorities for public investments.

(3) Provide assistance to local officials in understanding and implementing state programs.

(4) Assist State and local governments in identifying effective services to local governments.

ORGANIZATION: The State of Maine presently has ten Regional Councils. These organizations provide planning assistance to 369 of the 491 municipalities in the State. The full time staff employed by Maine's Regional Councils range from 4 to 32.

The 10 organizations in the State that are designated Regional Councils are:

(1) Androscoggin Valley Council of Governments
(2) Eastern Mid-Coast Planning Commission
(3) Greater Portland Council of Governments
(4) Hancock County Regional Planning Commission
(5) North Kennebec Regional Planning Commission
(6) Northern Maine Regional Planning Commission
(7) Penobscot Valley Council of Governments
(8) Southern Kennebec Planning & Development Council
(9) Southern Maine Regional Planning Commission
(10) Washington County Regional Planning Commission

NONPOINT SOURCE CONTROL PROGRAMS:

Technical Assistance

The Regional Councils have offered technical assistance through a variety of projects. This was accomplished in one Region through a project that produced 44 maps for member towns that depicted the location of known threats to groundwater and surface water (eg. underground storage tanks, sand-salt piles, land fills, hazardous waste activities etc.)

Another example of technical assistance is the development of "Best Management Practices to Minimize Discharges of Pollutants on Construction Sites" which is presently being done by another Regional Council. This will be a technical reference for contractors and town officials.

Advisory Activities

Regional Councils have recently worked to advise municipalities on planning for control of nonpoint source pollution including draft ordinance preparation. The Regional Councils work closely with their respective Water Quality Advisory Committee which were established in the last few years through a cooperative effort between the Regional Councils and the Maine Department of Environmental Protection.

A couple of the State Regional Councils have also created a "Technical Advisory Committee" to bring various local and regional expertise into the water quality improvement process.

Recently a Regional Council produced a handbook ("Protection for Private Wells") to be used as an advisory planning tool for ordinance development purposes. The handbook was published and sent to interested towns throughout the state. The demand for this booklet appears to be very widespread and many positive comments have been given its authors.

Educational Activities

One long-term project that a Regional Council has undertaken has proceeded to an educational phase. The project deals with aquifer protection and involved an extensive data gathering process. In the last few months the Regional Council, in cooperation with the Maine Department of Environmental Protection completed an impressive educational program in the region at schools, town meetings, and workshops. The educational effort was well received and praised from individuals and group that were involved.

A project that was discussed earlier ("Best Management Practices for Minimizing Discharges of Pollutants from Construction Sites" also has an educational component that will be useful to town officials. The end result of this effort will hopefully be less NPS pollution from construction activities and protection ordinance development.

A management plan for lake watersheds is being developed by another Regional Council. This may be used in other areas of the State as a model and a educational tool for local watershed ordinance development. This same Regional Council has produced a pamphlet ("For Your Lakes Sake") to be distributed to interested groups and individuals.

SOIL AND WATER CONSERVATION DISTRICTS

PURPOSE: Maine's 16 Soil and Water Conservation Districts (SWCD'S) were established to provide for the protection, proper use, maintenance and improvement of the soil, water and related resources of the State of Maine. The Districts identify soil and water conservation problems, develop programs to solve them, and enlist and coordinate help from all public and private sources in carrying out programs to solve problems.

ORGANIZATION: Soil and Water Conservation Districts are legal subdivisions of State government, responsible under State law for conservation work within their boundaries just as townships and counties are responsible for roads and other services and school districts are responsible for education. Maine's 16 Soil and Water Conservation Districts cover virtually all of the privately-owned land in Maine, except for portions of Maine's unorganized territory. District boundaries are usually drawn along county lines. One county, Aroostook, has three Districts, while two Districts include two counties. Maine's 16 Soil and Water Conservation Districts are:

* Androscoggin Valley SWCD
* Central Aroostook SWCD
* Cumberland County SWCD
* Franklin County SWCD
* Hancock County SWCD
* Kennebec County SWCD
* Knox-Lincoln County SWCD
* Oxford County SWCD
* Penobscot County SWCD
* Piscataquis County SWCD
* St. John Valley SWCD
* Somerset County SWCD
* Southern Aroostook SWCD
* Waldo County SWCD
* Washington County SWCD
* York County SWCD

Each of Maine's 16 Soil and Water Conservation Districts is managed by five local citizens who know area problems. These five members are the governing body and are called the Board of Supervisors. Three are elected by cooperators within the District and two are appointed by the State Soil and Water Conservation Commission.

NONPOINT SOURCE CONTROL PROGRAMS:

The working arrangements that SWCD's have with Federal and State agencies, institutions, groups, and private landowners provide a mechanism to achieve land and water quality goals. Maine's Soil and Water Conservation Districts share the recent concerns of environmental agencies about reducing water pollutants from agricultural enterprises.

The responsibilities of each SWCD's Board of Supervisors are to plan and direct the program, obtain assistance, coordinate the help of government agencies, assign priorities to resource development tasks, and serve as a community clearinghouse for information and services.

District Supervisors inventory resource needs and problems and, using public and private assistance, analyze agricultural, economic, and other trends. This inventory forms the basis for a long-range plan of action that records the facts about local resources and outlines what must be done to correct problems and develop resources for wider and better use.

To meet these goals, Districts work in two ways: (1) they provide technical assistance to individual landowners in planning and installing scientific land use and treatment systems and (2) they initiate and carry out project type programs as required. Districts also participate actively in group projects and regional resource development programs that benefit citizens in widespread areas. These include watershed projects, economic development projects, river basin development, comprehensive planning and environmental improvement programs.

These programs are important because through demonstration and subtle persuasion they encourage land-users to adopt best management practices (BMP's). The major problems dealt with in almost all of Maine's SWCD programs are sedimentation, erosion, and animal waste management. All of these problems affect water quality and all solutions to these problems improve water quality.

Soil and Water Conservation Districts, in addition to their own resources, rely on the personnel and facilities of the USDA Soil Conservation Service (SCS) for trained manpower. Several other Federal agencies provide services, including resource-oriented agencies of the United States, such as those in the Departments of Agriculture and the Interior.

Districts have entered into written memorandums of understanding with individual landowners and cooperating State and Federal agencies. These documents spell out goals, working relationships, and how each partner will function. Basically, SWCD assistance in conserving or developing soil and water or related resources is based on the following major elements:

Public Information and Education Assistance Informing and educating the public about resource management through the media, schools, civic forums, and other organizations.

Inventory and Evaluation Assistance Providing basic inventory data, such as soil surveys, hydrologic data, vegetative information, and other technical data and interpretations and evaluations of these data.

Planning Assistance Providing technical assistance to land users in determining alternative land uses and treatment needs and assisting in development of a conservation plan reflecting the specific land use and treatment decisions.

Application Assistance Providing technical assistance to cooperating land users to help them install planned conservation practices which include engineering and vegetative measures. Assistance may include site investigations, designs and specifications, construction plans, layout of practices, and supervision of installation.

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.