New Hampshire
2012 Section 305(b) & 303(d)
Surface Water Quality Report

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

NHDES-R-WD-12-4

NEW HAMPSHIRE
2012 SECTION 305(b) and 303(d)
SURFACE WATER QUALITY REPORT
and
RSA 485-A:4.XIV Report to
the Governor and General Court

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PART A. EXECUTIVE SUMMARY

A.1 INTRODUCTION

THIS DOCUMENT IS CURRENT AS OF JUNE 23, 2015. AS OF THIS DATE, NEW HAMPSHIRE'S 303(D) HAS NOT YET RECEIVED FINAL APPROVAL FROM EPA REGION ONE. AS SUCH, SOME DATA POINTS ARE SUBJECT TO CHANGE.

The primary purpose of this document is to report on the water quality status of New Hampshire's surface waters and groundwater in accordance with Section 305(b) and 303(d) of the Federal Water Pollution Control Act as last reauthorized by the Water Quality Act of 1987 [PL92-500, commonly called the Clean Water Act (CWA)], and New Hampshire Statutes Chapter 485-A:4.XIV.

Section 305(b) of the CWA requires submittal of a report (commonly called the "305(b) Report"), that describes the quality of its surface waters and an analysis of the extent to which all such waters provide for the protection and propagation of a balanced population of shellfish, fish and wildlife, and allow recreational activities in and on the water. Section 303(d) requires submittal of a list of waters (i.e., the 303(d) List) that are:

- impaired or threatened by a pollutant or pollutant(s),
- not expected to meet water quality standards within a reasonable time even after application of best available technology standards for point sources or best management practices for nonpoint sources and,
- require development and implementation of a comprehensive water quality study (i.e., called a Total Maximum Daily Load or TMDL study) that is designed to meet water quality standards.

New Hampshire Statutes Chapter 485-A:4.XIV requires the Department of Environmental Services (DES) to biennially provide a report to the governor and council (and others) of its findings regarding analysis of water quality monitoring data and identification of any long term trends which may affect the purity of the surface and groundwaters of the state.

The methodology for assessing surface waters in New Hampshire is fully described in the State's Consolidated Assessment and Listing Methodology or CALM (DES 2010). As described in the CALM, water quality data is compared to the State's surface water quality standards to determine which designated uses are supported, which are not, and which uses cannot be assessed due to insufficient information. Designated uses for New Hampshire surface waters include primary contact recreation, secondary contact recreation, aquatic life, fish consumption, drinking water after adequate treatment and wildlife. In addition, tidal waters include the shellfish consumption use. The facilitate management of water quality data, surface waters in New Hampshire have been divided into over 8,700 individual segments or assessment units (AUs). The ultimate goal is to have all surface waters assessed and supporting their designated uses.

The ability to assess a surface water is dependent on having high quality surface water monitoring data. In 2005, the State prepared a Water Monitoring Strategy (DES, 2005) which includes a description of the State's many monitoring programs and objectives as well as an estimate of the additional resources needed to accomplish all monitoring objectives. This analysis concluded that monitoring programs are underfunded by approximately one million dollars. Recognizing that the State does not have the resources to individually monitor and assess each of the over 8,800 assessment units (i.e. referred to as site specific assessments) DES has embarked on a probabilistic–based monitoring and assessment approach for some waterbody types. The probabilistic assessment approach utilizes data from a random sampling of a portion of a waterbody type to make statistically valid assessments of the waterbody type as a whole. Therefore, probabilistic assessments allow an entire waterbody to be statistically assessed with much fewer samples as compared to the site specific assessment approach. Site specific assessments, however, are still required when one wishes to know the surface water quality of a particular assessment unit. The probabilistic assessment approach was used to evaluate aquatic life, primary contact recreation, and secondary contact recreation in wadeable rivers (approximately 94% of New Hampshire's river miles) and in New Hampshire's estuaries.

A.2 SURFACE WATER ASSESSMENT RESULTS

New Hampshire, like many of the other New England States, has a statewide freshwater fish consumption advisory due to mercury levels found in fish tissue; the primary source of which is believed to be atmospheric deposition from both in-state and out-of-state sources. When this advisory is included in the assessment, all fresh surface waters are, by definition, less than fully supporting of all uses. Because New Hampshire cannot unilaterally resolve the mercury issue as much of the mercury is not generated in-state, and to provide a more balanced or fair assessment of the state's surface waters, two assessments are provided; one which takes into account the mercury advisory and one which does not. The assessment which does not account for mercury is perhaps more meaningful as it conveys information that would otherwise be masked by the mercury advisory and, perhaps more importantly, it represents information on impairments for which corrective action can be taken at the state level. Unless otherwise noted, the summary statistics below are from census or site specific assessments rather than probabilistic assessments.

Like other states, New Hampshire has a statewide freshwater fish consumption advisory in effect due to mercury. Because this advisory masks the other water quality issues that DES can directly resolve, two assessments are provided for fresh surface waters; one which includes the mercury advisory and one which does not.

In 2010 the DES Watershed Management Bureau and Wetlands Bureau worked with University of New Hampshire (UNH) Cooperative Extension to construct wetland complexes from the individual NWI wetland polygons in accordance with the 2011 "The Method for Inventorying and Evaluating Freshwater Wetlands in New Hampshire" (i.e., the NH Method, see http://nhmethod.org/index.htm). This does not include wetlands in

A revised version of the wetland assessment units have been added to the Assessment Database. In addition a revised Level 1 screening level assessment was performed. This represents a significant first step to ultimately being able to assess and report on wetlands water quality in the future.

open water to avoid overlap with existing AUs in other waterbody types. These new complexes were given assessment unit IDs to replace those built in 2008. The new base layer was built to be the foundation of a comprehensive wetlands catalog for the state and to act as a starting point for anyone applying the NH Method. While the NH Method applies to freshwater wetlands, the wetland complex creation methodology was applied to both fresh and marine wetlands independent of one another. (http://www.granit.unh.edu/data/datacat/pages/nhwetlandsbase.pdf and ftp://ftp.granit.sr.unh.edu/pub/GRANIT_Data/Vector_Data/Inland_Water_Resources/d-wetland/d-nhwetlandsbase) Although none of the wetlands were assessed as fully supporting or not supporting, the Level 1 assessment represents a significant step to ultimately being able to definitively assess and report on wetland water quality.

A.2.1 OVERALL QUALITY/ USE SUPPORT

The following tables and figures provide a summary of the overall support status for all designated uses for all waters within state jurisdiction. Results are presented with and without the statewide mercury fish consumption advisory to reveal the status masked by the mercury advisory. Definitions of terms used in the tables (i.e., meets water quality standards, impaired, impaired – marginal condition, etc.) may be found in the Consolidated Assessment and Listing Methodology (DES, 2012) a copy of which is provided in Appendix 4. Table 1 presents overall support status for all designated uses for all waters. Information regarding the statewide mercury fish consumption advisory is in Section (D.6)).

There is much work to be done to restore impaired waters and to monitor waters that could not be assessed due to insufficient information.

Figure 1 and Figure 2 graphically display the overall use support for both the Site Specific Assessments (SSA) and Probabilistic Assessments (PA). Site Specific Assessments were conducted for Aquatic Life, Primary and Secondary Contact Recreation, Fish Consumption, Shellfishing (tidal waters), Drinking Water, and Wildlife. Probabilistic Assessments were conducted for Aquatic Life, Primary Contact, and Secondary Contact Recreation. Probabilistic Assessments are discussed further in Section D.4. The graphs for freshwater lakes, impoundments and rivers are based on six designated uses, whereas the bar graphs for tidal water (i.e., estuaries and ocean) are based on seven designated uses. Consequently, each freshwater use represents 16.7% and each tidal use represents 14.3% of the total bar graph. The ultimate goal is to have all surface waters meet standards and be fully supportive of all uses. If this was accomplished, each of the bar graphs below would be entirely shaded in green to indicate that all uses were assessed and meeting water quality standards. As indicated in the figures and table below, even with the statewide mercury advisory excluded, this goal has not been accomplished for any waterbody type. In specific, the overall assessment results for each waterbody type show that approximately 26 to 67% of the State’s surface waters are fully supporting one or more designated uses. Consequently, there is still much work to be done to restore impaired waters and to monitor waters that could not be assessed due to insufficient information.

Figure 1: Overall Use Support Excluding the State-Wide Mercury Advisory

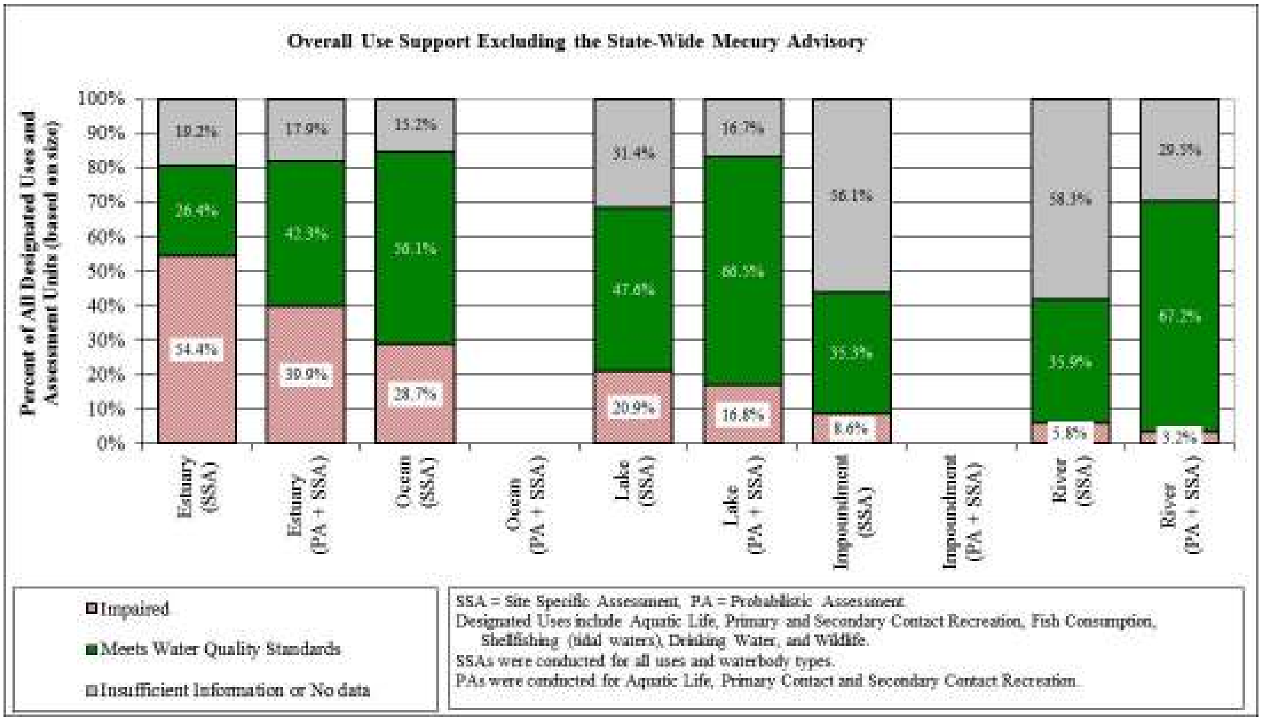


Figure 2: Overall Use Support Including the State-Wide Mercury Advisory

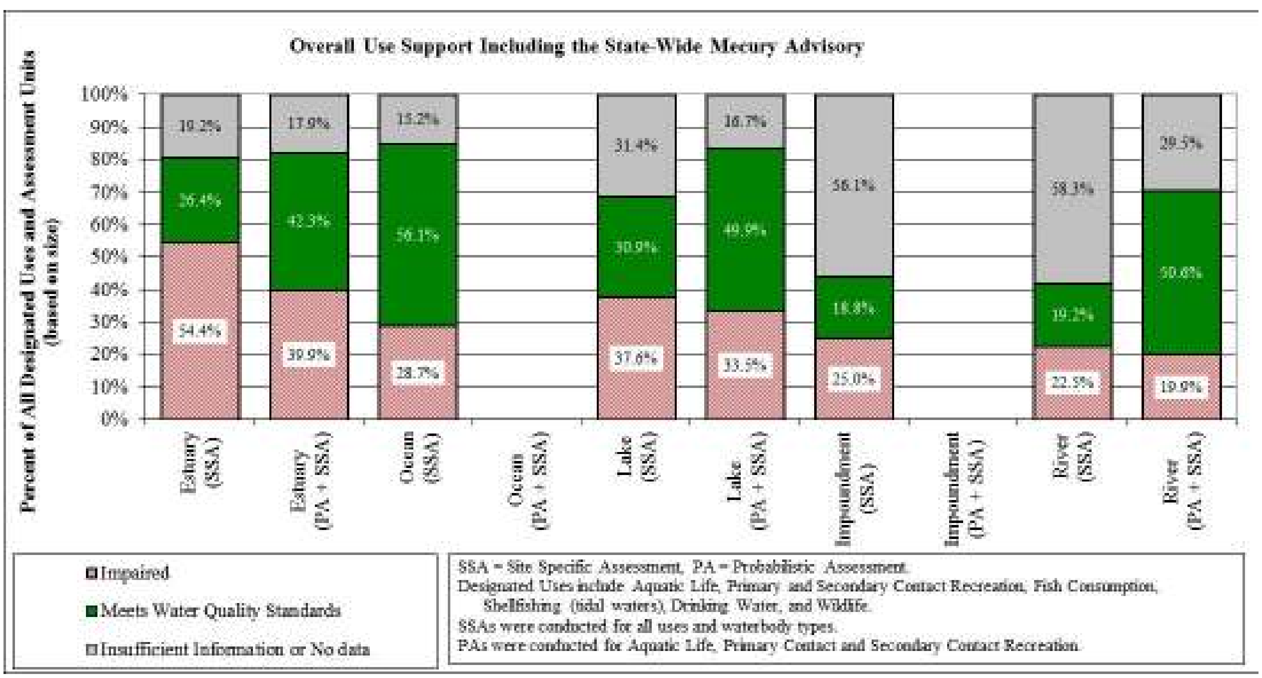


Table 1: Overall Use Support for All Surface Waters

Waterbody Type and Assessment Type	Overall Use Support (excluding mercury fish advisory) based on Site Specific Assessments	Overall Use Support (including mercury fish advisory) based on Site Specific Assessments

	Fully Meets WQS	Insufficient Information or No Data	Impaired	Total Assessed	Fully Meets WQS	Insufficient Information or No Data	Impaired	Total Assessed
Estuary (SSA)								
Percent of Assessment Units and Designated Uses	26.4%	19.2%	54.4%	80.8%	26.4%	19.2%	54.4%	80.8%
Estuary (PA + SSA)								
Percent of Assessment Units and Designated Uses	42.3%	17.9%	39.9%	82.1%	42.3%	17.9%	39.9%	82.1%
Ocean (SSA)								
Percent of Assessment Units and Designated Uses	56.1%	15.2%	28.7%	84.8%	56.1%	15.2%	28.7%	84.8%
Lake (SSA)								
Percent of Assessment Units and Designated Uses	47.6%	31.4%	20.9%	68.6%	30.9%	31.4%	37.6%	68.6%
Lake (PA + SSA)								
Percent of Assessment Units and Designated Uses	66.5%	16.7%	16.8%	83.3%	49.9%	16.7%	33.5%	83.3%
Impoundment (SSA)								
Percent of Assessment Units and Designated Uses	35.3%	56.1%	8.6%	43.9%	18.8%	56.1%	25.0%	43.9%
Rivers (SSA)								
Percent of Assessment Units and Designated Uses	35.9%	58.3%	5.8%	41.7%	19.2%	58.3%	22.5%	41.7%
Rivers (PA + SSA)								
Percent of Assessment Units and Designated Uses	67.2%	29.5%	3.2%	70.5%	50.6%	29.5%	19.9%	70.5%

A.2.2 INDIVIDUAL USE SUPPORT

A.2.2.1 Primary Contact Recreation / Swimming

Primary contact recreation is defined as the suitability of a waterbody for full body contact and/or incidental ingestion or swimming use. Assessments are primarily based on bacteria data as an indicator of human health risk and chlorophyll as an indicator of aesthetic suitability.

In freshwater rivers and streams, approximately 5.2% of the mileage is fully supportive of swimming, 7.8% is not supportive and 82.1% could not be assessed due to insufficient information. A probabilistic assessment performed on wadeable streams for swimming found that 83.2% of the mileage is fully supportive, 6.1% is not supportive and 10.7% could not be assessed due to insufficient information.

In lakes and ponds, approximately 70.4% of the acreage is fully supportive of swimming, 7.3% is not supportive and 22.3% could not be assessed due to insufficient information. A probabilistic assessment performed on lakes for swimming found that 95.3% of the acreage is fully supportive, 4.7%.

In impoundments, approximately 5.0% of the acreage is fully supportive of swimming, 8.5% is not supportive and 86.5% could not be assessed due to insufficient information.

In estuarine waters, approximately 19.8% of the square mileage is fully supportive of swimming, 65.2% is not supportive, and 15.0% could not be assessed due to insufficient information. Based on a probabilistic assessment, 82.1% of the square mileage is fully supportive, 7.7% is not supportive and 10.2% could not be assessed due to insufficient information.

In ocean waters, approximately 99.1% of the square mileage is fully supportive of swimming, 0.6% is not supportive and 0.2% could not be assessed due to insufficient information.

SWIMMING

Freshwaters

Based on site specific assessments, approximately 5.2% of rivers and streams support this use. Based on probabilistic assessments, 83.2% of rivers and streams fully support this use.

Based on site specific assessments, approximately 5.2% lakes and ponds support swimming. Based on probabilistic assessments, 95.3% of lakes fully support this use.

Approximately 5.0% of impoundments and ponds support swimming.

Tidal Waters

Based on site specific assessments, 19.8% of the estuaries fully support the swimming use. Based on probabilistic assessments, approximately 82.1% of estuarine waters fully support this use.

Approximately 99.1% of open ocean waters support swimming

A summary of the primary contact recreation use support for each waterbody type is shown in Figure 3 and a map showing the state-wide distribution of the assessment results is provided in Figure 4.

Figure 3: Assessment Unit Use Support Status for Primary Contact (i.e. Swimming)

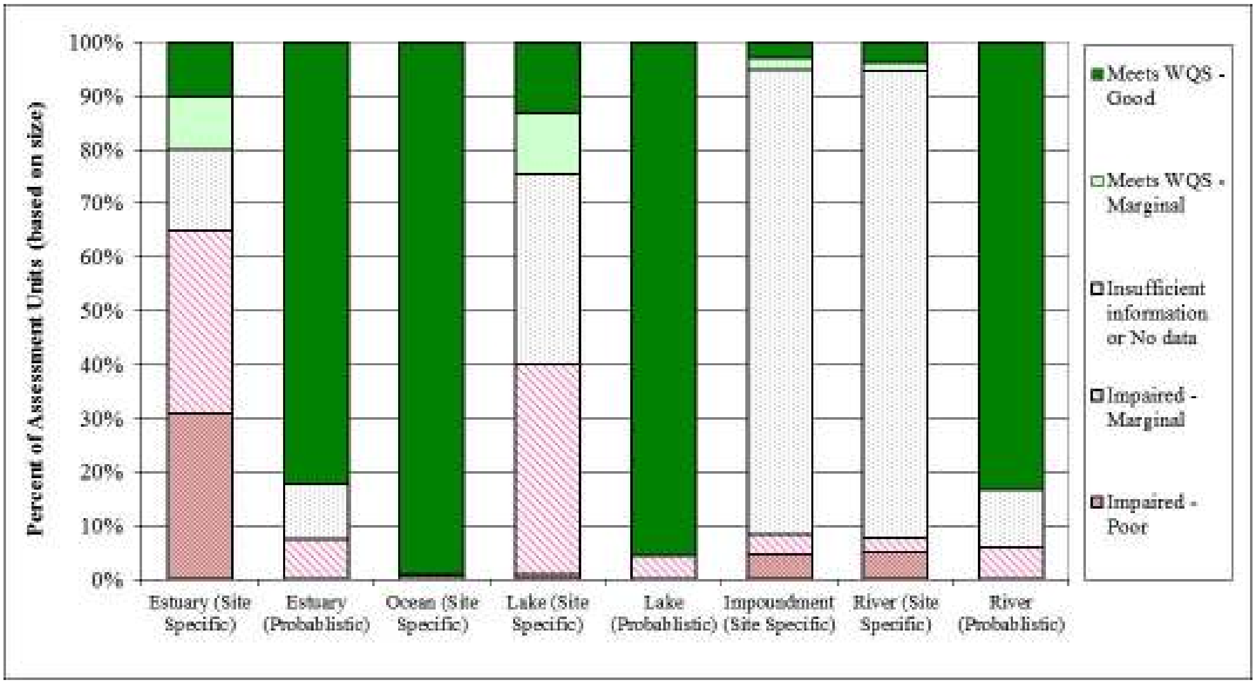
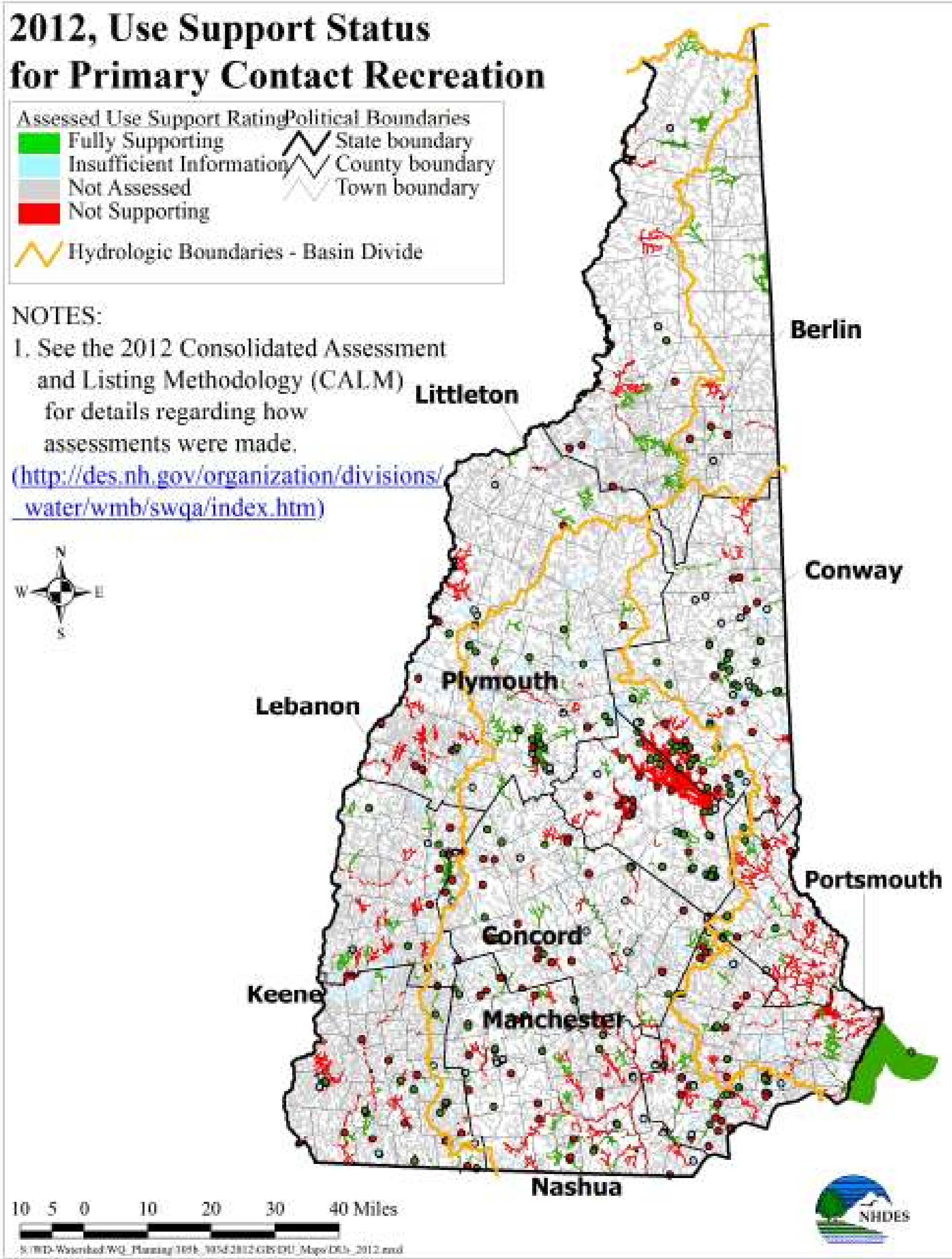


Figure 4: Statewide Use Support Status for Primary Contact (i.e. Swimming)



A.2.2.2 Secondary Contact Recreation / Boating

Secondary contact recreation is defined as activities that result in incidental water contact, aesthetic concerns, and obstacles to navigability.

In freshwater rivers and streams, approximately 9.5% of the mileage is fully supportive of secondary contact, 1.2% is not supportive and 89.3% could not be assessed due to insufficient information. A probabilistic assessment performed on wadeable streams for secondary contact found that 95.4% of the mileage is fully supportive, 0.0% is not supportive and 4.6% could not be assessed due to insufficient information.

In lakes and ponds, approximately 61.2% of the acreage is fully supportive of secondary contact, 0.6% is not supportive and 38.2% could not be assessed due to insufficient information. A probabilistic assessment performed on lakes for secondary contact found that 100% of the acreage is fully supportive.

In impoundments, approximately 5.0% of the acreage is fully supportive of secondary contact, 3.1% is not supportive and 88.9% could not be assessed due to insufficient information.

In estuarine waters, approximately 63.9 of the square mileage is fully supportive of secondary contact, 23.7% is not supportive and 12.4% could not be assessed due to insufficient information. A probabilistic assessment performed on estuarine waters for secondary contact found that 92.3% of the square mileage is fully supportive, 0.0% is not supportive and 7.7% could not be assessed due to insufficient information.

In ocean waters, approximately 99.4% of the square mileage is fully supportive of secondary contact, 0.4% is not supportive and 0.2% could not be assessed due to insufficient information.

SECONDARY CONTACT

Freshwaters

Based on site specific assessments, approximately 9.5% of rivers and streams support this use. Based on probabilistic assessments, 89.3% of rivers and streams fully support this use.

Based on site specific assessments, approximately 61.2% of lakes and ponds support swimming. Based on probabilistic assessments, 100% of lakes and ponds fully support this use.

Approximately 5.0% of impoundments and ponds support swimming.

Tidal Waters

Based on site specific assessments, 63.9% of the estuaries fully support the swimming use. Based on probabilistic assessments, approximately 92.3% of estuarine waters fully support this use.

Approximately 99.4% of open ocean waters support swimming

A summary of the secondary contact recreation use support status for each waterbody type is graphically shown in Figure 5 and a map showing the state-wide distribution of assessment results is provided in Figure 6.

Figure 5: Assessment Unit Use Support Status for Secondary Contact (i.e. Boating)

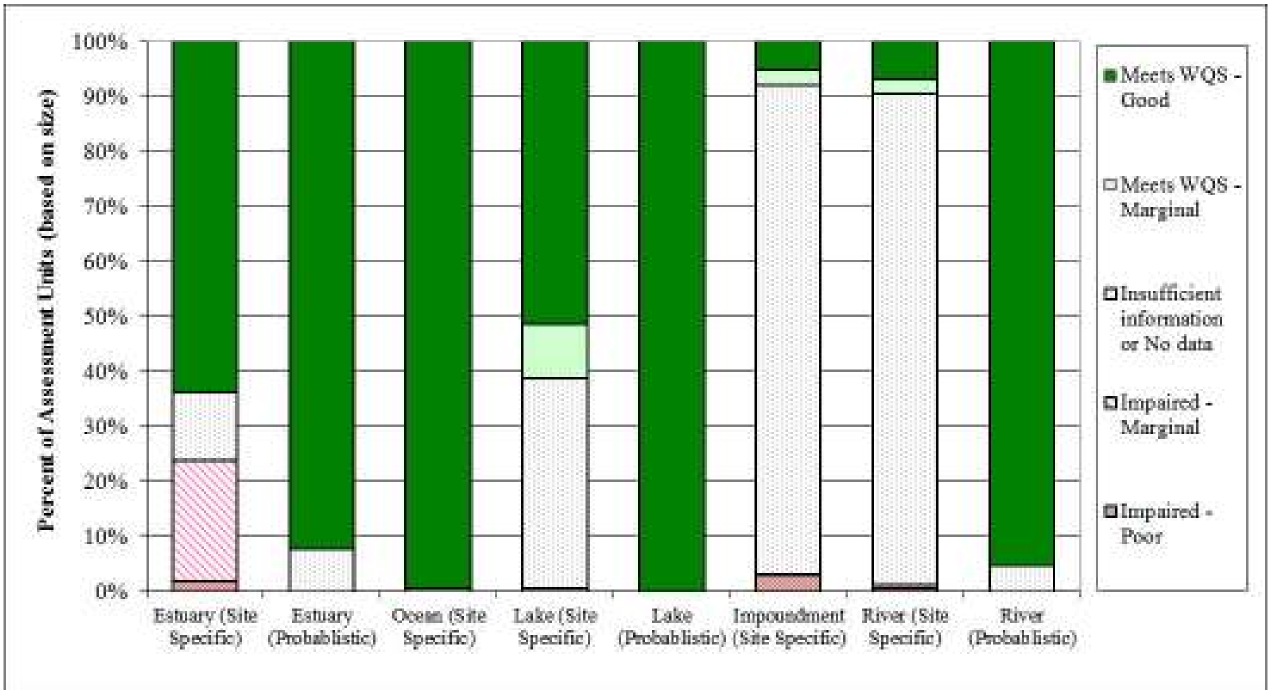
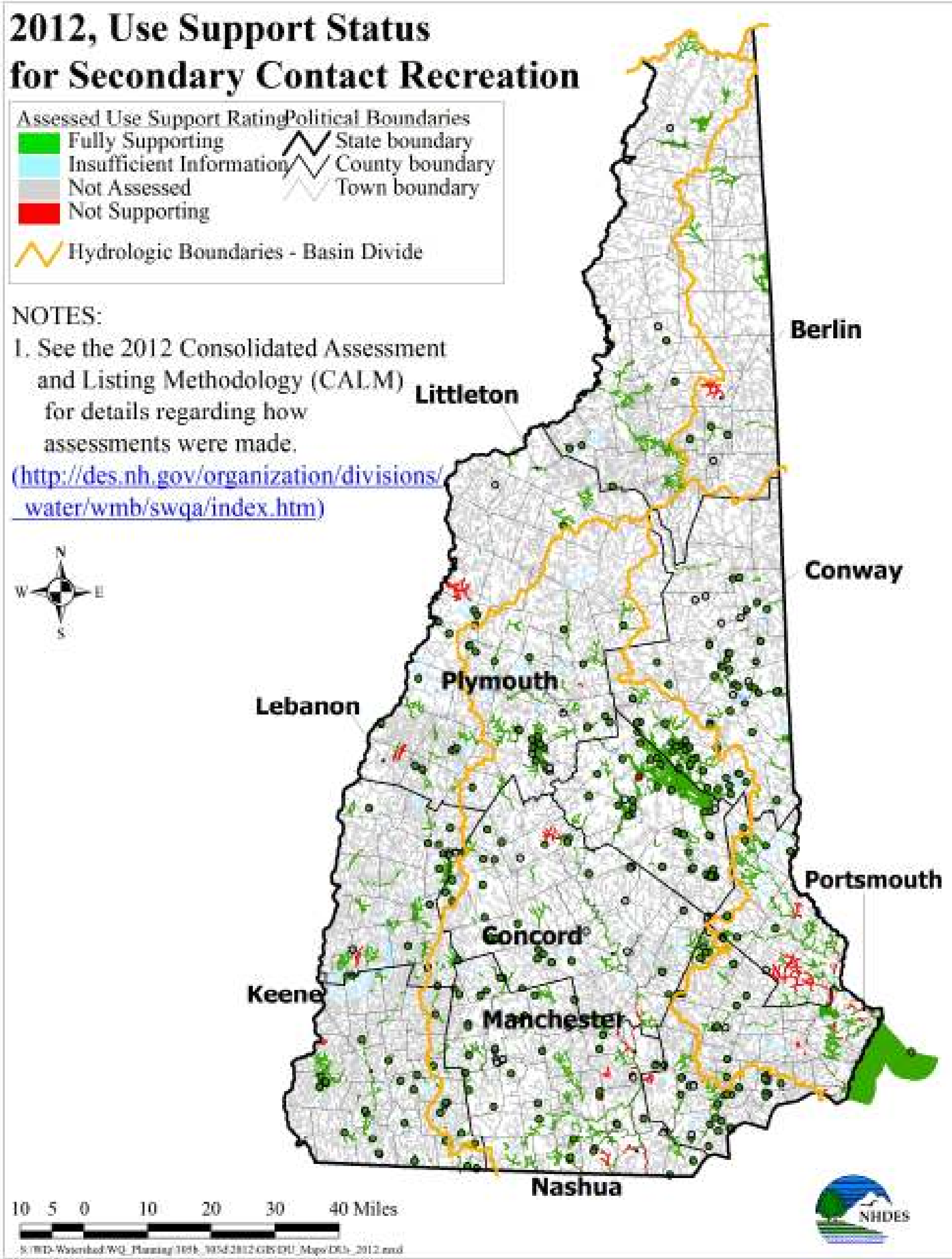


Figure 6: Statewide Use Support Status for Secondary Contact (i.e. Boating)



A.2.2.3 Aquatic Life Support

Aquatic life is defined as the suitability of a waterbody to sustain a balanced, integrated, and adaptive community of indigenous aquatic life. Use support is determined by physical, chemical, and biological criteria.

In freshwater rivers and streams, approximately 0.8% of the mileage is fully supportive of aquatic life, 26.0% is not supporting and 73.2% could not be assessed due to insufficient information. A probabilistic assessment performed on wadeable streams for aquatic life found that 37.9% of the mileage is fully supporting of aquatic life, 14.3% is not supporting and 47.8% could not be assessed due to insufficient information.

In lakes and ponds, approximately 0% of the acreage is fully supportive of aquatic life, 84.8% is not supporting and 15.2% could not be assessed due to insufficient information. A probabilistic assessment performed on lakes and ponds for aquatic life found that 3.8% of the acreage is fully supporting of aquatic life, 96.2% is not supporting and 0% could not be assessed due to insufficient information.

In impoundments, approximately 0% of the acreage is fully supportive of aquatic life, 38.5% is not supporting and 61.5% could not be assessed due to insufficient information.

In estuarine waters, approximately 0.8% of the square mileage is fully supportive of aquatic life, 91.9% is not supportive and 7.2% could not be assessed due to insufficient information. A probabilistic assessment performed on estuarine waters for aquatic life found that 21.4% of the square mileage is fully supportive of aquatic life, 71.3% is not supporting and 7.3% could not be assessed due to insufficient information.

In ocean waters, approximately 94.1% of the square mileage is fully supportive of aquatic life, 0.0% is not supportive and 5.9% could not be assessed due to insufficient information.

AQUATIC LIFE

Freshwaters

Based on site specific assessments, approximately 0.8% of rivers and streams support this use. Based on probabilistic assessments, 26.0% of rivers and streams fully support this use.

Based on site specific assessments, approximately 0.0% of lakes and ponds support aquatic life. Based on probabilistic assessments, 3.8% of lakes and ponds fully support this use.

Approximately 0% of impoundments and ponds support aquatic life.

Tidal Waters

Based on site specific assessments, 0.8% of the estuaries fully support the aquatic life use. Based on probabilistic assessments, approximately 21.4% of estuarine waters fully support this use.

Approximately 94.1% of open ocean waters support aquatic life.

A summary of the aquatic life use support status for each waterbody type is graphically shown in Figure 7 and a map showing the state-wide distribution of assessment results is provided in Figure 8.

With regards to wetlands, a Level 1 (i.e., screening level) assessment was performed for the first time this year. The distribution of Level 1 wetlands assessment scores are shown in

Figure 9. Since this is a screening level assessment, no wetlands were definitively assessed as fully supporting or not supporting. A total of 28,128 (58%) wetland assessment units were assessed as insufficient information - potentially supporting of aquatic life use. Figure 12 shows a distribution of how the potentially supporting and potentially not supporting wetland assessment units are geographically distributed. Results of the Level 1 assessment including both the Level 1 assessment score and the relationship to the potential support threshold are discussed in Section D.3.9 and Appendix 38.

Figure 7: Assessment Unit Use Support Status for Aquatic Life.

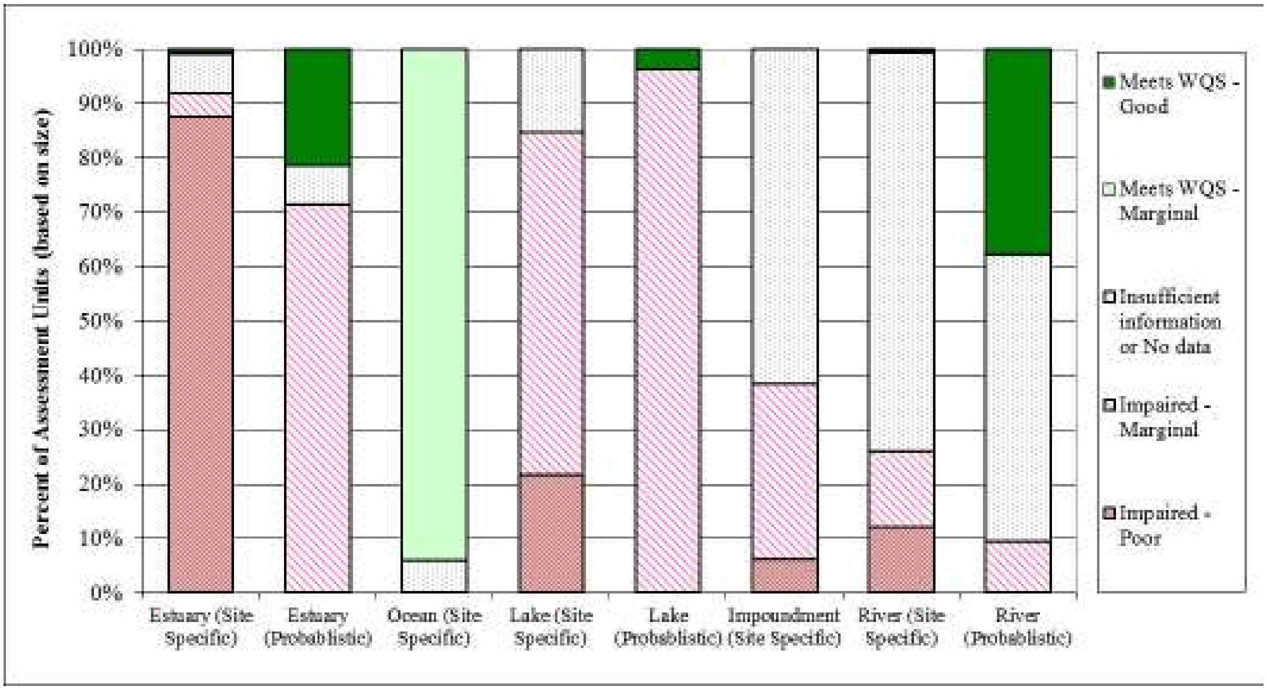


Figure 8: Statewide Use Support Status for Aquatic Life.

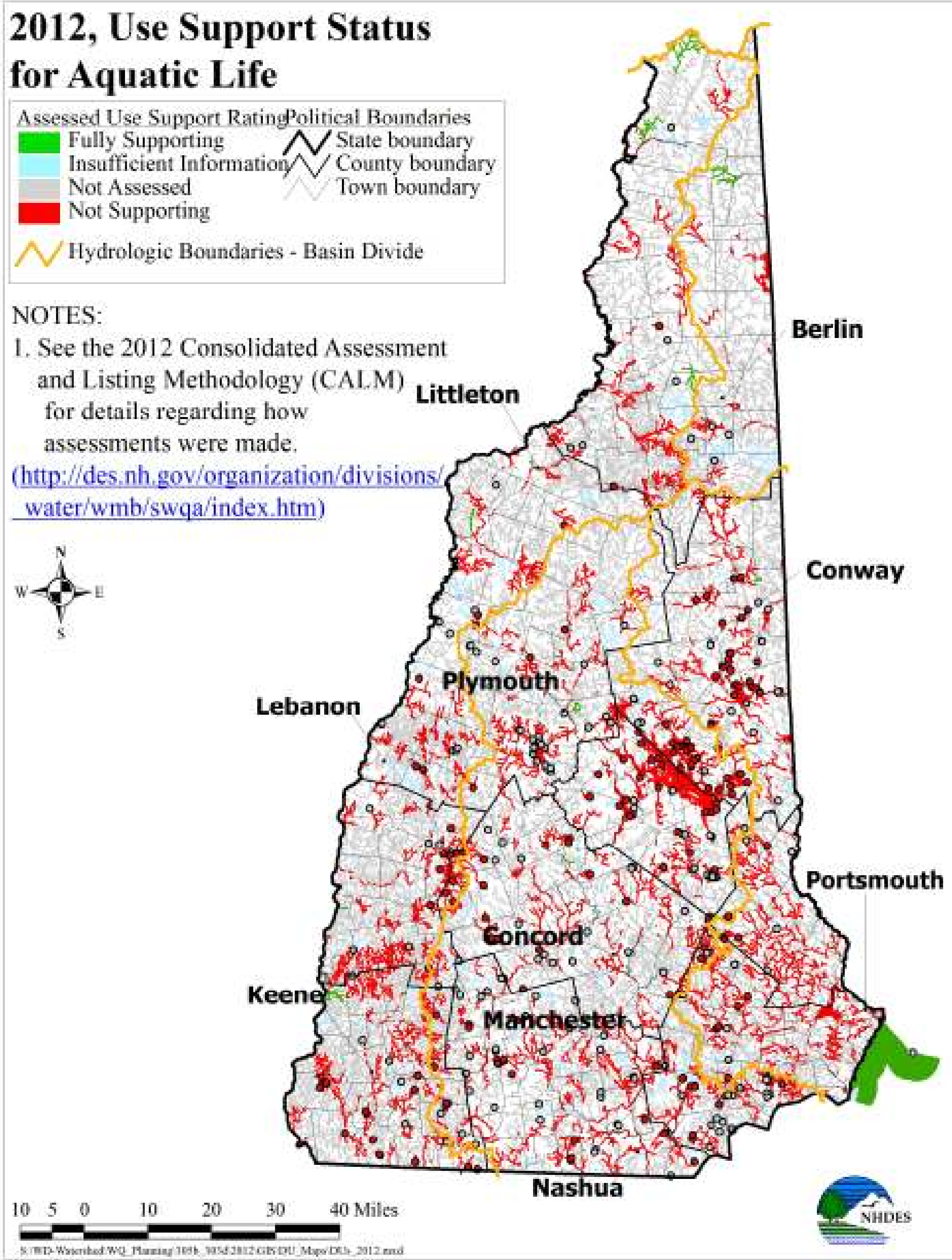


Figure 9: Distribution of Level 1 Wetland Assessment Scores**.**

ALL QUESTIONS AVERAGED

Score	*Count*	*Cumulative %*
0.00	0	0.00%
0.05	0	0.00%
0.10	0	0.00%
0.15	0	0.00%
0.20	0	0.00%
0.25	0	0.00%
0.30	0	0.00%
0.35	0	0.00%
0.40	12	0.02%
0.45	47	0.11%
0.50	260	0.61%
0.55	699	1.94%
0.60	1,334	4.49%
0.65	2,140	8.57%
0.70	2,929	14.16%
0.75	4,568	22.87%
0.80	5,110	32.62%
0.85	7,199	46.35%
0.90	6,224	58.22%
0.95	5,599	68.90%
1.00	16,305	100.00%

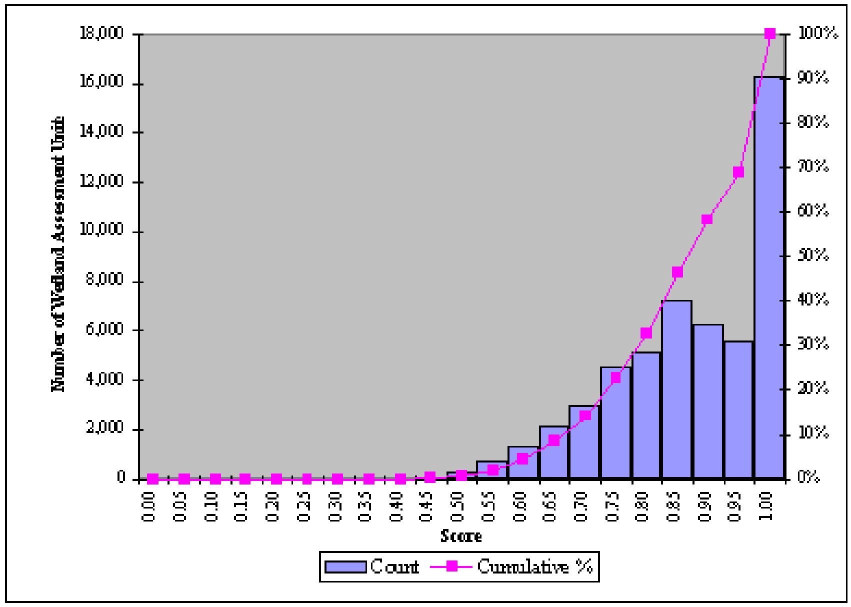
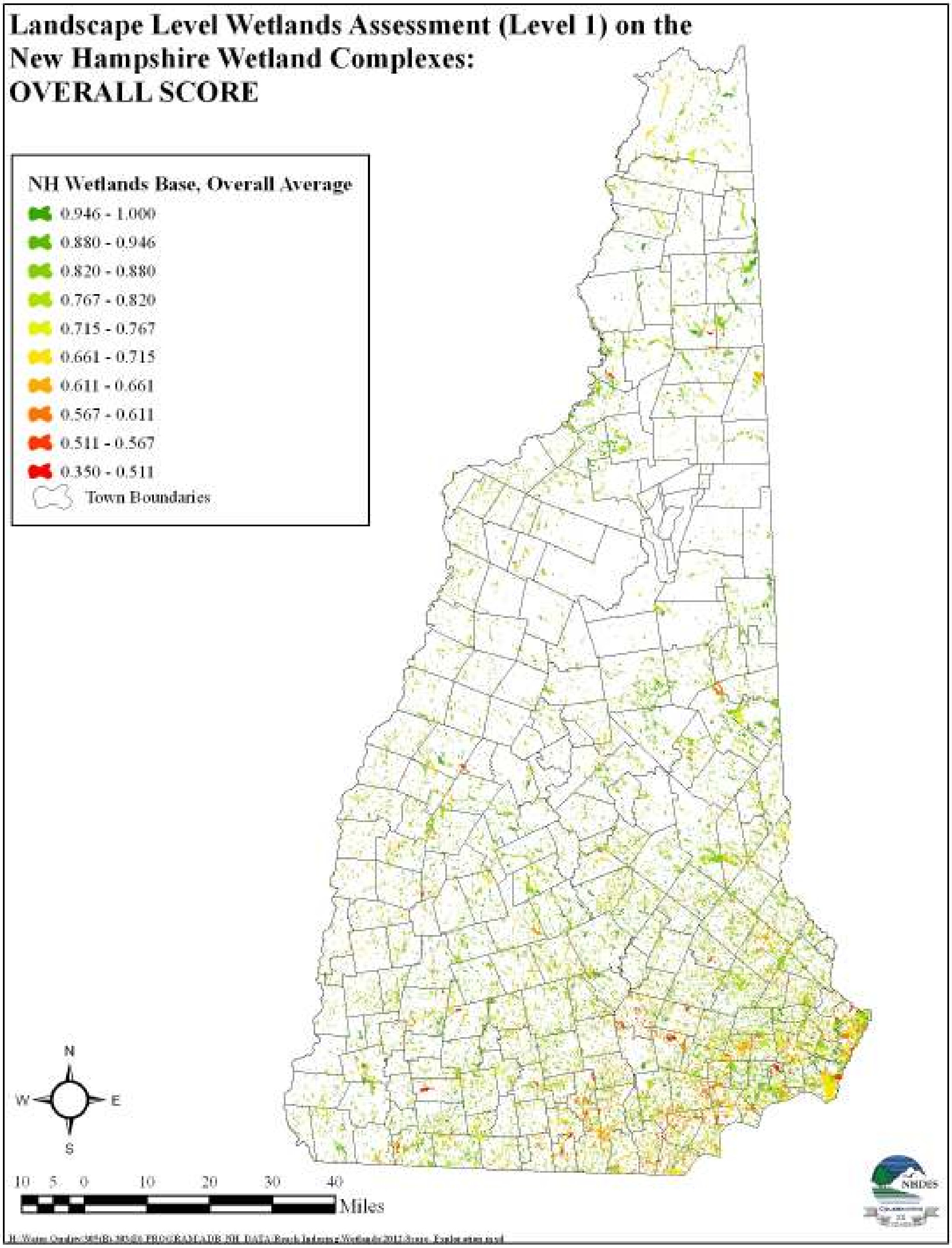


Figure 10: Statewide Distribution of Level 1 Wetland Assessment Scores**.**



A.2.2.4 Fish Consumption

Fish consumption is defined as the suitability of waters to support fish free from contamination at levels that pose a human health risk to consumers.

If the statewide fish consumption advisory due to mercury is accounted for in the assessment, none of the fresh surface waters are fully supportive of the fish consumption use.

Excluding the state-wide advisory:

- 100% of the total acreage of lakes and ponds fully supported and 0% did not support fish consumption;
- 98.2% of the total acreage of impoundments fully supported and 1.8% did not support fish consumption;
- 99.8% of the total miles of freshwater rivers and streams fully supported and 0.2% did not support fish consumption;
- 0.0% of the total square miles of estuaries and ocean waters fully supported and 100.0% did not support fish consumption.

In freshwaters, the only fish consumption advisory (other than mercury), is for dioxin on the Androscoggin River downstream of Berlin. The primary source of dioxin was removed in 1994. Although fish tissue sample results have shown a decrease in dioxin levels, they are not yet low enough to rescind the fish advisory

FISH CONSUMPTION
Excluding the state-wide mercury advisory, fish consumption is fully supported in,
- 100% of lakes
- 98.2% of impoundments
- 99.8% of rivers
- 0% of estuaries
- 0% of ocean water

Excluding mercury, none of the State's tidal waters fully support fish consumption due to a bluefish advisory that was issued in 1987 because of PCB levels in the fish tissue.

A.2.2.5 Shellfish Consumption

Shellfish consumption use is defined as the suitability of waters to support a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers.

SHELLFISH CONSUMPTION
46% of estuarine waters are conditionally approved for shellfishing.

None of the state's 18.1 square miles of estuaries are fully supportive of this use due to PCBs and dioxins detected in lobster tomalley and mercury in shellfish. Based on fecal bacteria or the potential for fecal contamination, a number of estuaries are open to shellfish harvesting as determined by sanitary surveys conducted in accordance with national shellfish guidelines. The National Shellfish Sanitation Program (NSSP) classifies 45.7 percent of the estuary as conditionally approved and 54.3 percent as closed. As of January 1, 2012, areas described as "conditionally approved" are open except when rainfall exceeds one to 2.5 inches depending upon the area in question. These areas may also be closed due to WWTF problems or discharge events at marinas. In the event of such a rainfall or discharge occurrences the resource is closed until sampling confirms safe conditions.

None of the state's 80.9 square miles of open ocean are fully supportive of this use due to PCBs and dioxins detected in lobster tomalley and mercury in shellfish. Based on fecal bacteria measurements or the potential for fecal contamination, a number ocean areas are open to shellfish harvesting as determined by sanitary surveys conducted in accordance with national shellfish guidelines. The NSSP classifies 94.9 percent of the ocean waters as open and 5.1 percent as closed.

A.2.2.6 Drinking Water Supply After Adequate Treatment

Drinking water supply after adequate treatment is defined as the suitability of waters, which, after adequate treatment, will be suitable for human intake and meet state/federal drinking water regulations.

All surface waters were assessed for the use of drinking water supply. All are reported to be fully supportive of this use based on state law, which requires all such waters to be suitable for drinking after adequate treatment.

DRINKING WATER SUPPLY AFTER ADEQUATE TREATMENT
All surface waters fully support the drinking water use.

A.2.2.7 Wildlife Uses

The wildlife use is defined as ability of waters to provide suitable physical and chemical conditions in the water and the riparian corridor to support wildlife as well as aquatic life.

WILDLIFE
Use support criteria for wildlife assessments have not yet been developed.

Criteria for determining use support are under development. For this cycle, all surface waters were assessed as "Not Assessed" for this use.

A.2.3 CAUSES AND SOURCES OF IMPAIRMENT

Causes (i.e., pollutants) and probable sources of impairment for each major waterbody type were ranked according the total size of the waterbody it impaired and provided in the tables below.

A.2.3.1 Rivers

Rank	Impairment	Total Size (Acres)	Number of AUs
1	Mercury	16,961.8	5924
2	pH	3,820.6	835
3	Escherichia coli	1,306.2	270
4	Oxygen, Dissolved	687.8	119
5	Aluminum	562.5	79
6	Dissolved oxygen saturation	511.2	90
7	Benthic-Macroinvertebrate Bioassessments (Streams)	422.8	59
8	Fishes Bioassessments (Streams)	222.1	20
9	Lead	188.3	26
10	Chloride	103.5	39
11	Invasive Aquatic Algae	98.9	8
12	Habitat Assessment (Streams)	94.1	18
13	Iron	74.2	19
14	Other flow regime alterations	52.8	9
15	Non-Native Aquatic Plants	38.3	9
16	Physical substrate habitat alterations	33.7	3
17	Copper	23.0	5
18	Dioxin (including 2,3,7,8-TCDD)	17.2	10
19	Chlorophyll-a	14.7	2
20	BOD, Biochemical oxygen demand	10.3	4
21	Zinc	9.1	4
22	Foam/Flocs/Scum/Oil Slicks	8.9	2
23	Ammonia (Total)	8.7	2
24	Ammonia (Un-ionized)	7.1	1
25	Cadmium	6.8	2
26	Taste and Odor	6.4	1
27	Low flow alterations	5.7	1
28	Creosote	3.7	1
29	Manganese	3.6	4
30	Phosphorus (Total)	2.3	2
31	Total Suspended Solids (TSS)	2.3	1
32	Arsenic	1.4	2
33	Chromium (total)	1.3	1
34	Sedimentation/Siltation	0.6	2
35	DDD	0.5	1
36	Turbidity	0.5	1
37	Benzo(a)pyrene (PAHs)	0.2	1

Rank	Source	Total Size (Acres)	Number of AUs
1	Atmospheric Deposition - Toxics	16,961.8	5924
2	Source Unknown	4,626.2	992
3	Municipal (Urbanized High Density Area)	73.5	18
4	Combined Sewer Overflows	58.8	16
5	Highway/Road/Bridge Runoff (Non-construction Related)	57.9	16
6	Commercial Districts (Shopping/Office Complexes)	56.9	14
7	Illicit Connections/Hook-ups to Storm Sewers	48.1	11
8	Streambank Modifications/destabilization	36.3	4
9	Industrial Point Source Discharge	35.5	19
10	Landfills	29.5	10
11	Unspecified Urban Stormwater	29.1	2
12	Impervious Surface/Parking Lot Runoff	28.7	6
13	Municipal Point Source Discharges	26.0	10
14	Freshets or Major Flooding	23.7	4
15	Contaminated Groundwater	14.9	2
16	Channelization	12.2	2
17	Inappropriate Waste Disposal	11.2	1
18	Impacts from Hydrostructure Flow Regulation/modification	7.5	3
19	Manure Runoff	7.5	3
20	Industrial/Commercial Site Stormwater Discharge (Permitted)	7.1	2
21	Airports	7.1	2
22	Acid Mine Drainage	6.7	1
23	Flow Alterations from Water Diversions	5.7	1
24	Sand/gravel/rock Mining or Quarries	3.9	1
25	RCRA Hazardous Waste Sites	3.7	1
26	Unpermitted Discharge (Industrial/commercial Wastes)	2.8	2
27	Unpermitted Discharge (Domestic Wastes)	2.5	1
28	Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)	2.1	2
29	Habitat Modification - other than Hydromodification	1.3	1
30	Highways, Roads, Bridges, Infrastructure (New Construction)	0.5	1
31	Petroleum/natural Gas Activities	0.2	1
32	Animal Feeding Operations (NPS)	0.1	1
33	Pollutants from Public Bathing Areas	0.01	1

A.2.3.2 Lakes

Rank	Impairment	Total Size (Acres)	Number of AUs
1	Mercury	162,742.9	1558
2	pH	132,626.6	568
3	Non-Native Aquatic Plants	69,586.7	59
4	Cyanobacteria hepatotoxic microcystins	63,403.4	94
5	Dissolved oxygen saturation	31,980.8	140
6	Oxygen, Dissolved	27,681.6	46
7	Chlorophyll-a	12,827.9	90
8	Phosphorus (Total)	11,974.5	75
9	Turbidity	4,203.9	2
10	Escherichia coli	1,752.3	120
11	Aluminum	1,546.1	35
12	Sedimentation/Siltation	239.2	2
13	Iron	151.3	2
14	Chloride	141.7	5
15	Other flow regime alterations	65.7	1
16	Nickel	46.5	1
17	Zinc	46.5	1
18	DDE	46.5	1
19	DDD	46.5	1
20	Lead	46.5	1
21	Indeno[1,2,3-cd]pyrene	46.5	1
22	Benzo[k]fluoranthene	46.5	1
23	Benzo[b]fluoranthene	46.5	1
24	Benzo(a)pyrene (PAHs)	46.5	1
25	Barium	46.5	1
26	Arsenic	46.5	1
27	Anthracene	46.5	1
28	Excess Algal Growth	1.3	1

Rank	Source	Total Size (Acres)	Number of AUs
1	Atmospheric Deposition - Toxics	162,742.9	1558
2	Atmospheric Deposition - Acidity	131,168.1	551
3	Source Unknown	105,475.2	361
4	Naturally Occurring Organic Acids	17,902.6	122
5	Highways, Roads, Bridges, Infrastructure (New Construction)	4,203.9	2
6	Municipal Point Source Discharges	418.1	1
7	Municipal (Urbanized High Density Area)	383.0	9
8	Streambank Modifications/destabilization	238.5	1
9	Channel Erosion/Incision from Upstream Hydromodifications	238.5	1
10	Waterfowl	235.9	7
11	Unpermitted Discharge (Domestic Wastes)	229.2	2
12	Package Plant or Other Permitted Small Flows Discharges	191.1	1
13	Residential Districts	73.6	2
14	Impacts from Hydrostructure Flow Regulation/modification	65.7	1
15	Highway/Road/Bridge Runoff (Non-construction Related)	55.8	3
16	Commercial Districts (Shopping/Office Complexes)	55.8	3
17	Flow Alterations from Water Diversions	53.9	1
18	Industrial Point Source Discharge	23.0	2
19	Animal Feeding Operations (NPS)	16.4	1
20	Pollutants from Public Bathing Areas	12.4	12
21	Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)	6.8	5
22	Yard Maintenance	0.6	1

A.2.3.3 Impoundments

Rank	Impairment	Total Size (Acres)	Number of AUs
1	Mercury	22,434.7	1235
2	pH	8,109.5	56
3	Non-Native Aquatic Plants	1,683.9	15
4	Escherichia coli	1,466.4	43
5	Dissolved oxygen saturation	1,143.0	16
6	Chlorophyll-a	569.1	8
7	Phosphorus (Total)	404.5	2
8	Cyanobacteria hepatotoxic microcystins	363.6	3
9	Oxygen, Dissolved	328.8	18
10	Dioxin (including 2,3,7,8-TCDD)	280.2	8
11	Chloride	60.9	2
12	Benthic-Macroinvertebrate Bioassessments (Streams)	27.5	2
13	Indeno[1,2,3-cd]pyrene	11.4	2
14	Benzo(a)pyrene (PAHs)	11.4	2
15	Benzo[b]fluoranthene	11.4	2
16	Benzo[k]fluoranthene	11.4	2
17	DDE	11.4	2
18	Pyrene	10.0	1
19	Acenaphthene	10.0	1
20	Benzo[a]anthracene	10.0	1
21	Dieldrin	10.0	1
22	Chrysene (C1-C4)	10.0	1
23	Lindane	10.0	1
24	DDD	10.0	1
25	2-Methylnaphthalene	10.0	1
26	Endrin	10.0	1
27	Heptachlor	10.0	1
28	Other flow regime alterations	5.0	1
29	Aluminum	4.7	2
30	Zinc	2.6	2
31	Sedimentation/Siltation	2.5	1
32	Nickel	1.4	1
33	Barium	1.4	1
34	Arsenic	1.4	1
35	Lead	1.2	1

Rank	Source	Total Size (Acres)	Number of AUs
1	Atmospheric Deposition - Toxics	22,434.7	1235
2	Atmospheric Deposition - Acidity	7,682.6	48
3	Source Unknown	3,166.2	63
4	Combined Sewer Overflows	597.0	6
5	Municipal Point Source Discharges	564.9	4
6	Impacts from Hydrostructure Flow Regulation/modification	502.5	2
7	Industrial Point Source Discharge	288.1	10
8	Illicit Connections/Hook-ups to Storm Sewers	279.0	10
9	Naturally Occurring Organic Acids	125.0	2
10	Municipal (Urbanized High Density Area)	60.0	1
11	Highway/Road/Bridge Runoff (Non-construction Related)	60.0	1
12	Commercial Districts (Shopping/Office Complexes)	60.0	1
13	Freshets or Major Flooding	5.0	1
14	Pollutants from Public Bathing Areas	4.1	3

A.2.3.4 Estuaries

Rank	Impairment	Total Size (Acres)	Number of AUs
1	Mercury	17.980	72
2	Dioxin (including 2,3,7,8-TCDD)	17.980	72
3	Polychlorinated biphenyls	17.980	72
4	Estuarine Bioassessments	14.863	35
5	Nitrogen (Total)	14.160	34
6	Light Attenuation Coefficient	12.612	27
7	Enterococcus	11.716	31
8	Fecal Coliform	10.705	46
9	pH	7.172	7
10	Chlorophyll-a	1.706	10
11	Oxygen, Dissolved	1.293	8
12	Dissolved oxygen saturation	1.088	7
13	Aluminum	1.086	5
14	trans-Nonachlor	1.071	4
15	DDD	0.924	3
16	Dieldrin	0.891	2
17	Chrysene (C1-C4)	0.733	4
18	Benzo(a)pyrene (PAHs)	0.733	4
19	Pyrene	0.733	4
20	Dibenz[a,h]anthracene	0.733	4
21	Benzo[a]anthracene	0.733	4
22	Phenanthrene	0.733	4
23	Fluoranthene	0.733	4
24	Acenaphthylene	0.733	4
25	Lindane	0.615	1
26	Anthracene	0.584	3
27	Acenaphthene	0.584	3
28	Fluorene	0.584	3
29	Lead	0.456	3
30	Copper	0.456	3
31	Nickel	0.456	3
32	Cadmium	0.456	3
33	Arsenic	0.456	3
34	DDT	0.310	2
35	2-Methylnaphthalene	0.310	2
36	Naphthalene	0.310	2
37	DDE	0.3	2
38	Benzo[g,h,i]perylene	0.3	1
39	Biphenyl	0.3	1
40	Indeno[1,2,3-cd]pyrene	0.3	1
41	Zinc	0.3	1
42	Ammonia (Un-ionized)	0.1	1
43	Total Suspended Solids (TSS)	0.05	1

Rank	Source of Impairment	Total Size (Square Miles)	Number of AUs
1	Source Unknown	17.980	72
2	Atmospheric Deposition - Toxics	17.980	72
3	Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)	2.629	24
4	Combined Sewer Overflows	1.005	4
5	Animal Feeding Operations (NPS)	0.479	2
6	Sanitary Sewer Overflows (Collection System Failures)	0.429	4
7	Illicit Connections/Hook-ups to Storm Sewers	0.399	2
8	Unpermitted Discharge (Domestic Wastes)	0.123	1
9	On-site Treatment Systems (Septic Systems and Similar Decencentralized Systems)	0.119	1
10	Petroleum/natural Gas Activities	0.033	1

A.2.3.5 Ocean

Rank	Impairment	Total Size (Acres)	Number of AUs
1	Polychlorinated biphenyls	81.480	26
2	Mercury	81.480	26
3	Dioxin (including 2,3,7,8-TCDD)	81.480	26
4	Enterococcus	0.528	14
5	Fecal Coliform	0.457	9

Rank	Source	Total Size (Acres)	Number of AUs
1	Source Unknown	81.421	26
2	Atmospheric Deposition - Toxics	81.421	26
3	Forced Drainage Pumping	0.133	2
4	Waterfowl	0.064	2
5	Unpermitted Discharge (Domestic Wastes)	0.052	1
6	Sewage Discharges in Unsewered Areas	0.034	1
7	Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)	0.015	1

A.2.4 LAKE TROPHIC AND ACIDITY STATUS

> ***Approximately 4.5% of the surface area of all surveyed lakes are eutrophic and have relatively high levels of nutrients and plant growth.***

Trophic surveys were conducted on 663 of the 667 "significant lakes" representing 155,601 acres or 83.7% of all of the lakes in the state. Approximately 28% of the significant lakes that were surveyed were classified as oligotrophic (relatively low levels of nutrients and plant productivity). Approximately 49.3% of the lakes, representing approximately 21.5% of the total surface area were mesotrophic (moderate levels of nutrients and plant productivity) and the remaining 22% of the surveyed lake were classified as eutrophic (relatively high levels of nutrients and plant productivity). Eutrophic lakes, however, accounted for only 4.5% of the total surface area.

> ***10% of the surface area of all surveyed lakes are highly acidic.***

Of the 575 lakes and ponds with pH data, approximately 9.6% experience non-natural highly acidic conditions (pH less than 5.5). According to the U.S. EPA, waters that have an acid neutralizing capacity (ANC) of zero or less (which corresponds to a pH of about 5.2), are considered to be acidified. A 2005 evaluation of lake data revealed that 3% of all lakes and 17% of remote, mostly high elevation ponds are acidic based on this definition

A.2.5 WATER QUALITY TRENDS

Four parameters were investigated in 108-115 lakes where at least ten years of data existed. For chlorophyll a, seven (6%) of the 115 lakes showed an improvement in water quality, 48 (42%) showed stable water quality, 14 (12%) showed a decline in water quality, and 46 (40%) showed fluctuating water quality. For Secchi transparency, five (4%) of the 115 lakes showed an improvement in water quality, 62 (54%) showed stable water quality, 32 (28%) showed declining water quality, and 16 (14%) showed fluctuating water quality. For epilimnetic total phosphorus, eight (7%) of the 113 lakes showed an improvement in water quality, 64 (57%) showed stable water quality, 11 (10%) showed declining water quality, and 30 (27%) showed fluctuating water quality. For hypolimnetic total phosphorus, 11 (10%) of the 108 lakes showed an improvement in water quality, 39 (36%) showed stable water quality, nine (8%) showed declining water quality, and 49 (45%) showed fluctuating water quality. A general assessment of the above trends suggests that most lakes show no trend (are either stable or fluctuating), and of those showing a trend, more are degrading than are improving.

Trends were analyzed in the data from the DES Acid Lake Outlet Monitoring Program. Trends were analyzed on the 20 year datasets for 20 lakes identified as having significant trends for a suite of parameters. For pH, two lakes had decreasing trends, four lakes had increasing trends and the remaining 14 lakes had no significant trends. For alkalinity, 12 of the 20 lakes had increasing trends (improvement in water quality) and only one lake had decreasing trends. For conductivity, ten of the 20 lakes had increasing trends (declining water quality) and six lakes had decreasing trends. The increasing trends at Echo Lake, Granite Lake, Loon Pond, Millen Pond, and Pleasant Lake were an order of magnitude higher than for the other lakes. For calcium, six lakes had increasing trends while only two lakes had decreasing trends. For sulfate, only one lake had an increasing trend (Granite Lake) while nine lakes had decreasing trends (improvement in water quality). In terms of the effects of acid rain, Granite Lake has the most troubling trends. Not only is pH decreasing but alkalinity is also decreasing and sulfate is increasing.

For rivers, trends were evaluated for a station on the Saco River at the New Hampshire / Maine border. The only trends that were apparent in the 14 year dataset (1990-2003) were increasing dissolved oxygen saturation, and decreasing turbidity and zinc which are indicative of improved water quality and increases in specific conductivity, and temperature, which can be indicative of declining water quality. The trends were apparent in both the raw and flow-adjusted concentrations.

Every three years, the Piscataqua Region Estuaries Partnership (PREP) publishes a State of the Estuaries report that communicates the status and trends of key environmental indicators for the Great Bay and Hampton-Seabrook estuaries and the Piscataqua Region watersheds. The 2009 report concludes that the environmental quality of the Piscataqua Region estuaries is declining. Eleven of 12 environmental indicators show negative or cautionary trends – up from seven indicators classified this way in 2006.

The total nitrogen load to the Great Bay Estuary increased by 42% in the past five years. In Great Bay, the concentrations of dissolved inorganic nitrogen, a major component of total nitrogen, have increased by 44% in the past 28 years. The symptoms of increasing nutrient loads in the estuary system are evident in the decline of water clarity, eelgrass habitat loss, and failure to meet water quality standards for dissolved oxygen concentrations in tidal rivers.

A.2.6 WETLANDS

In New Hampshire there are an estimated 5,554 acres of tidal wetlands and 400,000 to 600,000 acres of non-tidal wetlands. The net change in wetlands due to permitted projects and violations versus restoration projects over the past two years have resulted in a gain of 0.035% of the state's tidal wetlands, and a loss of 0.014% of non-tidal wetlands. Permitting conditions on major projects (more than 20,000 square feet of freshwater wetlands or any amount of tidal wetlands) are designed to assure that there has been no significant net loss of wetlands function.

Over the past two years, less than 0.03% of all wetlands were impacted. Monitoring and enforcement of permit requirements have been expanded to assure compliance with permitting conditions, including the mitigation of unavoidable impacts.

In 1992, New Hampshire became the first state to be issued an inclusive statewide programmatic general permit by the U.S. Army Corps of Engineers that eliminates federal reliance on Nationwide general permits. The New Hampshire state Programmatic General Permit (NHSPGP) was reissued in June 2002, and continues to serve as a model that other states strive to match. The NHSPGP will be up for renewal in 2012, and DES continues to work with federal agencies to improve the process even further.

As previously reported, New Hampshire has, added wetlands to the Assessment Database. In all, 52,313 wetland assessment units covering 286,696 acres were added. Though no wetlands were assessed this cycle, this represents a significant first step to ultimately being able to assess and report on wetland water quality.

A.3 GROUNDWATER ASSESSMENT

New Hampshire is highly dependent on groundwater for drinking water. Groundwater is found in both overburden and fractured bedrock aquifers. Highly productive stratified drift aquifers are found scattered throughout the state. Natural groundwater quality from stratified drift aquifers is generally good, however, this water can be impacted by such aesthetic concerns as iron, manganese, corrosiveness, taste and odor. Bedrock well water quality is also generally good although this water can be impacted by naturally occurring contaminants including fluoride, arsenic, mineral radioactivity, and radon gas. Elevated concentrations of radon gas occur frequently in bedrock wells.

In addition to naturally occurring contaminants, there are many areas of localized contamination due primarily to releases of petroleum and volatile organic compounds from petroleum facilities, commercial and industrial operations and landfills. Of particular concern recently are detections of MTBE, a gasoline additive, in public and private wells. Many of these detections appear to be associated with usage of small amounts of gasoline by homeowners rather than leaking underground storage tanks or commercial operations. In May 2005, Governor John Lynch signed legislation prohibiting the use of MtBE in gasoline in New Hampshire after January 1, 2007. Due to widespread winter application of road salt, sodium is also a contaminant of concern in New Hampshire groundwater. Although localized contamination continues to be discovered in New Hampshire, particularly from leaking underground storage tank sites, the state has made steady progress in remediating sites with contaminated groundwater.

Groundwater quality in New Hampshire is generally good although there are localized areas of degraded groundwater from human activity and natural sources.

Recently, groundwater availability issues are of increasing concern, particularly in southern and southeastern New Hampshire. This concern has led to the passage of legislation that requires that any adverse impact to surrounding water resources from a large groundwater withdrawal be identified and mitigated.

New Hampshire continues to involve all stakeholders in identifying and addressing groundwater protection issues. The second five-year workplan to improve groundwater protection in partnership with stakeholders has been completed and a third five-year workplan is in the development phase.

A.4 SPECIAL STATE CONCERNS

Although tremendous progress has been made in the past 35 years to clean up surface waters in the New Hampshire, there is much more to be done. The following is a list of the major water quality concerns and issues in the state that DES and others will be directing their attention to in upcoming years.

Special State concerns include:

Sustainability of Water Resources
Climate Change
Funding of Water Programs
Drinking Water Quality/Quantity
Upgrading Wastewater Facilities & CSO Abatement
Nonpoint Source Pollution
Nuisance Aquatic Species
Opening Shellfish Beds for Harvesting
Estuarine Eutrophication
Mercury Reduction
Acid Deposition
Chloride (Road Salt)
Cyanobacteria Blooms

SUSTAINABILITY OF WATER RESOURCES

Increasing growth and development is stressing the quality, quantity and natural aquatic biota of many of the State's water resources. Although much has been accomplished, there is concern and evidence that existing water management programs may not be adequate to protect water quality and quantity. To help restore and protect its water resources for future generations, the Commissioner of DES authorized the Lakes Management Advisory Committee (LMAC) and the Rivers Management Advisory Committee (RMAC) on January 3, 2007 to undertake a Sustainability Initiative. These committees are legislatively charged with advising the DES on maintaining water quality and quantity.

In January, 2008, the LMAC and RMAC published a report entitled, "The Sustainability of New Hampshire's Surface Waters" (LMAC/RMAC, 2008 and http://des.nh.gov/organization/divisions/water/wmb/rivers/rmac/documents/sustainability_initiative.pdf). For the purposes of their report, the LMAC and the RMAC developed the following functional definition of sustainability to achieve their goals:

> *"to institute anti-degradation measures to preserve and protect water quality and quantity, to maintain intact ecological linkages between surface waters and their surrounding watersheds, to achieve the appropriate balance between different human uses while protecting the biological integrity of the resource, and to restore and improve existing degraded systems."*

The report is a preliminary roadmap for the initiative in that it provides an overview of the problem, what has been done in the past, and, most importantly, identifies eight key issues that need to be addressed to achieve Sustainability.

CLIMATE CHANGE

The world's leading scientists concluded in 2007 that it is "unequivocal" that Earth's climate is warming, and that it is "very likely" (a greater than 90% certainty) that the heat-trapping emissions(i.e., carbon dioxide and other greenhouse gases) from the burning of fossil fuels and other human activities have caused "most of the observed increase in globally averaged temperatures since the mid-twentieth century" (NIECIA, 2007 and IPPC, 2007).

To address climate change, Governor John Lynch established a Climate Change Task Force through Executive Order in 2007 with the charge of developing a Climate Change Action Plan for the State of New Hampshire. Goals of the Task Force include reducing greenhouse gas emissions and recommending steps New Hampshire can take to meet those goals. Recommendations by the Task Force will also help New Hampshire achieve the Governor's goal of ensuring 25% of our energy comes from renewable sources by 2025.

The final Plan was released on March 25, 2009 at a Press Event with the Governor. The complete New Hampshire Climate Action Plan is available at http://des.nh.gov/organization/divisions/air/tsb/tps/climate/index.htm .

INSUFFICIENT FUNDING TO MANAGE WATER RESOURCES

Management of New Hampshire's surface waters requires adequate funding to support essential core programs. These programs are needed to 1) help prevent the degradation of surface waters in the state and the potential loss of revenue and 2) to protect the hundreds of millions of dollars which have already been invested to restore and maintain water quality in New Hampshire. For the past several years federal funding for many programs have remained flat or decreased. If this trend is not reversed soon, or if other sources of funding are not found, important water quality programs will need to be cut back in scope and staff or eliminated. This would be extremely detrimental to New Hampshire's water resources since many programs are already under-funded and understaffed. Further, if water quality is allowed to decline, recent studies have shown that it could have a significant negative impact on the State's economy.

DRINKING WATER ISSUES

Existing data demonstrates that most of the state has very high quality drinking water. However, as population increases and landscapes are altered by human activities, it is critical that New Hampshire implements land conservation practices, best management practices, education and outreach and regulatory enforcement where appropriate to protect water resources. Also, as our ability to detect and evaluate contaminants in drinking water has increased, so has the need to address emerging contaminants such as cyanotoxins, pharmaceuticals and personal care products. These challenges speak to the need for more effective efforts to prevent the degradation of water supply sources.

WASTEWATER TREATMENT FACILITY ISSUES

In accordance with the technology limits of state and federal law, the vast majority of municipal wastewater facilities receive at least secondary treatment. Many of these facilities, however, are beyond their design life and will soon need upgrades, equipment replacement, and the like. In addition, water quality studies have shown that some wastewater facilities will need to be upgraded to provide advanced treatment for pollutants such as biochemical oxygen demand, phosphorus, and/or nitrogen. Six New Hampshire communities are also dealing with abatement of combined sewer overflows. To expedite implementation of plant upgrades and CSO abatement plans, federal funding assistance is needed.

NONPOINT SOURCES

The major contributors to nonpoint source (NPS) pollution are people at home, work and play. To address such NPS issues it is necessary to 1) convince people that a problem exists, 2) develop reasonable solutions and 3) fund the solutions. Stormwater runoff is a major contributor of nonpoint source pollution in many areas. Education and funding are the major obstacles, which must be overcome to resolve NPS water quality concerns. Education and outreach are essential since many water quality impairments are the result of the cumulative impacts of individual actions. Integration of land use planning, land protection, and best management practices (BMP) implementation remains a challenge in preventing and controlling NPS pollution. Permanent protection of critical lands, including riparian buffers and headwater streams, is essential to maintaining water quality, particularly in urbanizing areas. Assisting communities with complying with Phase II of the federal NPDES stormwater permitting requirements will also help to abate urban stormwater pollution.

INTRODUCTION OF NON-NATIVE NUISANCE AQUATIC SPECIES

Preventing the spread of new exotic aquatic plants and animals into state waters is a major concern in New Hampshire. In 1997, legislation was passed to prohibit the sale, transport, and introduction of exotic aquatic weeds in the state. In 1999, rules were adopted pursuant to this legislation, further restricting activities that would result in new introductions of 29 species of plants. These rules were revised and expanded in 2007 and again in 2009. The Exotic Species Program must continue to prevent the introduction and spread of non-native nuisance aquatic species in New Hampshire's surface waters so as to protect the ecological, recreational, aesthetic, and economic values of our waterbodies. Through education and outreach efforts the rate of spread of exotic aquatic plants has slowed in New Hampshire, and new infestations are found much earlier when they are still pioneering and more easily managed, but still one or two new infestations are found each year, and more than 70 waterbodies have on-going management practices to reduce exotic plants in order to maintain designated uses of the waterbodies.

COASTAL ISSUES- SHELLFISHING AND EUTROPHICATION

Opening more shellfish beds for harvesting continues to be a priority in New Hampshire. Since 1993, the State has been actively working on reopening shellfish harvesting areas. Efforts to identify sources of bacteria pollution and classify shellfish growing areas have resulted in the reopening of over 850 acres of estuarine waters for harvest. In addition to the work in estuarine areas, the DES Shellfish Program reopened nearly all of the Atlantic Coast for harvesting in late 2000. To date, approximately 46% of the estuarine waters are conditionally approved and 95% of the coastal waters are approved for shellfishing.

Eutrophication from excess nutrients is a critical issue affecting the aquatic life designated use in the Great Bay Estuary. The Great Bay Estuary is a national treasure and a valuable resource to New Hampshire. It is one of 28 "estuaries of national significance" designated by EPA. Unfortunately, the 2009 State of the Estuaries Report for the estuary (PREP, 2009) showed all the classic signs of eutrophication: Increasing nitrogen concentrations, low dissolved oxygen, and disappearing eelgrass habitat. These symptoms of eutrophication from excess nutrients impair the aquatic life designated use which is a violation of the state water quality standards for nutrients (Env-Wq 1703.14) and biological and aquatic community integrity (Env-Wq 1703.19). Reducing nitrogen loads to the estuary to remove these impairments and restore the estuary are top priorities for DES and EPA.

MERCURY IN FISH

Similar to other states in the northeast, New Hampshire has statewide fish consumption advisory due elevated levels of mercury levels in fish tissue. The advisory recommends limiting the amount of fish eaten per month. Symptoms of mercury poisoning can include loss of sensation in the extremities (paresthesia), loss of coordination in walking, slurred speech, diminution of vision and/or loss of hearing. Human related sources that may emit mercury into the atmosphere include coal combustion, smelting, and waste incineration with the majority originating from outside of the northeast region.

Much work has been done to reduce mercury emissions in New Hampshire including development and implementation of a state level mercury reduction strategy, passage of legislation to impose stringent mercury emission limits on the State's largest municipal waste combustor, medical waste incinerators and coal-fired utilities as well as legislation banning the sale of many types of mercury-added products in the State. In addition, the State continues to actively participate an effort led by the Conference of the New England Governors and the Eastern Canadian Premiers to implement the Regional Mercury Action Plan and participated in the development of a mercury TMDL for the northeast region prepared by the New England Interstate Water Pollution Control Commission with assistance from the northeast states. Although significant progress has been made, more work remains to further reduce mercury down to levels that will ultimately allow the fish consumption advisory to be rescinded.

ACID DEPOSITION (ACID RAIN)

The passage of the Clean Air Act Amendments in 1990 resulted in a decrease in sulfur dioxide emissions from in-state and out-of-state sources. This resulted in a decline in sulfate deposition to the state and a decline in sulfate concentrations in state surface waters. It did not however, result in much improvement in the acidity or acid neutralizing capacity status of New Hampshire surface waters. The lack of improvement is due to a number of reasons, including the loss acid neutralizing minerals in the soils and the accumulation of sulfur and nitrogen in the soils. As a result, hundreds of waterbodies in the state do not meet state water quality standards for the protection of aquatic life due to low pH (i.e. acidic conditions). Additional reductions in nitrogen and sulfur emissions are necessary to expedite recovery from acid deposition in the Northeast.

CHLORIDES AND ROAD SALT

Monitoring data have shown increasing levels of sodium, chloride, and conductivity in surface waters, presumably from deicing (i.e., road salt) runoff. The most impacted surface waters are those that drain salted roads, highways, and urban areas. Total Maximum Daily Load (TMDL) studies were approved for four brooks in the I-93 expansion corridor that fail to meet the water quality criteria for chloride. Efforts are underway to work with New Hampshire Department of Transportation and stakeholders to decrease salt loadings in the region and to educate the public on the issue.

CYANOBACTERIA BLOOMS

DES considers Cyanobacteria (formerly referred to as blue-green algae) a significant public health risk to people who recreate in infected waters and increases the likelihood of animal mortality if infected waters are ingested. Nutrient enriched waterbodies increase the potential for nuisance blue-green scums that are potentially toxic to the aquatic ecology. Cyanobacteria scums can be fatal to all animals that consume the water and can cause severe illness or skin rashes if ingested or contacted by humans. To protect the public and environmental health, DES has taken a proactive approach by issuing advisories for designated public bathing beaches impacted by cyanobacteria and issuing press releases to warn shoreland owners that cyanobacteria scums are present around the waterbody.

PART B. INTRODUCTION

B.1 PURPOSE

The primary purpose of this document is to report on the water quality status of New Hampshire's surface waters and groundwater in accordance with Section 305(b) and 303(d) of the federal Clean Water Act and New Hampshire Statutes Chapter 485-A:4.XIV. Further information about these requirements is provided below. This report also provides an overview of water pollution conditions and abatement efforts in New Hampshire.

The Federal Water Pollution Control Act [PL92-500, commonly called the Clean Water Act (CWA)], as last reauthorized by the Water Quality Act of 1987, requires each state to submit two surface water quality documents to the U.S. Environmental Protection Agency (EPA) every two years. Section 305(b) of the CWA requires submittal of a report (commonly called the "305(b) Report"), that describes the quality of its surface waters and an analysis of the extent to which all such waters provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water. The second document is typically called the "303(d) List " and is so named because it is a requirement of Section 303(d) of the CWA. The 303(d) List includes surface waters that are:

1. Impaired or threatened by a pollutant or pollutants.
2. Not expected to meet water quality standards within a reasonable time even after application of best available technology standards for point sources or best management practices for nonpoint sources.
3. Require development and implementation of a comprehensive water quality study (i.e., a Total Maximum Daily Load or TMDL study) that is designed to meet water quality standards.

In addition to satisfying federal reporting requirements, this document is also intended to satisfy New Hampshire Statutes Chapter 485-A:4.XIV, which requires DES to biennially provide a report to the governor and council (and others) of its findings regarding analysis of water quality monitoring data and identification of any long term trends which may affect the purity of the surface and groundwaters of the state.

B.2 REPORT FORMAT

This report is organized in a manner consistent with national guidance and is similar to past 305(b) reports. This facilitates comparison with previous New Hampshire reports and with 305(b) reports from other states that followed the national guidance.

Part A includes the Executive Summary. Part B (Introduction) discusses the purpose of the report, an overview of the report format as well as how to obtain information from the DES surface water quality website.

The Background section (Part C) begins with New Hampshire surface water statistics such as the number and acres of lakes, total river miles, and square miles of estuaries and oceans.

This section also includes a description of the many water pollution control programs in New Hampshire including contact information. Examples include the water quality standards, non-point source control, and the coastal programs to name but a few. A cost/benefit analysis discusses the social and economic impacts of clean water. Finally, the state special concerns section provides a list of the major water quality concerns and issues in the state that DES and others will be directing their attention to in upcoming years.

Part D includes a discussion of New Hampshire's numerous water resource monitoring programs and "Water Monitoring Strategy". A brief review of how the monitoring data was assessed to determine water quality status is then provided. This is followed by details of the assessment results including a statewide overview and detailed assessments for each waterbody type. The lakes assessment section includes all of the CWA Section 314 reporting requirements. Results from new probabilistic assessment efforts in estuaries, wadeable streams, and lakes as well as results of trend analyses for estuaries, lakes, and rivers are also presented. Finally, Part D includes a section on public health issues such as drinking water restrictions, bathing beach advisories, and fish consumption advisories.

Part E discusses groundwater resources in New Hampshire. This discussion starts with groundwater protection programs followed by a summary of groundwater quality.

Part F of the report provides details of the public participation process that occurred throughout the assessment process. Public input was requested for water quality data, as well as comments on the 2010 Consolidated Assessment and Listing Methodology (CALM) (DES, 2010) which acted as the foundation for the 2012 CALM (DES, 2012), and the 2012 Section 303(d) list.

B.3 DES SURFACE WATER QUALITY ASSESSMENT WEBSITE

Readers are encouraged to visit the DES Surface Water Quality Assessment website at http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm for a downloadable copy of this document as well as additional assessment information, lists, and maps. The website also includes instructions to help find assessment information for any waterbody of interest through the "Watershed Report Cards" or by downloading the GIS files. Included is a list sorted in alphabetical order by waterbody type and then waterbody name and another sorted by town/city, then waterbody type and then waterbody name. Using these lists the Assessment Unit Identification Number (or AUID) for any waterbody can be obtained. The new 2012 Surface Water Quality Assessment Viewer (http://www2.des.state.nh.us/WaterShed_SWQA/SWQA_Map.aspx) was developed for users to,

1) see the spatial extend of assessment units,
2) see where sampling data was collected,
3) access the watershed report cards, and
4) run reports to access the water quality data summaries covering the 2006, 2008, 2010, and 2012 assessment cycles.

Knowing the AUID, the various lists can be consulted to find water quality assessment results for any surface water of interest.

PART C.BACKGROUND

C.1 TOTAL WATERS

While New Hampshire is not a large state in terms of land area or population, it is fortunate to have numerous lakes, ponds, rivers, streams, and estuaries. Though its coastline is limited, its tidal embayments are extensive. With an average of 40 inches of rainfall fairly evenly distributed throughout the year, New Hampshire's surficial aquifers are regularly replenished.

Table 1 provides a general overview of surface statistics for New Hampshire. For the 2010 assessment, the mapping has been moved from 1:100,000 to the more accurate 1:24,000 mapping scale hydrography that is linked to the National Hydrography Dataset (NHD); the national coverage used by EPA. By transitioning to higher resolution mapping many of the smaller waterbodies missed by the 1:100,000 scale mapping, are now shown. As such, the total number and size of assessment units reported since 2010 are significantly higher than in 2008. An additional advantage of transitioning to more accurate mapping is that the line work more closely resembles what is actually on the ground. These improvements have greatly enhanced the ability of DES to manage and report on the status of the State’s water resources.

The estimated miles of rivers and streams has dramatically increased from that reported in the 2008 305(b) Report with the 2012 assessment including approximately 7,000 more miles of rivers.

The category called Impoundment was new in 2002 and generally represents riverine impoundments or larger lake-like waters that exist because of the presence of a dam. With the higher resolution mapping the 2012 assessment includes approximately 450 more impoundments (approximately 1,500 acres) than the 2008 assessment.

The estimated number of lakes has increased by approximately 375 (approximately 4,600 acres). Most of the additional lakes are small.

With regard to the estuaries, a value of 17.98 square miles is reported this year versus 17.8 square miles in 2008. The 0.18 square miles increase from 2008 to 2012 reflects more detailed mapping of tidal creeks beyond that which the shellfishing program defines.

The Department’s estimate of total waters will continue to fluctuate slightly as additional waters are sampled that do not appear on the 1:24,000 mapping and need to be added. Additionally, as dams are added or removed the corresponding sections of river will transition from river to impoundment and from impoundment to river.

Table 2: Surface Water Atlas

Topic	Value
State Population as reported in 2010 US Census	1,316,470
Square miles of surface area[1]	9,304
Number of major water basin	6
Total miles of rivers and streams[3,4]	16,961.8
Border miles of shared rivers/streams[5]	310
Number of lakes/reservoirs/ponds[4,6]	1,558
Acres of lakes/reservoirs/ponds[4]	162,742.9
Number of impoundments[6,8]	1,235
Acres (Miles) of impoundments[8]	22,434.7 / (339)
Square miles of estuaries[4]	17.98
Square Miles of jurisdictional Ocean Waters	81.48
Miles of ocean coast[2]	18
Acres of freshwater wetlands[9]	400,000 - 600,000
Acres of tidal wetlands[9]	7,500

Footnotes

1. NH Office of state Planning estimate based on 1:24,000 scale U.S. Geological Survey maps.
2. DES estimate based on 1:24,000 scale U.S. Geological Survey maps.
3. The apparent increase in the number of stream miles in recent years is a function the 2010 remapping to a higher resolution data layer. The value of 9,658 miles reported in the 2008 305(b) Report is based on the 1:100,000 National Hydrography Database. The 2012 value is base synchronization with the 1:24,000 National Hydrography Database in March 2012.
4. Based upon New Hampshire's Assessment Units, which are based on the 1:24,000 scale, National Hydrography Database.
5. DES estimate of river miles for the Connecticut River, Halls Stream, the Salmon Falls River and the Piscataqua River.
6. Includes the 321 designated beaches on the 1,237 lake like waterbodies.
7. Includes the 25 designated beaches on the 1,210 impoundments.
8. The New Hampshire Department of Environmental Services began mapping and evaluating impoundments for the 2002 305(b)/303(d).
9. N.H. Department of Environmental Services, Wetland Bureau, Annual Report, FY 2002.

C.2 WATER POLLUTION CONTROL PROGRAM

New Hampshire has numerous water pollution control programs in place to help protect, restore and sustain the quality of its water resources. The following sections include a brief description of many of these programs including whom to contact for more information.

C.2.1 WATER QUALITY STANDARDS

Contact: Gregg Comstock, DES Watershed Management Bureau
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DES Website: http://des.nh.gov/organization/divisions/water/wmb/wqs/index.htm

C.2.1.1 Overview

Surface water quality standards establish the baseline quality that all surface waters of the state must meet in order to protect their intended uses. They are the "yardstick" for identifying where surface water quality is good or poor and for determining the effectiveness of regulatory pollution control and prevention programs. The Water Quality Standards Program is in charge of ensuring that the States surface water quality standards are up-to-date and protective of the designated uses assigned to each surface water.

Water quality standards in New Hampshire are included in the state's surface water quality regulations (Env-Wq 1700) (DES, 2008b) and in New Hampshire state statute RSA 485-A:8. A downloadable copy of the regulations may be obtained from http://des.nh.gov/organization/divisions/water/wmb/index.htm and a copy of the state statute may be obtained from http://www.gencourt.state.nh.us/rsa/html/l/485-a/485-a-mrg.htm.

The standards are composed of three parts: designated uses, water quality criteria, and antidegradation. Each of these components is briefly discussed below.

C.2.1.2 Designated Uses

Surface waters of the state are classified as either Class A or B, with the majority of waters being Class B. DES maintains a list that includes a narrative description of all the legislative classified waters. Designated uses are the desirable uses that surface waters should support such as swimming (i.e., primary contact recreation) and fishing (i.e., aquatic life). As indicated below, state statute RSA 485-A:8 is quite general with regards to designated uses for New Hampshire surface waters.

Classification	Designated Uses as described in RSA 485-A:8
Class A -	These are generally of the highest quality and are considered potentially usable for water supply after adequate treatment. Discharge of sewage or wastes is prohibited to waters of this classification.
Class B -	Of the second highest quality, these waters are considered acceptable for fishing, swimming and other recreational purposes, and, after adequate treatment, for use as water supplies.

Further review and interpretation of the regulations (Env-Wq 1700), however, reveals that the general uses can be expanded and refined to include the seven specific designated uses shown in Table 3. Each of these designated uses, with the exception of wildlife, was assessed for this reporting cycle. An assessment methodology for wildlife has not yet been developed but will be included in future assessments.

Table 3: Designated Uses for New Hampshire Surface Waters

Designated Use	DES Definition	Applicable Surface Waters
Aquatic Life	Waters that provide suitable chemical and physical conditions for supporting a balanced, integrated and adaptive community of aquatic organisms.	All surface waters
Fish Consumption	Waters that support fish free from contamination at levels that pose a human health risk to consumers.	All surface waters
Shellfish Consumption	Waters that support a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers	All tidal surface waters
Drinking Water Supply After Adequate Treatment	Waters that with adequate treatment will be suitable for human intake and meet state/federal drinking water regulations.	All surface waters
Primary Contact Recreation (i.e. swimming)	Waters suitable for recreational uses that require or are likely to result in full body contact and/or incidental ingestion of water	All surface waters
Secondary Contact Recreation	Waters that support recreational uses that involve minor contact with the water.	All surface waters
Wildlife	Waters that provide suitable physical and chemical conditions in the water and the riparian corridor to support wildlife as well as aquatic life.	All surface waters

C.2.1.3 Water Quality Criteria

The second major component of the water quality standards is the "criteria". Criteria are designed to protect the designated uses of all surface waters and may be expressed in either numeric or narrative form. A waterbody that meets the criteria for its assigned classification is considered to meet its intended use. Water quality criteria for each classification may be found in RSA 485-A:8, I-V and in the state's surface water quality regulations (DES, 2008b).

C.2.1.4 Antidegradation

The third component of water quality standards is antidegradation which are provisions designed to preserve and protect the existing beneficial uses and to minimize degradation of the state's surface waters. Antidegradation regulations are included in Part Env-Wq 1708 of the state's surface water quality regulations (DES, 2008b). According to Env-Wq 1708.03, antidegradation applies to the following:

- Any proposed new or increased activity, including point and nonpoint source discharges of pollutants that would lower water quality or affect the existing or designated uses;
- A proposed increase in loadings to a waterbody when the proposal is associated with existing activities;
- An increase in flow alteration over an existing alteration; and
- All hydrologic modifications, such as dam construction and water withdrawals.

C.2.1.5 Revisions to Water Quality Standards

In accordance with the Clean Water Act (CWA), water quality standards are reviewed and revised, as necessary, at least every three years. Statutory authority to create (or revise) the water quality standards is provided under RSA 485-A:6 and RSA 485-A:8. Any new rules or changes to rules must be adopted in accordance with RSA 541-A, which first requires a public hearing.

The New Hampshire Surface Water Quality Regulations Env-Wq 1700 were re-adopted without change as interim rules for a period of six months, effective December 10, 2007. The rules with minor revisions updating and clarifying the existing rules, and now referred to as Env-Wq 1700, were formally adopted on May 21, 2008. Two sections of the rules, Env-Wq 1708.10 and 1708.12, were updated and formally adopted on August 23, 2011.

In 2000, DES formed a Water Quality Standards Advisory Committee (WQSAC). The Committee is comprised of approximately 30 representatives from a variety of interests and organizations. The purpose of the Committee is to provide input to DES on water quality standards issues, including any proposed rule changes. Over the past few years, DES has worked with the WQSAC to revise sections of the Surface Water Quality Regulations, Env-Wq 1700.

On April 14, 2011, DES held a Triennial Review hearing for suggestions from the public for possible revisions to the standards per 40 CFR 131.20. These suggestions will be considered by the WQSAC for future modifications to New Hampshire's water quality standards. Six people provided testimony at the hearing or in writing. These individuals requested that DES consider the following revisions to the surface water quality standards. These topics will be reviewed by the WQSAC and its subcommittees.

- Add language regarding no increased pollutant loads to impaired waters
- Update antidegradation provisions
- Review the water temperature criteria
- Review a biotic ligand model for copper aquatic life criteria
- Review the turbidity criteria
- Review the chloride criteria
- Update the classification system and designated uses

C.2.2 POINT SOURCE CONTROL PROGRAM

Contact: Stergios Spanos P.E., DES Wastewater Engineering Bureau
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The Clean Water Act of 1972 provided much of the impetus for the water pollution abatement effort of the last three decades. With associated federal, state and local funding, involving the earlier Construction Grants Program, the current state Revolving Loan Program, as well as the state Aid Grant Program, significant progress in abating pollution from point sources was made and concomitant improvements in New Hampshire surface water quality was noted. The construction of industrial and municipal Wastewater Treatment Facilities (WWTF) initially focused on technology-based controls and on conventional pollutants. With the completion of the upgrade of the primary plants to secondary treatment and with the elimination of most dry weather raw municipal discharges, New Hampshire has shifted emphasis to water quality-based controls and to the control of toxic pollutants.

The following is an overview of the major components comprising New Hampshire's point source control program. First discussed in Section C.2.2.1 is the discharge permit process, which is the primary vehicle used to control and prevent point source discharges from violating water quality standards. In Section C.2.2.2, EPA's Combined Sewer Overflow Policy for abating pollution from Combined Sewer Overflows (CSOs) is discussed. Another important component is the industrial pretreatment program, the purpose of which is to control the pollutants that industries discharge to municipal WWTFs so that the pollutants do not pass through or interfere with the treatment processes at the WWTF or contaminate the sewage sludge; this is discussed in Section C.2.2.3. The methods used to ensure compliance of point sources with water quality standards is covered in Section C.2.2.4.

C.2.2.1 Discharge Permits

Contact: Jeff Andrews, P.E., DES Wastewater Engineering Bureau,
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The primary means of regulating point sources in New Hampshire is through the discharge permit process. Since the state is not "delegated," EPA is responsible for implementing the NPDES (National Pollutant Discharge Elimination System) permit process in accordance with Section 402 of the Clean Water Act (CWA). As a rule, the state works closely with EPA to establish appropriate discharge limits. Prior to issuance of the NPDES permit, the state must certify that the permit meets state water quality laws and regulations.

In accordance with RSA 485-A:13, dischargers are also required to obtain a state discharge permit. In almost all cases, the NPDES permit serves as the state discharge permit. In such cases, and after the NPDES permit is issued, DES sends a letter to the discharger informing them that their NPDES permit is also their state discharge permit. In this manner, the permittee only has one set of permit conditions with which to comply.

Permits are generally issued for five years. In New Hampshire there are presently 144 NPDES permits that have been adopted as state discharge permits. Of these 144 permits, 86 are individual permits and 58 are general permits (general cooling water permits, water treatment plant general permits, remediation general permits, and POTW general permits). Of the 86 individual NPDES permits 51 are categorized as major permits and 35 are categorized as minor permits.

RSA 485-A:8, I-IV and the Surface Water Quality Regulations (Env-Wq 1700) are the primary references used to develop permit effluent limits. Where toxics are a concern, specific permit limits, based on the chemical specific criteria in the Surface Water Quality Regulations, are set for those toxics in the permittee's effluent, which may cause water quality violations. To further prevent toxic discharges, most permits also include a requirement to perform Whole Effluent Toxicity (WET) tests to determine if the combined effect of all substances in the discharge are potentially toxic to aquatic organisms in the receiving water.

C.2.2.2 Combined Sewer Overflow (CSO) Strategy

Contact: Tracy L. Wood, P.E., DES Wastewater Engineering Bureau
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Combined sewer overflows are point source discharges regulated under the NPDES and state discharge permit system. By 2011, 33 CSOs remain located in the six communities of Berlin, Exeter, Lebanon, Manchester, Nashua, and Portsmouth.

In 1994, EPA issued a national strategy to address CSOs by requiring communities to implement nine minimum technology-based controls and develop CSO Long-Term Control Plans (LTCP). The LTCP addresses a range of CSO control options that would ultimately lead to achieving appropriate water quality objectives and compliance with the CWA.

Berlin has one remaining CSO that during storm events occasionally discharges to the Androscoggin River. This CSO acts as an emergency relief point to prevent flooding of the main pumping station, which pumps wastewater across the Androscoggin River to the WWTF. The City continues to monitor the frequency, volume, and duration of overflows. In December 2010, EPA issued an Administrative Order to Berlin to address E. coli limit violations from the CSO, including development of an updated long-term CSO control plan (LTCP). The City intends to eliminate this CSO by reducing Infiltration/Inflow (I/I) in the sewers upstream of the pump station, in addition to possible storage.

Exeter has eliminated all of its CSOs, except one, through a separation program. The remaining CSO overflows during storm events to Clemson Pond, which outlets to the Squamscott River. Exeter is currently working with EPA to develop a plan to reduce the CSO overflow events, and possibly eliminate all CSO overflows.

Lebanon has four remaining CSOs (one eliminated in 2011) that occasionally discharge during storm events to the Connecticut and Mascoma Rivers. In August 2009, Lebanon entered into a Consent Decree (CD) with EPA and DES. Under the terms of the CD the City is to eliminate its five (now four) remaining CSOs by December 31, 2020. This is to be accomplished by completing specific sewer separation projects in several phases with each phase to be completed by November 1st of 2011, 2015, 2018, and 2020. Also under the terms of the CD, the City will complete an assessment of its wastewater collection system's Capacity, Management, Operation and Maintenance (CMOM) practices to identify sources of I/I and elimination of Sanitary Sewer Overflows (SSOs).

There are 15 CSOs remaining in Manchester. Twelve of the CSOs discharge to the Merrimack River, two CSOs discharge to the Piscataquog River, and one CSO discharges to Ray Brook. In March 1999, EPA issued an Administrative Order (AO) (amended May 2002) to Manchester to eliminate its CSOs. The City spent $58 million over its ten-year Phase I program, eliminating 13 CSOs, and reducing the overall CSO discharges to the west side of the Merrimack River by 99%. In November 2009, Manchester submitted its final report for its Phase I (1999 to 2009) CSO Abatement Program. In March 2010 Manchester submitted its revised LTCP for

CSO Abatement for its Phase II objectives, which includes the CSOs from the east side of the City, and even longer-term its four remaining CSOs from the west side of the City.

Nashua has eight CSOs remaining; four of the CSOs discharge to the Nashua River and four discharge to the Merrimack River. Nashua is undergoing a wet weather pollution control program in lieu of a complete separation program. In December 2005, Nashua entered into a Consent Decree (CD) with EPA and DES to reduce its CSO discharges, and included milestones for the design and construction of wet weather storage facilities for CSO 003 and CSO 004, and the design and construction of screening and disinfection facilities for CSO 005 and CSO 006. In 2009, Nashua completed the construction of its high-rate Wet Weather Flow Treatment Facility (WWFTF). In dry weather, the Nashua WWTF provides full secondary treatment for approximately 13 mgd, and can handle up to 38 mgd additional flow through its primary process during wet weather events. The WWFTF is able to handle an additional 60 mgd.

Portsmouth has four remaining CSOs which either discharge to a tidal pond which outlets to the Piscataqua River or directly to the Piscataqua River. In September 2009, Portsmouth entered into a CD with EPA and DES to provide secondary treatment for its collected wastewater and reduce its annual CSO volumes and frequency. Portsmouth is to achieve secondary treatment for its collected wastewater by December 1, 2016.

C.2.2.3 Industrial Pretreatment Program

Contact: Alex Rastorguyeff,DES Wastewater Engineering Bureau
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In accordance with the CWA, some municipal NPDES permits also include requirements to develop (or update) and implement an Industrial Pretreatment Program (IPP). "Pretreatment" refers to measures industry must take to prevent the discharge into municipal sewers of toxic pollutants from industry that are incompatible or will interfere with the municipal wastewater treatment process that will pass through the treatment plant and cause problems in the receiving waterbody, cause a problem with sludge disposal, or poses a health threat to WWTF workers. Dischargers regulated by the IPP are referred to as "indirect" dischargers because their flow does not discharge directly to the receiving water before being treated at the municipal WWTF.

The requirements to implement a federal IPP are generally limited to municipalities with industry that have wastewater treatment plants designed for 5 million gallons per day (MGD) or more. However, small communities may also be required to implement a federal IPP if nondomestic wastes have caused or could potentially cause upsets, sludge contamination, or violations of the municipal wastewater treatment plant's NPDES permit conditions. There are currently 13 municipalities in New Hampshire with EPA approved IPPs. Though the state does not have delegation for either the NPDES program or the federal IPP, DES assists EPA by providing program coordination, Pretreatment Compliance Inspections, Audits, and reviews of Annual Reports, Sewer Use Ordinances, and Local Limits.

New Hampshire also has an IPP, which supplements the federal program. Statutory authority for the state IPP is included in RSA 485-A:5. Regulations (Env-Wq 904) regarding standards for pretreatment of industrial wastes were recently revised and became effective on April 21, 2005.

In general, the state IPP requires municipal wastewater treatment plants with industrial contributors to:

- Develop Local Limits and minimum pretreatment standards, which are included in its DES approved Sewer Use Ordinance.
- Implement a system to permit all significant industrial dischargers, including sampling, monitoring, and reporting requirements.
- Apply to DES for approval of an Industrial Discharge Request (IDR) for the industrial discharge. This is submitted by the municipality using information provided by the industry. IDR approval is required to allow any new industry or any existing industry which is proposing to increase its flow or change its wastewater characteristics, to discharge to the municipal wastewater treatment plant.

The state IPP applies equally to all municipal wastewater treatment plants with or without federally approved IPPs. To date, several municipalities have implemented or are working on their own local pretreatment programs.

The economic cost to the communities of the pretreatment programs has generally been transferred to the industrial users by means of fees. In addition to municipal program administration costs, industrial users bear the cost of monitoring and pretreatment.

At this time it does not appear that interference of treatment processes or sludge recycling due to industrial discharges or the "pass-through" of industrial wastewater at municipal WWTFs is a significant concern. Continued oversight of industrial pretreatment programs by the state and federal government is necessary however to support local pursuit of program goals and to create incentives for pollution prevention.

C.2.2.4 Permit Compliance and Enforcement Program

Contact: Tracy L. Wood, P.E., DES Wastewater Engineering Bureau
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DES regularly inspects NPDES facilities and reviews discharge monitoring reports submitted by permittees for compliance with their permit limitations. When a violation is discovered, and assuming it does not pose an imminent threat to human health or the environment, DES will first do all it can to bring a violator into compliance through technical assistance, pollution prevention techniques, and/or Letters of Deficiency (LODs). This process allows the violator to voluntarily attain compliance, and in many cases it is very effective.

In more serious cases, or where compliance efforts have not been effective, formal enforcement actions may be necessary. These may include Administrative Orders (AO), Administrative Fines, Consent Agreements, or Consent Decrees. In cases where court orders such as Consent Agreements or Consent Decrees are to be issued, a referral is made to the New Hampshire Department of Justice. Depending on the availability of resources, and the specifics of a case, enforcement actions may be turned over to the EPA or performed in conjunction with the EPA.

New Hampshire remains concerned that all WWTFs maintain compliance with the requirements of their NPDES permits. Also of continuing concern is the maintenance of physical plants. To insure that local, state, and federal investments are secure and that permit limits are being complied with, DES inspectors regularly conduct either Compliance Sampling Inspections (CSIs) or Compliance Evaluation Inspections (CEIs). Emphasis is placed on the major NPDES permits, which are usually inspected on an annual basis. Inspections of the minor permittees are normally conducted on a biannual basis. At the time of plant inspections, inspectors prepare and issue comprehensive inspection reports to the facility citing deficiencies or recommending corrective action relative to such things as permit requirements, correct and timely filing of Discharge Monitoring Reports (DMRs), laboratory quality assurance programs, and correct laboratory procedures for all required testing.

C.2.2.5 Wastewater Treatment Facility Technical Assistance Program

Contact: Ana Ford – DES Wastewater Engineering Bureau/Operations Section
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For many years, DES has had an active Technical Assistance program for publicly-owned WWTFs. Frequent on-site inspections are performed each year, to assist WWTFs in maintaining compliance. Particular attention is paid to minor facilities that are not currently subjected to routine compliance inspections. Occasionally, assistance is also requested from industrial discharges.

In addition to offering highly technical advice, DES also conducts an extensive training program both in classroom environments as well as on-site over-the shoulder teaching and assistance.

Finally, DES administers a comprehensive Operator Certification program. The purpose of this program is to assure that properly trained and responsible personnel oversee the cost-effective operation and maintenance of treatment facilities, thereby protecting the over $1 billion government dollars, invested on such installations in New Hampshire.

C.2.3 SECTION 319 NONPOINT SOURCE CONTROL PROGRAM

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DES's nonpoint source program is administered by the DES Watershed Management Bureau, Watershed Assistance Section (http://des.nh.gov/organization/divisions/water/wmb/was/index.htm). Funds for Watershed Assistance Grants are appropriated through the DES Watershed Assistance Section from the U.S. Environmental Protection Agency under Section 319 of the Clean Water Act. Grant funds are available to develop and implement watershed based plans addressing nonpoint pollution problems in high quality watersheds or in impaired watersheds. A database of funded projects can be found at http://www2.des.state.nh.us/OneStop/watershed_npsgrants_query.aspx .

Half of the Section 319 funds are earmarked by federal guidance for restoration of impaired watersheds. Beginning in 2004, watershed restoration projects using 319 funds were required to address all of the elements of a watershed-based plan specified in EPA guidance. In general, plans must identify an impairment, determine pollutant load reductions needed to meet water quality standards, determine best management practices required to meet the targeted load reductions, and measure progress toward water quality goals.

Four impaired waters have been removed from the 303(d) list as a result of projects funded with 319 funds: Bog Brook in North Stratford, Middle Brook Canal in Moultonborough, and Black Brook and Crystal Lake in Manchester. A recently completed project in the Cains Pond watershed in Seabrook is likely to result in a fifth success story. Over 25 watershed based plans were recently completed in accordance with EPA guidance for impaired waters. For a list of watershed based plans, see http://des.nh.gov/organization/divisions/water/wmb/was/index.htm.

Watershed-based plans for high quality waters were recently completed by the Acton Wakefield Watershed Alliance for several lakes and by the Lakes Region Planning Commission (LRPC) for several bays on Lake Winnipesaukee. The LRPC plan is the first interactive web-based plan developed in the state, see http://winnipesaukeegateway.org/.

Each year, the Watershed Assistance Section prepares annual reports, which provide an overview of activities funded by the Section 319 program for the previous year as well as other activities within the within DES that address nonpoint source pollution. The annual reports provide a sense of the scope of work and costs that are necessary to abate various types of impairment caused by nonpoint sources as well as an indication of where future nonpoint source control efforts will be focused. Copies of the nonpoint source management annual reports for 2010 and 2011 are provided at as Appendix 2

EPA recently completed a study of the 319 program for the Office of Management and Budget. This study is likely to result in several changes to the 319 program. DES will likely update the state Nonpoint Source Management Plan in 2013 and the updated plan will include prioritized watersheds directing expenditure of future 319 funds.

C.2.4 MONITORING PROGRAMS

Please see section D.1 for a description of water monitoring programs in New Hampshire.

C.2.5 401 WATER QUALITY CERTIFICATION PROGRAM

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The purpose of the Water Quality Certification (WQC) program is to protect surface water quality and uses (such as swimming and aquatic life) by ensuring compliance with State surface water quality standards. Examples of surface waters include lakes, ponds, rivers, streams, wetlands and tidal waters. The WQC program is authorized by NH RSA 485-A:12, III and IV. Water Quality Certification for federal National Pollutant Discharge Elimination System (NPDES) permits are administered by the DES Wastewater Engineering Bureau. All other WQCs are administered by the DES Watershed Management Bureau. Water Quality Certifications typically include enforceable conditions, including monitoring requirements, to ensure compliance with surface water quality standards.

There are two situations where Water Quality Certification is required. In accordance with RSA 485-A:12, III, the first includes projects that require certification under Section 401 of the federal Clean Water Act (CWA). According to Section 401, any applicant for a federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities that may result in any discharge into navigable waters, shall provide the licensing or permitting agency with a certification from the state where the discharge originates or will originate, that the discharge will meet state surface water quality standards. It is important to note that the WQC must be written to ensure that both the construction (if applicable) and operation of the facility will comply with state surface water quality standards.

Examples of projects that require Water Quality Certification under section 401 of the CWA include activities that require a CWA Section 404 permit from the U.S. Army Corps of Engineers (ACOE) for the discharge of dredged or fill material in navigable waters, hydropower projects requiring a Federal Energy Regulatory Commission (FERC) license, and discharges of wastewater and/or stormwater that require a U.S. Environmental Protection Agency NPDES permit.

There are two types of Section 404 ACOE permits: an individual permit and the New Hampshire Programmatic General Permit (PGP). Projects determined by the Army Corps of Engineers to require an individual Section 404 permit must file an application with and receive a Water Quality Certification from the DES Watershed Management Bureau. The PGP is a general permit, which is issued every five years. Prior to issuance, DES issues a 401 Water Quality Certification for the PGP. In general, the conditions in the PGP 401 WQC require all eligible projects to meet New Hampshire surface water quality standards. Since PGP projects are already covered by the PGP 401 WQC, most applicants do not need to do anything more with regards to obtaining 401 Water Quality Certification approval. However, it is important to realize that DES may modify the PGP 401 WQC for any Programmatic General Permit project to include more specific conditions to ensure compliance with surface water quality standards. DES will notify applicants in advance if their project requires modification of the PGP 401 WQC.

In accordance with RSA 485-A:12, IV, the second situation includes projects that do not require a Water Quality Certification under Section 401 of the CWA, but involve the direct surface water withdrawal or diversion of surface water that require registration under RSA 488:3, and were not in active operation as of July 7, 2009. According to RSA 488:3, registration is required when the cumulative amount of withdrawal or discharge is more than 20,000 gallons of water per day, averaged over any seven-day period, or more than 600,000 gallons of water over any 30-day period."

For all projects requiring Water Quality Certification (except those applying for an NPDES permit), applicants must submit a complete Water Quality Certification application to the DES Watershed Management Bureau. For projects requiring an NPDES permit, a separate Water Quality Certification application is not needed since information included in the NPDES permit request, the NPDES fact sheet, and the final permit prepared by EPA, is typically sufficient to process the Water Quality Certification.

C.2.6 TMDLS AND LAKE DIAGNOSTIC FEASIBILITY STUDIES

C.2.6.1 Total Maximum Daily Load Studies (TMDLs)

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As mentioned in section B.1, Section 303(d) of the Clean Water Act requires Total Maximum Daily Load studies (TMDLs) to be conducted on all surface waters included on the Section 303(d) list of impaired waters. The term "total maximum daily load" (TMDL) refers to the calculation of the maximum amount of a pollutant that a waterbody can receive, and attain or maintain water quality standards for its designated use.

The TMDL calculation allows for the determination of a carefully identified allowable pollutant load equivalent to the sum of the waste load allocations (WLA) for point sources, load allocations (LA) for nonpoint sources and naturally occurring background sources, and an allocation of that load among the pollutant's sources. The TMDL is required to account for seasonal variations and must also include a margin of safety (MOS) that accounts for uncertainty and any lack of knowledge concerning the relationship between effluent limitations and water quality. In equation form, the TMDL may be expressed as:

$$\mathbf{TMDL = WLA + LA + MOS}$$

Once calculated, the TMDL is then allocated between all sources of the pollutant causing impairment. As a minimum, TMDLs must be expressed in terms of a mass (i.e., load) per day, but also may be expressed in other ways (i.e., concentration, toxicity, etc.) to facilitate implementation and determination of compliance. All TMDLs are subject to public review and comment and must be submitted to the United States Environmental Protection Agency (EPA) for review and approval.

In the broader sense, a TMDL refers to a detailed plan that identifies the pollutant reductions a waterbody needs to meet state surface water quality standards and develops a strategy to implement those reductions is order to restore the water quality. The general process for developing TMDLs includes identifying the problem pollutant, establishing the water quality goals or target values needed to achieve water quality standards, identifying the specific sources contributing the pollutant of concern, and then assigning a specific load allocation to each of the sources. Follow-up monitoring is usually needed to ensure that the implemented TMDL results in the attainment of the targeted water quality standard.

Since 2010, the DES TMDL Program has received EPA approval for eight beach TMDLs that are impaired for aquatic life use support due to low pH caused by atmospheric deposition (acid rain), 25 lake phosphorous TMDLs for waterbodies that are impaired for primary contact recreation due to the presence of cyanobacteria, and a total of 453 bacteria TMDLS (394 in rivers/lakes, 59 in beaches) for waterbodies impaired for primary contact recreation due to the presence of bacteria. For more information on the TMDL program including a list of completed TMDLs and TMDLs scheduled to be completed in the near future, visit the DES TMDL website at *http://des.nh.gov/organization/divisions/water/wmb/tmdl/index.htm*.

C.2.6.2 Diagnostic Feasibility Studies (Lakes)

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The Clean Lakes Program at the DES involves the diagnostic evaluation of water quality within a given watershed. Lakes and ponds in New Hampshire are recommended for the Clean Lakes Program if data from other monitoring programs, like the DES Lake Survey Program or the Volunteer Lake Assessment Program (VLAP) show signs of declining water quality over time.

Diagnostic Feasibility studies are typically conducted over the course of a 16-month period with hydrologic and nutrient inputs to lakes and ponds from their watersheds monitored for a range of chemical, biological, physical, and ecological parameters. Land use patterns and characteristics are also evaluated through the course of this study. These data are then used to develop hydrologic and nutrient budgets for the lake, and are ultimately used to pinpoint elevated sources of nutrients or other inputs to the waterbody from its watershed.

Once sources of pollution are identified, DES makes recommendations for remediation and lake rehabilitation. The program focuses on addressing watershed sources of nutrients (e.g., erosion, septic systems, fertilizers, development, etc.) before addressing in-lake symptoms of degradation (e.g., decreased clarity, algal blooms, low oxygen levels, odors, etc.).

Volunteers from the lake or pond are encouraged to assist in collecting samples, much like their role in the VLAP program. A strong relationship with the lake association and local town(s) is integral in formulating a long-term management strategy for the lake and its watershed.

A list of lakes with completed Diagnostic Feasibility studies as well as those that have studies underway, is provided in Section D.3.6.3.

C.2.7 EXOTIC SPECIES CONTROL PROGRAM

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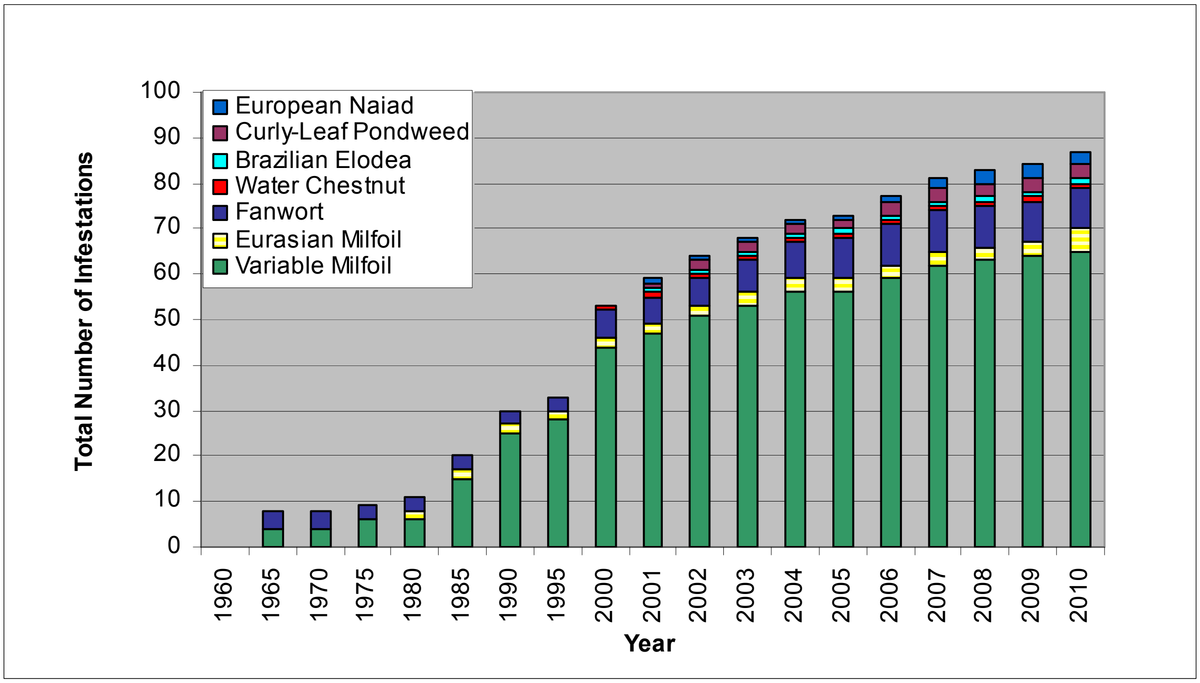
The primary purpose of New Hampshire's Exotic Aquatic Plant Program is to "prevent the introduction and further dispersal of exotic aquatic weeds and to manage or eradicate exotic aquatic weed infestations in the surface waters of the state" (RSA 487:17, II). The program focuses on submerged exotic aquatic plants, including variable milfoil (*Myriophyllum heterophyllum*), Eurasian milfoil (*Myriophyllum spicatum*), fanwort (*Cabomba caroliniana*), Brazilian elodea (*Egeria densa*), Hydrilla (*Hydrilla verticillata*) and water chestnut (*Trapa natans*), among other species. Other exotic aquatic plants such as common reed (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*), are also of concern and, while not a focus of the program, are prohibited by the program for sale and distribution.

"Exotic aquatic plants" are plants living in lakes, rivers, or other waterbodies that are not part of New Hampshire's native aquatic flora. These plants, sometimes called 'nuisance' or 'invasive' species, or 'weeds,' can grow and reproduce rapidly, taking over large portions of waterbodies and impairing boating, recreation, and aesthetics, threatening native plant species and causing habitat loss. A study by the University of New Hampshire documented that there may be up to a 20% decline in lakefront property values attributable to the presence of exotic aquatic plants (Halstead et al., 2003).

Exotic aquatic plants propagate primarily by fragmentation, a process by which a piece broken from a mature plant can grow roots, settle in a new location, and begin growth of a new plant. Plant fragments, most often generated by human activity, can easily become entangled on boats, trailers, fishing equipment, or diving gear, thus spreading from waterbody to waterbody.

The first exotic aquatic plant infestation in New Hampshire was discovered in 1965 in Lake Winnipesaukee. Since then, infestations have increased to a total of 86 infestations on 76 waterbodies in 2011 (Figure 11).

Figure 11: Exotic Aquatic Plant Infestations 1960 to 2010



Four fanwort infestations were documented in the 1960s, but a dredge of Millville Lake during the early 1980s led to its eradication in this lake, leaving only three infestations (Phillips Pond, Sandown; Big Island Pond, Derry; and Arlington Mill Reservoir, Salem). Other fanwort populations were documented in the Nashua River and Mine Falls Pond, Nashua, and in Robinson Pond, Hudson, in the late 1990s, and in Lake Massabesic in 2003. Fanwort infestations were also documented in 2004 in Otternic Pond, Hudson, and in Wilson Lake, Salem in 2005, bringing the total in 2009 to nine infestations.

Water chestnut, first found in New Hampshire in 1998, is currently documented only in the Nashua River, though we expect this plant to spread based on evidence of seed dispersal on carpeted bunks of boat trailers over the last two years.

During the summer of 2001, the first New Hampshire infestation of Brazilian elodea (*Egeria densa*) was identified in Nutts Pond, Manchester. Fortunately, this plant has not moved to other waterbodies yet in New Hampshire.

Seven waterbodies now have more than one species of exotic aquatic plants: Mine Falls Pond, Nashua (milfoil and fanwort), Robinson Pond and Otternic Pond, Hudson (milfoil and fanwort), Lake Massabesic, Auburn (milfoil and fanwort), the Nashua River, Nashua (milfoil, fanwort, curly-leaf pondweed, and water chestnut), the Connecticut River south of Hanover (Eurasian water milfoil, two exotic water naiads, and curly-leaf pondweed), and Glen Lake, Goffstown (variable milfoil and invasive water naiad).

A new problem was documented in 2007 with the identification of the invasive alga *Didymosphenia geminata* in the Connecticut River. By the summer of 2011, the alga had continued to spread throughout the Connecticut River system, and three additional waterbodies, each tributaries to the Connecticut River, were also found to support Didymo growths.

This program, initiated in 1981, has five focus areas: 1) Prevention of new infestations, 2) Monitoring for early detection of new infestations to facilitate rapid control activities, 3) Control of new and established infestations, 4) Research towards new control methods with the goal of reducing or eliminating infested areas, and 5) Regional cooperation.

The program is funded through a $7.50 fee derived from New Hampshire boat registrations (a fee increase of $2.50 was added as a result of the 2009 legislative session). Of that $7.50 fee, a total of $7.00 is dedicated to tasks and projects associated with exotic aquatic plants.

C.2.8 DAM REMOVAL PROGRAM

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There are more than 5,100 active and inactive dams in the state of New Hampshire. Many of these dams were built during the Industrial Revolution in the 19th and early 20th centuries, and played a crucial role in New Hampshire's economic and societal growth during that period. But as technological and societal needs changed over the years, so too has the need for dams. Although many dams continue to serve valuable purposes, others are no longer being used for their intended purpose and pose safety, environmental, and other problems. Addressing these concerns can be costly and controversial, however, in New Hampshire, owners are given the option of dam removal. Selective dam removal can eliminate a public safety hazard, relieve a dam owner's financial and legal burdens, and restore a river to a healthier, free-flowing condition.

Since the inception of the Program in 2001, the Program and New Hampshire River Restoration Task Force have provided technical assistance to eighteen successful dam removal projects. Currently, there are approximately twenty dams that are under consideration for removal, which are at various phases of the process. In recent years there has been an increase in requests from dam owners who wish to explore the option of dam removal, which is believed to be a result of the increase in the Annual Dam Registration Fee (ADRF) in New Hampshire, an aging infrastructure that is in need of repair, and environmental reasons.

In 2009, Maxwell Pond Dam, was captured on film and is one of only three projects selected nationwide to be part of a national documentary sponsored by American Rivers. The documentary was released in the spring of 2010 and is a follow-up to the highly successful documentary "Taking a Second Look: Communities and Dam Removal". Many of the Maxwell Pond Dam project partners were interviewed including several DES employees. The documentary provides decision makers with real-life stories of dams and the responsibilities of ownership, which include making tough decisions on the fate of these dams. Steve Landry, DES

Merrimack Watershed Supervisor, managed the Maxwell Pond Dam removal and was bestowed the 2010 DES Employee of the Year as a result. His project management skills and attention to detail resulted in a successful dam removal project. EPA recently published this story as one of the *EPA 319 Nonpoint Source Program Success Story*. The impoundment (aka Maxwell Pond) was on the New Hampshire 303(d) impaired waters list for dissolved oxygen, however, post-removal data collected has indicated levels of dissolved oxygen at a healthy level and has been removed from the 303(d) list for this parameter.

Table 4: Dams Removed in New Hampshire 2000 - 2011

Dam Name	Municipality	Waterbody	Year Removed
McGolderick Dam	Hinsdale	Ashuelot River	2001
Winchester Dam	Winchester	Ashuelot River	2002
Bearcamp River Dam	Tamworth	Bearcamp River	2003
Bellamy River Dam #5	Dover	Bellamy River	2004
West Henniker Dam	Henniker	Contoocook River	2004
Badger Pond Dam	Belmont	Tioga River	2004
Champlin Pond Dam	Rochester	Clark Brook	2005
Champlin Farm Pond Dam	Rochester	Farm Pond	2005
Pearl Lake Brook Dam	Lisbon	Pearl Lake Brook	2007
Merrimack Village Dam	Merrimack	Souhegan River	2008
Maxwell Pond Dam	Manchester	Black Brook	2009
Winnicut River Dam	Greenland	Winnicut River	2009
Homestead Woolen Mill Dam	West Swanzey	Ashuelot River	2010
Heads Pond Dam	Hooksett	Brown Brook	2010
Bunker Pond Dam	Epping	Lamprey River	2011
Buck Street Dam East	Allenstown	Suncook River	2011
Buck Street Dam West	Pembroke	Suncook River	2011
Stevens Brook Dam	Claremont	Stevens Brook	2011

Dam removal is an option, as is dam repair, and should be considered on its own merits. When the costs associated with dam repair outweigh dam removal then removal may be a wise decision and can result in positive environmental, economic and social benefits.

C.2.9 INSTREAM FLOW PROGRAM

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The New Hampshire legislature created the River Management and Protection Program (RSA 483) in 1988. In 1990 instream flow protection provisions for Designated Rivers were added and the first five rivers were designated. These provisions require methods to define flows to protect the riverine resources of the river. The history of Instream Flow Protection in New Hampshire has been long and at times contentious. In 2002, a compromise (Chapter 278) was reached where a pilot program would test proposed assessment and management methods on two rivers before applying them to the State's other Designated Rivers. With this compromise, instream flow rules were promulgated in 2003 applying a pilot process to the Lamprey and Souhegan Rivers.

There are two major steps in the pilot process. The first step is a study to determine the protected instream flows. The Souhegan study phase to determine protected flows for the Designated River was completed and its findings presented before the public in March 2007. The Souhegan protected flows were established as water quality standards in April 2008. The Lamprey protected instream flow study phase began in 2006. The study collected data during 2006 and 2007. The results of this study were analyzed and presented in 2008. A public hearing was held in January 2009.

The two pilots used similar methods to identify flow needs for the Designated Rivers. A reconnaissance of each river was conducted to identify flow-dependent resources. Several methods were applied to identify the flow needs of these resources. Whitewater boaters' flow needs were identified by interviewing them on their boating preferences. The timing and magnitude of flows for supporting wetlands and riparian vegetation life cycles were assessed by elevation transects that are translated to flows. Fish species were evaluated using a habitat simulation model that determines the changes in habitat with changes in flow. Estimates of available habitat are made at different flows. Specific flow needs for life cycle needs like spawning, rearing, and growth of juveniles are assessed by determining the specific needs for stream depth, flow velocity, substrate, and canopy.

The protected flows were developed under the concepts of the Natural Flow Paradigm developed by Poff *et. al.* (1997). This paradigm says that the ecosystem species have developed, and are adapted to, the natural variations during the year. This includes floods in the spring from meltwater and low flows in the summer. The natural flow regime benefits and restricts riverine species at different times, which keeps their populations in balance. By using this framework to constrain protected flows, natural droughts can occur without concern for the ecosystem because the riverine community is adapted to these conditions. The protected flows based on this paradigm quantify the magnitudes, times, durations, and frequency of flow changes that place the riverine community.

The second step in the pilot process is developing a water management plan to implement the protected flows. Water Management Plans apply to larger water users and to dam owners. The water management plans describe the conservation, water use, and impoundment management activities that will maintain the protected flows. Water users will help define conservation plans to reduce the impact of their use. They will also establish the conditions for a water use plan that may include additional storage, alternate water supplies, or management of the timing and volumes of their use. Dams will be assessed under a dam management plan for their ability to support protected flow needs by storing and releasing water to maintain stream flows within the natural flow paradigm. The Water Management Plans were developed using a process of coordination and discussion with water users and dam owners to define their priorities and needs and identify management alternatives that best suit their needs and the ecosystem needs under the Instream Flow Program. Each water management plan was evaluated for costs and an implementation schedule was developed. Draft plans have been completed and undergone public review and comment. The final plans are close to completion as of March 2012. In 2013 a review will be held with a public hearing to evaluate the pilot process and decide if changes are needed before applying the process to the other Designated Rivers. Documentation of the pilot programs' results is available on the program's website.

In addition to the pilot instream flow program, the rules include requirements that all of the Designated Rivers be assessed annually to evaluate the level of water use versus stream flow. The assessment is made comparable from river to river by defining water use relative to a uniform General Standard. The General Standard defines levels of water use relative to monthly stream flow. The assessment compares those levels to the reported withdrawals, returns, and transfers. The months and locations where water use exceeds the General Standard indicate locations of concern for possible violation of water quality standards for flow. Locations not in compliance with the General Standard are considered Potentially Non-Supporting; however no final determination can be made until an instream flow study is completed.

C.2.10 LAKES AND RIVERS MANAGEMENT PROGRAMS

C.2.10.1 Rivers Management Program

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The New Hampshire River Management and Protection Program (RMPP) was established in 1988 with the passage of RSA 483 to protect certain rivers, called designated rivers, for their outstanding natural and cultural resources. The program is administered by the New Hampshire Department of Environmental Services.

For a river to be designated for protection, an interested individual or organization must first develop a nomination outlining the river's values and characteristics. Support by local municipal officials and residents of the riverfront communities for the designation must also be sought and reported. Once completed, the nomination is submitted to the DES Commissioner and, if and when approved, forwarded to the General Court for consideration. If the Legislature approves the nomination, looking closely at the level of local support and presence of important river values, and if the Governor signs the bill, RSA 483 is amended to designate the river for protection under the program.

After designation, a management plan is developed so that the outstanding qualities of the river may be protected for future generations. The plan is developed and implemented by a volunteer local river advisory committee that also coordinates activities affecting the river on a regional basis. A typical plan identifies management goals and recommends actions that may be taken to protect the resources identified in the nomination. At the state level, the Department of Environmental Services assists with the development and implementation of the management plan and enforces regulations concerning the quality and quantity of flow in protected river segments.

Presently, the Ammonoosuc, Ashuelot, Cocheco, Cold, Connecticut, Contoocook, Exeter-Squamscott, Isinglass, Lamprey, Mascoma, Lower Merrimack, Upper Merrimack, Oyster, Pemigewasset, Piscataquog, Saco, Souhegan and Swift Rivers are designated under RSA 483.

C.2.10.2 Lakes Management Program

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Recognizing the impacts of man's activities and the potential financial consequences if the quality of New Hampshire's lakes is allowed to deteriorate, the Legislature established the Lakes Management and Protection Program with the passage of RSA 483-A in 1990. The program is administered by the DES.

The Program includes a Lakes Coordinator, and the Lakes Management Advisory Committee (LMAC) that advises the DES Commissioner and Lakes Coordinator in carrying out the purposes of the statute. The Advisory Committee is made up of 18 members representing state agencies, municipalities, the conservation community, marine, tourism, real estate, business and industry interests, and academia. The increased pressure we have placed on our lakes has resulted in the need for an active, multidisciplinary management approach to secure the wise management and preservation of our lakes. The numerous projects and products of the Lakes Program encompass the broad spectrum of lakes management.

Some of the more significant program goals include:

- To update and revise state level management criteria for lakes that would form the basis for state agency decisions regarding lakes management and protection.
- To track the progress of the recommendations included in the management criteria.
- To update and revise detailed guidelines for coordinated lake management and shoreland protection plans and develop recommendations for implementing the plans.
- To provide technical assistance to lake stakeholders regarding the development and implementation of lake and shoreland plans.
- To review the status and appropriateness of existing state statutes and proposed legislation addressing lakes and water quality management.
- To provide and exchange technical assistance among state and federal agencies and public and private sectors regarding lakes management and related issues.
- To continue working with the Rivers Management Advisory Committee (RMAC) on The Sustainability of New Hampshire’s Surface Waters. In January 2008, the Lakes Management Advisory Committee (LMAC) and the Rivers Management Advisory Committee (RMAC) presented The Sustainability of New Hampshire’s Surface Waters to DES Commissioner Thomas Burack. The document provides a roadmap to address the concerns expressed by the LMAC and RMAC that despite decades of efforts, the quality and integrity of the state’s water resources will decline under current efforts. The LMAC and RMAC believe that if adequate resources and information are not made available now, then achieving sustainability of New Hampshire’s surface waters will become more difficult, more costly or impossible.

C.2.11 SHORELAND PROTECTION PROGRAM

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In 1991, the General Court passed the Comprehensive Shoreland Protection Act (CSPA). The CSPA recognizes that the shorelands of the state of New Hampshire are among its most valuable and fragile natural resources and that the protection of these shorelands is essential to maintain the integrity and exceptional quality of the state's public waters. The Act establishes minimum standards for activities that impact the soils, vegetation, and topography within 250 feet of the state's public waters (the Protected Shoreland). The minimum standards create several individual setbacks and areas of restricted use within the Protected Shoreland depending on the nature of the project or activity. Setbacks are specified for primary structures, accessory structures, septic systems, fertilizer and pesticide use and natural woodland and waterfront buffers establish limitations on vegetation removal.

The CSPA became effective on July 1, 1994. In July of 2007, the Governor signed into law several significant changes to the CSPA. Those changes took effect April 1, 2008 and July 1, 2008 and included the establishment of a 30% impervious surface limitation on the area of the lot within the protected shoreland; a 50 ft wide waterfront buffer within which natural ground covers are protected and trees and saplings are managed using a grid and point system; a uniform, statewide minimum primary building setback of 50 ft from the reference line, and a permit requirement for most new construction, excavation, and filling activities within the protected shoreland. Additional changes were made to the CSPA effective September 13, 2009. Most important among these were the elimination of the limit on residential living dwelling units for sites with on-site septic; the addition of notification requirements to Local River Advisory Committees for impacts that occur adjacent to Designated Rivers under RSA 483-B; and a more specific definition of "urbanization" for those municipalities seeking to determine if areas qualify for an "Urbanized Shoreland Exemption" under RSA 483-B:12.

Effective July 1, 2011, the CSPA was amended again and included a name change to the Shoreland Water Quality Protection Act (SWQPA). Most notably among these changes included the elimination of the cap on impervious area, the establishment of a new scoring methodology that allows a greater quantity of trees and saplings to be removed from the waterfront buffer and the implementation of a new streamlined permit by notification (PBN) process for projects that propose no greater than 1,500 sq ft of total impact area of which no more than 900 sq ft is new, impervious area, public infrastructure projects and environmental enhancement and stormwater management projects.

C.2.12 ALTERATION OF TERRAIN PROGRAM (ALTERATION OF TERRAIN PERMITS)

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The Alteration of Terrain permit program was established in 1981 under the statutory authority of RSA 485-A:17 to regulate activities that significantly alter the characteristics of the existing ground surface. The purpose of the program is to review such projects to evaluate their potential adverse impacts on surface waters, drinking water supplies, and groundwater by controlling soil erosion and managing stormwater runoff from developed areas. An AoT permit is required whenever a project proposes to disturb more than 100,000 square feet of contiguous terrain (50,000 square feet, if any portion of the project is within the protected shoreland), or disturbs an area of greater than 2,500 square feet, is located within 50 feet of any surface water and has a flow path 50 feet or longer disturbing a grade of 25% or greater. This permitting program applies to earth moving operations, such as industrial, commercial, and residential developments as well as sand pits, gravel pits, and rock quarries. In addition to these larger disturbances, the AoT Permit by Rule applies to smaller sites.

As of January 1, 2009, the Alteration of Terrain regulations were revised to include updated stormwater treatment practices, groundwater recharge requirements, and new channel and flood protection requirements.

C.2.13 MERCURY REDUCTION PROGRAM

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Mercury (Hg) is a naturally-occurring element that is released into the environment through human and natural activities, primarily in the form of air emissions. Mercury is classified as a persistent, bioaccumulative, toxic pollutant and, when it is deposited into surface waters via precipitation or runoff, it is changed into its more toxic, methyl form by bacteria and passed up the food chain where it accumulates in fish tissue. Since the late 1800's, mercury has been accumulating in the food chain in water bodies throughout New Hampshire and the region.

The impacts of mercury on fish-eating bird species such as the common loon, bald eagle and belted kingfisher have been well documented. Aquatic mammals such as otter and mink are also considered to be at risk from elevated mercury levels. Studies have shown that mercury is also present in land-based ecosystems and wildlife, including mountain songbirds such as the Bicknell's Thrush. Impacts on wildlife include changes in body chemistry, behavior, and decreased reproductive success

Similarly, the primary means by which people are exposed to mercury is through the consumption of fish. Mercury exposure in humans can lead to a variety of negative health effects, including impacts on the central nervous system, gastrointestinal tract, kidneys, and cardiovascular system. Fetuses and young children, whose central nervous systems are still developing, can be particularly susceptible to mercury toxicity.

Human related sources which may emit mercury into the atmosphere include fossil fuel combustion, waste incineration, and breakage of mercury-added products. Although New

Hampshire sources still emit some mercury, substantial quantities are emitted in states upwind and carried east by prevailing winds. Mercury is then deposited upon the lakes and soil of New Hampshire.

Efforts have been underway for well over a decade at the federal, state and regional levels to address mercury contamination in the environment. In 1997, EPA released the "Mercury Study Report to Congress," to help states plan for mercury mitigation (USEPA, 1997). The report compiled the best available information at the time, on the link between mercury emissions and fish contamination, the role of atmospheric transport in mercury contamination, the status of the nationwide inventory of mercury emissions, the costs and types of mercury control technologies and the health risks posed by mercury contamination.

In February, 1998 a report was issued by the Northeast States and Eastern Canadian Provinces, which took a regional look at the sources, transport and deposition, impacts, and ways to reduce mercury pollution (NEG/ECP, 1998). The study estimated that 47% of the mercury deposited in the Northeast United States originated in the Northeast, while 30% came from sources outside of the region and the remaining 23% came from the global atmospheric reservoir.

Based on this study, the New England States and Eastern Canadian Provinces developed a regional Mercury Action Plan (MAP) with specific actions and reduction goals. The implementation of the Plan is overseen by a regional Mercury Task Force. The initial goal of 50% reduction by 2003 was met, and based on preliminary data analysis, the interim goal of 75% reduction by 2010 was also achieved. The long-term goal remains the virtual elimination of man-made mercury releases.

Most recently, the Northeast States, led by the New England Interstate Water Pollution Control Commission (NEIWPCC), completed a mercury Total Maximum Daily Load (TMDL), for the region, which was approved by USEPA. The TMDL plan concluded that mercury reductions of 98% were needed from both in-region and out-of-region sources to meet desired fish tissue mercury concentration levels.

In New Hampshire, a state level mercury reduction strategy was drafted and released in October 1998. The strategy contains 40 recommended actions to reduce mercury releases in New Hampshire, including those from medical and municipal waste incineration and power generation. http://des.nh.gov/organization/commissioner/pip/publications/co/documents/nhdes-co-98-2.pdf). Implementation of the strategy has resulted in a 74% reduction in mercury releases to date.

The largest reductions in New Hampshire emissions have occurred in municipal and medical waste combustion / incineration sources. Due to legislative and regulatory efforts these sources have been reduced by 98% and 100% respectively (see Figure 12). Recently, efforts were made to better characterize emissions from other fossil fuel sources such as burning of fuel oil and gasoline. Results of those efforts showed that these sources are much less significant contributors of mercury emissions than previously thought.

In 2006, the New Hampshire legislature passed a bill (HB 1463) to limit mercury emissions from coal-fired power plants, which are the largest remaining single source of emissions in the state. Full implementation of the legislation is required by 2013. Construction of scrubber equipment at the state's largest remaining mercury source, Merrimack Station, was completed ahead of schedule and initial stack testing is underway, with results expected by mid-2012. Although the law requires a minimum 80% reduction in mercury emissions, installation of the scrubber is expected to achieve a 90% or greater, bringing New Hampshire's overall mercury reduction to 95% from the 1997 baseline.

The Mercury Reduction Strategy also emphasizes eliminating or reducing the use of non-essential mercury in common products and properly managing and recycling these products so that they are not incinerated or landfilled. Legislative efforts have resulted in prohibiting the use of mercury and mercury compounds in schools; banning the sale of many types of mercury-added products that have adequate substitutes (thermometers, measuring devices, switches, relays, and thermostats); requiring manufacturers to report on mercury-added products sold in the state; and banning the disposal of all mercury-added products in landfills, incinerators, and transfer stations. Most recently, New Hampshire passed legislation, which mandates the collection and recycling of mercury-added thermostats

New Hampshire was the first state to pass legislation that requires dentists to install amalgam separators with a minimum mercury removal efficiency of 95%. Self-certification, along with compliance checks indicated that 99% of the state's dentists are in compliance with this requirement, which should result in a significant reduction in dental discharges of mercury to wastewater. An 83% reduction in mercury emissions (based on recent stack testing) from the Manchester, NH sewage sludge incinerator is likely the result of installation of amalgam separators at dental offices in the area, since no other changes have been made at the plant.

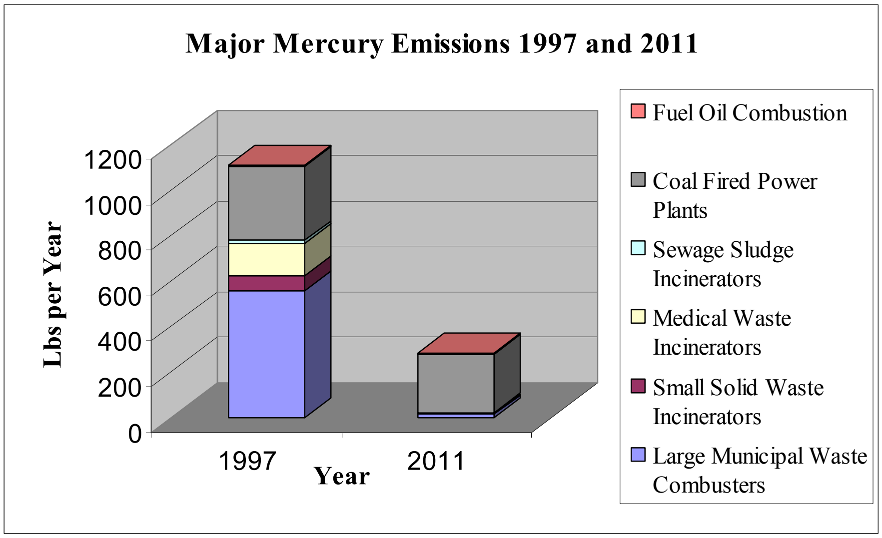
The other New England states and several states outside of the region have also succeeded in passing legislation to restrict or prohibit the sale of many mercury-added products. The Interstate Mercury Education and Reduction Clearinghouse used data submitted by manufacturers on their use of mercury in products sold in the US in 2007 to update its analysis of the trends in mercury use in products. Key findings include:

- Overall use of mercury in products declined 46% between 2001 and 2007
- Dental amalgam use dropped nearly 50% between 2004 and 2007
- Mercury use in thermostats dropped 73% between 2001 and 2007 and continues to decline as more manufacturers phase-out mercury-added thermostats

The findings are largely attributed to efforts by the states to prohibit sales and distribution of products. Trends in products will likely be updated after all 2010 manufacturer data is received and analyzed.

Outreach efforts to New Hampshire hospitals, businesses, schools, auto salvage yards, municipalities, and citizens on mercury reduction are also ongoing and are instrumental in the reduction of mercury in waste. Ensuring the proper management and recycling of mercury-added products is an ongoing challenge, which New Hampshire will continue to pursue.

Figure 12: Reduction in New Hampshire Mercury Emissions 1997-2011



Source: NH Department of Environmental Services, Air Resources Division 2011 Mercury Emissions Inventory

C.2.14 ENVIRONMENTAL HEALTH PROGRAM - FISH ADVISORIES

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The responsibility for fish consumption advisories was transferred from the New Hampshire Department of Health and Human Services (DHHS) to the Environmental Health Program (EHP) of the New Hampshire Department of Environmental Services in July 2004. Most of the fish tissue analyses done to date were conducted as part of human health risk assessment studies. Fish tissue analyses are not routinely conducted in the state for state-wide risk assessment; rather they are usually performed when there is a perceived risk to public health associated with consumption of fish from a certain waterbody. Once a risk assessment is completed, EHP decides if a fish consumption advisory should be issued. Information regarding fish consumption advisories currently in effect in New Hampshire are presented in Section D.6.3

C.2.15 COASTAL PROGRAMS

C.2.15.1 New Hampshire Coastal Program (NHCP)

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Administered by the New Hampshire Department of Environmental Services, the DES New Hampshire Coastal Program (NHCP) was established in 1982 and is one of 34 federally approved coastal programs nationwide. Responding to the increasing demands on the nation's coast, Congress passed the Coastal Zone Management Act in 1972. This legislation authorized funding for state coastal programs through the National Oceanic and Atmospheric Administration.

New Hampshire's coastal zone is rich with natural, recreational, and cultural resources that improve our quality of life and support and strengthen our economy. The coastal zone includes 17 towns, 18 miles of shoreline and 235 miles of tidally influenced land, including Great Bay, Little Bay, Hampton-Seabrook Estuary, and many other coves and bays on the coast. The program's efforts are focused on New Hampshire's coastal zone as well as New Hampshire's coastal watershed, an area that encompasses 820 square miles and 42 municipalities.

NHCP's mission is to balance the use and preservation of coastal resources. The Coastal Program provides funding and staff assistance to towns and cities, and other local and regional groups who protect clean water, restore coastal habitats, and help make communities more resilient to flooding and other natural hazards. The Coastal Program supports the region's economy by helping to preserve the environmental health of the coast and Great Bay and Hampton-Seabrook estuaries for fishing and shellfishing, and assisting with the maintenance of our ports, harbors and tidal rivers for commercial and recreational uses.

Under its federal mandate, NHCP conducts reviews to ensure consistency with state policy for coastal activities. Through funding and staff assistance, NHCP enables water quality protection, research, and environmental stewardship and education. Using its extensive partner network, the Coastal Program coordinates the restoration of degraded coastal rivers and wetlands. The following is a summary of key NHCP accomplishments by category in 2011.

Coordination and Public Involvement:

- Chaired the N.H. Dredge Management Task Force.
- Developing dam removal sediment management guidance document to provide dam owners, environmental consultants and state agency staff with a clear, science-based approach for assessing and managing sediments from proposed dam removal projects (in progress).

Coastal Water Quality Protection:

- Funded and helping to coordinate the Seacoast Stormwater Coalition's best management practices for municipal green spaces fertilizer reduction project.

Coastal Habitat Conservation and Restoration:

- The restoration of 39 miles of fish habitat in the Great Bay Estuary with the construction of a fish pass at the Route 33 Bridge over the Winnicut River.
- Funded the Blue Ocean Society for Marine Conservation to coordinate 201 beach cleanups that removed an estimated total 15,181 pounds of marine debris.
- Initiated a service-learning project at Odiorne State Park to help control invasive plant species with volunteers from the Surfrider Foundation. This control effort

builds upon work already being done to control invasive plants at other areas of Odiorne by the Coastal Watershed Invasive Plant Partnership (CWIPP), which is chaired by Coastal Program staff.

Coastal Hazards:

- Worked collaboratively with the New Hampshire Coastal Adaptation Workgroup to move forward with climate change and natural hazards preparedness, including hosting four community preparedness workshops; assisting the Piscataqua Region Estuaries Partnership, Rockingham Regional Planning Commission and the New England Environmental Finance Center to provide economic analysis of adaptation strategies for three coastal communities; and taking the lead on developing the StormSmart New Hampshire website.

Community Planning and Development:

- Provided local technical planning assistance through two regional planning commissions, including ordinance and regulation updates, subdivision and site plan reviews, and other planning assistance to local town boards in coastal communities.
- Provided technical assistance on stormwater regulations through the Natural Resources Outreach Coalition.

C.2.15.2 Piscataqua River Estuaries Partnership (PREP)

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The Piscataqua River Estuaries Partnership (PREP) is part of the U.S. Environmental Protection Agency's (EPA's) National Estuary Program. The National Estuary Program was established by Congress in 1987 to provide additional protections for "estuaries of national significance." Section 320 of the Clean Water Act provides the statutory authority for this program. PREP was established in 1995 when the Great Bay Estuary and Hampton-Seabrook Harbor were designated as "estuaries of national significance." PREP receives funding from the EPA and is hosted by the University of New Hampshire. The organization's name was changed in 2009 from the "New Hampshire Estuaries Project" to the "Piscataqua Region Estuaries Partnership" when the study area was expanded to include 10 Maine communities in the watershed of the Great Bay Estuary.

Currently, PREP is implementing the 2010 Piscataqua Region Comprehensive Conservation and Management Plan (CCMP), which is an update of the 2000 CCMP that addresses current and emerging issues impacting the water quality and environmental health of estuaries in the Piscataqua Region. The ten-year plan includes seven goals, 35 objectives, and 82 action plans that were developed through an extensive 18-month process involving 159 stakeholders representing federal and state resource management agencies, non-government organizations, industry, legislators, and the 52 communities of the Piscataqua Region. Action plans are categorized by critical theme areas, including water resources, land use and habitat protection, living resources and habitat restoration, and watershed stewardship.

PREP addresses Action Items by either completing them directly or funding other organizations to complete the work. In general, PREP strives to:

- Improve the water quality and overall health of New Hampshire's estuaries;
- Support regional development patterns that protect water quality, maintain open spaces and important habitat, and preserve estuarine resources;
- Track environmental trends through the implementation of a long term monitoring program to assess indicators of estuarine health; and,
- Develop broad-based popular support for the implementation of the Management Plan by encouraging involvement of the public, local government, and other interested parties in its implementation.

PREP funds a variety of monitoring programs. The programs provide information on water quality, shellfish resources, aquatic habitat, and land use in the coastal watershed. The PREP monitoring programs are selected for funding because they complement existing monitoring programs of other agencies and fill critical data gaps. In addition to the data collection, the PREP Monitoring Program also contains a rigorous data analysis component. Data from the PREP programs and data from other agencies are combined to calculate a suite of environmental indicators. The indicators are used to inform the PREP Management Committee of the status and trends of environmental conditions in the estuary. The indicators are also used for the triennial State of the Estuaries report.

C.2.15.3 Shellfishing Program

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DES, under the authority granted by RSA 487:34, 143:21 and 143:21-a, is responsible for classifying shellfish growing waters in the state of New Hampshire. The purpose of conducting shellfish water classifications is to determine if growing waters meet standards for human consumption of molluscan shellfish. DES uses a set of guidelines and standards known as the National Shellfish Sanitation Program (NSSP) for classifying shellfish growing waters.

The DES Shellfish Program conducts sanitary surveys to determine which shellfish growing areas are suitable for shellfish harvest/consumption. This work involves a shoreline survey for pollution sources, studies to determine each pollution source’s impact to the receiving water, and intensive water monitoring under a variety of environmental conditions. Sanitary survey results are updated annually with new water quality data, and triennially with updated pollution source evaluations and other studies. A database of all properties inspected, and pollution sources identified, is maintained.

Routine monitoring provides updated water quality information, and consists of monthly water sampling of over 75 sites for fecal coliform bacteria and salinity. Each site is sampled six to 12 times per year. Additional water and/or shellfish tissue samples are examined for bacteria levels following rainfall, sewage discharges, or other pollution events. Red tide monitoring involves weekly sampling of blue mussel tissue (April through October) from Hampton/Seabrook Harbor and from Star Island, Isles of Shoals.

C.2.16 CLEAN VESSEL ACT PROGRAM

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The Federal Clean Vessel Act (CVA) of 1992 was established to support adequate facilities for recreational boaters to dispose of waste from marine sanitation devices. The act authorized a competitive grant program for states to provide funds for the construction, renovation, operation, and maintenance of pump-out and dump stations. Eligible activities also include the operation and maintenance of a mobile pump-out boat service and educational outreach to marina owners, boat dealers and their consumers. These federal funds can be used to account for up to 75% of all approved projects with the remaining 25% supplemented by the applicant who can include state and local government, private businesses, or associations.

Federal law prohibits the discharge of treated or untreated boat sewage in water that is designated a No Discharge Area (NDA). All waters within three miles of the New Hampshire shoreline and the Isles of Shoals are part of the coastal NDA. Tidal and estuarine waters, including all bays and rivers to the tidal dams, are incorporated. New Hampshire also enforces a "No Discharge" law for inland waters. Freshwater vessels cannot contain devices that will allow for overboard discharge of treated/untreated sewage or greywater.

Currently there are four operational coastal pump-out stations and fifteen freshwater stations. Lake Winnipesaukee dominates the inland count with thirteen facilities while the remaining two stations are on Lake Winnisquam and Sunapee. The 2010/11 season completed two inland facility replacements on Lake Winnipesaukee where the service has been offered for 20+ years at each of the locations. Funding requests for station upkeep and replacement continue to be popular while locations for new stationary facility placement are researched as needed.

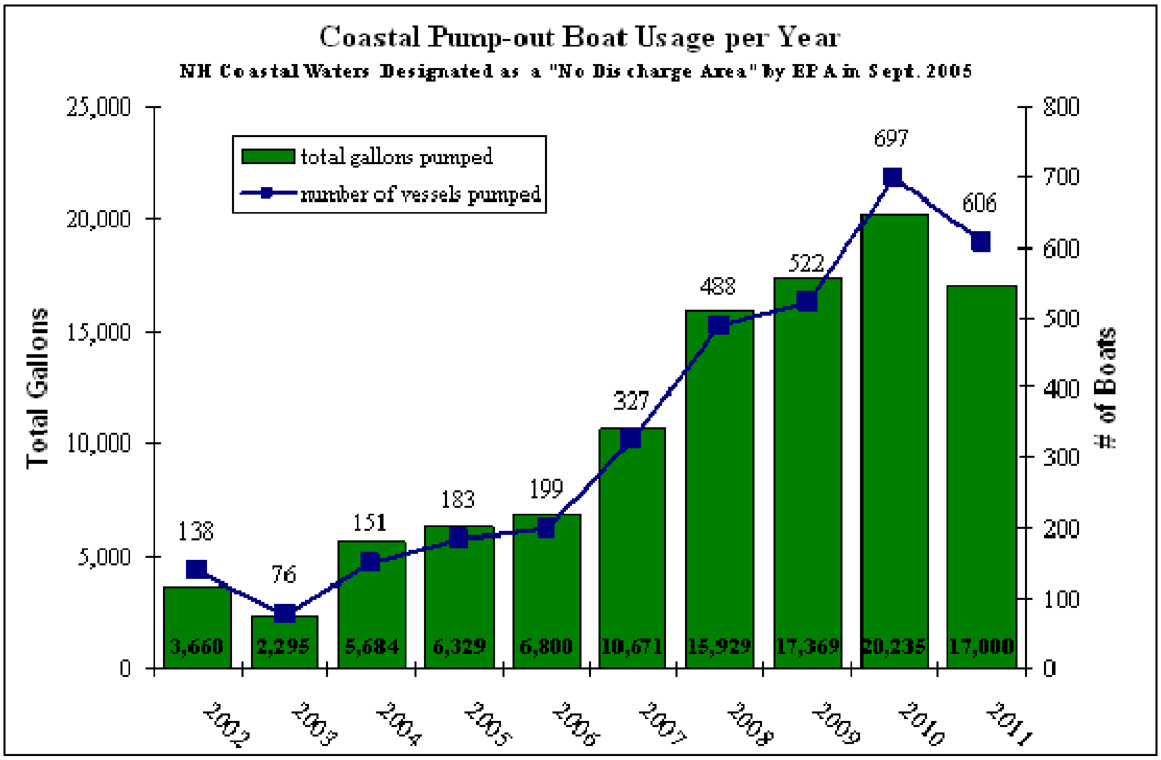
Since 2002 New Hampshire's coastal waters have had the added support of a mobile pump-out boat service. To date, more than 100,000 gallons of sewage have been removed from recreational boats just through use of the mobile service. The program has been pleased to see an increase and consistency in boater user numbers and sewage pumped since program implementation (see

Figure 13).

Additionally, the boating seasons of 2010 and 2011 offered an inland mobile pump-out service to boating patrons of Sunapee and Newfound Lake. Prospective service areas included waterbodies with limited or no vessel sewage pump off facilities. Two hundred and fifty gallons of sewage were removed from recreational boats on Sunapee Lake in 2011.

Greater accessibility to pump-out options including the mobile service reduces or eliminates the environmental impacts of recreational boaters in New Hampshire waters. Important goals of the CVA program continue to include educating the boating fraternity of their environmental responsibilities and encouraging public awareness of sources of pollution and pump-out resources.

Figure 13: Coastal Pump-out Boat Usage per Year



C.2.17 WETLANDS PROGRAM

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New Hampshire's Wetland Resources

New Hampshire has an estimated 400,000 to 600,000 acres of non-tidal wetlands and approximately 5,554 acres of tidal wetlands (6.7% to 10% of the state). The acreage estimate for non-tidal wetlands is based on: 1) LANDSAT telemetry data, which is limited in resolution to wetlands that are greater than two acres in size. 2) The National Wetlands Inventory (NWI) identified nearly 290,000 acres of wetlands, covering 5% of the state's land area. Palustrine wetlands are the main type, totaling about 278,000 acres and representing 96% of the state's wetland area. Only 8,029 acres of estuarine wetlands occur, occupying nearly 3% of the wetland area. Emergent wetlands (salt and brackish marshes) were the most common estuarine wetlands, accounting for 70% of the estuarine wetlands. Riverine, lacustrine, and marine wetlands when combined account for 2,792 acres which is roughly 1% of the state's wetlands.

The U.S.D.A. National Resources Conservation Service has conducted soil surveys for New Hampshire during which soil scientists have identified wet soils known as "hydric soils." According to the latest soil survey statistics, over 576,000 acres of hydric soils have been mapped in New Hampshire. The conclusion is that the actual extent of wetlands probably lies somewhere between the NWI estimate and the USDA hydric soils estimate. From the statewide perspective then, the acreage of wetlands ranges between 290,000 acres (NWI) and 576,386 acres. Consequently wetlands may occupy anywhere between 5-10 percent of the state. (New Hampshire Wetlands and Waters: Results of the National Wetlands Inventory, Ralph W. Tiner, 2007)

It is estimated that New Hampshire still has about 50% of its *tidal* and 90% of its non-tidal wetlands present in the 18th century. A summary of wetlands loss over the past two years is shown in Table 5 below. The "Estimated Two-Year Impact" column of the table includes those impacts that have been permitted. The Department's database to track impacts and mitigation is limited to permitting activities.

The two-year creation/restoration numbers represent three types of activities; 1) creation and restoration that is conducted as compensatory mitigation for permitted wetland impacts, 2) restoration that is being conducted for that purpose (such as dam removal), or 3) restoration that is required for past unpermitted impacts as a requirement for the permit for another activity. In addition to the creation and restoration estimated in Table 5, easements were placed or other permanent land protection occurred on more than 1,800 acres as mitigation for permitted impacts, including projects funded by the Aquatic Resource Mitigation Fund. Most of this is upland buffer to wetlands, or complexes of uplands and wetlands, and as such protects considerable wetland functions that would otherwise be vulnerable to development. Additional wetland and aquatic resources were the subject of enhancement projects; those are not represented in the figures provided below.

Table 5: Extent of Wetlands Type

Wetland Type	Estimated Total Size (acres)	Estimated Two Year Permanent Impacts (acres)	*Estimated Two Year Creation/ Restoration (acres)	Estimated Two Year Change (acres)	Percent Change
Tidal	5,554	(2.27)	4.2	1.93	+0.035%
Non-Tidal	400,000 - 600,000	(97.45)	20.16	(69.69)	(0.014%)

Notes: ** Percent change is based on the 500,000 acre estimate of non-tidal wetlands.

New Hampshire Wetlands Regulations

New Hampshire was one of the first states to regulate activities in its non-tidal wetlands, and remains one of only 14 states that do so today. New Hampshire first passed a statute regulating impacts to tidal wetlands in 1967, and the law was expanded to include non-tidal wetlands and surface waters in 1969. RSA 482-A is more inclusive than Section 404 of the Federal Clean Water Act in that it addresses both dredge and fill, requires permits for all projects regardless of size, and has no special exemptions for agriculture or other uses. New Hampshire statute RSA 482-A gives the New Hampshire Department of Environmental Services authority to promulgate rules and regulate activities involving dredge, fill, or construction in any wetland or upland areas adjacent to state designated prime wetlands, as well as any surface water body, sand dune, or tidal buffer zone in the state. The Wetlands Bureau in the DES Water Division is responsible for application review, enforcement activities, and the issuance of permits, denials, orders, and other administrative documents. The Bureau maintains a web site at http://des.nh.gov/organization/divisions/water/wetlands/index.htm, which includes weekly permit decisions, rules, law, fact sheets, application forms, and other useful information. The Bureau has offices in Concord and Portsmouth. Operation of the Portsmouth Office is partially funded through the New Hampshire Coastal Program using federal funds.

Appeals of wetlands permitting decisions go to the Wetlands Council whose membership includes the commissioners of the departments of Safety, Transportation, and Resources and Economic Development; the directors of the Office Energy and Planning, and Fish and Game; and seven public members representing county conservation districts, local conservation commissions, elected municipal officials, the non-marine construction industry, the marine construction industry, a member of the New Hampshire Association of Natural Resource Scientists, and general environmental protection and resource management interests. The public members are nominated by their respective interest groups and are appointed by the Governor and Council for three-year terms. The Wetlands Council reviews the record developed by DES, and can remand decisions to the Department if it finds the Department acted in an unreasonable or unlawful manner.

The DES 401 certification program is linked to wetlands regulation by a requirement that Wetlands Bureau approval is required prior to certification for any project involving dredge, fill, or construction of a structure in wetlands or surface waters. Surface waters and wetlands are included in the state's definition of "Waters of the state," but water quality criteria have not yet been defined for wetlands. The scope of New Hampshire wetlands regulation has evolved over the last 39 years, with several significant changes during the last 20 years. These changes reflect the response of the New Hampshire Legislature to an evolving understanding of both public and environmental needs in the state. In 1986 authorization was given to issue administrative fines. In 1989 the tidal buffer zone was expanded and boundaries clarified for easier determination in the field; a minimum impact notification process was added for forestry; authorization was given to issue administrative cease and desist orders and administrative removal/restoration orders; and the Superior Court was provided with significant civil and criminal penalties and a strengthened removal/restoration authority. In 1990 a graduated fee structure was developed that benefits both the applicant and the environment. The fees provide resources for a more timely review process, and the environment benefits from the financial incentive to minimize impacts. In 1993, legislation enabled the former Wetlands Board to delegate minimum impact permitting to the Bureau, resulting in an expedited process. In 1995, a minimum impact notification process was added for recreational trail maintenance, and in 1996, legislation was passed which transferred the responsibilities of the Wetlands Board to the DES Wetlands Bureau and abolished the Wetlands Board. In 2003 the legislature increased the above referenced graduated fee structure from $0.04 per square foot of requested impact (no refund for denials or partial approvals) to $0.10 per square foot requested impact. In 2007 the fee was increased again, to $0.20 per square foot of requested impact. All fees, as well as administrative fines, go to DES for support of the Wetlands regulatory program. In 2004, rules were adopted for compensatory mitigation of larger wetland impacts. In 2006 an in-lieu fee program was implemented as another form of compensation. Those fees go into a fund for each watershed to be pooled and later used for significant watershed improvement projects.

Interaction with Federal Regulations

On June 1, 1992, the U.S. Army Corps of Engineers issued a New Hampshire state Programmatic General Permit (NHSPGP), and at the same time revoked most Nationwide Permits for use in the state of New Hampshire. The NHSPGP has broken new ground for reasonable and efficient environmental regulation. New Hampshire was the first state to have an inclusive state-wide state programmatic permit, and the unmitigated success of the process provides an excellent example of benefits accrued by increased cooperation between federal and state agencies. Less than 1% of the projects approved by the Wetlands Bureau require an individual permit from the Army Corps. The NHSPGP was reissued for another five years in June 2002, and again in 2007. It will be up for renewal again in 2012.

The NHSPGP evolved from recognition by the Army Corps, the U.S. Fish and Wildlife Service, and the U.S. Environmental Protection Agency that the New Hampshire wetlands law, and the Wetlands Bureau's thorough review process, provided a sound basis for streamlining federal wetlands permitting. All projects are reviewed on an individual basis, and permitted projects are classified as one of three categories: minimum impact (e.g., less than 3,000 square feet impact), minor impact (e.g., less than 20,000 square feet of impact), or major impact (e.g., 20,000 or more square feet of impact). The NHSPGP handles each of these New Hampshire categories as follows:

- Projects approved and classified as minimum impact by the Wetlands Bureau may fall under the NHSPGP, with no Corps action required. The Wetlands Bureau notifies applicants to this effect.
- Minor impact projects approved by the Bureau are screened by the Army Corps and the other federal agencies for possible inclusion under the NHSPGP. The Army Corps notifies the applicant within 30 days if an individual permit is required. If the project meets the conditions of the NHSPGP, and the Army Corps does not intervene in 30 days, minor impact projects are automatically approved under the NHSPGP.
- Major impact projects approved by the Bureau are screened by the federal agencies, and the permittee is notified within 30 days whether she/he can proceed under the NHSPGP or whether she/he needs an individual Corps permit. This 30 day period is not an automatic approval for major projects; the permittee needs written affirmative notification from the Corps before he/she can proceed.

The following categories of projects are excluded from the NHSPGP, and always need an individual federal permit:

- More than three acres of fill.
- New boating facilities including marinas, yacht clubs, boat clubs, public docks, etc.
- Projects within the limits of a Corps navigation project.
- Discharge of spoils in the ocean.
- Improvement dredging in the lower Merrimack River, the Connecticut River, Lake Umbagog, or tidal waters.
- Breakwaters extending more than 50 feet from the shoreline.
- Projects adversely affecting a National Park, National Forest, National Wildlife Refuge, endangered species, or National Wild and Scenic River.
- Projects of national concern (e.g. significant wetlands fills; work that could affect archeological sites).

The process benefits everyone. The applicant is relieved of a time-consuming parallel federal permitting process, and is assured that they have a federal permit in effect (the applicant was previously at risk if they assumed coverage by a Nationwide Permit). The Corps has reduced its average turn-around time on general permit decisions to 12 days (for projects that are not minimum impact), from a pre-NHSPGP 45 to 60 days (minimum impact projects have automatic federal approval). Environmental protection is enhanced by the team effort because limited federal and state regulatory resources are freed to address the most significant problems.

Development of Wetland Water Quality Standards

In accordance with RSA 485-A:2, XIV, Env-Wq 1702.46 and Env-Wq 1702.53, wetlands are considered surface waters of the state. As such, they are protected by the state's water quality standards. Current water quality standards include the following narrative criteria specific to wetlands

Env-Wq 1703.02 Wetlands Criteria.

(a) Subject to (b) below, wetlands shall be subject to the criteria listed in this part.

(b) Wherever the naturally occurring conditions of the wetlands differ from the criteria listed in these rules, the naturally occurring conditions shall be the applicable water quality criteria.

To help assess wetlands, DES developed GIS-based criteria using the characteristics of adjacent land uses. This information was used to conduct Level 1 or “screening level” assessments of wetlands. The screening level assessments will also be useful for identifying candidate wetlands for testing of wetlands specific numeric criteria to see if there are significant differences between potentially impaired and reference (i.e., pristine) wetlands. Level 1 assessment results are presented in Section D.3.9.

C.2.18 GROUNDWATER PROTECTION PROGRAMS

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Groundwater in New Hampshire supplies water to 60% of the state's population. In addition, water stored beneath the ground surface replenishes rivers, lakes, and wetlands during dry periods, supporting ecosystems and providing water for other uses. Groundwater in New Hampshire is closely connected to both surface waters and to land use. Landscape change can negatively impact groundwater quantity (recharge) and quality, as well as the availability of future well sites, if it is not conducted in a water-wise manner. More education is needed for citizens to better understand the occurrence and importance of groundwater. State and, particularly, local efforts to protect this resource are necessary to ensure a plentiful future supply of high quality groundwater. Recognizing the importance of ongoing routine monitoring of groundwater levels and quality DES is in the process of expanding its groundwater level monitoring network. A list of the various groundwater protection programs is provided in PART A of this report.

C.3 COST/BENEFIT ASSESSMENT

C.3.1 OVERVIEW

Sections 305(b)(1)(D)(ii) and (iii) of the CWA require an estimate of the economic and social impact to achieve the objectives of Section 305(b) and the economic and social benefits of such achievement. The following is presented in fulfillment of this requirement.

C.3.2 SOCIAL IMPACTS OF CLEAN WATER

Most people recognize the importance and benefits of clean water and place a high social value on it. Quantification of the social impacts of clean water, however, is difficult. Generally speaking though, there is a positive social impact when the designated uses of a surface water are being met (i.e., clean water) and a negative social impact when uses are not being attained. For example, there is a negative social impact (i.e., on public health) in surface waters where the use of fish consumption is impaired by the presence of toxins. Similarly, negative social impact can occur in waters where the general recreational/aesthetic enjoyment of the surface water is impaired by the presence of floating scums and excessive algal blooms. Thresholds for determining when designated uses are impaired (and therefore when positive and negative social impacts are likely to occur) are included in the state's Surface Water Quality Standards and Consolidated Assessment and Listing Methodology (DES, 2012).

C.3.3 ECONOMIC IMPACTS OF CLEAN WATER

Like social impacts, quantification of the economic impacts of clean water are difficult to determine with complete certainty. There is no doubt that there is a cost associated with keeping our waters clean. However, there is also an economic benefit in terms of increase in property value, additional revenue brought in by visitors attracted to our clean waters, lower treatment costs, etc.

Section C.3.3.1 through C.3.3.3 includes information on costs to keep our waters clean. Because data is not readily available for privately funded projects, the discussion focuses on the readily available information which includes costs associated with past or ongoing public pollution control projects that have received state and/or federal financial assistance. Other pollution abatement costs associated with federally funded Section 319 nonpoint source projects may be found at http://www2.des.state.nh.us/OneStop/watershed_npsgrants_query.aspx ..

With regards to economic benefit, Section C.3.3.4 includes a review of a recently completed economic study to determine the economic value of New Hampshire's lakes, rivers, streams and ponds.

C.3.3.1 Federal Construction Grants Program

Since the passage of the Federal Water Pollution Control Act of 1972 (Public Law 92-500), EPA assistance to municipalities for the planning, design, and construction of projects under the Construction Grants for Wastewater Treatment Works Program has totaled nearly $442 million in grants. Under the state Aid Grant Program, New Hampshire has awarded grants for these projects of over $337 million, with actual payments for these projects totaling nearly $326 million. Although it is difficult to determine the actual contribution by municipalities to these projects, it is estimated that local shares over this period are nearly $59 million. This would suggest a total commitment to wastewater treatment works projects in New Hampshire from all funding sources of $838 million during the era of the Construction Grants Program. The phase-out of the federal construction grants program in 1990 was completed in New Hampshire with the administrative completion of all grant projects in Fiscal Year 1997.

C.3.3.2 20 percent to 30 percent state Grant Program

In response to the phasing out federal grant funds, the Governor and Legislature stepped forward by enacting Chapter 277 of the Laws of 1992 to provide a new 20 to 30% state grant program for local water pollution control projects. This law directs DES to establish and maintain a priority list of projects eligible to receive grant funds, using the existing priority system developed under the federal construction grants program, and further directs that an annual public hearing be held to receive comments on the priority list. The New Hampshire Water Pollution Control Program has provided 379 grants to 81 municipalities totaling nearly $112 million under this program. The current priority list includes 87 projects with total costs of nearly $140 million in Fiscal Year 2012, and 48 projects with total costs of nearly $180 million in Fiscal Year 2013.

C.3.3.3 State Revolving Fund (SRF) Program

Under the State Revolving Fund (SRF) Program, New Hampshire has received $300,230,435 in Federal Fiscal Years (FFY) 1989 thru 2011 Title VI capitalization grant funds as of the end of FFY 2011. In addition, $4,862,431 in Title II funds have been transferred to the State Revolving Fund. These amounts along with the required 20% state matching funds of $61,046,573 and the American Recovery and Reinvestment Act of 2009 grant of $39,163,900 have provided a total of $405,303,339 for the State Revolving Fund Program. SRF loans to municipalities using Federal funds totaled $347,341,450 through the end of FFY 2011. The repayment of loans by municipalities totaled $297,736,047 through the end of FFY 2011 and loans from this repayment account totaled $219,296,587 for the same period. The grand total of loans made from the SRF Program from all accounts totaled $566,277,928. Actual disbursements for construction projects in progress totaled $484,238,959 through the end of FFY 2011. Eligible SRF projects include, but are not limited to, upgrades to wastewater treatment facilities, collection systems and pump stations, as well as implementation of measures to collect, treat, and transport stormwater for entities regulated under the federal NPDES Municipal Separate Storm Sewer System (MS4) permit program..

C.3.3.4 Economic Value of Lakes, Rivers, Streams and Ponds

In 2001, the New Hampshire Lakes Association commissioned a multi-phased multi-year study on behalf of the Lakes, Rivers, Streams, and Ponds Partnership to provide estimates of the economic value from fishing, swimming, boating, public drinking water supplies, and waterfront property ownership for lakes, rivers, streams, and ponds in New Hampshire (Shapiro and Kroll, 2001, Shapiro and Kroll, 2003, Shapiro and Kroll, 2004, and Nordstrom, 2007). Phase I of the study conducted in 2001 was the literature and methodological review; Phase II of the study was conducted in 2003 and is titled "Estimates of Select Economic Values of New Hampshire Lakes, Rivers, Streams and Ponds"; Phase III of the study was conducted in 2004 and is titled "Public Opinion Poll Results in the Study of Select Economic Values of New Hampshire Lakes, Rivers, Streams and Ponds; Phase IV of the study was conducted in 2006 and is titled "The Economic Impact of the Potential Decline in New Hampshire Water Quality: The Link Between Visitor Perceptions, Usage and Spending." Copies of phases II, III, and IV of the study are available at http://des.nh.gov/organization/divisions/water/wmb/lakes/economic_values.htm. The Steering Committee for this economic study consisted of the following with contributions from numerous other organizations and agencies:

- NH Lakes Association
- NH Rivers Council
- NH Department of Environmental Services
- NH Department of Fish and Game
- Squam Lakes Association
- Lake Sunapee Protective Association
- Newfound Lake Region Association.

Results of Phase II of the study are summarized below (from Shapiro and Kroll, 2003).

- The total sales generated by recreational uses (i.e., boating, fishing, swimming) of New Hampshire's freshwaters, and by public drinking water supplies, range from $1.1 billion to as much as $1.5 billion annually.
- Annually, there are approximately 14.7 million visitor days spent by both residents and nonresidents in New Hampshire boating, fishing, and swimming. These visitor days represent roughly 65% of the state's summer visitor days and roughly 25% of the state's annual visitor days.
- Days spent boating, fishing, and swimming collectively generate approximately:
    - $320 million to $340 million in annual household income;
    - 9,000 to 15,000 full- and part-time jobs; and,
    - $850 million to $1.2 billion in annual total sales, which represents 8% to 12% of the total impact of visitor spending on the state's economy.

- Nearly 200,000 households and businesses rely on public drinking water from surface water supplies. This generates approximately $75 million to $150 million in annual household income, 1,900 to 2,600 full- and part-time jobs, and $276 million to $300 million in annual total sales.
- A preliminary estimate suggests that waterfront property owners on lakes, rivers, streams and ponds pay an estimated $247 million per year in property taxes.

The study confirms that the economic value of our fresh surface waters is significant based on these five factors. In reality, the value is much higher as the study did not include:

- Other recreational uses such as hunting waterfowl, shoreline picnics, or bird watching;
- Commercial and industrial uses of surface waters;
- The economic benefit of business locating in New Hampshire due to access to surface waters;
- People's willingness to pay to keep surface waters clean for themselves as well as future generations.

In 2004, the Partnership commissioned a survey of New Hampshire residents as Phase III of the study. The purpose of Phase III of the study, conducted in 2004, was to ascertain public opinion about:

- The relative importance of different freshwater attributes, such as overall beauty of the area, water quality, pollution, and crowding, when New Hampshire residents decide to use the state's surface waters for recreational purposes, and
- How residents' attitudes and behavior would change if these freshwater attributes were altered.

Results of the survey are summarized below (from Shapiro and Kroll, 2004).

- The survey, conducted by the UNH Survey Center, found that 75% of in-state swimmers, boaters, anglers, and other water users would decrease use if crowding got worse; 71% would decrease use if mercury got worse; and 70% would decrease use if algae blooms got worse. Sixty-seven percent would decrease their use if invasive plants got worse, and 59% would decrease use if water levels/flows got worse.
- The survey asked residents to rate the seriousness of a range of environmental and management issues, and invasive plants and crowding topped the list (68% rated these each as "very serious" or "serious"). These were followed by algae blooms (54%), water levels or water flows (52%), and mercury (48%).
- The survey also asked if residents would change their behavior if these issues worsened, the respondents indicated that they would indeed do so. Of swimmers, boaters, anglers, and other users:
    - 58% would decrease use if water levels/flows worsened.
    - 67% would decrease use if invasive plants worsened.
    - 70% would decrease use if algal blooms worsened.
    - 71% would decrease use if mercury worsened.

- 75% would decrease use if crowding worsened.

The survey confirmed that our lakes and rivers are a draw for residents and out-of-state visitors. New Hampshire residents are concerned about water quality and broad environmental factors, such as crowding and development along the shorelines. Maintaining the quality of our rivers and lakes, as well as the quality of the experience people have when they go out to recreate or sight-see is a real economic issue.

The final phase of the study conducted in 2006 consisted of a survey of individuals swimming, boating, and fishing at 75 randomly selected access sites across the state ascertained their opinions about New Hampshire's surface water resources. This phase of the study determined if conditions worsen and these users change their behavior, meaning they would visit our waters less often, how this might financially impact New Hampshire. The results of this final phase of the study are summarized below (from Nordstrom, 2007). To review a brochure summarizing the findings of Phase IV of the study, please visit:
http://www.nhlakes.org/docs/Economic-Study-Phase-IV-Brochure.pdf

- The total annual visitor days made by anglers, boaters, and swimmers is 14.9 million; about 29% of the 51.4 million visitor days for the entire year in New Hampshire.
- The total sales generated by anglers, boaters and swimmers combined are nearly $400 million, or 26% of summer spending in New Hampshire.
- The total household income generated from these sales is about $134 million.
- Just under 6,000 jobs (full-time and part-time) are generated by fishing, boating, and swimming visits to New Hampshire.
- A range of 79% to 94% of recreationalists report high levels of satisfaction with the water quality, clarity and purity, natural views and scenery, crowding levels and water levels and flows.
- Half to two-thirds of visitors would decrease or cease their visiting days to a particular site if they perceived a decline in water clarity and purity, natural views and scenery, crowding levels and water levels and flows.
- Overall, perceived degradation to water clarity and purity will result in the greatest economic loss to New Hampshire. Perceived declines in water clarity and purity would result in about $51 million of lost sales, $18 million in lost income and more than 800 lost jobs statewide.

C.4 SPECIAL STATE CONCERNS AND RECOMMENDATIONS

C.4.1 INTRODUCTION

Although tremendous progress has been made in the past 35 years to clean up surface waters in the New Hampshire, there is much more to be done. The following is a list of the major water quality concerns and issues in New Hampshire that DES and others will be directing their attention to in upcoming years.

C.4.2 SUSTAINABILITY OF WATER RESOURCES

New Hampshire's water resources are essential elements of the State's unique natural beauty, tourist economy, quality of life, and livelihood for many. However, increasing growth and development is stressing the quality, quantity, and natural aquatic biota of many of the State's water resources. Although much has been accomplished, there is concern and evidence that existing water management programs may not be adequate to protect water quality and quantity. To help restore and protect its water resources for future generations, the Commissioner of DES authorized the Lakes Management Advisory Committee (LMAC) and the Rivers Management Advisory Committee (RMAC) on January 3, 2007 to undertake a Sustainability Initiative. These committees, which are comprised of representatives from numerous state agencies and public and private sector groups with water interests, are legislatively charged with advising DES on maintaining water quality and quantity.

In January, 2008, the LMAC and RMAC published a report entitled, "The Sustainability of New Hampshire's Surface Waters" (LMAC/RMAC, 2008 and http://des.nh.gov/organization/divisions/water/wmb/rivers/rmac/documents/sustainability_initiative.pdf). An excerpt from the report summarizing why a Sustainability Initiative is needed, is provided below:

> *"A combination of forces, including rapid population growth and urbanization are imposing new stresses on New Hampshire's surface waters and the State's ability to protect, maintain, and when necessary, restore surface water quality. This is the last major opportunity the State has to address critical water issues, before they either become extremely costly to manage or irreversible. To prevent the negative consequences that accompany our growing population we must develop new approaches that go beyond tasks forces and piecemeal strategies. If we adequately protect the ecological function of our terrestrial and aquatic resources, do not burden them with pollutants, nutrients, toxins, or sediment, or demand more than they can provide, they will be sustainable. To attain and continue to achieve excellent water quality, the State must take the lead by promoting a strong economy and maintaining environmental integrity. However, based on our performance to date we are not attaining these objectives. The LMAC and RMAC recommend that the State move forward with a Sustainability Initiative where the State undertakes an aggressive effort, including addressing landscape change and development and its impact upon water quality and quantity."*

For the purposes of their report, the LMAC and the RMAC developed the following functional definition of sustainability to achieve their goals:

> *"to institute anti-degradation measures to preserve and protect water quality and quantity, to maintain intact ecological linkages between surface waters and their surrounding watersheds, to achieve the appropriate balance between different human uses while protecting the biological integrity of the resource, and to restore and improve existing degraded systems."*

The report is a preliminary roadmap for the initiative in that it provides an overview of the problem, what has been done in the past, and, most importantly, identifies eight key issues that need to be addressed to achieve Sustainability. These issues are summarized below:

#1 Lack of data to properly manage water resources (i.e., the need to increase the network of stream gages and to expand and improve the water quality monitoring network) and the need to improve data access and management by data users;

#2 Lack of a coordinated well-communicated strategy on a state-wide scale to effectively address landscape change and its impacts on water quality and quantity;

#3 The need to improve protection of shorelands and riparian buffers;

#4 The need to limit impacts to water quality and quantity from urbanization and watershed development (including stormwater impacts);

#5 The need to determine the biological, social and physical carrying capacity of State surface waters and to provide adequate public access;

#6 The need to control invasive species;

#7 The need to determine and properly manage consumptive uses of surface and groundwater (i.e., determine and implement Instream Flow Protection and Groundwater Withdrawal); and

#8 The need to address climate change impacts (i.e., rising sea levels, altered runoff patterns from reduced amounts of snowfall and more frequent extremes in precipitation from drought to floods, and increased water temperatures that could degrade cold water fisheries).

Having identified the issues, next steps include cataloging ongoing efforts, describing roadblocks to success, prioritizing the issues, proposing concrete options to consider for each of the eight issues, and proposing environmental and programmatic indicators to measure how well success is achieved. Development of a Sustainability Initiative is a high priority at DES and is a major undertaking that will take significant time, resources, coordination, and cooperation to complete and implement.

C.4.3 CLIMATE CHANGE

The world's leading scientists concluded in 2007 that it is "unequivocal" that Earth's climate is warming, and that it is "very likely" (a greater than 90% certainty) that the heat-trapping emissions (i.e., carbon dioxide and other greenhouse gases) from the burning of fossil fuels and other human activities have caused "most of the observed increase in globally averaged temperatures since the mid-twentieth century" (NIECIA, 2007 and IPPC, 2007). According to a summary of the Northeast Climate Impacts Assessment (NEICIA, 2007) prepared by the Union of Concerned Scientists (USC, 2007), higher emissions of greenhouse gases could:

- cause average temperatures across New Hampshire to rise 9°F to 13°F above historic levels in winter and 6°F to 14°F in summer by late-century;
- result in an increase in winter precipitation on the order of 20 to 30%;
- increase the frequency and severity of major flooding river flooding events such as those that occurred in New Hampshire between 2005 and 2007;
- increase the frequency of short term (one to three month) droughts in New Hampshire; and
- cause global sea levels to rise between 10 and 24 inches by the end of this century which could increase the frequency of damaging coastal flooding and potentially inundate valuable coastal wetlands in New Hampshire.

To address climate change, Governor John Lynch established a Climate Change Task Force through Executive Order in 2007 with the charge of developing a Climate Change Action Plan for the State of New Hampshire. Members of the Task Force include business leaders, environmental leaders, state officials, legislators and community representatives with the chairman of the task force being the Commissioner of DES.

Goals of the Task Force include reducing greenhouse gas emissions and recommending steps New Hampshire can take to meet those goals. Recommendations by the Task Force will also help New Hampshire achieve the Governor's goal of ensuring 25% of our energy comes from renewable sources by 2025.

New Hampshire has joined other Northeast States in developing the Regional Greenhouse Gas Initiative, which is a regional effort to cap emissions from power plants. The Governor has called for passage this legislative session of a law implementing the Initiative. The Task Force will assist the state in its efforts as that Initiative continues to develop.

In accordance with the Executive Order, the Climate Action Plan was originally scheduled to be submitted to the Governor by September 1, 2008. Due to the extensive detail and comprehensive nature of the recommendations that were developed through this process for the Task Force to consider for inclusion in the final Climate Action Plan, the final Plan was released on March 25, 2009 at a Press Event with the Governor. The complete New Hampshire Climate Action Plan is available at http://des.nh.gov/organization/divisions/air/tsb/tps/climate/index.htm .

C.4.4 INSUFFICIENT FUNDING TO MANAGE WATER RESOURCES

Management of New Hampshire's surface waters requires adequate funding to support essential core programs such as those described in Section C.2. These programs are needed to 1) help prevent the degradation of surface waters in the state and the potential loss of revenue and 2) to protect the hundreds of millions of dollars which have already been invested to restore and maintain water quality in New Hampshire. For the past several years federal funding for many programs have remained flat or decreased. As a result, some programs, such as the biomonitoring program have already had to downsize. If this trend is not reversed soon, or if other sources of funding are not found, other important water quality programs will need to be cut back in scope and staff or eliminated. This would be extremely detrimental to New Hampshire's water resources since many programs are already under-funded and understaffed.

For example, based on the New Hampshire Water Monitoring Strategy (DES, 2005), surface water monitoring programs in the State are currently under funded by approximately one million dollars (see section D.1). As a result, DES does not always have the data that it would prefer to make water management decisions. Further, if water quality is allowed to degrade, it could have a significant impact on the State's economy. As reported in section C.2.10.2, perceived declines in water clarity and purity are estimated to result in about $51 million of lost sales, $18 million in lost income and more than 800 lost jobs statewide.

C.4.5 DRINKING WATER ISSUES

New Hampshire has an abundant supply of clean drinking water. There are challenges, however, for the public water systems that serve 60% of New Hampshire's population and for the remaining 40% of residents that rely on private household drilled or dug wells. Drinking water from public water supplies is highly regulated to protect public health, but aging infrastructure and the cost of treating drinking water and otherwise meeting ever increasing regulatory requirements are significant issues for public water suppliers. Also, as our ability to detect and evaluate contaminants in drinking water has increased, so has the need to address emerging contaminants such as cyanotoxins, pharmaceuticals and personal care products. These challenges speak to the need for more effective efforts to prevent the degradation of water supply sources. For both private well owners and public water systems that use wells, naturally occurring contaminants such as radon and arsenic are also significant health concerns. Finally, New Hampshire is a nationally recognized leader in source water protection, but landscape change has the potential to degrade our sources of drinking water by both contributing contaminants and changing hydrology.

C.4.6 WASTEWATER TREATMENT FACILITY ISSUES

C.4.6.1 Upgrading Existing Wastewater Treatment Facilities

Many wastewater treatment plants in New Hampshire are facing the challenge treating wastewater while the plants are approaching their hydraulic and or technology limitations. These plants have served the purpose for which they were designed, but with increased flow to the headworks and new or more stringent permit limits, permittees are faced with the need for facility upgrades, equipment replacement, and construction of new wastewater treatment facilities. The availability of ARRA funding has spurred a flurry of upgrade activity for municipalities with wastewater treatment facilities but many permittees are facing significant upgrade costs with less funding support than they have had in the past.

C.4.6.2 Combined Sewer Overflows

The Combined Sewer Overflow (CSO) program is addressed in Section C.2.2.2. As mentioned, there are currently 33 CSOs located in the six New Hampshire communities of Berlin (one CSO), Lebanon (four CSOs), Manchester (15 CSOs), Nashua (eight CSOs), Portsmouth (four CSOs), and Exeter (one CSO). Each of these communities has implementation plans to abate CSO pollution. Studies to date suggest that bacteria and floatables are the major pollutants of concern. To expedite implementation of CSO abatement plans, federal funding assistance will be needed.

C.4.7 NONPOINT SOURCES

The major contributors to Nonpoint Source (NPS) pollution are people at home, work, and play. To address such NPS issues it is necessary to 1) convince people that a problem exists, 2) develop reasonable solutions, and 3) fund the solutions. Stormwater runoff causes or contributes to 83% of water quality impairments document in the state. To address nonpoint sources in impaired watersheds, DES uses a quantitative approach documenting the sources, load reductions, and BMPs necessary to bring the waterbody into compliance with water quality standards. Since 2004, DES has assisted local organizations in developing more than 25 watershed-based plans addressing impaired waters, and several plans using a quantitative approach to improve or maintain high quality waters.

In urban areas, stormwater utilities offer a promising tool for municipalities to address stormwater infrastructure and improve water quality. DES worked with the cities of Dover, Manchester, Nashua, and Portsmouth to conduct stormwater utility feasibility studies, addressing such issues as public needs, capital improvements, optimal stormwater programs, and billing structure. While no municipality has adopted a utility, these studies improved local understanding of how such an entity can be implemented. New federal stormwater regulations are likely to increase the desirability of local utilities as a stable funding source for local stormwater programs.

Since publication of four chloride TMDLs covering I-93 corridor watersheds in 2007, substantial progress has been made in both local and statewide programs addressing road salt. The University of New Hampshire Technology Transfer Center developed the Green SnowPro certification program, providing a training program for winter road maintainers with particular emphasis on the private sector. Initially launched in the fall of 2011, the program has already certified over 200 salt applicators. The course work emphasizes the basics of road salt management and focuses on improved efficiency to achieve the desired level of service while using less salt. In some impaired watersheds, private parking lots and driveways are as much as 50% of the total chloride load. There are now more than 30 chloride-impaired watersheds in the state. To address the demand side, DES is working with the State Police and the Department of Transportation on improved communications and public messaging designed to give road crews the time they need to provide safe roadways as soon as practical after a storm ends.

As DES continues to assess nitrogen loading in Great Bay, it has become clear that much work is needed to address nitrogen sources in the 46 coastal watershed communities. DES is participating with NEIWPCC on a voluntary fertilizer guidelines initiative designed to reduce unnecessary applications by working with industry, fertilizer applicators, and other stakeholders. This topic, as well as septic system management, stormwater management, financing, and others, will be addressed through a Great Bay dialogue process, the results of which will help to determine recommended actions addressing nonpoint sources affecting the Bay.

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C.4.8 INTRODUCTION OF NON-NATIVE NUISANCE AQUATIC SPECIES

Preventing the spread of new exotic aquatic plants and animals into state waters is a major concern in New Hampshire. In 1997, legislation was passed to prohibit the sale, transport, and introduction of exotic aquatic weeds in the state. In 1999, rules were adopted pursuant to this legislation, further restricting activities that would result in new introductions of 29 species of plants. These rules were revised and expanded in 2007 and again in 2009. The Exotic Species Program must continue to prevent the introduction and spread of non-native nuisance aquatic species in New Hampshire's surface waters so as to protect the ecological, recreational, aesthetic, and economic values of our waterbodies. Through education and outreach efforts the rate of spread of exotic aquatic plants has slowed in New Hampshire, and new infestations are found much earlier when they are still pioneering and more easily managed, but still one or two new infestations are found each year, and more than 70 waterbodies have on-going management practices to reduce exotic plants in order to maintain designated uses of the waterbodies. For additional information about the exotics species control program, see section C.2.7.

C.4.9 COASTAL ISSUES- SHELLFISHING AND EUTROPHICATION

C.4.9.1 Opening Shellfish Beds

The State of New Hampshire has been actively working on reopening shellfish harvesting areas since 1993, when an interagency committee (Department of Health and Human Services, Office of State Planning, Fish and Game Department, Department of Environmental Services, and UNH/Jackson Estuarine Laboratory) began work in Hampton/Seabrook Harbor and successfully reopened some beds in 1994, and again in 1995. This group's work was expanded in the mid-1990s with the creation of the New Hampshire Estuaries Project (part of EPA's National Estuary Program) and additional openings were realized in areas such as Little Bay, Hampton/Seabrook, and others.

In 1999 the New Hampshire General Court transferred authority for shellfish water classification from the Department of Health and Human Services to the Department of Environmental Services, which then created a full-time program within the Watershed Management Bureau. Since late 1999 two program staff have worked toward the NHEP goal (also a DES Strategic Plan objective) of classifying all estuarine shellfish waters. Through 2007, over $2.6 million in state and federal funds have been applied toward this goal. Currently, 88.5% of the estuarine shellfish waters have been classified, and 45.7% of estuarine shellfish waters are open for harvest.

Efforts to identify pollution sources and classify shellfish growing areas have resulted in the reopening of over 850 acres of estuarine waters for harvest. These efforts have included the inspection of 1715 properties and the identification of 830 potential/actual pollution sources. Of these sources, 87 have been confirmed as actual pollution sources and are receiving some level of follow-up investigation by the DES Watershed Assistance Section and/or the DES Shellfish Program. The major remaining point sources of pollution are three CSOs located in Portsmouth and one CSO in Exeter. Efforts to mitigate CSO pollution are discussed in Section C.2.2.2.

In addition to the work in estuarine areas, the DES Shellfish Program reopened nearly all of the Atlantic Coast for harvesting in late 2000. That, plus the development of a shellfish classification program that complies with the National Shellfish Sanitation Program, led to the state of New Hampshire obtaining federal recognition as a "shellfish producing state." This recognition has subsequently allowed for the development of a commercial aquaculture industry in the state. The state aquaculture industry includes offshore blue mussel and estuarine oyster culture operations. The oyster industry in New Hampshire has more than doubled in size in recent years, with the number of licensed operations increasing from two to five, and the number of acres licensed for aquaculture production increasing from six to 15.5 acres.

C.4.9.2 Estuarine Eutrophication

Eutrophication from excess nutrients is a critical issue affecting the aquatic life designated use in the Great Bay Estuary. The Great Bay Estuary is a national treasure and a valuable resource to New Hampshire. It is one of 28 "estuaries of national significance" designated by EPA. Unfortunately, the 2009 State of the Estuaries Report for the estuary (PREP, 2009) showed all the classic signs of eutrophication: Increasing nitrogen concentrations, low dissolved oxygen, and disappearing eelgrass habitat. These symptoms of eutrophication from excess nutrients impair the aquatic life designated use which is a violation of the state water quality standards for nutrients (Env-Wq 1703.14) and biological and aquatic community integrity (Env-Wq 1703.19). Reducing nitrogen and other pollutant loads to restore the estuary are top priorities for DES and EPA.

C.4.10 MERCURY IN FISH

As discussed in Section D.6.3, a statewide fish consumption advisory was issued in 1994 for all inland freshwater bodies because of mercury levels found in fish tissue. The advisory recommends limiting the amount of fish eaten per month. As a result of the statewide advisory, all surface waters are considered impaired for fish consumption due to elevated levels of mercury in fish tissue. Since the first issuance of the fish advisory continuous sampling efforts and additional analysis have significantly increased the New Hampshire Fish Mercury Database. This led to a re-examination and update of the statewide fish consumption advisory in April 2008. The basis for the update can be found in the DES document "Technical Background for the 2008 Update to the New Hampshire Statewide Mercury Fish Consumption Advisory" (Schnepper, 2008). Changes to the advisory were: exemption of stocked trout from the statewide advisory; inclusion of perch with other species that have length restrictions; and listing of four new waterbody-specific advisories for Dubes Pond, Jackman Reservoir, Mascoma Lake, and Tower Hill Pond.

Symptoms of mercury poisoning can include loss of sensation in the extremities (paresthesia), loss of coordination in walking, slurred speech, diminution of vision and/or loss of hearing.

Human related sources that may emit mercury into the atmosphere include coal combustion, smelting, and waste incineration. Although New Hampshire sources emit some amounts of mercury, substantial quantities are also emitted in states upwind and carried east by prevailing winds. Modeling by NESCAUM shows that only 14% of the mercury deposition falling on the northeast region (New England and New York) originates within the region. The emitted mercury is then deposited on the lakes and soils of New Hampshire, is methylated by bacteria, and is concentrated as it moves up the food chain into fish and fish-consuming animals, including humans.

In New Hampshire, a state level mercury reduction strategy (section C.2.13) was drafted and released in October 1998. The strategy contains 40 recommended actions to reduce mercury releases in New Hampshire, including those from medical and municipal waste incineration and power generation. Implementation of the strategy has resulted in an estimated 70% reduction in regional mercury releases to date, with a long-term goal of the virtual elimination of man-made mercury releases. Legislation passed in 1999 imposes a stringent mercury emissions limit on the States' largest municipal waste combustor. Similarly, regulations put in place for medical waste incinerators have reduced emissions for that source by 98%. Legislation was also passed to limit emissions from the State's coal-fired utilities, with full implementation required by 2013. The strategy also emphasizes source reduction, and legislation was passed in 2007 that banned the sale of many types of mercury-added products in the State, beginning January 1, 2008. In addition, a separate bill makes it illegal to dispose of any mercury-added product in a landfill, transfer station, and incinerator. Most recently, legislation was passed to mandate the collection and recycling of mercury-added thermostats. To encourage proper recycling and disposal of mercury-added products DES has been working with private and municipal partners to conduct outreach and develop free recycling programs for consumers and businesses. Other ongoing mercury reduction outreach efforts are targeted to hospitals, businesses, schools, dentists, municipalities, and citizens.

New Hampshire also continues to actively participate (including co-chairing) an effort led by the Conference of the New England Governors and the Eastern Canadian Premiers to implement the Regional Mercury Action Plan, adopted by the Governors and Premiers in June 1998. Although significant progress has been made since the release of the mercury reduction strategy, much remains to be done.

New Hampshire also participated in the development of a mercury TMDL for the northeast region. The TMDL was coordinated and prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) with assistance from the northeast states and was approved by EPA in 2007. The TMDL indicates that reductions are needed in anthropogenic sources of mercury from in-region and especially out-of-region sources to reduce mercury concentrations in fish to levels more acceptable for fish consumption.

New Hampshire is currently in the third round of sampling in a long-term mercury monitoring program involving ten lakes, with two lakes being sampled each year in a five year rotation. This program is an inter-agency collaboration between the New Hampshire Fish and Game Department, New Hampshire Public Health Association and DES. The experimental design will allow DES to evaluate the overall trend of mercury in New Hampshire fish, and to determine if there is a difference in trends based on lake acidity, color or dissolved oxygen levels. The study will also determine if different species show different trends. DES samples two fish species, largemouth bass and yellow perch, because of their general availability and popularity to anglers. These species are also among the top species for accumulating mercury.

New Hampshire is also involved in a multi-year study with the USFWS to determine if pollution control measures placed on a local coal fired power plant are showing reductions in the amount of mercury found in fish and wildlife in adjacent and downwind areas.

C.4.11 ACID DEPOSITION (ACID RAIN)

The passage of the Clean Air Act Amendments in 1990 has resulted in a decrease in sulfur dioxide emissions from in-state and out-of-state sources. Unfortunately, this has resulted in little if any improvement in the acidity or acid neutralizing capacity status of New Hampshire surface waters. As a result, hundreds of waterbodies in the state do not meet state water quality standards for the protection of aquatic life due to low pH (i.e. acidic conditions).

A number of reasons contribute to this lack of improvement in surface waters and the need for further cuts in emissions. Nitrogen emissions have not decreased substantially region-wide and wet deposition of nitrogen has remained largely unchanged since the 1980s. Additionally, the loss of acid-neutralizing minerals from the soil and the long-term accumulation of sulfur and nitrogen in the soil have left many ecosystems more sensitive to the input of additional acids, further delaying recovery from acid deposition.

Computer model results for the Hubbard Brook Experimental Forest show that the 1990 Clean Air Act Amendments will have a positive effect on sulfate deposition but will not facilitate full recovery for acid-sensitive ecosystems in the Northeast. Results of the Hubbard Brook model further suggests that deeper cuts in electric utility sulfur emissions (at least 80% beyond the Clean Air Act) will be needed for greater and faster recovery from acid deposition in the Northeast (Driscoll *et al.* 2001).

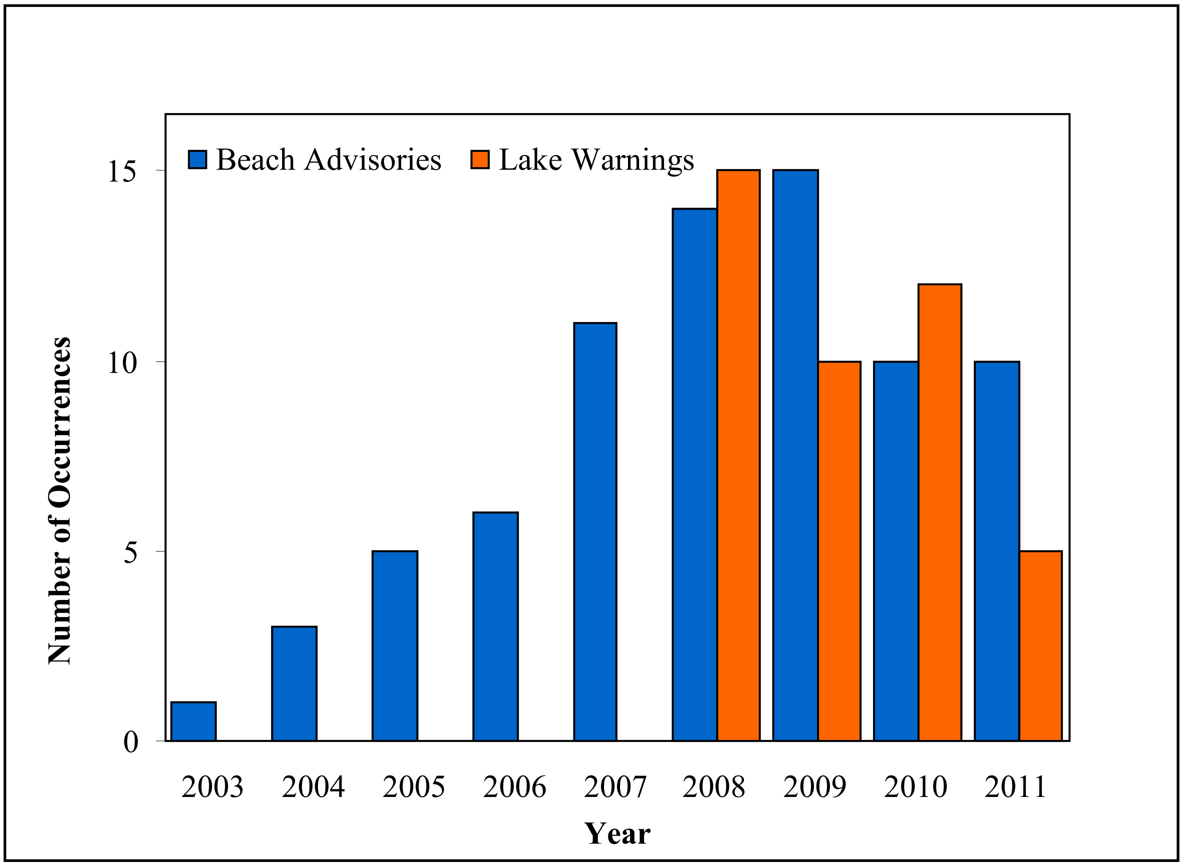
C.4.12 CHLORIDES AND ROAD SALT

Monitoring data have shown increasing levels of sodium, chloride, and conductivity in surface waters, largely from deicing runoff. Most lakes continue to meet the chronic chloride criteria of 230 mg/L but increases of well over 100% in all three parameters have been documented in many lakes over the past 25 to 30 years, with the greatest increases occurring in recent years. The most impacted lakes are lakes that drain salted roads, highways, and urban areas. Streams also show increases in conductivity and streams in urban areas may violate criteria. Between 2006 and 2008, DES prepared Total Maximum Daily Load (TMDL) studies for four brooks in the I-93 corridor in conjunction with the expansion of I-93. EPA approved these TMDLs in 2009. DES is collecting data in watersheds in seacoast communities to document water quality impairments and for future TMDL studies. Efforts are underway to work with DOT and stakeholders to decrease salt loadings in the region and to educate the public on the issue.

C.4.13 CYANOBACTERIA BLOOMS

DES considers Cyanobacteria (formerly referred to as blue-green algae) a significant public health risk to people who recreate in infected waters. Animal mortality and disease likely increase with increased exposure and ingestion of highly concentrated cells. Dogs are especially at risk as they ingest high volumes of concentrated cells in the water. Nutrient enriched waterbodies increase the potential for nuisance cyanobacteria scums that are potentially toxic to the aquatic ecology. Historically scums occurred in New Hampshire when treated sewage effluent was discharged to lakes (e.g., Winnisquam, Kezar, and Glen Lakes). Cyanobacteria begin their annual cycle by sediment derived nutrients before their rise to the surface for sunlight. When favorable growth conditions exist, cyanobacteria reproduction is rapid, forming surface scums that accumulate along downwind shores. Scums can be fatal to all animals that consume the water and can cause severe illness or skin rashes if ingested or contacted by humans. To protect the public and environmental health, DES has taken a proactive approach by issuing advisories for designated public bathing beaches impacted by cyanobacteria and issuing press releases to warn shoreland owners that cyanobacteria scums are present around the waterbody (see figure for advisories and warnings) (Figure 14). DES has also been active through public education of veterinarians, doctors, volunteer monitors, and local lake associations.

Figure 14: Number of Cyanobacteria Advisories and Warnings



PART D. SURFACE WATER MONITORING AND ASSESSMENT

D.1 MONITORING PROGRAM

New Hampshire has numerous water resource monitoring programs including two very active volunteer monitoring programs (i.e., the Volunteer Lake Assessment Program or VLAP and the Volunteer Rivers Assessment Program or VRAP). The majority of these programs are summarized in the New Hampshire "Water Monitoring Strategy" (DES, 2005), a copy of which is provided in Appendix 3. DES plans to update the strategy in 2011 (DES, 2014).

The strategy specifies a process for determining water monitoring data required to address New Hampshire's water management needs. It describes a vision for collection, management, and analysis of water data in a way that supports public management decisions about protection and restoration of our water resources. The first edition focuses on surface water quality data for all waterbody types, with an emphasis on water quality assessment under the Clean Water Act (CWA). It is expected that future editions will incorporate other objectives, including groundwater and flow monitoring.

The purpose of developing the strategy is to provide a vehicle for planning and coordination among all organizations that collect water data in New Hampshire – federal, state, and local government, as well as non-government and academic. Furthermore, it fulfills the EPA requirement for a Strategy to implement the Elements of a State Water Monitoring and Assessment Program (USEPA, 2003) in the context of surface water quality assessment and reporting under sections 305(b) and 303(d) of the Clean Water Act. In a broader context, the strategy aims to provide unifying concepts, purposes, and methods for all who collect water quality data, leading to more efficient water monitoring, more available data, more complete and informed analysis, and ultimately better public decision-making about actions affecting water resources.

The strategy is underlain by the following three principles all of which are described in more detail in Appendix 3:

1) Water management decisions should be data-driven, and framed on a watershed basis.
2) The purpose for collecting water data should be clearly understood.
3) Water data should be accessible and interoperable, with documented data quality and metadata.

Implementation of these underlying principles in all New Hampshire water monitoring efforts depends on a statewide mechanism for coordination, communication, collaboration, and data sharing among all entities that collect, manage, or use monitoring data. For this mechanism, DES proposes to create a state water monitoring council, the New Hampshire Monitoring Network. Steps are currently underway to initiate formation of the network. The network's purpose will be to join the individual efforts of the disparate agencies and organizations that now collect monitoring data into a coordinated, integrated, and mutually understood process for data-driven decision making, using the principles described above. DES committed to forming the network in FY 06, as a participant with EPA and USGS in a pilot project to integrate USEPA and USGS water quality monitoring and assessment activities in New Hampshire and New England.

To ensure that the purpose for collecting water quality data is clearly understood (i.e., underlying principal #2), DES is implementing a data-driven decision making paradigm, which is based on the Data Quality Objectives (DQO) process developed by EPA (USEPA, 2000). Using this concept, the entire strategic plan for monitoring becomes a dynamic composite of objectives as the seven steps of the DQO process frame, quantify, and analyze key management questions. The seven steps are described in detail in the Strategy. DES is encouraging other agencies and organizations to partner with DES in its use.

Part of the DQO process includes establishing monitoring objectives. Interim objectives identified in the strategy are shown in Table 6. Numbered objectives are either required by EPA for Clean Water Act reporting purposes, or they are the basis for ongoing surface water quality monitoring at DES. Lettered objectives are draft placeholders for inclusion in subsequent editions of the strategy. DES expects this interim list to grow and be refined in subsequent editions. The DQO process, consistently applied, will concisely link the objectives shown in Table 6 with the water monitoring data needed to fulfill them.

Table 6: Interim Water Monitoring Objectives

Objective #	Description	CWA Section
1	Determining surface water quality standards attainment	305(b), 314
2	Identifying impaired surface waters, waters meeting standards, and high quality waters	303(d)
3	Assessing surface water quality trends	305(b), 314
4	Support surface water quality modeling studies such as TMDLs and Diagnostic Feasibility Studies	303(d)), 314
5	Identifying causes and sources of surface water quality impairments	303(d), 305(b)
6	Supporting the evaluation of program effectiveness.	303, 305, 402, 314, 319
7	Supporting surface water compliance and enforcement actions	
8	Investigating surface water quality complaints	
9	Establishing, reviewing, and revising surface water quality standards	303(c)
10	Supporting special research projects, including emerging public and environmental health issues	
11	Supporting the implementation of surface water quality management programs	303, 305, 402, 314, 319
12	Supporting protection for high quality surface waters under the surface water antidegradation policy	314, 303(c)
A	Supporting contaminated site remediation	

Objective #	Description	CWA Section
B	Providing data for dam management and operation	
C	Providing data for flood and drought control and prediction	
D	Providing data for water management plans for surface and groundwater use and dam operation	
E	Assessing groundwater quality for domestic water supply	
F	Providing data for source water protection for surface and groundwater supplies	
G	Assessing surface water impacts of groundwater and surface water withdrawals	

With regards to Objective 1, it is apparent that a census approach to meeting this objective is unworkable as it would mean that all 8,750+ surface water assessment units would have to be monitored and assessed for all uses every five to ten years. This is simply not feasible. Consequently, too achieve this objective (pending the availability of funding) DES proposes to conduct probabilistic assessments of all New Hampshire surface waters, grouped into six strata by waterbody type. The probabilistic assessment will be repeated for each stratum every 10 years. More details regarding the proposed probabilistic monitoring are provided in Appendix 3.

Although probabilistic assessments satisfy Objective 1, they do not provide any information toward Objective 2 – identifying impaired waterbodies. This is because the amount of data collected in each assessment unit does not meet minimum CALM requirements. Therefore it is neither useful for reporting to EPA under CWA section 303(d) nor for local watershed management decisions that require complete assessment of targeted waterbodies. Plans for achieving Objective 2 are included in the strategy and focus on use of modeling tools to make assessments in less populated areas and ways to expand and better integrate volunteer monitoring to achieve Objective 2 as well as the monitoring objectives of the volunteers. To this end, DES intends to aggressively pursue building statewide capability for enhanced volunteer monitoring. This will include seeking additional staff so that DES can provide direct technical support to more volunteer groups, making the DES Environmental Database (EMD) easy to use for organizations outside DES, and better coordination with organizations that have their own monitoring capabilities, such as UNH Lay Lakes Monitoring Program, GLOBE, Plymouth State University Center for the Environment, UNH Jackson Lab, Lake Sunapee Protective Association, and others. The New Hampshire Monitoring Network will be an important communication tool for this effort.

With regards to resources, traditional long term federal funding sources for monitoring and assessment include federal Clean Water Act Section 106 and 604(b) grants for rivers and streams, state general funds for lakes, and federal Coastal Zone Management and National Estuaries Program funds for tidal waters. These sources have essentially stayed level over the last few years. Meanwhile salaries and benefits, as well as laboratory analysis costs, continue to increase, resulting in less actual monitoring activity on a per site visit basis.

In fiscal years (FY) 03-05 DES was able to maintain its base monitoring and assessment programs for rivers and streams by supplementing long term funding sources with PPG carryover funds from previous grant years and by applying for short term competitive funds such as Section 104(b) (3) grants. After FY08, however, it is projected that carryover money will be essentially exhausted. In order to maintain existing levels of monitoring effort, DES will need to become more efficient by reducing staff costs per site visit, and secure additional funding. DES will continue work with ASIWPCA, ECOS, other states and EPA to present the needs to Congress for federal budget action. DES also intends to explore state and watershed-based funding possibilities, as is presently being done, for example by the DES Shellfish Program.

Table 7 shows staffing and funding needs to fully implement New Hampshire's Monitoring Strategy. This analysis was conducted in 2005.

Table 7: Staffing and Funding Needed to Implement NH Monitoring Strategy

Element	2006 (Year 1)				Peak Year (in 2005 dollars)			
	Total Cost	Available Funds	Surplus / Deficit	Total # Staff Required (New Staff)	Total Cost	Available Funds	Surplus / Deficit	Total # Staff Required (New Staff)
# 1	$2.17 M	$2.17 M	$0	24.0 (6.3)	$3.06 M	$ 2.17 M	($0.89 M)	33.8 (15.5)
# 2	$0.22 M	$0.22 M	$0	2.5 (0.0)	$0.34 M	$0.22 M	($0.12 M)	4.5 (2.0)
# 3	$0.14 M	$0.14 M	$0	1.6 (0.0)	$0.21 M	$0.14 M	($0.07 M)	2.6 (1.0)
TOTAL	$2.53 M	$2.53 M	$0	28.1 (6.3)	$3.61 M	$2.53 M	($1.09 M)	40.9 (18.5)

NOTES:

1. Element # 1 = MONITORING AND QA/QC
   Element # 2 = DATA MANAGEMENT
   Element #3 = ASSESSMENT OR ANALYSIS AND REPORTING.
2. M = Million

As shown in Table 7, it is estimated that DES spent approximately $2.53 M in 2006 on all three elements addressed in the strategy (monitoring and QA/QC, data management and assessment/ reporting). This effort will require approximately 28.1 full time equivalent (fte) staff of which, 21.8 fte are existing and 6.3 fte are new (part time interns which are hired by DES every summer). Sufficient funds were available to cover expenses in 2006.

To fully implement the strategy, Table 7 (peak year) shows that approximately $3.61 M (in 2005 dollars) is needed on an annual basis, the majority of which is needed for monitoring ($3.06 M). Assuming that future funding from existing sources remains at 2006 levels, this results in a $1.09 M deficit. The peak year requires approximately 40.9 fte, of which approximately 18.5 would be new. This includes 10 new full time staff and 2.8 fte in additional part time interns to the 6.3 fte of part time interns which are currently hired each summer. Projects requiring additional full time staff for strategy implementation are shown in Table 8. All of these projects are currently functioning with no more than one full time staff member.

Table 8: Projects Requiring Additional Staff for Strategy Implementation

Number of New Full Time Staff	Project
2	Ambient River Monitoring Programs
2	Total Maximum Daily Load (TMDL) Program
2	Volunteer Lake and River Assessment Programs (VLAP and VRAP)
1	DES Limnology Center
2	Data Management
1	Assessment and Reporting

Vehicles for transportation to sampling events are a major additional equipment need. The Peak Year scenario includes three vehicles. Other major equipment needs in the future include datasondes and biomonitoring equipment.

D.2 ASSESSMENT METHODOLOGY

The purpose of the Consolidated Assessment and Listing Methodology (CALM) is to describe, in detail, how surface water quality data are analyzed and how assessment decisions for 305(b) reporting and 303(d) listing purposes are made. The CALM is the translator document bridging the gap between the Water Quality Criteria and water quality data for waterbodies in the state. The CALM also includes descriptions and definitions of the many terms used in the assessment tables and lists presented in the following sections. Readers are strongly encouraged to read the CALM before reviewing assessments as it will help one to better understand and interpret assessment results.

Examples of topics addressed in the CALM include:

- Waterbody coverage, types and assessment units
- Designated uses
- Data sources
- Data quality
- Data age
- Core parameters
- Definition of independent samples
- Spatial coverage per sample site
- Minimum number of samples for various parameters
- Magnitude of exceedance indicators
- Specific assessment criteria for each designated use
- Section 303(d) listing and delisting
- Total Maximum Daily Load (TMDL) priority ranking

Assessment methodologies often change as new information, new or changed criteria, and new assessment techniques become available. Consequently, DES reviews and updates its CALM a minimum of every 2 years. These periodic updates should result in more accurate and reliable assessments, and therefore, better management of water resources in the future.

The first edition of the CALM was prepared for New Hampshire's 2002 Section 305(b) and 303(d) Surface Water Quality Report. Since then, the CALM has been updated biennially. A copy of the 2012 CALM is available in Appendix 4 at http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm . Prior to being finalized, a draft of the 2012 CALM was released for public comment. For more information regarding the public participation process for the CALM, see section F.2.

D.3 ASSESSMENT RESULTS

D.3.1 OVERVIEW

In this section, the water quality of the state's waters is discussed. In accordance with EPA guidance, the assessment addresses the overall use support, the individual use support, as well as the causes (i.e., the pollutants), and probable sources of nonsupport. Tables and graphs are provided that summarize each of the assessed waterbody types.

In 2008 wetlands were added to the assessment process and the assessment units were revised in 2010. In all, 52,313 wetland assessment units covering 286,696 acres were added. This does not include wetlands in open water to avoid overlap with existing AUs in other waterbody types. As discussed in section D.3.9, DES developed a GIS-based evaluation criteria using the characteristics of adjacent land uses. This information was used to conduct preliminary or "screening level" assessments of wetlands.

D.3.2 OVERALL USE SUPPORT SUMMARY

The Clean Water Act goal is to assess 100% of the State's waters for all designated uses. Figure 15 shows the percent assessed based on size (i.e., miles, acres, etc.) and site specific assessments (see section D.4) for each waterbody type and designated use. As shown, there is reasonably good to very good coverage based on site-specific assessments for aquatic life, primary and secondary contact recreation in estuaries, oceans, lakes, and impoundments. For the same uses, the percent assessed in rivers is much lower. All tidal waters were assessed for shellfishing. All surface waters were assessed for fish consumption whether including or excluding the fish consumption advisory due to mercury. All surface waters were assessed for the use of drinking water supply based on state law which requires all such waters to be suitable for drinking after adequate treatment. None of the surface waters were assessed for the use of wildlife since criteria have not yet been developed to assess this use.

Figure 15: Overall Percent Assessed

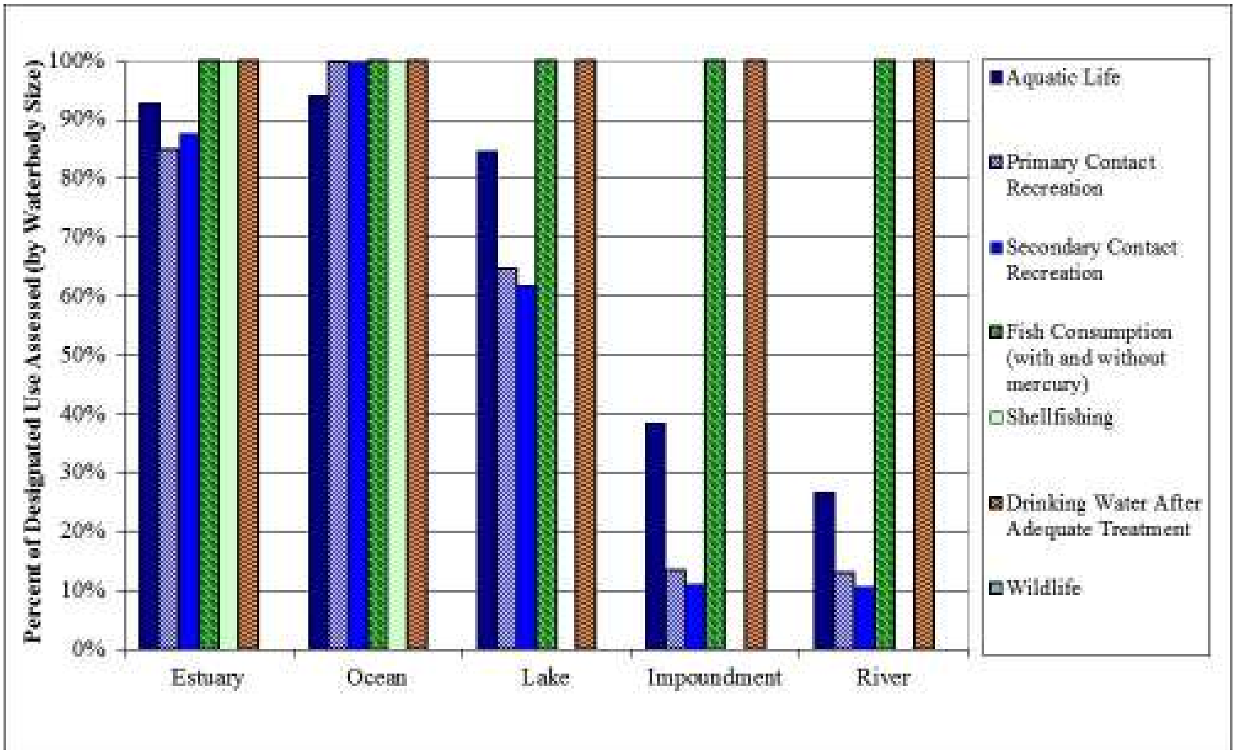


Table 9 and Table 10 presented at the end of this section show the values for the percent assessed used to develop Figure 15 as well as overall use support status for each waterbody type using EPA's assessment categories (i.e., 1, 2, 3, 4a, 4b, 4c, and 5). Two tables are presented to show the difference in assessment results with and without the statewide mercury fish consumption advisory which affects all surface waters in New Hampshire (see section D.6.3) Definitions for each category are provided at the bottom of Table 9 and Table 10. Percentages shown in the two tables are in terms of total size (i.e., miles, acres, etc.). Also shown in Table 9 and Table 10 are assessment results based solely on site specific assessments (SSA) as well as those based on a combination of site specific and probabilistic assessments (PA). Descriptions of these two types of assessments are provided in section D.4.

In addition to the information provided in Table 9 and Table 10, overall assessment results are also presented graphically in Figure 16 and Figure 17. The bar graphs presented in Figure 16 and Figure 17 are based on the values provided in Table 9 and Table 10 respectively. For example, for estuaries based on site specific assessments (SSA), Table 9 shows 26.4% of all designated use/assessment unit combination in estuaries meet water quality standards (the sum of category 1 and 2 waters), 19.2% have insufficient information or no data to assess the uses (category 3 waters), and 54.4% are impaired for one or more uses (the sum of categories 4a, 4b, 4c and 5). The total assessed is 80.8%, which is the sum of the percent meeting water quality standards and percent that are impaired. These same results are shown in the first bar graph in Figure 16 with waters meeting one or more designated uses with none impaired or threatened in green, waters with one or more uses that are impaired or threatened in red, and waters with insufficient information to assess any use in gray. The total assessed is the sum of the green and red areas.

The bar graphs presented in Figure 16 and Figure 17 are very helpful because one can tell at a glance how well we are meeting the ultimate goal of having all waters attain all designated uses. If this goal was achieved, all the bar graphs shown in these two figures would be entirely green. If all waters were impaired for all uses, each bar graph would be entirely red and if there was insufficient information to assess any water for any use, each bar graph would be entirely gray. As previously mentioned, the total percent assessed can be easily obtained by adding the green (attaining) and red (impaired) percentages together. As discussed in section C.2.1.2, all freshwaters have six designated uses and all tidal waters have seven designated uses. Therefore, for freshwaters (impoundments, lakes and rivers), each designated use represents 16.7% (100%/6 uses) of the total bar graph and for tidal waters (estuaries and ocean) each designated use represents 14.3% (100%/7 uses) of the total bar graph. Of the 14.3% or 16.7%, the percent assessed as attaining, impaired, or insufficient information is based on the individual use assessments presented in section D.3.4 through D.3.8. For example, for estuaries, the individual use support assessment (see Table 11 in section D.3.4.1) for aquatic life use shows that 0.8% of the estuaries is fully supportive, 91.9% of the estuary is impaired, and 7.2% had insufficient information to assess the aquatic life use. In the bar graphs presented in Figure 16 and Figure 17, this represents 0.1% (0.8%/ 7 uses) of the green area (attaining), 13.1% (i.e., 91.9% / 7 uses) of the area in the red zone (impaired), and 1.0% (7.2%/ 7 uses) in the gray area (insufficient information). The sum of the green, red and gray areas in Figure 16 and Figure 17 for aquatic life use is therefore 14.3% (0.1% + 13.1% + 1.0%) which agrees the earlier statement that each designated use for tidal waters represents 14.3% (100% /7 uses) of the total bar graph in these figures.

All waters are considered assessed and impaired for fish consumption due to statewide fish and shellfish consumption advisories. The advisory was issued for all New Hampshire surface waters because of elevated levels of mercury in fish/shellfish tissue (see section D.6 for more information on fish advisories). Consequently, in Table 9 and Figure 16 a large portion of the impairments are attributable to mercury.

For comparison purposes, Table 10 and Figure 17 are presented which show what the overall use support would be if the mercury issue was resolved and the statewide mercury fish/shellfish consumption advisory was no longer in effect. A list and map of all impaired waters excluding the mercury advisory are provided in Appendix 6 and Appendix 7 respectively. In the absence of the state-wide fish consumption mercury advisory, no other state-wide advisories are in effect which would result in all being assessed as impaired. This is considered a reasonable assumption based on fish tissue analyses done to date and the fact that most New Hampshire surface waters are not believed to be subject to any significant toxic discharges (other than mercury) that would impact fish consumption. Consequently, in Table 10 and Figure 17 a large portion of the supporting waters are attributable to fish consumption. Other localized fish consumption advisories are in effect for tidal waters and specific freshwaters (see section D.6.3)

Figure 16: Overall Use Support With Mercury

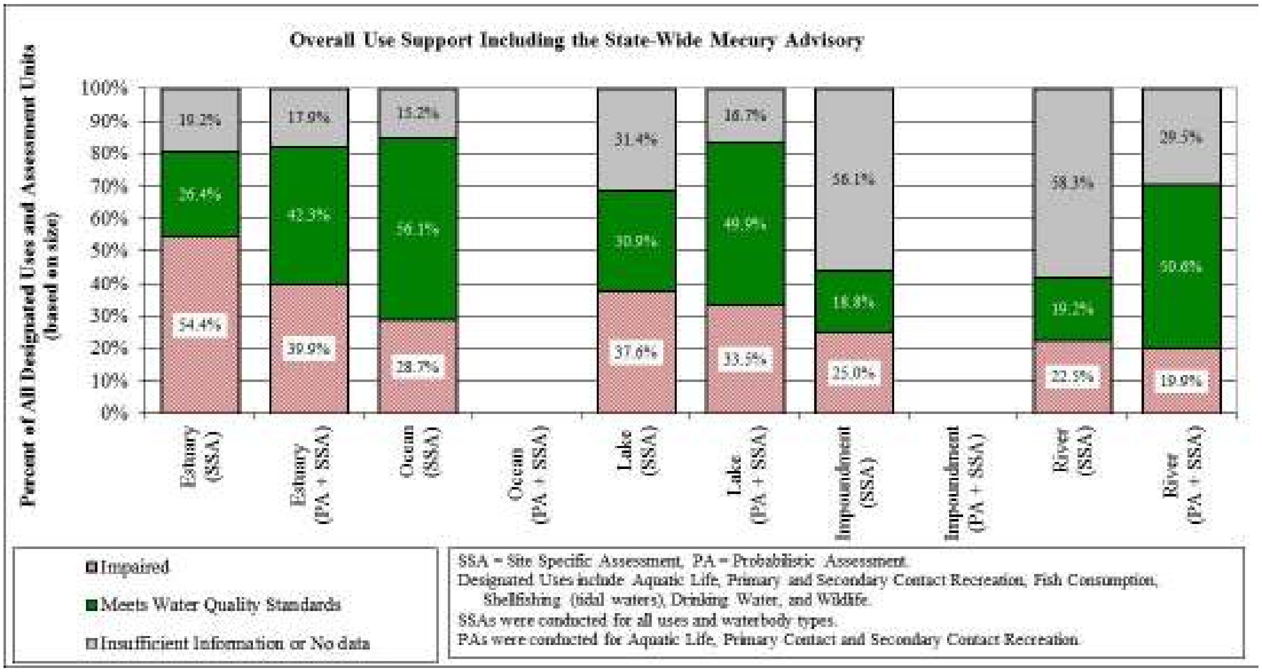
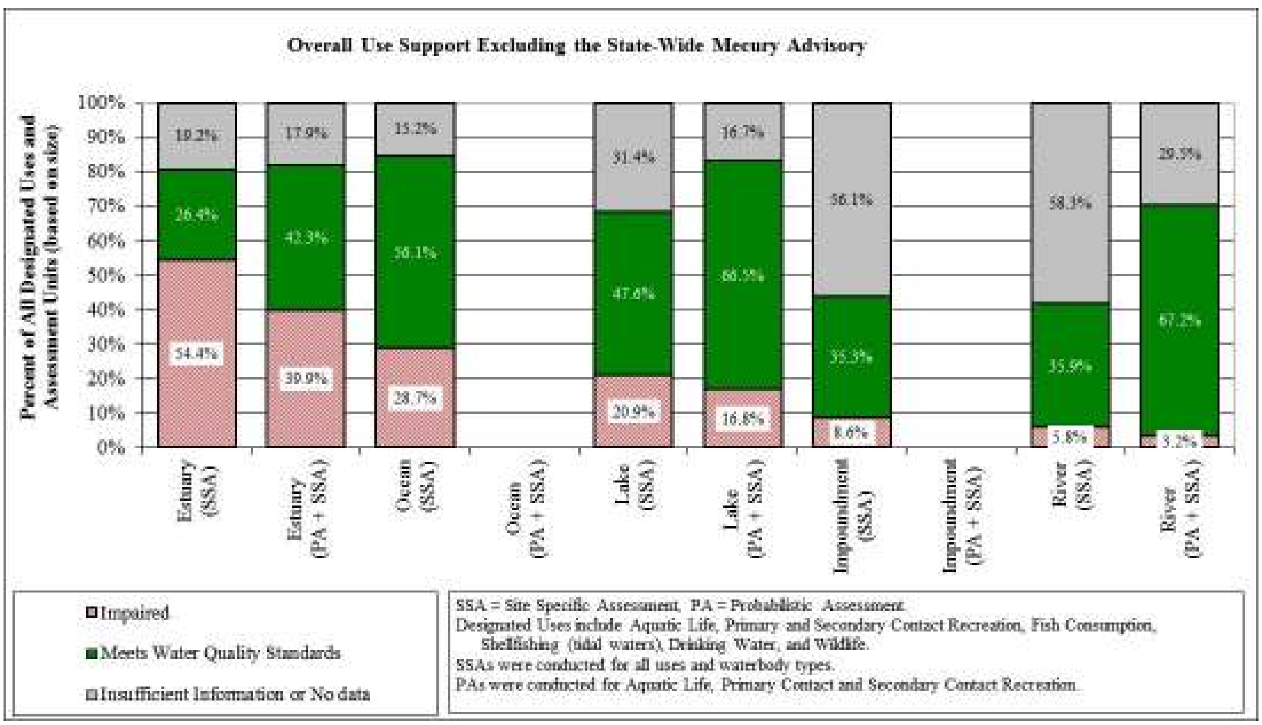


Figure 17: Overall Use Support Without Mercury



Excluding the mercury advisory, 66.5%, 35.3% and 67.2% of designated uses on lakes, impoundments, and rivers respectively are considered fully supporting. There is no difference between the mercury included and mercury excluded graphics for tidal waters as all tidal waters are impaired due to other fish consumption advisories that are in effect (i.e., dioxin and PCBs).

There are approximately 16,961.8 miles of rivers and streams (1:24,000 scale mapping) all of which have six designated uses. Based on site specific assessments or probabilistic assessments (where available), 70.5% of the mileage and designated use combinations were assessed while 29.5% remains unassessed. Without the statewide freshwater fish consumption advisory due to mercury included in the assessment, 67.2% of the rivers and streams met water quality standards and 3.2% were impaired. With the statewide fish consumption advisory included, 50.6% of the rivers and streams met water quality standards and 19.9% were impaired. By way of the site specific assessments 41.7% of the mileage and designated use combinations were assessed while 58.3% remains unassessed. Without the statewide freshwater fish consumption advisory due to mercury included in the assessment, 35.9% of the rivers and streams met water quality standards and 5.8% were impaired. With the statewide fish consumption advisory included in the assessment, 19.2% of the rivers and streams met water quality standards and 22.5% were impaired.

There the approximately 162,742 acres of lakes and ponds all of which have six designated uses. By way of the site specific assessments, 68.8% of the acreage and designated use combinations were assessed while 31.2% of the resource remains unassessed. Based on site specific assessments or probabilistic assessments (where available), 83.3% of the acreage and designated use combinations were assessed while 26.7% remains unassessed. Without the statewide freshwater fish consumption advisory due to mercury included in the assessment, 66.5% of the lakes and ponds met water quality standards and 16.8% were impaired. With the statewide fish consumption advisory included, 49.9% of the lakes and ponds met water quality standards and 33.5% were impaired. By way of the site specific assessments without the statewide freshwater fish consumption advisory due to mercury included in the assessment, 47.6% of the lakes and ponds met water quality standards and 20.9% were impaired. With the statewide fish consumption advisory included in the assessment, 30.9% of the lakes and ponds met water quality standards and 37.6% were impaired.

There are approximately 22,435 acres of impoundments on rivers and streams, all of which have six designated uses. By way of the site specific assessments, 43.9% of the acreage and designated use combinations were assessed while 56.1% remain unassessed. Without the statewide freshwater fish consumption advisory due to mercury included in the assessment, 35.3% of the impoundments met water quality standards and 8.6% were impaired. With the statewide fish consumption advisory included in the assessment, 18.8% of the impoundments met water quality standards and 25.0% were impaired.

With respect to tidal waters, none of New Hampshire's 81.48 square miles of open ocean waters under the state's jurisdiction, or the 17.98 square miles of estuaries are fully supportive of all uses. This is because of a bluefish consumption advisory due to concerns with PCBs in fish tissue which impacts all tidal waters and shellfish consumption advisories in the estuaries due to bacteria in the water column and PCB concentrations found in lobster tomalley (see section D.6.3 and D.6.4).

There are 17.98 square miles of estuarine waters, all of which have seven designated uses. By way of the site specific assessments, 80.8% of the square mileage and designated use combinations were assessed. With or without the statewide freshwater fish consumption advisory due to mercury included in the assessment, 26.4% of estuarine waters met water quality standards and 54.4% were impaired while 19.2% of the resource remains unassessed. By way of the combined probabilistic and site specific assessments, 82.1% of the square mileage and designated use combinations were assessed. With or without the statewide freshwater fish consumption advisory due to mercury included in the assessment, 42.3% of estuarine waters met water quality standards and 39.9% were impaired while 17.9% of the resource remains unassessed.

There are 81.48 square miles of ocean waters, all of which have seven designated uses. By way of the site specific assessments, 84.8% of the square mileage and designated use combinations were assessed. With or without the statewide freshwater fish consumption advisory due to mercury included in the assessment, 56.1% of ocean waters met water quality standards and 28.7% were impaired while 15.2% of the resource remains unassessed.

Details regarding the parameters causing impairment as well as the probable sources of impairment are provided in sections D.3.4 through D.3.8.

Table 9: Overall Use Support (including mercury)

Waterbody Type and Assessment Type	CATEGORY						Fully Meets WQS	Insufficient Information or No Data	Impaired	Total Assessed
	2	3	4a	4b	4c	5				
Estuary (SSA) Percent of Assessment Units and Designated Uses	26.4%	19.2%	11.2%	0.1%	0.0%	43.1%	26.4%	19.2%	54.4%	80.8%
Estuary (PA + SSA) Percent of Assessment Units and Designated Uses	-	-	-	-	-	-	42.3%	17.9%	39.9%	82.1%
Ocean (SSA) Percent of Assessment Units and Designated Uses	56.1%	15.2%	0.1%	0.0%	0.0%	28.6%	56.1%	15.2%	28.7%	84.8%
Lake (SSA) Percent of Assessment Units and Designated Uses	30.9%	31.4%	24.0%	0.0%	0.2%	13.5%	30.9%	31.4%	37.6%	68.6%
Lake (PA + SSA) Percent of Assessment Units and Designated Uses	-	-	-	-	-	-	49.9%	16.7%	33.5%	83.3%
Impoundment (SSA) Percent of Assessment Units and Designated Uses	18.8%	56.1%	18.0%	0.2%	0.3%	6.5%	18.8%	56.1%	25.0%	43.9%
Rivers (SSA) Percent of Assessment Units and Designated Uses	19.2%	58.3%	18.0%	0.1%	0.1%	4.3%	19.2%	58.3%	22.5%	41.7%
Rivers (PA + SSA) Percent of Assessment Units and Designated Uses	-	-	-	-	-	-	50.6%	29.5%	19.9%	70.5%

* Notes:

Category 1: All designated uses are attained and no use is threatened.
Category 2: Attaining some designated uses, no uses are threatened and there is insufficient information to assess remaining uses.
Category 3: Insufficient or no data and information is available to determine if a designated use is attained (i.e., more monitoring is needed to assess a use).
Category 4a: Impaired or threatened for one or more designated uses but does not require the development of a TMDL because a TMDL has been completed.
Category 4b: Impaired or threatened for one or more designated uses but does not require the development of a TMDL because other pollution control requirements are reasonably expected to result in attainment of the water quality standard in the near future.
Category 4c: Impaired or threatened for one or more designated uses but does not require the development of a TMDL because the impairment is not caused by a pollutant(s), and
Category 5: Impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL (this is the 303(d) List).

SSA = Site Specific Assessment
PA = Probabilistic Assessment

Table 10: Overall Use Support (excluding mercury)

Waterbody Type and Assessment Type	CATEGORY						Fully Meets WQS	Insufficient Information or No Data	Impaired	Total Assessed
	2	3	4a	4b	4c	5				
Estuary (SSA) Percent of Assessment Units and Designated Uses	26.4%	19.2%	11.2%	0.1%	0.0%	43.1%	26.4%	19.2%	54.4%	80.8%
Estuary (PA + SSA) Percent of Assessment Units and Designated Uses	-	-	-	-	-	-	42.3%	17.9%	39.9%	82.1%
Ocean (SSA) Percent of Assessment Units and Designated Uses	56.1%	15.2%	0.1%	0.0%	0.0%	28.6%	56.1%	15.2%	28.7%	84.8%
Lake (SSA) Percent of Assessment Units and Designated Uses	47.6%	31.4%	7.3%	0.0%	0.2%	13.5%	47.6%	31.4%	20.9%	68.6%
Lake (PA + SSA) Percent of Assessment Units and Designated Uses	-	-	-	-	-	-	66.5%	16.7%	16.8%	83.3%
Impoundment (SSA) Percent of Assessment Units and Designated Uses	35.3%	56.1%	1.4%	0.4%	0.3%	6.5%	35.3%	56.1%	8.6%	43.9%
Rivers (SSA) Percent of Assessment Units and Designated Uses	35.9%	58.3%	1.3%	0.1%	0.1%	4.3%	35.9%	58.3%	5.8%	41.7%
Rivers (PA + SSA) Percent of Assessment Units and Designated Uses	-	-	-	-	-	-	67.2%	29.5%	3.2%	70.5%

*Notes:

Category 1: All designated uses are attained and no use is threatened.
Category 2: Attaining some designated uses, no uses are threatened and there is insufficient information to assess remaining uses.
Category 3: Insufficient or no data and information is available to determine if a designated use is attained (i.e., more monitoring is needed to assess a use).
Category 4a: Impaired or threatened for one or more designated uses but does not require the development of a TMDL because a TMDL has been completed.
Category 4b: Impaired or threatened for one or more designated uses but does not require the development of a TMDL because other pollution control requirements are reasonably expected to result in attainment of the water quality standard in the near future.
Category 4c: Impaired or threatened for one or more designated uses but does not require the development of a TMDL because the impairment is not caused by a pollutant(s), and
Category 5: Impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL (this is the 303(d) List).

SSA = Site Specific Assessment
PA = Probabilistic Assessment

D.3.3 SECTION 303(D) LIST OF THREATENED AND IMPAIRED WATERS

As previously mentioned, Section 303(d) of the CWA requires submittal of a list of surface waters (i.e., the "303(d) List") that are:

- impaired or threatened by a pollutant or pollutant(s),
- not expected to meet water quality standards within a reasonable time even after application of best available technology standards for point sources or best management practices for nonpoint sources and,
- require development and implementation of a comprehensive water quality study (i.e., called a Total Maximum Daily Load or TMDL study) that is designed to meet water quality standards.

It is important to note that the Section 303(d) List only includes waters that are impaired or threatened by pollutants that require Total Maximum Daily Load studies (TMDLs). Consequently, the 303(d) List represents a subset of all impaired waters as not all impairments require a TMDL. In the EPA Assessment Database, Category 5 is used to represent the 303(d) List. Waters with completed TMDLs are in Category 4A, those where other enforceable control measures will restore water quality are in Category 4B, and those impaired by non-pollutants are in Category 4C.

The Consolidated Assessment and Listing Methodology (DES, 2012) provided in Appendix 4 describes the process used to develop the Section 303(d) List and how TMDL schedules are established for waterbodies on the list. A description of the public participation process used to develop the 2012 Section 303(d) List is included in section F.3.

A copy of the 2012 Section 303(d) List is provided in Appendix 8 and on the DES website (http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm). A map of the 303(d) surface waters (excluding the mercury advisory) is provided in Appendix 9. The List is sorted by waterbody type and then Assessment Unit ID number or AUID (each waterbody has a unique AUID). Each record includes the use support status for each impaired designated use in that assessment unit, the cause and source of impairment (if applicable) and the estimated date that the TMDL will be completed.

Finally, Appendix 10 includes a list of waters removed from the 2010 303(d) list and the reasons why they were removed.

D.3.4 ESTUARIES

D.3.4.1 Estuaries: Individual Designated Use Support

The following table and figures provide a summary of the use support status for all designated uses in estuarine waters. Results are presented with and without the statewide mercury fish consumption advisory to reveal the status masked by the mercury advisory. Definitions of terms used in the tables (i.e., fully supporting, not supporting, threatened, fully supporting – marginal condition, etc.) may be found in the Consolidated Assessment and Listing Methodology (DES, 2012) a copy of which is provided in Appendix 4.

The percent assessed for each use with and without mercury is shown in Table 11 and Figure 18. Individual use support information is shown in Table 11 and Figure 19. The table and figures present the individual use assessments with the statewide mercury fish consumption advisory in effect (see section D.6) as well as assuming that the advisory did not exist. Additionally the table and figures present DES's more refined definitions of use support which give an idea of the degree of water quality standard attainment or impairment (Fully Supporting-Good, Fully Supporting – Marginal, Not Supporting – Marginal and Not Supporting -Poor).

Table 11: Estuaries: Individual Designated Use Support

Designated Use	Total	Total Assessed	Fully Supporting (FS) = Attaining Water Quality Standards			Not Supporting (NS) = Not Attaining Water Quality Standards = Impaired			Threatened	Insufficient Data and Information
			FS - Good	FS - Marginal	FS - Total	NS - Marginal	NS - Poor	NS - Total		
Aquatic Life										
Square Miles	18.0	16.7	0.1	0.0	0.2	0.8	15.7	16.5	6.3	1.3
% of Total	100.0%	92.8%	0.7%	0.2%	0.8%	4.4%	87.5%	91.9%	35.0%	7.2%
% of Assessed		100.0%	0.7%	0.2%	0.9%	4.8%	94.3%	99.1%	37.7%	
Fish Consumption (excluding mercury advisory)										
Square Miles	18.0	18.0	0.0	0.0	0.0	18.0	0.0	18.0	0.0	0.0
% of Total	100.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
% of Assessed		100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	
Fish Consumption (including mercury advisory)										
Square Miles	18.0	18.0	0.0	0.0	0.0	18.0	0.0	18.0	0.0	0.0
% of Total	100.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
% of Assessed		100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	
Shellfishing										
Square Miles	18.0	18.0	0.0	0.0	0.0	18.0	0.0	18.0	0.0	0.0
% of Total	100.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
% of Assessed		100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	
Primary Contact Recreation										
Square Miles	18.0	15.3	1.8	1.8	3.6	6.1	5.6	11.7	0.0	2.7
% of Total	100.0%	85.0%	10.0%	9.8%	19.8%	34.1%	31.1%	65.2%	0.0%	15.0%
% of Assessed		100.0%	11.8%	11.6%	23.3%	40.1%	36.6%	76.7%	0.0%	
Secondary Contact Recreation										
Square Miles	18.0	15.8	11.5	0.0	11.5	4.0	0.3	4.3	0.0	2.2
% of Total	100.0%	87.6%	63.9%	0.0%	63.9%	22.0%	1.7%	23.7%	0.0%	12.4%
% of Assessed		100.0%	72.9%	0.0%	72.9%	25.1%	2.0%	27.1%	0.0%	
Drinking Water (after Treatment)										
Square Miles	18.0	18.0	18.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0
% of Total	100.0%	100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% of Assessed		100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	
Wildlife (Not Assessed)										
Square Miles	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0
% of Total	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
% of Assessed										

Figure 18: Estuaries: Percent Assessed by Use

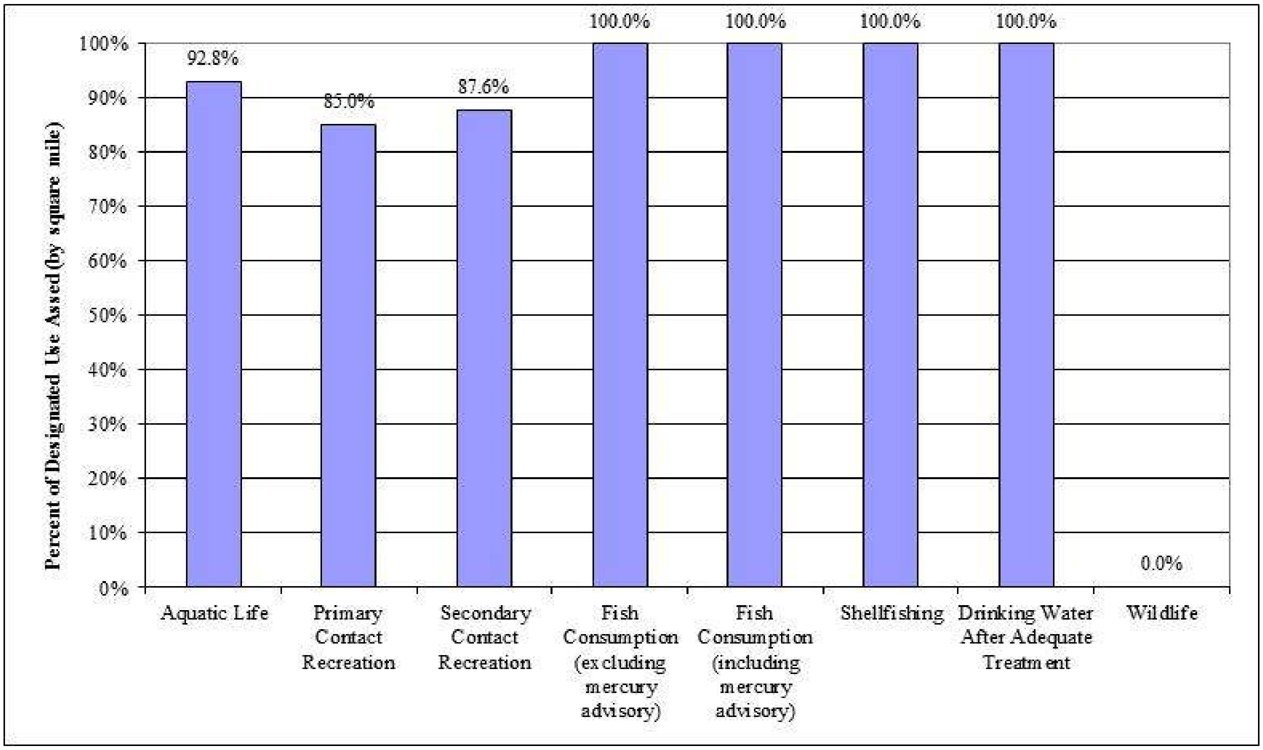
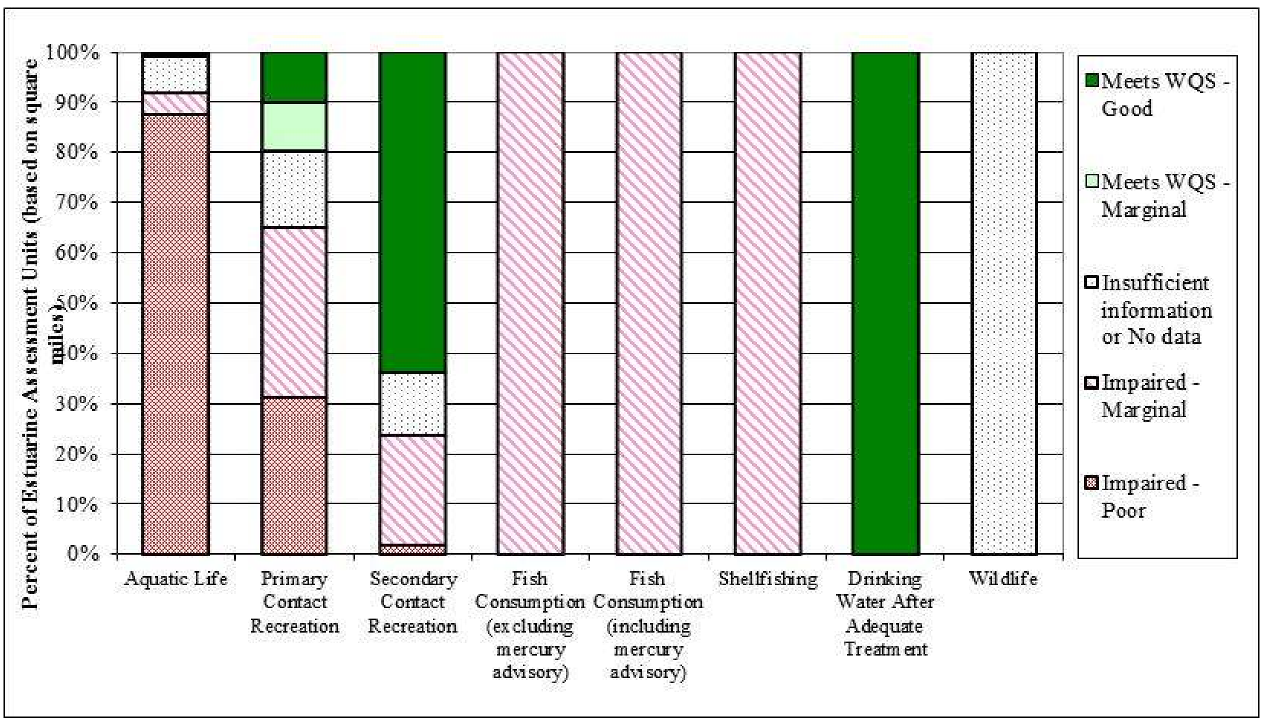


Figure 19: Estuaries: Individual Designated Use Support of Assessed Waters



D.3.4.2 Estuaries: Causes and Sources of Impairment

Table 12 shows the total square miles of estuaries impaired or threatened by various pollutants and nonpollutants (i.e. causes of impairment).

Table 12: Estuaries: Causes of Threatened or Impairment Status

Rank	Impairment	Total Size (Acres)	Number of AUs
1	Mercury	17.980	72
2	Dioxin (including 2,3,7,8-TCDD)	17.980	72
3	Polychlorinated biphenyls	17.980	72
4	Estuarine Bioassessments	14.863	35
5	Nitrogen (Total)	14.160	34
6	Light Attenuation Coefficient	12.612	27
7	Enterococcus	11.716	31
8	Fecal Coliform	10.705	46
9	pH	7.172	7
10	Chlorophyll-a	1.706	10
11	Oxygen, Dissolved	1.293	8
12	Dissolved oxygen saturation	1.088	7
13	Aluminum	1.086	5
14	trans-Nonachlor	1.071	4
15	DDD	0.924	3
16	Dieldrin	0.891	2
17	Chrysene (C1-C4)	0.733	4
18	Benzo(a)pyrene (PAHs)	0.733	4
19	Pyrene	0.733	4
20	Dibenz[a,h]anthracene	0.733	4
21	Benzo[a]anthracene	0.733	4
22	Phenanthrene	0.733	4
23	Fluoranthene	0.733	4
24	Acenaphthylene	0.733	4
25	Lindane	0.615	1
26	Anthracene	0.584	3
27	Acenaphthene	0.584	3
28	Fluorene	0.584	3
29	Lead	0.456	3
30	Copper	0.456	3
31	Nickel	0.456	3
32	Cadmium	0.456	3
33	Arsenic	0.456	3
34	DDT	0.310	2
35	2-Methylnaphthalene	0.310	2
36	Naphthalene	0.310	2
37	DDE	0.3	2
38	Benzo[g,h,i]perylene	0.3	1
39	Biphenyl	0.3	1
40	Indeno[1,2,3-cd]pyrene	0.3	1
41	Zinc	0.3	1
42	Ammonia (Un-ionized)	0.1	1
43	Total Suspended Solids (TSS)	0.05	1

Table 13 shows the total square miles of estuaries impaired or threatened by various sources of impairment.

Table 13: Estuaries: Sources of Threatened or Impairment Status

Rank	Source of Impairment	Total Size (Square Miles)	Number of AUs
1	Source Unknown	17.980	72
2	Atmospheric Deposition - Toxics	17.980	72
3	Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)	2.629	24
4	Combined Sewer Overflows	1.005	4
5	Animal Feeding Operations (NPS)	0.479	2
6	Sanitary Sewer Overflows (Collection System Failures)	0.429	4
7	Illicit Connections/Hook-ups to Storm Sewers	0.399	2
8	Unpermitted Discharge (Domestic Wastes)	0.123	1
9	On-site Treatment Systems (Septic Systems and Similar Decencentralized Systems)	0.119	1
10	Petroleum/natural Gas Activities	0.033	1

D.3.5 IMPOUNDMENTS

D.3.5.1 Impoundments: Individual Designated Use Support

The following tables and figures provide a summary of the use support status for all designated uses in impoundments. Results are presented with and without the statewide mercury fish consumption advisory to reveal the status masked by the mercury advisory. Definitions of terms used in the tables (i.e., fully supporting, not supporting, threatened, fully supporting – marginal condition, etc.) may be found in the Consolidated Assessment and Listing Methodology (DES, 2012) a copy of which is provided in Appendix 4.

The percent assessed for each use with and without mercury is shown in Table 14 and Figure 20. Individual use support information is shown in Table 14 and Figure 21. The table and figures present the individual use assessments with the statewide mercury fish consumption advisory is in effect (see section D.6) as well as assuming that the advisory did not exist. Additionally the table and figures present DES's more refined definitions of use support which give an idea of the degree of water quality standard attainment or impairment (Fully Supporting-Good, Fully Supporting – Marginal, Not Supporting – Marginal and Not Supporting -Poor).

Table 14: Impoundments: Individual Designated Use Support

Designated Use	Total	Total Assessed	Fully Supporting (FS) = Attaining Water Quality Standards			Not Supporting (NS) = Not Attaining Water Quality Standards = Impaired			Threatened	Insufficient Data and Information
			FS - Good	FS - Marginal	FS - Total	NS - Marginal	NS - Poor	NS - Total		
Aquatic Life										
Acres	22,434.7	8,634.8	0.0	0.0	0.0	7,286.7	1,348.1	8,634.8	0.0	13,799.9
% of Total	100.0%	38.5%	0.0%	0.0%	0.0%	32.5%	6.0%	38.5%	0.0%	61.5%
% of Assessed		100.0%	0.0%	0.0%	0.0%	84.4%	15.6%	100.0%	0.0%	
Fish Consumption (excluding mercury advisory)										
Acres	22,434.7	22,434.7	0.0	22,154.5	22,154.5	280.2	0.0	280.2	0.0	0.0
% of Total	100.0%	100.0%	0.0%	98.8%	98.8%	1.2%	0.0%	1.2%	0.0%	0.0%
% of Assessed		100.0%	0.0%	98.8%	98.8%	1.2%	0.0%	1.2%	0.0%	
Fish Consumption (including mercury advisory)										
Acres	22,434.7	22,434.7	0.0	0.0	0.0	22,714.9	0.0	22,714.9	0.0	0.0
% of Total	100.0%	100.0%	0.0%	0.0%	0.0%	101.2%	0.0%	101.2%	0.0%	0.0%
% of Assessed		100.0%	0.0%	0.0%	0.0%	101.2%	0.0%	101.2%	0.0%	
Shellfishing (Not Applicable)										
Acres	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% of Total										
% of Assessed										
Primary Contact Recreation										
Acres	22,434.7	3,028.9	620.4	497.0	1,117.5	812.1	1,099.4	1,911.4	0.0	19,405.8
% of Total	100.0%	13.5%	2.8%	2.2%	5.0%	3.6%	4.9%	8.5%	0.0%	86.5%
% of Assessed		100.0%	20.5%	16.4%	36.9%	26.8%	36.3%	63.1%	0.0%	
Secondary Contact Recreation										
Acres	22,434.7	2,499.7	1,147.4	661.7	1,809.1	55.6	635.0	690.6	0.0	19,935.1
% of Total	100.0%	11.1%	5.1%	2.9%	8.1%	0.2%	2.8%	3.1%	0.0%	88.9%
% of Assessed		100.0%	45.9%	26.5%	72.4%	2.2%	25.4%	27.6%	0.0%	
Drinking Water (after Treatment)										
Acres	22,434.7	22,434.7	22,434.7	0.0	22,434.7	0.0	0.0	0.0	0.0	0.0
% of Total	100.0%	100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% of Assessed		100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	
Wildlife (Not Assessed)										
Acres	22,434.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22,434.7
% of Total	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
% of Assessed										

Figure 20: Impoundments: Percent Assessed by Use

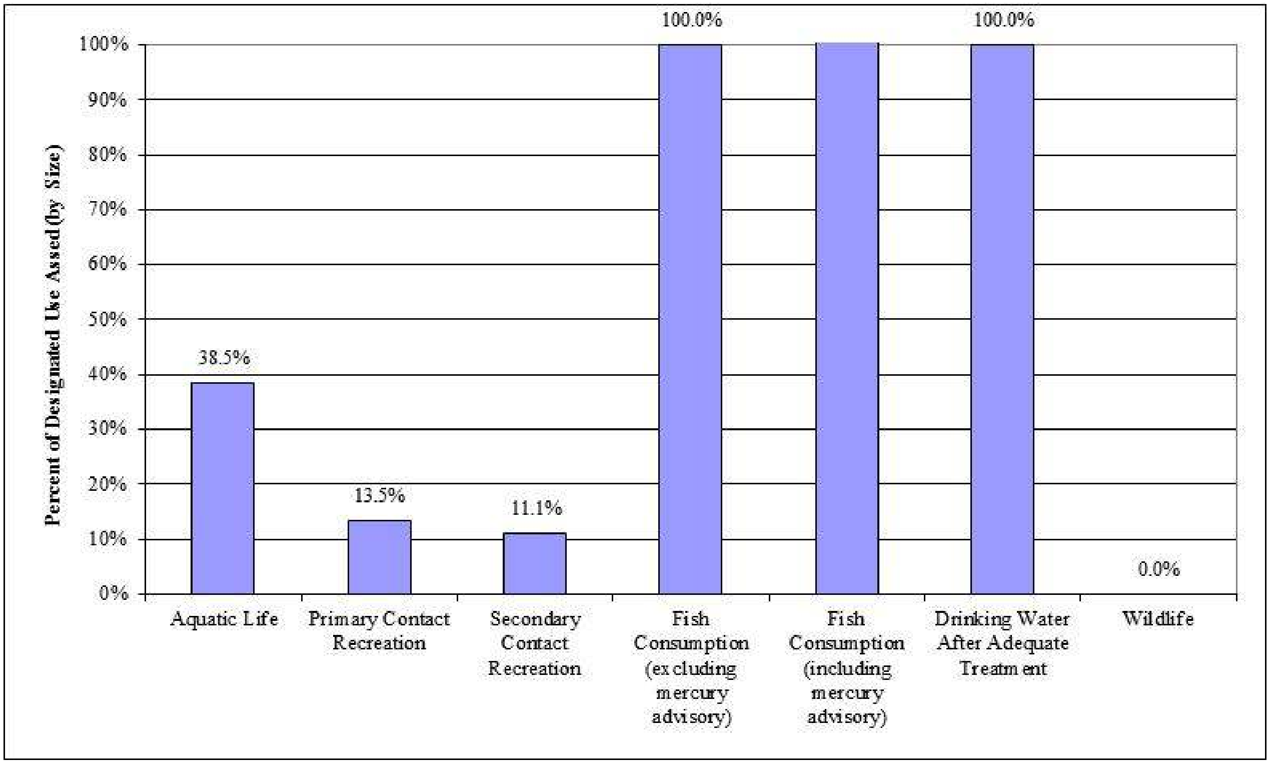
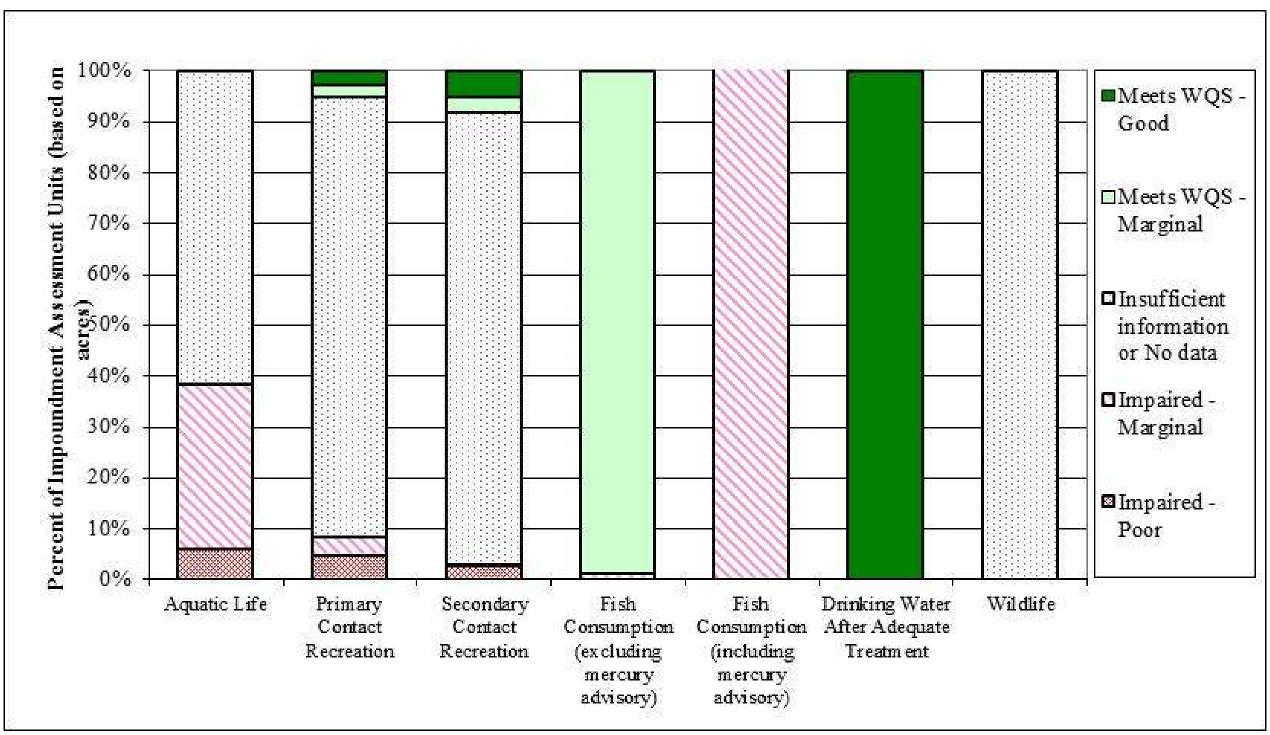


Figure 21: Impoundments: Individual Designated Use Support of Assessed Waters



D.3.5.2 Impoundments: Causes and Sources of Impairment

Table 15 shows the total acres of impoundments impaired or threatened by various pollutants and nonpollutants (i.e. causes of impairment).

Table 15: Impoundments: Causes of Threatened or Impairment Status

Rank	Impairment	Total Size (Acres)	Number of AUs
1	Mercury	22,434.7	1235
2	pH	8,109.5	56
3	Non-Native Aquatic Plants	1,683.9	15
4	Escherichia coli	1,466.4	43
5	Dissolved oxygen saturation	1,143.0	16
6	Chlorophyll-a	569.1	8
7	Phosphorus (Total)	404.5	2
8	Cyanobacteria hepatotoxic microcystins	363.6	3
9	Oxygen, Dissolved	328.8	18
10	Dioxin (including 2,3,7,8-TCDD)	280.2	8
11	Chloride	60.9	2
12	Benthic-Macroinvertebrate Bioassessments (Streams)	27.5	2
13	Indeno[1,2,3-cd]pyrene	11.4	2
14	Benzo(a)pyrene (PAHs)	11.4	2
15	Benzo[b]fluoranthene	11.4	2
16	Benzo[k]fluoranthene	11.4	2
17	DDE	11.4	2
18	Pyrene	10.0	1
19	Acenaphthene	10.0	1
20	Benzo[a]anthracene	10.0	1
21	Dieldrin	10.0	1
22	Chrysene (C1-C4)	10.0	1
23	Lindane	10.0	1
24	DDD	10.0	1
25	2-Methylnaphthalene	10.0	1
26	Endrin	10.0	1
27	Heptachlor	10.0	1
28	Other flow regime alterations	5.0	1
29	Aluminum	4.7	2
30	Zinc	2.6	2
31	Sedimentation/Siltation	2.5	1
32	Nickel	1.4	1
33	Barium	1.4	1
34	Arsenic	1.4	1
35	Lead	1.2	1

Table 16 shows the total acres of impoundments impaired or threatened by various sources of impairment.

Table 16: Impoundments: Sources of Threatened or Impairment Status

Rank	Source	Total Size (Acres)	Number of AUs
1	Atmospheric Deposition - Toxics	22,434.7	1235
2	Atmospheric Deposition - Acidity	7,682.6	48
3	Source Unknown	3,166.2	63
4	Combined Sewer Overflows	597.0	6
5	Municipal Point Source Discharges	564.9	4
6	Impacts from Hydrostructure Flow Regulation/modification	502.5	2
7	Industrial Point Source Discharge	288.1	10
8	Illicit Connections/Hook-ups to Storm Sewers	279.0	10
9	Naturally Occurring Organic Acids	125.0	2
10	Municipal (Urbanized High Density Area)	60.0	1
11	Highway/Road/Bridge Runoff (Non-construction Related)	60.0	1
12	Commercial Districts (Shopping/Office Complexes)	60.0	1
13	Freshets or Major Flooding	5.0	1
14	Pollutants from Public Bathing Areas	4.1	3

D.3.6 LAKES AND PONDS

D.3.6.1 Lakes and Ponds: Individual Designated Use Support

The following tables and figures provide a summary of the use support status for all designated uses in lakes and ponds. Results are presented with and without the statewide mercury fish consumption advisory to reveal the status masked by the mercury advisory. Definitions of terms used in the tables (i.e., fully supporting, not supporting, threatened, fully supporting – marginal condition, etc.) may be found in the Consolidated Assessment and Listing Methodology (DES, 2012) a copy of which is provided in Appendix 4.

The percent assessed for each use with and without mercury is shown in Table 17 and Figure 22. Individual use support information is shown in Table 17 and Figure 23. The table and figures present the individual use assessments with the statewide mercury fish consumption advisory in effect (see section D.6) as well as assuming that the advisory did not exist. Additionally the table and figures present DES's more refined definitions of use support which give an idea of the degree of water quality standard attainment or impairment (Fully Supporting-Good, Fully Supporting – Marginal, Not Supporting – Marginal and Not Supporting -Poor).

It should be noted that all of the above referenced tables and charts for this section are presented in terms of acreage. Lake sizes in New Hampshire range from roughly one to 45,000 acres. If results were presented in terms of the number of lakes rather than acreage, the summary statistics shown below would be different. Finally, the lake assessments presented below include the assessment of beaches on lakes.

Table 17: Lakes and Ponds: Individual Designated Use Support

Designated Use	Total	Total Assessed	Fully Supporting (FS) = Attaining Water Quality Standards			Not Supporting (NS) = Not Attaining Water Quality Standards = Impaired			Threatened	Insufficient Data and Information
			FS - Good	FS - Marginal	FS - Total	NS - Marginal	NS - Poor	NS - Total		
Aquatic Life										
Acres	162,742.9	137,963.0	0.0	0.0	0.0	102,709.9	35,253.0	137,963.0	7.9	24,779.9
% of Total	100.0%	84.8%	0.0%	0.0%	0.0%	63.1%	21.7%	84.8%	0.0%	15.2%
% of Assessed		100.0%	0.0%	0.0%	0.0%	74.4%	25.6%	100.0%	0.0%	
Fish Consumption (excluding mercury advisory)										
Acres	162,742.9	162,742.9	0.0	162,742.9	162,742.9	0.0	0.0	0.0	0.0	0.0
% of Total	100.0%	100.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% of Assessed		100.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	
Fish Consumption (including mercury advisory)										
Acres	162,742.9	162,742.9	0.0	0.0	0.0	162,742.9	0.0	162,742.9	0.0	0.0
% of Total	100.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
% of Assessed		100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	
Shellfishing (Not Applicable)										
Acres	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% of Total										
% of Assessed										
Primary Contact Recreation										
Acres	162,742.9	105,302.8	21,219.6	18,541.8	39,761.3	63,638.5	1,903.0	65,541.5	0.0	57,440.1
% of Total	100.0%	64.7%	13.0%	11.4%	24.4%	39.1%	1.2%	40.3%	0.0%	35.3%
% of Assessed		100.0%	20.2%	17.6%	37.8%	60.4%	1.8%	62.2%	0.0%	
Secondary Contact Recreation										
Acres	162,742.9	100,619.0	83,948.6	15,656.1	99,604.7	1,014.3	0.0	1,014.3	0.0	62,123.9
% of Total	100.0%	61.8%	51.6%	9.6%	61.2%	0.6%	0.0%	0.6%	0.0%	38.2%
% of Assessed		100.0%	83.4%	15.6%	99.0%	1.0%	0.0%	1.0%	0.0%	
Drinking Water (after Treatment)										
Acres	162,742.9	162,742.9	162,742.9	0.0	162,742.9	0.0	0.0	0.0	0.0	0.0
% of Total	100.0%	100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% of Assessed		100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	
Wildlife (Not Assessed)										
Acres	162,742.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	162,742.9
% of Total	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
% of Assessed										

Figure 22: Lakes and Ponds: Percent Assessed by Use

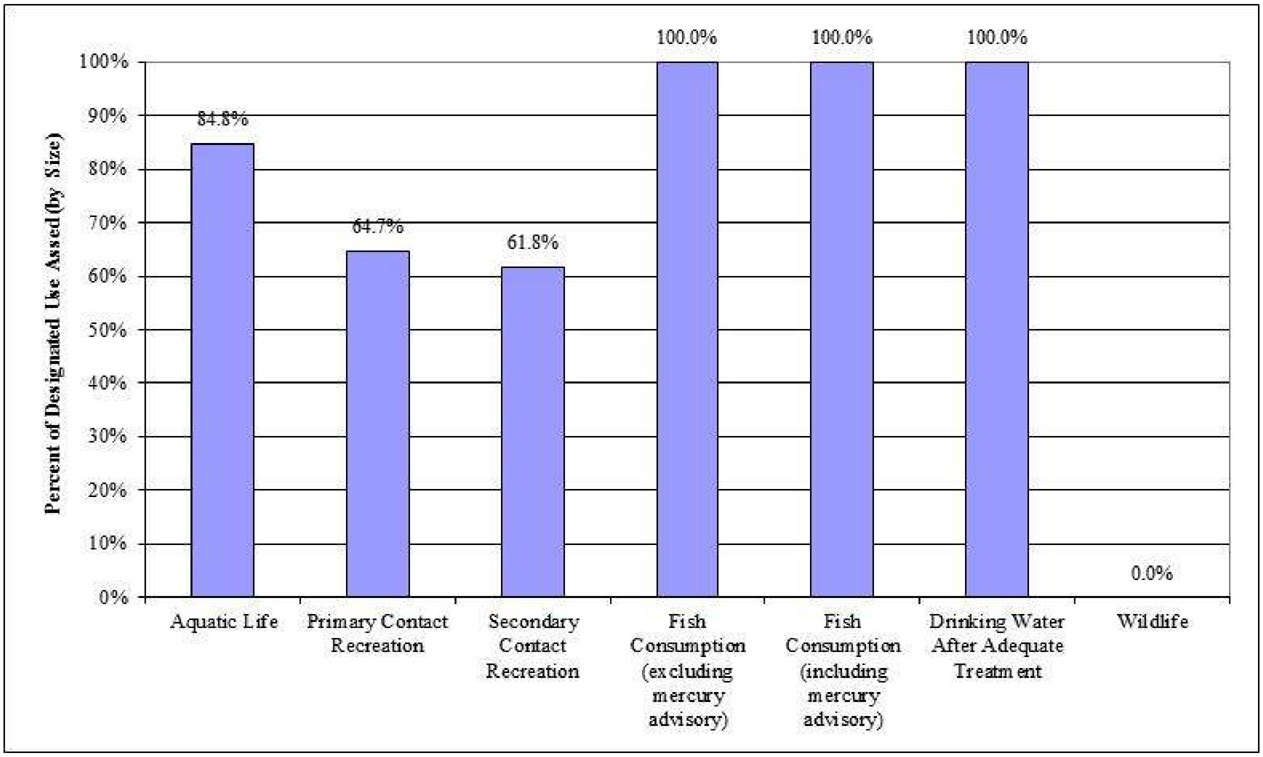
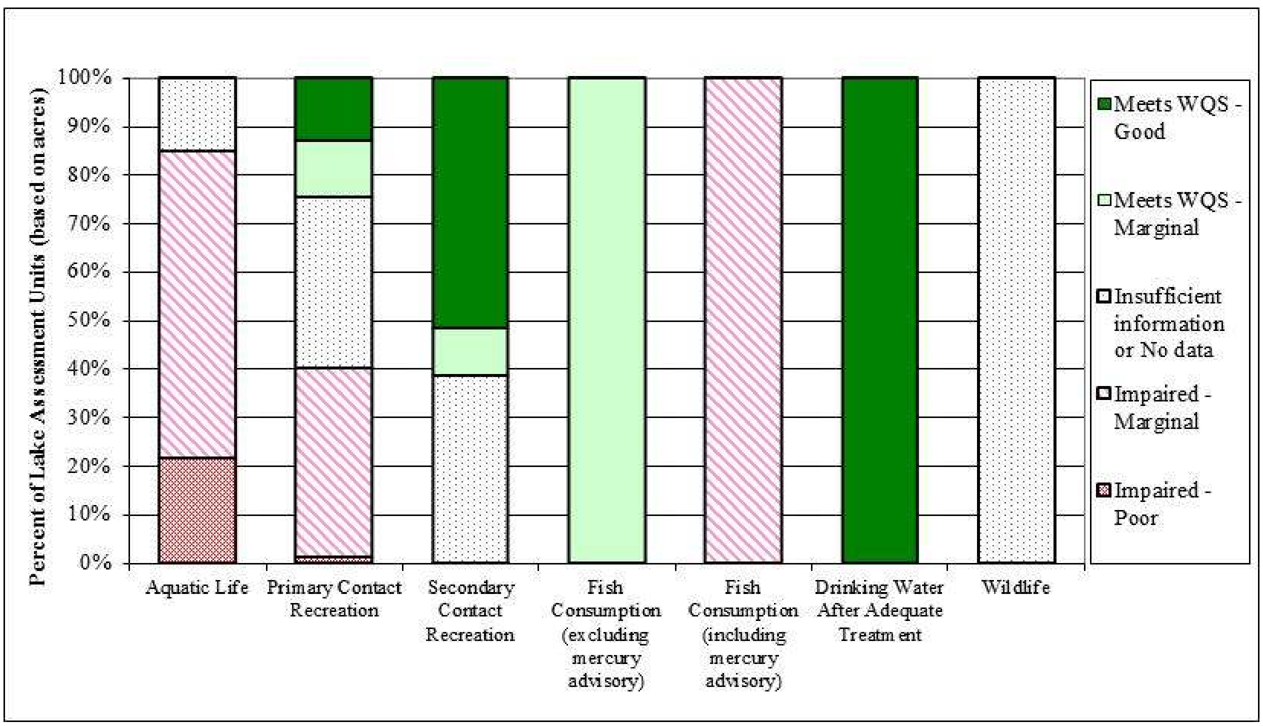


Figure 23: Lakes and Ponds: Individual Designated Use Support of Assessed Waters



D.3.6.2 Lakes and Ponds: Causes and Sources of Impairment

Table 18 shows the total acres of lakes and ponds impaired or threatened by various pollutants and nonpollutants (i.e. causes of impairment).

Table 18: Lakes and Ponds: Causes of Threatened or Impairment Status

Rank	Impairment	Total Size (Acres)	Number of AUs
1	Mercury	162,742.9	1558
2	pH	132,626.6	568
3	Non-Native Aquatic Plants	69,586.7	59
4	Cyanobacteria hepatotoxic microcystins	63,403.4	94
5	Dissolved oxygen saturation	31,980.8	140
6	Oxygen, Dissolved	27,681.6	46
7	Chlorophyll-a	12,827.9	90
8	Phosphorus (Total)	11,974.5	75
9	Turbidity	4,203.9	2
10	Escherichia coli	1,752.3	120
11	Aluminum	1,546.1	35
12	Sedimentation/Siltation	239.2	2
13	Iron	151.3	2
14	Chloride	141.7	5
15	Other flow regime alterations	65.7	1
16	Nickel	46.5	1
17	Zinc	46.5	1
18	DDE	46.5	1
19	DDD	46.5	1
20	Lead	46.5	1
21	Indeno[1,2,3-cd]pyrene	46.5	1
22	Benzo[k]fluoranthene	46.5	1
23	Benzo[b]fluoranthene	46.5	1
24	Benzo(a)pyrene (PAHs)	46.5	1
25	Barium	46.5	1
26	Arsenic	46.5	1
27	Anthracene	46.5	1
28	Excess Algal Growth	1.3	1

Table 19 shows the total acres of lakes and ponds impaired or threatened by various sources of impairment.

Table 19: Lakes and Ponds: Sources of Threatened or Impairment Status

Rank	Source	Total Size (Acres)	Number of AUs
1	Atmospheric Deposition - Toxics	162,742.9	1558
2	Atmospheric Deposition - Acidity	131,168.1	551
3	Source Unknown	105,475.2	361
4	Naturally Occurring Organic Acids	17,902.6	122
5	Highways, Roads, Bridges, Infrastructure (New Construction)	4,203.9	2
6	Municipal Point Source Discharges	418.1	1
7	Municipal (Urbanized High Density Area)	383.0	9
8	Streambank Modifications/destabilization	238.5	1
9	Channel Erosion/Incision from Upstream Hydromodifications	238.5	1
10	Waterfowl	235.9	7

Rank	Source	Total Size (Acres)	Number of AUs
11	Unpermitted Discharge (Domestic Wastes)	229.2	2
12	Package Plant or Other Permitted Small Flows Discharges	191.1	1
13	Residential Districts	73.6	2
14	Impacts from Hydrostructure Flow Regulation/modification	65.7	1
15	Highway/Road/Bridge Runoff (Non-construction Related)	55.8	3
16	Commercial Districts (Shopping/Office Complexes)	55.8	3
17	Flow Alterations from Water Diversions	53.9	1
18	Industrial Point Source Discharge	23.0	2
19	Animal Feeding Operations (NPS)	16.4	1
20	Pollutants from Public Bathing Areas	12.4	12
21	Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)	6.8	5
22	Yard Maintenance	0.6	1

D.3.6.3 Lakes and Ponds: Section 314 Clean Lake Requirements

Section 314 of the CWA includes six requirements which states must address in their Section 305(b) report. The following is in response to these requirements.

CWA Section 314 Requirement 1: An identification and classification according to eutrophic condition of all publicly owned lakes in such state.

Although the term “significant” is not in statute (section 314 of the Clean Water Act), previous and current guidance has always requested that trophic status be reported for “significant” publicly owned lakes. The current guidance provides a table as the “recommended format for reporting on the trophic status of ‘significant’ publicly owned lakes”. New Hampshire has adopted this recommended format. New Hampshire's definition of a significant lake, for the purposes of the Section 314 Clean Lakes Program, is as follows and is unchanged from previous 305(b) reports.

A "significant lake" is any freshwater lake or pond that has a surface area of ten or more acres, is not private, and does not prohibit recreational activity. It includes both natural and manmade lakes. Significant lakes do not include saltwater ponds, public water supplies (unless recreational activities are not prohibited), wetlands, or river impoundments (unless the impoundment functions as a lake both hydrologically and recreationally). A lake does not need an unencumbered public access to be considered significant. However, a lake completely surrounded by private land under one ownership, and where access is not granted to the general public, is considered to be private for the purposes of Section 314 of the Clean Water Act. This includes natural ponds that are legally "public waters". In addition, trout ponds less than 10 acres that are stocked by the N.H. Fish and Game Department and are open to the general public for fishing are considered to be significant lakes. Recall that the Clean Lakes Program is directed toward accessible recreational lakes. While public water supplies and wetlands are not considered significant under the Clean Lakes program, clearly they are significant under other DES programs.

The New Hampshire Department of Environmental Services initiated Lake Trophic Surveys in 1975 in response to this Section 314 requirement that was first passed in 1972. The surveys have continued to the present day, albeit very few, and most reasonably accessible lakes, ponds and non-riverine impoundments have been assessed at least once, and a trophic class assigned. The system used to trophically classify New Hampshire lakes and ponds is presented in Table 21. The system consists of four criteria that measure the biological production that occurs in a lake as a result of both nutrient inputs and lake aging (filling in). It is based on a system developed for Wisconsin lakes (Uttormark and Wall, 1975) and was selected because it includes parameters that are visible to lake users, unlike a system based on nutrient (phosphorus) concentration only. It results in a trophic classification based on in-lake biological production including both planktonic algae and rooted aquatic macrophytes.

Summary statistics on the trophic status of New Hampshire lakes is presented in Table 20. The most recent assessment was used for each lake. For larger lakes with multiple stations, the deepest spot station was used so that each lake is assigned one trophic class only.

Table 20: Trophic Status of New Hampshire Lakes

Description	Number of Lakes[1]	Percent	Acres of Lakes	Percent
Oligotrophic	185	21	109,734	67
Mesotrophic	364	42	36,485	22
Eutrophic	146	17	8,828	5
Class Unknown	180	21	8,215	5
Total Classified	695	79	155,047	95
Total in State[2]	875	36[3]	163,262	88[3]

Note:

[1] Values include some impoundments which are considered Significant Publicly Owned Lakes.

[2] Total in state is total lakes, ponds and impoundments from the Water Atlas including those impoundments that will be reclassified as riverine for the 2012 assessment.

[3] The percentage of significant lakes to all New Hampshire lakes is based on a total non-beach lake + impoundment number of 2,437 and total acres of 184,869. Of the 1,207 waters classified as impoundments it is anticipated that approximately 90-95% will be hydrologically classified as riverine in nature in some future assessment. As such, the percent of all waters in the state assessed is a underestimate of the percent of lakes with trophic class evaluations.

The trophic class results indicate that oligotrophic lakes tend to be the larger lakes while eutrophic ponds tend to be smaller. The 185 lakes that are oligotrophic represent only 21% of the total lakes assessed but 67% of the total lake acres assessed. Conversely, only 5 percent of lake acres are eutrophic despite being 17% of the total number of lakes. The results also show that most of the unassessed lakes are very small given the 36% of lake-like waterbodies assessed, which represent 88% of the lake-like area.

Table 21: Trophic Classification System for New Hampshire Lakes and Ponds

1. Summer Bottom Dissolved Oxygen:	**Trophic Points**
a. D.O. > 4 mg/L	0
b. D.O. = 1 to 4 mg/L & hypolimnion volume $\leq$ 10% of lake volume	1
c. D.O. = 1 to 4 mg/L & hypolimnion volume > 10% of lake volume	2
d. D.O. < 1 mg/L in < 1/3 hypo. volume & hypo. volume < 10% lake volume	3
e. D.O. < 1 mg/L in $\geq$ 1/3 hypo. volume & hypo. volume $\leq$ 10% lake volume	4
f. D.O. < 1 mg/L in < 1/3 hypo. volume & hypo. volume > 10% lake volume	5
g. D.O. < 1 mg/L in $\geq$ 1/3 hypo. volume & hypo. volume > 10% lake volume	6
2. Summer Secchi Disk Transparency:	**Trophic Points**
a. > 7 m	0
b. > 5 m - 7 m	1
c. > 3 m - 5 m	2
d. > 2 m - 3 m	3
e. > 1 m - 2 m	4
f. > 0.5 m - 1 m	5
g. $\leq$ 0.5 m	6
3. Aquatic Vascular Plant Abundance:	**Trophic Points**
a. Sparse	0
b. Scattered	1
c. Scattered/Common	2
d. Common	3
e. Common/Abundant	4
f. Abundant	5
g. Very Abundant	6
4. Summer Epilimnetic Chlorophyll-a (mg/M^3):	**Trophic Points**
a. < 4	0
b. 4 - < 8	1
c. 8 - < 12	2
d. 12 - < 18	3
e. 18 - < 24	4
f. 24 - < 32	5
g. $\geq$ 32	6

Trophic Points

Trophic Classification	Stratified	*Unstratified
Oligotrophic	0-6	0-4
Mesotrophic	7-12	5-9
Eutrophic	13-24	10-18

*Lakes without hypolimnions are not evaluated by the bottom dissolved oxygen criterion.

CWA Section 314 Requirement 2: A description of procedures, processes and methods (including land use requirements) to control sources of pollution of such lakes.

The state has numerous laws, rules, and regulations designed to protect lakes. The laws are based on the philosophy that it is easier, cheaper, and more logical to protect lakes from degradation than it is to restore degraded lakes. The New Hampshire Department of Environmental Services has long had a policy of removing point discharges of sewage and waste from lakes and from tributaries to lakes. During the two decades of the 1980s and '90s, a major effort was made through the Construction Grants program to remove such discharges, and, with few exceptions, New Hampshire lakes and lake tributaries are free from point discharges. New Hampshire also has surface water quality standards that protect lakes as well as all other surface waters. More information on water quality standards and point source control can be found in sections C.2.1.

In addition to point source controls and water quality standards, DES has many other programs in place to further protect New Hampshire's lakes and ponds. Many are listed in section C.2 and include the Section 319 Nonpoint Source, Alteration of Terrain, 401 Water Quality Certification, and Total Maximum Daily Load (TMDL) programs.

A brief summary of some of the laws and regulations that help protect New Hampshire lakes is presented below.

1. All lakes are classified at least B (RSA 485-A:11), which means they're suitable for fishing, swimming, and other recreational activities (RSA 485-A:8-II), and violations of assigned classifications are not allowed (RSA 485-A:12-II).
2. No discharge is allowed to a lake without a permit (RSA 485-A:13-I).
3. No trash can be dumped in or on the banks of a lake (RSA 485-A:15).
4. Marine toilets cannot be discharged into a lake (RSA 487:2).
5. Graywater (sink and shower wastes) from boats cannot be discharged into a lake (RSA 487:3).
6. No new or increased discharge of phosphorus or nitrogen to lakes are allowed, no new or increased discharges of phosphorus or nitrogen to tributaries of lakes are allowed that would contribute to cultural eutrophication or growth of weeds or algae, and existing discharges containing either phosphorus or nitrogen which encourage cultural eutrophication shall be treated to remove phosphorus or nitrogen (Env-Wq 1703.14).
7. Existing high quality lakes shall be maintained at their existing high quality (Env-Wq 1708.07).
8. No automobiles may be washed in or driven into any lake (uncodified regulation - may not be enforceable).
9. Automobiles and other petroleum powered vehicles lost through the ice into a lake must be removed (RSA 485-A:14).
10. No dredge and fill activities are allowed in or around a lake without a permit (RSA 482-A:3; 485-A:17).

11. No person shall dredge, excavate, place fill, mine, transport forest products, or undertake construction in or on the borders of surface waters of the state and no person shall undertake any activity that will significantly alter the characteristics of the terrain without a general permit by rule, a timber harvesting permit by rule, or an alteration of terrain (AOT) permit obtained in accordance with Env-Wq 1500 (RSA 485-A:17).
12. No earth moving activities are allowed near a lake without a permit (RSA 485-A:17).
13. No subsurface disposal system may be installed near a lake without a permit and certain minimum standards met (RSA 485-A:29).
14. No pesticides can be applied to a lake without a permit (RSA 430:31 & 32 and Pes 600) and no pesticide can be applied to a lake of 10 acres or larger without the recommendation of DES (Pes 601.01(b)).
15. No pesticides can be applied within 25 feet of surface waters (Pes 1001.01(a)) and no chemicals other than pesticides can be applied within the 50 foot waterfront buffer (RSA 483-B:9(v)).
16. Cottages near lakes or tributaries to lakes cannot be converted from seasonal to year-round use unless an application for approval of the sewage disposal system has been submitted and approved (RSA 485-A:38).
17. Cottages near lakes or tributaries to lakes cannot be expanded in size such that the load on the sewage disposal system is increased unless an application for approval of the sewage disposal system is submitted (RSA 485-A:38).
18. No property with a sewage disposal system located within 200 feet of a great pond can be offered for sale until a licensed sewage disposal designer has performed a site assessment to determine if the site meets current standards for sewage disposal systems (RSA 485-A:39).
19. The Lakes Management and Protection Program established a lakes coordinator and lakes management advisory committee to prepare: (1) statewide lake management criteria and (2) guidelines for the development of local lake management and shoreland protection plans (RSA 483-A).
20. The Comprehensive Shoreland Protection Act (RSA 483-B) provides minimum protective standards for activities occurring within 250 feet of lakes and ponds with a surface area of 10 acres or more.
21. No household cleansing products except those used in dishwashers shall be distributed, sold or offered for sale in New Hampshire which contain a phosphorus compound in excess of a trace quantity (RSA 485-A:56).
22. No exotic aquatic weeds shall be offered for sale, distributed, sold, imported, purchased, propagated, transported, or introduced in the state (RSA 487:16a).
23. DES is directed to prevent the introduction and further dispersal of exotic aquatic weeds and to manage or control exotic aquatic weed infestations in the lakes of the state RSA 487:17,II).

24. Permits are also required for the following activities, and permits would not be issued if lake water quality were endangered:

    A. groundwater discharges (RSA 485-A:13)
    B. underground storage tanks (RSA 146-A)
    C. solid waste landfills (RSA 149-M)
    D. sludge pits (RSA 149-M)
    E. hazardous waste sites (RSA 147-A)

With most point sources eliminated, the greatest threats to the continued health of New Hampshire lakes are atmospheric deposition (including both acid rain impacts and mercury), the introduction of non-native aquatic organisms, and the overuse of and over-development around the lakes. Stormwater runoff from developed (urban) areas is probably the greatest threat to the health of New Hampshire lakes. Acid rain and mercury impacts have been and continue to be addressed by state and national (Clean Air Act) legislation. DES adopted a mercury reduction strategy in 1998 that resulted and continues to result in various laws, rules and activities to reduce the amount of mercury discharged to the environment. In December 2007 EPA approved a mercury TMDL for New Hampshire and the other New England states and New York, designed to reduce mercury deposition in the state. Programs to address non-native exotic weeds were listed above (22 & 23). Programs to reduce runoff (primarily erosion and nutrients) from the developed watersheds of lakes are managed by above-listed programs (10-13) along with the 401 certification program, the Alteration of Terrain program, and the implementation of best management practices through the 319 program.

Of the 108 recommendations included in the "Lakes Management Criteria for New Hampshire state agencies," ten recommendations called for legislative action. Since the document was released in 1996, the New Hampshire General Court has acted upon six of the ten recommendations. The state, through the interagency Council on Resources and Development (CORD) and legislative action, continues to improve its ability to protect lakes from overuse and from stormwater runoff from developed areas.

Section 314 Requirement 3: A description of methods and procedures, in conjunction with appropriate federal agencies, to restore the quality of such lakes.

Procedures and methods to protect lakes by controlling sources of pollution were discussed in the previous section. In this section, activities to ameliorate poor water quality conditions that may occur beyond the above regulations controlling pollution are discussed.

Lake restoration efforts usually take one of two basic approaches, or a combination of the two. The first is to attack the cause of the problem; the second is to treat the problem. As discussed above the major problems for lakes are acid and mercury issues related to atmospheric deposition, the introduction of exotic plants, and nutrient and sedimentation issues from stormwater runoff. The different problems may require the use of different approaches. For example, reducing mercury emissions is an example of controlling the cause of a problem whereas applying herbicides to exotic milfoil is an example of treating a problem.

Lake restoration techniques have been reviewed periodically in the literature, including EPA's 1990 document "The Lake and Reservoir Restoration Guidance Manual," second edition, and NALMS' 2001 document "Managing Lakes and Reservoirs," third edition. Reports such as these include a listing of restoration techniques. In this section, procedures that New Hampshire has carried out to restore lake water quality are discussed.

Cause Treatment

Controlling sources of pollution involves controlling both point and non-point sources.

Point Sources:

Point sources of phosphorus to a lake are usually removed or reduced by two basic methods. The most common is to divert the discharge away from the lake. A number of New Hampshire lakes have been restored or protected by sewage diversions, including Lakes Winnisquam, Kezar, Winnipesaukee, Glen, Kellys Falls, and Mascoma. A second method to reduce a point source of phosphorus is to provide tertiary treatment to the discharge through spray irrigation or rapid infiltration basins (RIBs, 2 mg/l P limit in discharge). Lakes protected through tertiary treatment include:

- Sunapee (RIBs)
- Winnipesaukee, Wolfeboro (spray irrigation and RIBs)
- Winnipesaukee, Tuftonboro (spray irrigation, forest)
- Lovell Lake (RIBs)
- Pearly (potential for chemical phosphorus precipitation, RIBs)
- Kezar (wetlands uptake)
- Eastman Pond (spray irrigation, golf course)

Nonpoint sources:

The Water Division of DES deals with non-point sources of pollution, including phosphorus and erosion. As discussed in the previous section, the state has a number of laws that reduce phosphorus and sediment runoff from logging operations, earth moving activities, dredge and fill operations, and subsurface disposal systems. The Department also works closely with local planning agencies, the Natural Resources Conservation Service, Cooperative Extension, and others to develop and implement best management practices for non-point sources. Public information and education is a large part of this process. A general discussion of the non-point program can be found in C.2.3. Examples of non-point control projects to protect lakes are found in the Clean Lakes – 319 projects section below.

Problem Treatment

Algae:

Historically, the Department used copper sulfate to control algal blooms caused by cultural sources of phosphorus. As point sources were eliminated, the need for the chemical control of algae diminished greatly. The DES Biology Section personnel continue to maintain pesticide applicator licenses and continue to have the ability to treat algal blooms if conditions warrant. In recent years most copper sulfate treatments have been related to taste and odor or filter clogging problems associated with public water supplies.

No copper sulfate treatments by DES personnel have occurred since the 2008 report.

Rooted Aquatic plants:

The state funds a program designed to stop the spread of exotic aquatic plants in the state. The money can be used to eradicate new small infestations of exotic plants and to make matching grants for the management of existing infestations. Table 22 shows the waterbodies with exotic plant infestations and what control actions have been used. More specific information on various waterbodies, including detailed maps, are available on file at DES. Funds are also available for public informational and educational efforts to stop the spread of exotic plants and for research. A reduction in the rate of spread of exotic plants has been observed over the last several years.

Funds are not available to manage native plants and very few herbicide treatments occur to control native plant growth. Since 1990, only two ponds, Long Pond in Pelham (1995, 1997) and Pillsbury Lake in Webster (multiple years) have been treated with herbicides to control non-exotic plants. Lake drawdown has been used, with limited success, to control native aquatic plants in a few lakes.

Table 22: Lakes Where Exotic Plants have been Eradicated or Managed

Waterbody (TOWN)	Species	Control Actions
Arlington Mill Reservoir (SALEM)	Fanwort	Limited herbicide treatment. Infestations restriction to cove areas.
Ashuelot River (WINCHESTER)	Variable milfoil	No action to date.
Balch Lake (WAKEFIELD)	Variable milfoil	Herbicide treatment and hand pulling and suction harvesting. Infestations reduced.
Barnstead Parade Pond/Suncook (BARNSTEAD/ PITTSFIELD)	Variable milfoil	Herbicide treatment and hand pulling and suction harvesting. Infestations reduced.
Belleau Lake (WAKEFIELD)	Variable milfoil	Herbicide treatment and hand pulling and suction harvesting. Infestations reduced.
Big Island Pond (DERRY)	Variable milfoil, Fanwort	Diver Assisted Suction Harvesting only. Infestation expanding.
Big Turkey Pond (CONCORD)	Variable milfoil	Herbicide treatment in small areas, not comprehensive control.
Bixby Pond (EPSOM)	Variable milfoil	No action to date.
Brindle Pond (BARNSTEAD)	Variable milfoil	No action to date.
Captain Pond (SALEM)	Variable milfoil	Herbicide treatment and diving work. Infestation nearly eradicated.
Cheshire Pond (JAFFREY)	Variable milfoil	No action to date.
Cobbetts Pond (WINDHAM)	Variable milfoil	Herbicide treatments greatly reduced distribution, using hand removal work now.
Cocheco River (ROCHESTER)	Variable milfoil	No action to date.
Connecticut River (CHARLESTOWN)	Eurasian milfoil, European Naiad, Didymo (rock snot), Curly-leaf Pondweed	No action to date.
Contoocook Lake (JAFFREY)	Variable milfoil	Herbicide treatments to reduce infestation and then diver work to
Contoocook River (VARIOUS LOCATIONS)	Variable milfoil	No action to date.
Crescent Lake (WOLFEBORO)	Variable milfoil	Herbicide treatment then diving. Infestation greatly reduced.
Danforth Pond (FREEDOM)	Variable milfoil	Herbicide treatment then diving. Infestation greatly reduced.
Dublin Lake (DUBLIN)	Variable milfoil	Diving. Eradicated.
Flints Pond (HOLLIS)	Variable milfoil	Herbicide treatment with great success. Needs follow up monitoring.
Forest Lake (WINCHESTER)	Variable milfoil	Herbicide treatment greatly reduced footprint. Diving and spot treatment needed.
Glen Lake (GOFFSTOWN)	Variable milfoil	Herbicide treatment reduced footprint. Upstream sources on this impoundment.

Waterbody (TOWN)	Species	Control Actions
Gorham Pond (DUNBARTON)	Variable milfoil	No action to date.
Halfmoon Pond (BARNSTEAD)	Variable milfoil	Diver work. Eradicated.
Hopkinton Lake/Dam (HOPKINTON)	Variable milfoil	Herbicide treatment reduced footprint. More work needed on this large system.
Horseshoe Pond (MERRIMACK)	Variable milfoil	Herbicide treatments in past, more work needed.
Jones Pond (Stumpfield Pond) (NEW DURHAM)	Variable milfoil	Herbicide treatment and diving work. Infestation reduced, more work needed.
Kimball Pond (HOPKINTON)	Variable milfoil	Hand removal and benthic barrier placement. Possibly eradicated.
Lake Pemigewasset (MEREDITH)	Variable milfoil	Herbicide treatment and diver hand removal. Close to eradication.
Lees Pond (MOULTONBOROUGH)	Variable milfoil	Herbicide treatment, diver hand removal and suction harvesting. Much reduced.
Little Suncook River (EPSOM/NORTHWOOD)	Variable milfoil	No action to date.
Little Turkey Pond (CONCORD)	Variable milfoil	Herbicide treatment for small areas. Not comprehensive control.
Locke Lake (BARNSTEAD)	Variable milfoil	Herbicide treatment, diver hand removal and suction harvesting. Much reduced.
Long Pond (DANVILLE)	Variable milfoil	Herbicide treatment and suction harvesting. Seed bank a problem, more work.
Mascoma Lake (ENFIELD)	Eurasian milfoil	Diver hand removal and suction harvesting keeping infestation low.
Massabesic Lake (AUBURN)	Variable milfoil, Fanwort	Diver hand removal, suction harvesting and benthic barriers. Infestation in check.
Massasecum Lake (BRADFORD)	Variable milfoil	Herbicide treatment, much diver work, nearly eradicated.
Melendy Pond (BROOKLINE)	Variable milfoil	Herbicide treatment, diver work, more work needed.
Merrimack River (BOSCAWEN/ CANTEBURY/CONCORD)	Variable milfoil	No action to date.
Mine Falls Pond (NASHUA)	Variable milfoil, Fanwort	Mechanical harvesting reduced water chestnut. Other invasives present.
Monomonac Lake (RINDGE)	Variable milfoil	Herbicide treatment and hand removal, infestations limited.
Mountain Pond (BROOKFIELD)	Eurasian milfoil	Hand removal and drawdown. Plants still present.
Nashua River (NASHUA)	Variable milfoil, Eurasian milfoil, Fanwort, Water Chestnut, European Naiad, Curly-leaf Pondweed	Mechanical harvesting reduced water chestnut. Other invasives present.
Northwood Lake (NORTHWOOD)	Variable milfoil	Herbicide treatment and diver work. Infestation greatly reduced.
Nutts Pond (MANCHESTER)	Brazilian elodea	Herbicide treatment and benthic barriers. Infestation reduced.
Opechee Lake (LACONIA)	Variable milfoil	Herbicide treatment and hand removal. Infestation reduced. Upstream source.
Ossipee Lake (Broad Bay) (FREEDOM)	Variable milfoil	Herbicide treatment and much diver work. Infestation reduced.
Otternic Pond (HUDSON)	Variable milfoil, Fanwort	Herbicide treatment and diver work. Infestation greatly reduced.
Paugus Bay (LACONIA)	Variable milfoil	Limited controls in various locations. Variable milfoil common.
Pearly Pond (RINDGE)	Variable milfoil	Herbicide treatment and hand removal. Infestation reduced.
Pemigewasset River (SANBORNTON)	Variable milfoil	No action to date.
Phillips Pond (SANDOWN)	Fanwort	Herbicide treatment and hand removal. Infestation in check.
Piscataquog River (GOFFSTOWN)	Variable milfoil	Herbicide treatment and some hand removal. More work needed.
Post Pond (LYME)	Eurasian milfoil	Hand removal and small herbicide treatment. Infestation limited.
Potanipo Lake (BROOKLINE)	Variable milfoil	Herbicide treatment and hand removal. Infestation low.
Powder Mill Pond (HANCOCK)	Variable milfoil	No action to date.
Powwow Pond (KINGSTON)	Variable milfoil	Herbicide treatment and hand removal. Infestation scattered.
Robinson Pond (HUDSON)	Variable milfoil, Fanwort	Herbicide treatment and hand removal and suction harvesting. Reduced growth.
Rocky Pond (GILMANTON)	Variable milfoil	Herbicide treatment and hand removal and suction harvesting. Reduced growth.
Rockybound Pond (CROYDON)	Curly-leaf Pondweed	Herbicide treatment and hand removal and suction harvesting. Reduced growth.

Waterbody (TOWN)	Species	Control Actions
Scobie Pond/Haunted Lake (FRANCESTOWN)	Variable milfoil	Herbicide treatment and hand removal and suction harvesting. Reduced growth.
Silver Lake (TILTON)	Variable milfoil	Herbicide treatment and hand removal and suction harvesting. Reduced growth.
Spaulding Pond (MILTON)	Variable milfoil	No action to date.
Squam Lakes (HOLDERNESS/ASHLAND)	Variable milfoil	Herbicide treatment and hand removal and suction harvesting. Reduced growth.
Squam River (ASHLAND)	Variable milfoil	Hand pulling and drawdown. Infestation dense.
St Paul's School Pond (CONCORD)	Variable milfoil	Herbicide treatment in small areas, not comprehensive control.
Sunapee Lake (SUNAPEE)	Variable milfoil	Hand pulling and benthic barriers. Eradicated.
Suncook Lakes (BARNSTEAD)	Variable milfoil	Herbicide treatment and hand removal and suction harvesting. Reduced growth.
Sunrise Lake (MIDDLETON)	Variable milfoil	Herbicide treatment and hand removal and suction harvesting. Reduced growth.
Turtle Pond (CONCORD)	Variable milfoil	Herbicide treatment but infestation rebounded with no action.
Upper Goodwin Pond (CONCORD)	Variable milfoil	No action to date.
Wentworth Lake (WOLFEBORO)	Variable milfoil	Herbicide treatment and hand removal and suction harvesting. Reduced growth.
Willand Pond (DOVER)	Variable milfoil	Herbicide treatment and hand removal. Reduced growth.
Wilson Lake (SALEM)	Fanwort	No action to date.
Winnipesaukee Lake (GILFORD)	Variable milfoil	Herbicide treatment and hand removal and suction harvesting. Reduced growth.
Winnipesaukee River (TILTON)	Variable milfoil	No action to date.
Winnisquam Lake (MEREDITH/BELMONT)	Variable milfoil	Herbicide treatment and hand removal and suction harvesting. Reduced growth.

Clean Lakes Diagnostic Studies

The Department participated in the federal Clean Lakes Program (Section 314) when funds were available. A number of Phase I diagnostic/feasibility studies were conducted using existing state personnel as the 30 percent match. One 314-funded Phase II implementation project and one Phase III monitoring project were completed. Although only one Phase II project was funded, locally implemented controls, such as outreach and zoning changes, were implemented for a number of lakes as a result of recommendations presented in the Phase I reports. A state-funded Clean Lakes Program was established in 1990 and several diagnostic studies have been completed under this program with assistance from volunteers in the Volunteer Lake Assessment Program. Watershed implementation projects for these lakes were funded through the non-point source (319) program and the 104(b)(3) programs. The following Phase I, II, III, state diagnostic studies, 319 and 104(b)(3) projects have been undertaken and/or completed at New Hampshire lakes.

Phase I:

- Kezar Lake, Sutton
- Dorrs Pond, Manchester
- Crystal Lake, Manchester
- Northwood Lake, Northwood
- Silver Lake, Hollis (205 (j))
- Baboosic Lake, Amherst (205 (j))
- French Pond, Henniker (205 (j))
- Keyser Pond, Henniker (205 (j))
- Webster Lake, Franklin
- Mendums Pond, Barrington
- Beaver Lake, Derry

- Robinson/Otternic Ponds, Hudson
- Pawtuckaway Lake, Nottingham
- Flints Pond, Hollis
- Great Pond, Kingston

Phase II:

Kezar Lake, Sutton: sediment phosphorus inactivation through aluminum salts application and management of an upstream wetland.

Phase III:

Kezar Lake, Sutton: monitoring of the long-term effectiveness of hypolimnetic alum treatment to inactivate sediment phosphorus, and evaluation of long-term impacts of aluminum additions to aquatic biota.

State funded lake diagnostic studies:

- Lake Wentworth, Wolfeboro
- Silver Lake, Harrisville
- Pleasant Lake, Deerfield
- Partridge Lake, Littleton
- Rust Pond, Wolfeboro
- Perkins Pond, Sunapee

<u>EPA Section 319 Watershed Based Plans:</u>

The Clean Lakes Program manages several EPA Section 319 funded Watershed Based Plan Projects. Watershed Based Plans sometimes provide updates or site specific recommendations for previous diagnostic feasibility studies to meet EPA requirements necessary to receive future Section 319 money for watershed best management practice (BMP) implementation projects. The following Section 319 funded projects have either been recently completed, currently active, or are due to receive funding in 2012.

Impaired Waters:

- Webster Lake, Franklin
- Baboosic Lake, Amherst
- Pawtuckaway Lake, Nottingham
- Partridge Lake, Littleton
- Nutt Pond, Manchester (funded by Manchester SEPP)
- Mirror Lake, Tuftonboro and Wolfeboro

High Quality Waters:

- Sunapee Lake, Sunapee
- Granite Lake, Nelson
- Lake Winnisquam/Black Brook, Sanbornton (under development)

- Lake Wentworth, Wolfeboro (under development)

<u>EPA Section 319 Implementation Projects:</u>

Impaired Waters:

- Webster Lake, Franklin
- Baboosic Lake, Amherst
- Rust Pond, Wolfeboro (underway)
- Cobbetts Pond, Windham (underway)
- Mirror Lake, Tuftonboro and Wolfeboro

In addition to the Clean Lakes Program-managed EPA Section 319 funded Watershed Based Plan Projects for high quality waters and impaired waters in New Hampshire, DES Watershed Assistance Section staff manage several other Section 319 projects on lakes in the state. These projects address both the development of watershed based plans to protect high quality waters and watershed restoration plans designed to return surface waters to meeting their designated uses. The following Section 319 funded projects have either been recently completed, currently active, or are due to receive funding in 2012.

High Quality Waters

- A Lake Winnipesaukee Watershed Management Plan: Phase I – Meredith, Paugus & Sanders Bays
- Salmon Falls Headwaters Watershed-based Management Plan Implementation Project - Phase 1 (Great East Lake, Lake Ivanhoe, Horn Pond, Wilson Lake, Lovell Lake – Wakefield, NH and Acton, ME)
- Salmon Falls Headwaters Watershed-based Management Plan Implementation Project - Phase 2 (Great East Lake, Lake Ivanhoe, Horn Pond, Wilson Lake, Lovell Lake – Wakefield, NH and Acton, ME)
- Chocorua Village Area Bioretention Stormwater System Treatment Project at Mill Pond – Tamworth
- Hancock Village Stormwater Management and Water Quality Improvement Project at Norway Pond – Hancock
- Newfound Lake Watershed Master Plan Development and Implementation – Bristol, Groton, Alexandria, Bridgewater, Hebron, Plymouth, Orange
- Water Quality Mitigation Project and Community Outreach in the Lake Waukewan Watershed – Meredith, Center Harbor, New Hampton
- Ossipee Lake Watershed-based Management Plan- 14 municipalities
- Newfound Lake, Phase 2 Implementation

Impaired Waters:

- Cains Pond Restoration Plan – Seabrook
- City of Dover Willand Pond Drainage Project – Dover
- Maxwell Pond Dam Removal and Black Brook Restoration Project – Manchester
- East Washington Mill Pond Restoration Project – Washington
- Nutt Pond Restoration Project, Phase II- Manchester

104(b)(3):

Crystal Lake, Manchester: installation of a StormTreat system to treat stormwater runoff from an urban area, with post-installation monitoring using 319 funds. Several other stormwater BMPs were installed at Crystal Lake.

Supplemental Environmental Projects (SEP):

Manchester, NH: As part of a long-term combined sewer overflow (CSO) strategy, the City of Manchester implemented a broad environmental program (the SEP) as well as standard CSO mitigation measures. One aspect of the SEP was an Urban Ponds Restoration project which included cooperative watershed assessments, restoration, education and outreach for the following urban ponds in Manchester: Maxwell Pond; Nutt Pond; Stevens Pond; McQueston Pond; Pine Island Pond; Dorrs Pond; and Crystal Lake. The dam creating Maxwell Pond was removed, restoring Black Brook to a free-flowing stream.

Miscellaneous:

Cobbetts Pond and Canobie Lake, Windham: Cooperative approach between DES and DOT to address potential short-term water quality impacts during I-93 expansion construction and potential long-term water quality impacts by designing and installing stormwater treatment. DOT contracts in the Cobbetts Pond and Canobie Lake watersheds that are currently underway include 13933K (R-08-M-01) and 13933G (R-10-M-05). Project 13933K is was completed in January 2011 and 13933G is expected to be completed in the fall of 2012.

The Section 314 Clean Lakes Program was extremely beneficial to the lakes programs of New Hampshire. It helped develop many of the lake monitoring programs that provided information for the lake assessments used in this 305(b) report. Unfortunately, with the elimination of federal funding for the program, the lakes programs suffered. Phase I, II and III projects are no longer conducted. The number of lakes monitored and the parameters analyzed are reduced from previous levels. The state has provided additional state funds to the lakes programs to help offset this loss. State funds were provided to implement the Shoreland Protection Act (renamed in 2011 to the Shoreland Water Quality Protection Act), to expand the beach and pool inspection program, and to expand the exotic species control, and volunteer lake diagnostic study program. Modified diagnostic studies were conducted through the volunteer and state Clean Lakes programs. The purpose of these studies is to work with volunteers to identify pollution (primarily phosphorus and sediment) sources and to develop recommendations to ameliorate those sources in order to protect the lake from becoming impaired. Once causes and sources of water quality declines are determined, 319 funds (rather than Phase II 314 funds) are now used for lake watershed implementation projects.

The TMDL program is used to restore impaired lakes. Total phosphorus TMDLs on 28 lakes impaired by high chlorophyll values (algae) and/or cyanobacteria scums were approved from May 2011to June 2012.

CWA Section 314 Requirement 4: Methods and procedures to mitigate the harmful effects of high acidity, including innovative methods of neutralizing and restoring buffering *capacity of lakes and methods of removing from lakes toxic metals and other toxic substances mobilized by high acidity.*

New Hampshire has not and has no plans to mitigate the aquatic impacts of acid deposition by trying to treat the symptoms of the problem. The only rational solution to deal with the issue of high acidity is to treat the cause of the problem – reduce the emissions of sulfur dioxide and nitrogen oxides. The Department of Environmental Services, as well as the Governor and Congressional delegation, strongly supported the Clean Air Act Amendments of 1990 to reduce sulfur dioxide and nitrogen oxide emissions, and continue to support state, regional and national efforts to further reduce acid-causing emissions. It makes no sense to treat the symptoms of the problem without treating the causes. The only valid reason for liming a lake is to protect a commercial fishery, a heritage strain of fish for broodstock or a threatened or endangered fish species until such time as acid rain controls are in place. This situation does not exist in New Hampshire.

New Hampshire, along with the other states in the region, has implemented legislation to reduce in-state emissions of sulfur dioxide and is a participant in the NEG/ECP Acid Rain Action Plan to reduce in-region sources of SO_2 and NO_x. Out-of-region sources of acidifying compounds, particularly sulfur emissions from the mid-west, continue to be a major cause of acid deposition in New Hampshire. New Hampshire completed and EPA approved acid rain TMDLs on 223 different lakes and their beaches. These TMDLs called for reductions in acidifying emissions from both in-state and out-of-state sources. New Hampshire was a participant in the lawsuit against EPA that was won by the states and found that EPA's current rules implementing the Clean Air Act requirements were improper.

CWA Section 314 Requirement 5: A list and description of those publicly owned lakes in such state for which uses are known to be impaired, including those lakes which are known not to meet applicable water quality standards or which require implementation of control programs to maintain compliance with applicable standards and those lakes in which water quality has deteriorated as a result of high acidity that may be reasonably due to acid deposition.

See sections D.3.6.1 and D.3.6.2 for the assessment result tables that show the acres of lakes that are supporting and not supporting each designated use as well as the acres impacted by each cause and suspected source of impairment.

CWA Section 314 Requirement 6: An assessment of the status and trends of water quality in lakes in such state, including but not limited to, the nature and extent of pollution loading from point and non-point sources and the extent to which the use of lakes is impaired as a result of such pollution, particularly with respect to toxic pollution.

Acid Rain Trends

The passage of the Clean Air Act Amendments in 1990 resulted in a decrease in sulfur dioxide emissions from in-state and out-of-state sources. This has resulted in a similar decline in sulfate deposition to the state and, to a lesser extent, a decline in sulfate concentrations in surface waters. Unfortunately, this has resulted in little if any improvement in the acidity or acid neutralizing capacity status of New Hampshire lakes. Computer model results for the Hubbard Brook Experimental Forest show that the 1990 Clean Air Act Amendments will have a positive effect on sulfate deposition but will not facilitate full recovery for acid-sensitive ecosystems in the Northeast. Deeper cuts in electric utility sulfur emissions (at least 80 percent beyond the Clean Air Act) will be needed for greater and faster recovery from acid deposition in the Northeast (Driscoll *et al.* 2001).

A number of reasons contribute to this lack of improvement in surface waters and the need for further cuts in emissions. While sulfur emissions have decreased, nitrogen emissions have not decreased substantially region-wide and wet deposition of nitrogen has remained largely unchanged since the 1980s. Additionally, the loss of acid-neutralizing minerals from the soil and the long-term accumulation of sulfur and nitrogen in the soil have left many ecosystems more sensitive to the input of additional acids, further delaying recovery from acid deposition.

For many years, the state has monitored the effects of acid deposition on waterbodies in New Hampshire by regularly taking water samples from lakes and ponds. As defined by the U.S. Environmental Protection Agency, waters that have an ANC of zero or less, which corresponds to a pH of about 5.2, are considered to be acidified. A 2005 evaluation of lake data revealed that 3 percent of all lakes and 17 percent of remote, mostly high elevation ponds are acidic based on this definition. These values are unchanged from a similar assessment conducted five years previously.

A number of reports have been published in recent years that support the acid rain trend conclusions discussed above, and DES contributed data to some of these studies. Selected references include:

- Driscoll, C.T. et al. 2001. Acid Rain Revisited : advances in scientific understanding since the passage of the 1970 and 1990 Clean Air Act Amendments. Hubbard Brook Research Foundation. Science Links:1(1).
- Dupont, J. et al. 2000. Temporal Trends in Surface Water Quality in Northeastern America. NEG/ECP Acid Rain Steering Committee report.
- Dupont, J. et al. 2005. Estimation of Critical Loads of Acidity for Lakes in Northeastern United States and Eastern Canada. Env. Mon & Assess. 109.
- Kahl, J.S. et al. 2004. Have U.S. Surface Waters Responded to the 1990 Clean Air Act Amendments? ES&T. December 15, 2004.
- Stoddard, J.L. et al. 2003. Response of Surface Water Chemistry to the Clean Air Act Amendments of 1990. EPA 620/R-03/001.
- USEPA. 2005. The EPA Acid Rain Program 2004 Progress Report. http://www.epa.gov/airmarkets/cmprpt/arp04/
- USGAO. 2000. Acid Rain: Emissions Trends and Effects in the Eastern United States. GAO/RCED-00-47.

Trophic Trends

The Volunteer Lake Assessment Program was initiated with one lake in 1985 and has expanded to the point where approximately 180 lakes currently participate. In general, participating lakes sample once a month for the three summer months. Lakes with at least 10 consecutive years of data were statistically analyzed for trends in four trophic parameters. A linear regression analysis was used (95 percent confidence level) to determine if a specific water quality parameter was increasing, decreasing or not changing. A subjective "eye ball" test was used to determine if the non-changing trend was better characterized as a stable trend or a fluctuating trend. To account for the fact that an “increasing trend” is good for Secchi transparency but bad for chlorophyll and phosphorus, the trends are described as “improving” or “degrading” in the tables. In other words, an improving trend indicates the Secchi transparency is increasing whereas the chlorophyll or phosphorus concentration is decreasing.

The results of the trend analysis are summarized in the tables below. Samples are from the deep spot of the lakes. For larger lakes where more than one station was sampled, either the deeper spot or the worst case trend was used or, in the case of Lake Sunapee where four deep spot stations were sampled, the majority trend was used. Approximately 115 lakes were assessed for trophic trends. With approximately 800 lakes over 10 acres in New Hampshire, the trend analysis represents about 14 percent of these lakes (note: totals may not be exact because of rounding percentages and acres to the nearest whole number).

Table 23: Trend in chlorophyll

Trend	Number of lakes	Percent	Acres of lakes	Percent
Improving	14	12%	4,699	14%
Stable	58	42%	15,661	47%
Degrading	7	6%	1,470	4%
Fluctuating	46	40%	11,565	35%
total	115	100%	33,395	100%

Table 24: Trend in Secchi transparency

Trend	Number of lakes	Percent	Acres of lakes	Percent
Improving	5	4%	390	1%
Stable	62	54%	17,587	53%
Degrading	32	28%	9,337	28%
Fluctuating	16	14%	6,081	18%
total	115	100%	33,395	100%

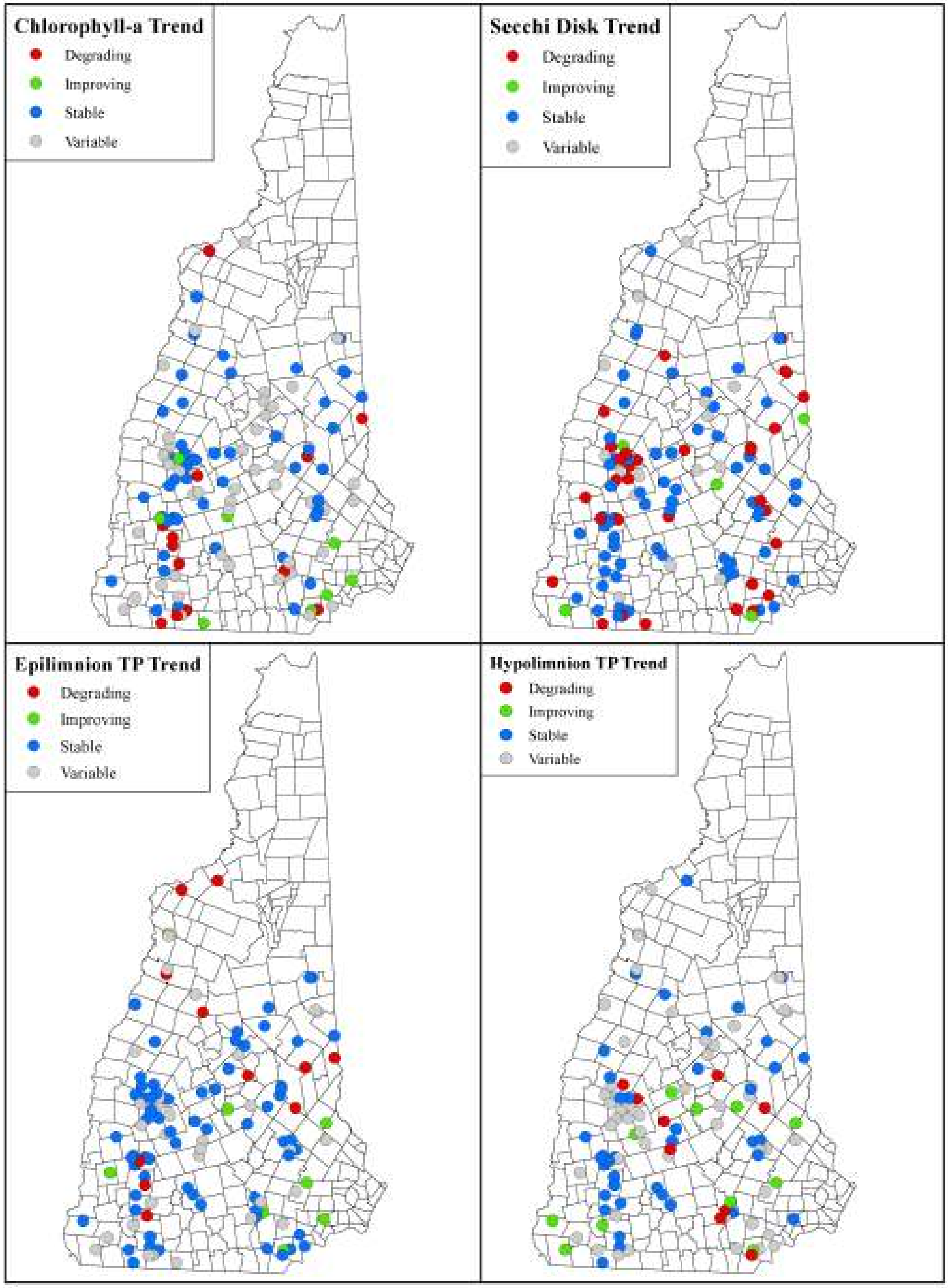
Table 25: Trend in epilimnetic or upper layer total phosphorus

Trend	Number of lakes	Percent	Acres of lakes	Percent
Improving	11	10%	5,973	18%
Stable	64	57%	18,610	56%
Degrading	8	7%	2,048	6%
Fluctuating	30	27%	6,639	20%
total	113	100%	33,270	100%

Table 26: Trend in hypolimnetic or lower layer total phosphorus

Trend	Number of lakes	Percent	Acres of lakes	Percent
Improving	9	8%	5,466	14%
Stable	39	36%	9,781	36%
Degrading	11	10%	2,954	3%
Fluctuating	49	45%	13,853	47%
total	108	100%	32,054	100%

Figure 24: Volunteer Lake Assessment Program Trends



A general assessment of the above trends suggests that most lakes (80 plus percent) show no trend (are either stable or fluctuating), and of those showing a trend, a similar number are improving and degrading. An exception to the second conclusion is for Secchi transparency where more lakes are degrading than improving.

D.3.7 OCEAN

D.3.7.1 Ocean: Individual Designated Use Support

The following tables and figures provide a summary of the use support status for all designated uses in ocean waters in state jurisdiction. Results are presented with and without the statewide mercury fish consumption advisory to reveal the status masked by the mercury advisory. Definitions of terms used in the tables (i.e., fully supporting, not supporting, threatened, fully supporting – marginal condition, etc.) may be found in the Consolidated Assessment and Listing Methodology (DES, 2012) a copy of which is provided in Appendix 4.

The percent assessed for each use with and without mercury is shown in Table 27 and Figure 25. Individual use support information is shown in Table 27 and Figure 26. The table and figures present the individual use assessments with the statewide mercury fish consumption advisory is in effect (see section D.6) as well as assuming that the advisory did not exist. Additionally the table and figures present DES's more refined definitions of use support which give an idea of the degree of water quality standard attainment or impairment (Fully Supporting-Good, Fully Supporting – Marginal, Not Supporting – Marginal and Not Supporting -Poor).

Table 27: Ocean: Individual Designated Use Support

Designated Use	Total	Total Assessed	Fully Supporting (FS) = Attaining Water Quality Standards			Not Supporting (NS) = Not Attaining Water Quality Standards = Impaired			Threatened	Insufficient Data and Information
			FS - Good	FS - Marginal	FS - Total	NS - Marginal	NS - Poor	NS - Total		
Aquatic Life										
Square Miles	81.5	76.7	0.0	76.7	76.7	0.0	0.0	0.0	0.0	4.8
% of Total	100.0%	94.1%	0.0%	94.1%	94.1%	0.0%	0.0%	0.0%	0.0%	5.9%
% of Assessed		100.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	
Fish Consumption (excluding mercury advisory)										
Square Miles	81.5	81.5	0.0	0.0	0.0	81.5	0.0	81.5	0.0	0.0
% of Total	100.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
% of Assessed		100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	
Fish Consumption (including mercury advisory)										
Square Miles	81.5	81.5	0.0	0.0	0.0	81.5	0.0	81.5	0.0	0.0
% of Total	100.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
% of Assessed		100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	
Shellfishing										
Square Miles	81.5	81.5	0.0	0.0	0.0	81.5	0.0	81.5	0.0	0.0
% of Total	100.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
% of Assessed		100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	
Primary Contact Recreation										
Square Miles	81.5	81.3	80.6	0.1	80.8	0.0	0.5	0.5	0.0	0.2
% of Total	100.0%	99.8%	99.0%	0.2%	99.1%	0.0%	0.6%	0.6%	0.0%	0.2%
% of Assessed		100.0%	99.2%	0.2%	99.4%	0.0%	0.6%	0.6%	0.0%	
Secondary Contact Recreation										
Square Miles	81.5	81.3	81.0	0.0	81.0	0.0	0.3	0.3	0.0	0.2
% of Total	100.0%	99.8%	99.4%	0.0%	99.4%	0.1%	0.3%	0.4%	0.0%	0.2%
% of Assessed		100.0%	99.6%	0.0%	99.6%	0.1%	0.3%	0.4%	0.0%	
Drinking Water (after Treatment)										
Square Miles	81.5	81.5	81.5	0.0	81.5	0.0	0.0	0.0	0.0	0.0
% of Total	100.0%	100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% of Assessed		100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	
Wildlife (Not Assessed)										
Square Miles	81.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.5
% of Total	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
% of Assessed										

Figure 25: Ocean: Percent Assessed by Use

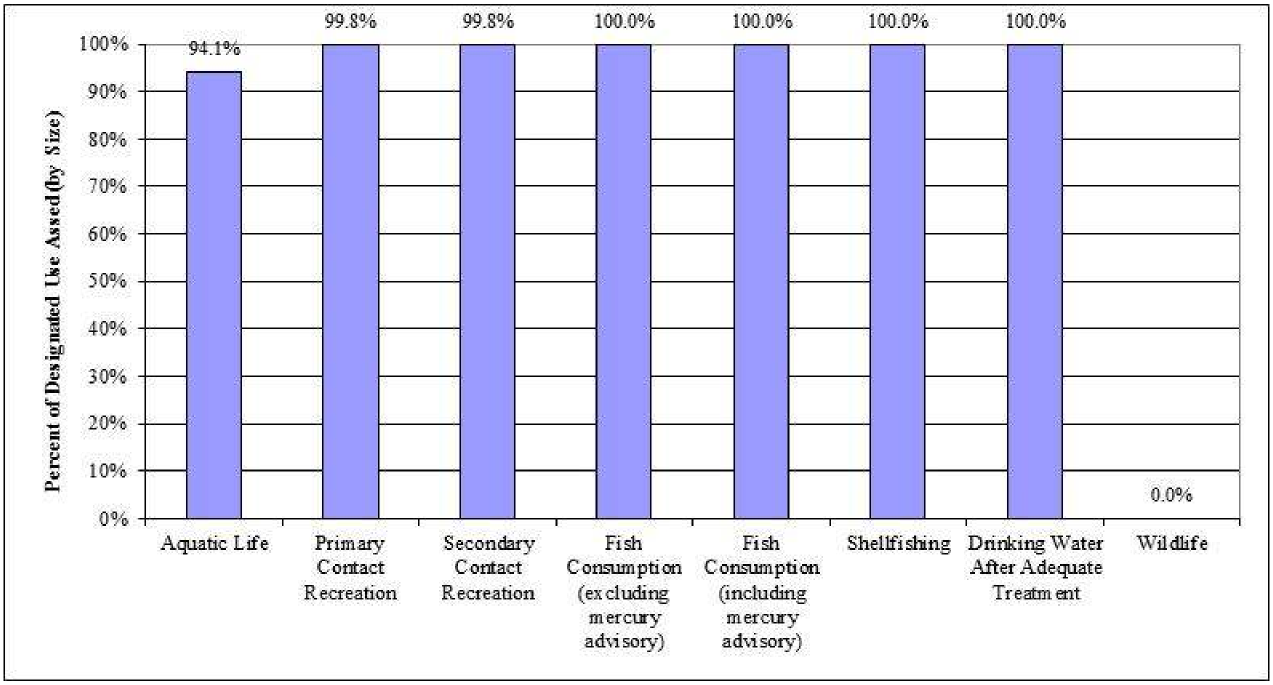
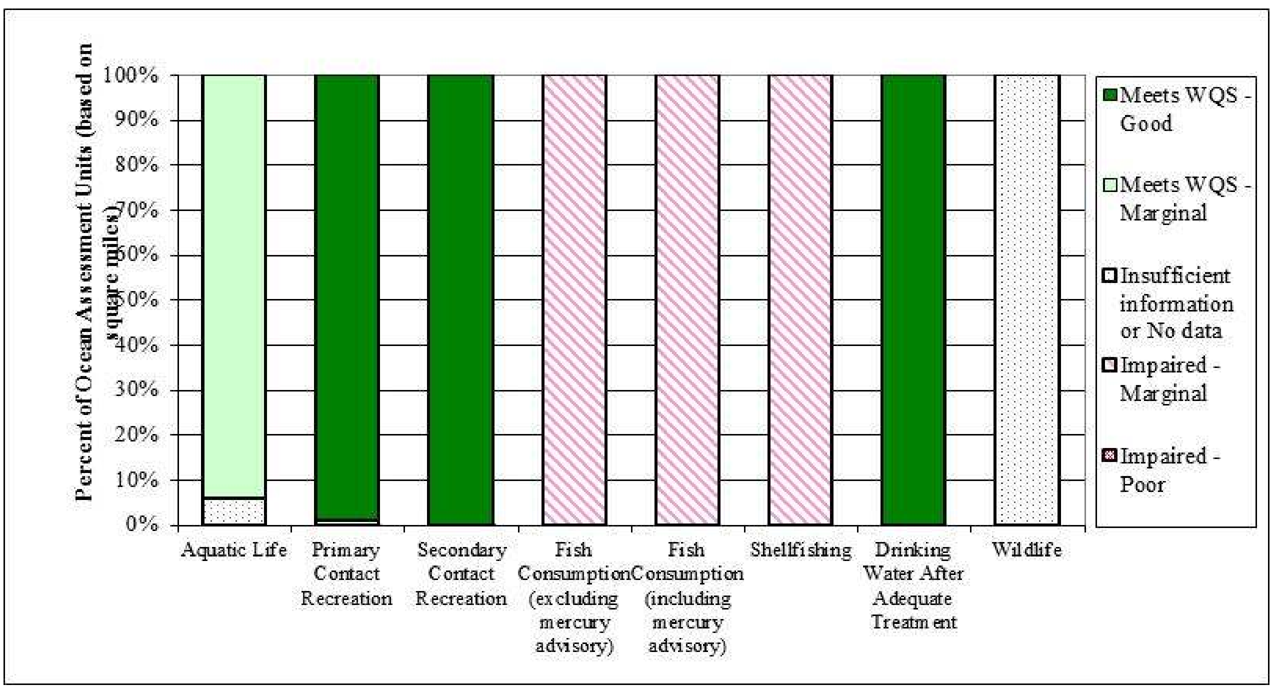


Figure 26: Ocean: Individual Designated Use Support of Assessed Waters



D.3.7.2 Ocean: Causes and Sources of Impairment

Table 28 shows the total square miles of ocean waters within state jurisdiction impaired or threatened by various pollutants and nonpollutants (i.e., causes of impairment).

Table 28: Ocean: Causes of Threatened or Impairment Status

Rank	Impairment	Total Size (Acres)	Number of AUs
1	Polychlorinated biphenyls	81.480	26
2	Mercury	81.480	26
3	Dioxin (including 2,3,7,8-TCDD)	81.480	26
4	Enterococcus	0.528	14
5	Fecal Coliform	0.457	9

Table 29 shows the total square miles of ocean waters within state jurisdiction impaired or threatened by various sources of impairment.

Table 29: Ocean: Sources of Threatened or Impairment Status

Rank	Source	Total Size (Acres)	Number of AUs
1	Source Unknown	81.421	26
2	Atmospheric Deposition - Toxics	81.421	26
3	Forced Drainage Pumping	0.133	2
4	Waterfowl	0.064	2
5	Unpermitted Discharge (Domestic Wastes)	0.052	1
6	Sewage Discharges in Unsewered Areas	0.034	1
7	Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)	0.015	1

D.3.8 RIVERS AND STREAMS

D.3.8.1 Rivers and Streams: Individual Designated Use Support

The following tables and figures provide a summary of the use support status for all designated uses in rivers and streams. Results are presented with and without the statewide mercury fish consumption advisory to reveal the status masked by the mercury advisory. Definitions of terms used in the tables (i.e., fully supporting, not supporting, threatened, fully supporting – marginal condition, etc.) may be found in the Consolidated Assessment and Listing Methodology (DES, 2012) a copy of which is provided in Appendix 4.

The percent assessed for each use with and without mercury is shown in Table 30 and Figure 27. Individual use support information is shown in Table 30 and Figure 28. The table and figures present the individual use assessments with the statewide mercury fish consumption advisory is in effect (see section D.6) as well as assuming that the advisory did not exist. Additionally the table and figures present DES's more refined definitions of use support which give an idea of the degree of water quality standard attainment or impairment (Fully Supporting-Good, Fully Supporting – Marginal, Not Supporting – Marginal and Not Supporting -Poor).

Table 30: Rivers and Streams: Individual Designated Use Support

Designated Use	Total	Total Assessed	Fully Supporting (FS) = Attaining Water Quality Standards			Not Supporting (NS) = Not Attaining Water Quality Standards = Impaired			Threatened	Insufficient Data and Information
			FS - Good	FS - Marginal	FS - Total	NS - Marginal	NS - Poor	NS - Total		
Aquatic Life										
Miles	16,961.8	4,542.3	78.5	51.0	129.5	2,374.1	2,038.6	4,412.8	6.3	12,419.5
% of Total	100.0%	26.8%	0.5%	0.3%	0.8%	14.0%	12.0%	26.0%	0.0%	73.2%
% of Assessed		100.0%	1.7%	1.1%	2.9%	52.3%	44.9%	97.1%	0.1%	
Fish Consumption (excluding mercury advisory)										
Miles	16,961.8	16,961.8	0.0	16,943.8	16,943.8	17.7	0.3	18.0	0.0	0.0
% of Total	100.0%	100.0%	0.0%	99.9%	99.9%	0.1%	0.0%	0.1%	0.0%	0.0%
% of Assessed		100.0%	0.0%	99.9%	99.9%	0.1%	0.0%	0.1%	0.0%	
Fish Consumption (including mercury advisory)										
Miles	16,961.8	16,961.8	0.0	0.0	0.0	16,961.4	0.3	16,961.8	0.0	0.0
% of Total	100.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
% of Assessed		100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	
Shellfishing (Not Applicable)										
Miles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% of Total										
% of Assessed										
Primary Contact Recreation										
Miles	16,961.8	2,208.8	635.9	250.6	886.5	440.5	881.7	1,322.2	0.0	14,753.0
% of Total	100.0%	13.0%	3.7%	1.5%	5.2%	2.6%	5.2%	7.8%	0.0%	87.0%
% of Assessed		100.0%	28.8%	11.3%	40.1%	19.9%	39.9%	59.9%	0.0%	
Secondary Contact Recreation										
Miles	16,961.8	1,806.9	1,177.1	431.5	1,608.7	112.4	85.8	198.2	0.0	15,154.9
% of Total	100.0%	10.7%	6.9%	2.5%	9.5%	0.7%	0.5%	1.2%	0.0%	89.3%
% of Assessed		100.0%	65.1%	23.9%	89.0%	6.2%	4.7%	11.0%	0.0%	
Drinking Water (after Treatment)										
Miles	16,961.8	16,961.8	16,961.8	0.0	16,961.8	0.0	0.0	0.0	0.0	0.0
% of Total	100.0%	100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% of Assessed		100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	
Wildlife (Not Assessed)										
Miles	16,961.8	0.2	0.0	0.0	0.0	0.2	0.0	0.2	0.0	16,961.6
% of Total	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
% of Assessed										

Figure 27: Rivers and Streams: Percent Assessed by Use

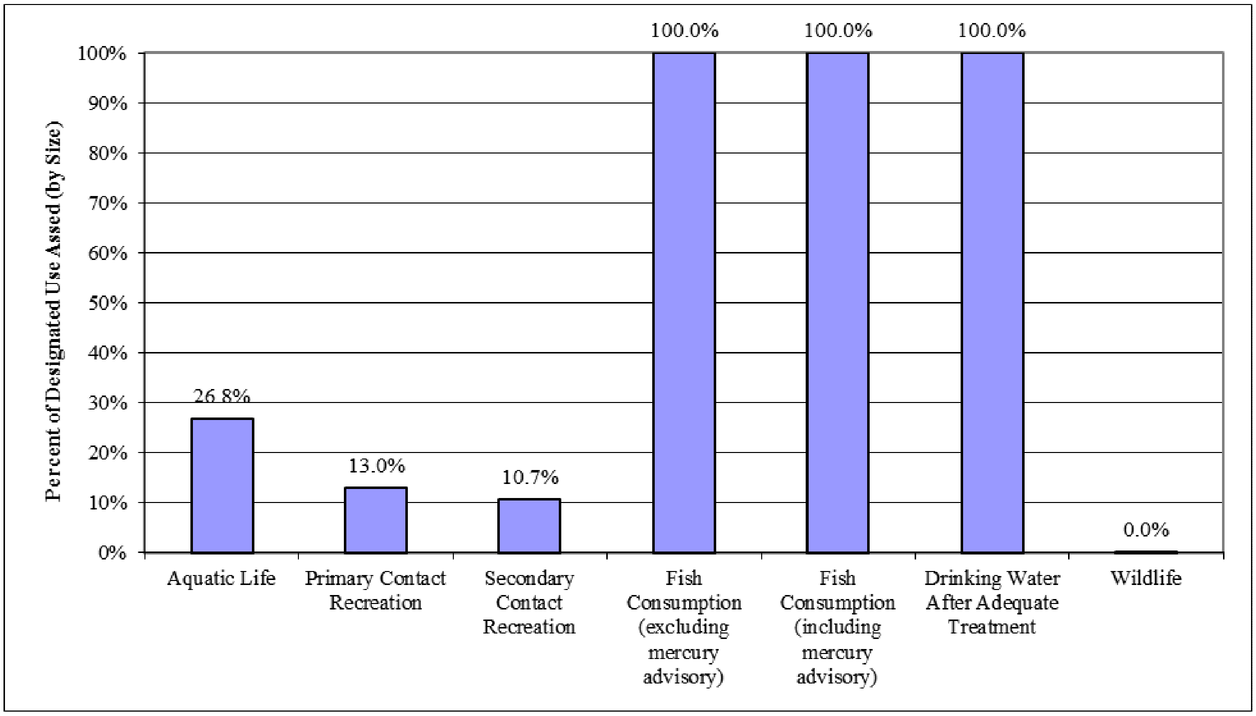
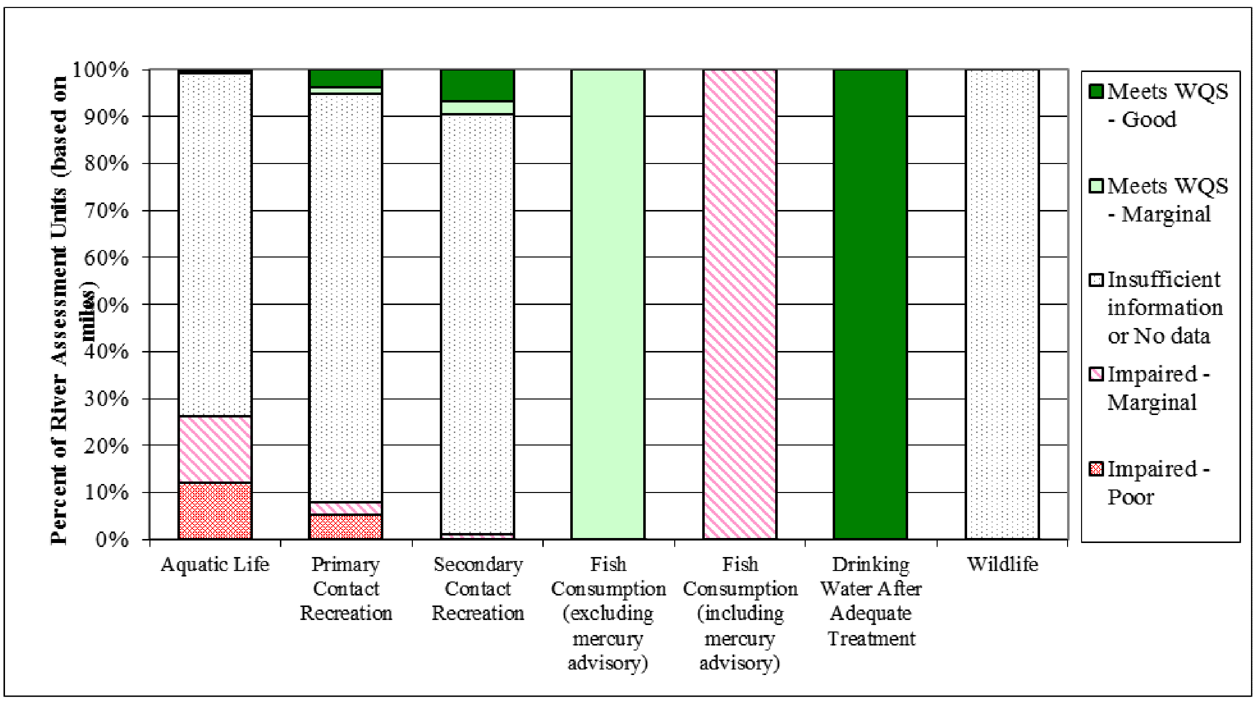


Figure 28: Rivers and Streams: Individual Use Support of Assessed Waters



D.3.8.2 Rivers and Streams: Causes and Sources of Impairment

Table 31 shows the total miles of rivers and streams impaired or threatened by various pollutants and nonpollutants (i.e. causes of impairment).

Table 31: Rivers and Streams: Causes of Threatened or Impairment Status

Rank	Impairment	Total Size (Acres)	Number of AUs
1	Mercury	16,961.8	5924
2	pH	3,820.6	835
3	Escherichia coli	1,306.2	270
4	Oxygen, Dissolved	687.8	119
5	Aluminum	562.5	79
6	Dissolved oxygen saturation	511.2	90
7	Benthic-Macroinvertebrate Bioassessments (Streams)	422.8	59
8	Fishes Bioassessments (Streams)	222.1	20
9	Lead	188.3	26
10	Chloride	103.5	39
11	Invasive Aquatic Algae	98.9	8
12	Habitat Assessment (Streams)	94.1	18
13	Iron	74.2	19
14	Other flow regime alterations	52.8	9
15	Non-Native Aquatic Plants	38.3	9
16	Physical substrate habitat alterations	33.7	3
17	Copper	23.0	5
18	Dioxin (including 2,3,7,8-TCDD)	17.2	10
19	Chlorophyll-a	14.7	2
20	BOD, Biochemical oxygen demand	10.3	4
21	Zinc	9.1	4
22	Foam/Flocs/Scum/Oil Slicks	8.9	2
23	Ammonia (Total)	8.7	2
24	Ammonia (Un-ionized)	7.1	1
25	Cadmium	6.8	2
26	Taste and Odor	6.4	1
27	Low flow alterations	5.7	1
28	Creosote	3.7	1
29	Manganese	3.6	4
30	Phosphorus (Total)	2.3	2
31	Total Suspended Solids (TSS)	2.3	1
32	Arsenic	1.4	2
33	Chromium (total)	1.3	1
34	Sedimentation/Siltation	0.6	2
35	DDD	0.5	1
36	Turbidity	0.5	1
37	Benzo(a)pyrene (PAHs)	0.2	1

Table 32 shows the total miles of rivers and streams impaired or threatened by various sources of impairment.

Table 32: Rivers and Streams: Sources of Threatened or Impairment Status

Rank	Source	Total Size (Acres)	Number of AUs

Rank	Source	Total Size (Acres)	Number of AUs
1	Atmospheric Deposition - Toxics	16,961.8	5924
2	Source Unknown	4,626.2	992
3	Municipal (Urbanized High Density Area)	73.5	18
4	Combined Sewer Overflows	58.8	16
5	Highway/Road/Bridge Runoff (Non-construction Related)	57.9	16
6	Commercial Districts (Shopping/Office Complexes)	56.9	14
7	Illicit Connections/Hook-ups to Storm Sewers	48.1	11
8	Streambank Modifications/destabilization	36.3	4
9	Industrial Point Source Discharge	35.5	19
10	Landfills	29.5	10
11	Unspecified Urban Stormwater	29.1	2
12	Impervious Surface/Parking Lot Runoff	28.7	6
13	Municipal Point Source Discharges	26.0	10
14	Freshets or Major Flooding	23.7	4
15	Contaminated Groundwater	14.9	2
16	Channelization	12.2	2
17	Inappropriate Waste Disposal	11.2	1
18	Impacts from Hydrostructure Flow Regulation/modification	7.5	3
19	Manure Runoff	7.5	3
20	Industrial/Commercial Site Stormwater Discharge (Permitted)	7.1	2
21	Airports	7.1	2
22	Acid Mine Drainage	6.7	1
23	Flow Alterations from Water Diversions	5.7	1
24	Sand/gravel/rock Mining or Quarries	3.9	1
25	RCRA Hazardous Waste Sites	3.7	1
26	Unpermitted Discharge (Industrial/commercial Wastes)	2.8	2
27	Unpermitted Discharge (Domestic Wastes)	2.5	1
28	Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)	2.1	2
29	Habitat Modification - other than Hydromodification	1.3	1
30	Highways, Roads, Bridges, Infrastructure (New Construction)	0.5	1
31	Petroleum/natural Gas Activities	0.2	1
32	Animal Feeding Operations (NPS)	0.1	1
33	Pollutants from Public Bathing Areas	0.01	1

D.3.9 WETLANDS

As previously reported, DES added wetlands to the Assessment Database in 2008. For 2010 the wetland complexes were rebuilt to correspond to the wetland complex methodology of the New Hampshire Method (Stone and Mitchell, 2011) In all, 52,313 wetland assessment units covering 286,696 acres were added. This does not include wetlands in open water to avoid overlap with existing AUs in other waterbody types. Although none of the wetlands were assessed as fully supporting or not supporting this cycle, this represents a significant first step to ultimately being able to assess and report on wetland water quality.

In 2010 the DES Watershed Management Bureau and Wetlands Bureau worked with University of New Hampshire (UNH) Cooperative Extension to construct wetland complexes from the individual NWI wetland polygons in accordance with the 2011 "The Method for Inventorying and Evaluating Freshwater Wetlands in New Hampshire" (i.e., the NH Method, see http://nhmethod.org/index.htm). These new complexes were given assessment unit IDs to replace those built in 2008. The new base layer was built to be the foundation of a comprehensive wetlands catalog for the state and to act as a starting point for anyone applying the NH Method. While the NH Method applies to freshwater wetlands, the wetland complex creation methodology was applied to both fresh and marine wetlands independent of one another. (http://www.granit.unh.edu/data/datacat/pages/nhwetlandsbase.pdf and ftp://ftp.granit.sr.unh.edu/pub/GRANIT_Data/Vector_Data/Inland_Water_Resources/d-wetland/d-nhwetlandsbase)

The landscape level wetland assessment is based upon the aquatic life designated use and is intended to identify those wetlands that are likely or unlikely to provide suitable conditions for supporting a balanced, integrated and adaptive community of aquatic flora and fauna. Due to the inherent roughness of a landscape level analysis and that no in-wetland measurements were conducted no definitive support categories were made. Based upon the results of the analysis the use support category “insufficient information - potentially supporting” or “insufficient information - potentially not supporting” were assigned to each assessment unit.

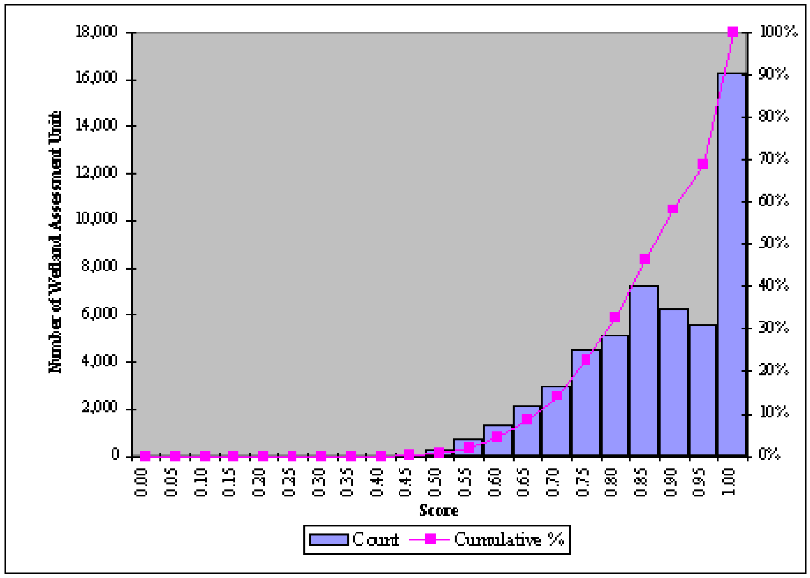
The second version of the Landscape Level Wetlands Assessment (i.e., Level 1) integrated some of the strategies developed by VHB in 2009 and the new assessment unit complexes built from the NWI based on the 2011 NH Method. By applying GIS modeling to 12 of the questions within the NH Method that best relate to the aquatic life designated use, this multi-metric approach provides a more robust Level 1 assessment of the aquatic life designated use. As DES gains experience with this Level 1 assessment it's possible that further adjustments will be made to the scoring system.

Figure 29 shows the distribution of the resulting scores from the Level 1 assessment. No wetlands were assessed as fully support or not supporting. A total of 28,128 (58%) wetland assessment units were assessed to score 90% or better or what may be considered as insufficient information - potentially supporting . The methodology used to create the wetland assessment units and conduct the Level 1 assessment are detailed in **Appendix 38: Level 1 Landscape Level Wetlands Assessment**. The Level 1 assessment is a huge first step towards ultimately being able to develop criteria and a methodology for definitively assessing wetlands as fully supporting or not supporting.

Figure 29: Distribution of Level 1 Wetland Assessment Scores**.**

ALL QUESTIONS AVERAGED

Score	Count	Cumulative %
0.00	0	0.00%
0.05	0	0.00%
0.10	0	0.00%
0.15	0	0.00%
0.20	0	0.00%
0.25	0	0.00%
0.30	0	0.00%
0.35	0	0.00%
0.40	12	0.02%
0.45	47	0.11%
0.50	260	0.61%
0.55	699	1.94%
0.60	1,334	4.49%
0.65	2,140	8.57%
0.70	2,929	14.16%
0.75	4,568	22.87%
0.80	5,110	32.62%
0.85	7,199	46.35%
0.90	6,224	58.22%
0.95	5,599	68.90%
1.00	16,305	100.00%



D.4 PROBABILISTIC ASSESSMENT SUMMARIES

D.4.1 OVERVIEW

One of the goals of Section 305(b) of the CWA is to assess the water quality status of all surface waters. To assess a large population such as surface waters, there are two generally accepted data collection schemes. The first is a census, which requires examination of every unit in the population (i.e., site specific assessments or SSA). This, however, is usually very expensive and often impractical. The assessment results presented in section D.3 are based on SSAs.

A more practical and economic approach is to conduct a sample survey which involves sampling a portion of the population through probability (or random) sampling. Random sampling ensures that no particular portion of the population being sampled is favored (or biased) over another. Results of sample surveys can be used to make statistically based inferences (i.e., probabilistic assessments) about the condition of the population as a whole. For example, if a sample survey was conducted on lakes and 30% of the random samples indicated aquatic life use impairment, it could be stated that 30% of the all lakes were impaired for aquatic life. Another benefit of sample surveys is that statistical analyses can then be conducted to determine the margin of error or confidence limits in the assessment.

Probabilistic assessments are most useful for Section 305(b) reporting purposes because they can provide a general overall idea of the condition of an entire waterbody type (i.e., all rivers or lakes) which might otherwise be impossible to do using the census approach. General rules for conducting and using probabilistic assessments for surface water quality assessments in New Hampshire, include the following.

- Probability assessments shall be conducted in accordance with accepted statistical practices.
- Sampling shall be based on a random sampling design.
- Sample surveys should be designed to produce an estimate of the percent of the resource (e.g., all lakes) in any use support category (e.g., fully supporting, not supporting, etc.) that are no more than +/- 20% at the 95% confidence limits.
- Criteria for determining use support shall be in accordance with the Consolidated Assessment and Listing Methodology with the exception of the minimum number of samples required. That is, when conducting probabilistic assessments, each random sample can, by itself, be used to make a discrete use support decision.
- The percentage of discrete random samples meeting each use support category can be used as an estimate of the percentage of the resource meeting each use support category. For example, if 20% of the discrete random samples taken in lakes indicate full support of aquatic life, then it can be reported that 20% of the lakes fully support aquatic life.

Probabilistic assessment results have no bearing on the Section 303(d) List other than the fact that samples collected for the probabilistic assessment can be combined with other samples within an assessment unit (AU) and assessed in accordance with the Consolidated Assessment and Listing Methodology (including the minimum sample size) to determine if the assessment unit should be included on the Section 303(d) List.

D.4.2 OVERALL PROBABILISTIC USE SUPPORT SUMMARY

New Hampshire conducted its first probabilistic assessment (PA) in 2004 for the uses of Aquatic Life and Primary and Secondary Contact Recreation in estuaries. Results and details of that assessment may be found in DES, 2004. Probabilistic assessments for Aquatic Life and Primary and Secondary Contact Recreation were once again conducted for the estuaries for the 2010 assessment cycle (Appendix 23). Wadeable streams (4th order or less) were assessed for the 2006 cycle (Appendix 24) and Lakes (>10 acres) were assessed for the first time for the 2010 assessment cycle(Appendix 25). PA results for estuaries are presented in Table 33, Figure 30, and Figure 31. PA summaries for wadeable rivers / streams are presented in Table 34, Figure 32, and Figure 33. PA summaries for lakes over 10 acres are presented in Table 35, Figure 34, and Figure 35. Further information and statistics regarding these probabilistic assessments may be found in Appendix 23, Appendix 24 and Appendix 25 for estuaries, river/streams, and lakes respectively. Figure 30, Figure 32, and Figure 34 compare the percent of waters assessed using site specific and probabilistic assessment methods. Before proceeding, it should be noted that while similar, the methodologies for assessments by the site specific approach and probabilistic approach is fundamentally different in terms of the data required to make support and non-support determinations. For example, under the probabilistic approach, a single dissolved oxygen grab sample can add to the total area of waters in full support or non-support. Under the site specific approach, a minimum of ten samples with no more than one sample showing an exceedance would be required to make a full support determination and at least two exceedences are needed for to assess a water as not supporting. Additionally, comparisons for rivers and streams are approximate as the two assessment methods are based on slightly different populations. That is, the percent assessed for the SSA is based on all rivers and streams at 1:24,000 mapping (16,961.8 miles) whereas the percent assessed for the PA is based on rivers and streams of 4th order or less from the 1:100,000 mapping (9050 miles or 94% of the rivers at 1:100,000 mapping). Though different scales of mapping, the 94% of the total miles of river/stream as 4th order or less is reasonable consistent between the 1:24,000 and 1:100,000 mapping. Similarly, comparisons for lake are approximate as the two assessment methods are based on different methods of quantification. That is, the percent assessed for the SSA is based on all lakes (162,742.9 acres) whereas the percent assessed for the PA is based on a count of the lakes greater than 10 acres (n=1,004). Though different, the 1,004 lakes greater than 10 acres make up the majority of lake area in the state. Consequently, direct comparison of the two methods provides a reasonable estimate of the differences between the two assessment methods even though the populations are a little different.

As expected, Figure 30, Figure 32, and Figure 34 show that a higher percentage of surface waters can be reported as assessed using PAs as compared to SSAs. For example, Figure 30 indicates that approximately 92.7% of the estuaries were assessed for Aquatic Life as compared to 92.8% using site specific assessments. Figure 34 indicates that approximately 100% of the lakes were probabilistically assessed for Aquatic Life as compared to 84.8% using site specific assessments The difference is even more pronounced for the rivers/streams where approximately 52.2% are reported as assessed for Aquatic Life using PA compared to only 26.8% for the SSA method.

Comparisons of use support using the two methods are provided in Figure 31, Figure 33, and Figure 35 for estuaries, rivers/streams, and lakes respectively. For the assessed uses, both figures show that PAs generally result in a higher percentage of waters that are fully supporting as compared to SSAs. This is not surprising as SSAs are usually based on water samples taken at locations and times when water quality violations are most likely to occur. Consequently SSAs are often biased towards impaired waters. By definition, PAs must be based on random samples and therefore samples are not necessarily collected under critical conditions. This removes some of the bias associated with SSAs but does not guarantee that a certain percentage of waters will meet water quality standards under the critical conditions. As a result PAs may provide a more accurate representation of the overall quality of the surface waters than SSAs (assuming there are insufficient resources to sample every surface water). For estuaries the most pronounced difference is for primary contact where approximately 23.3 and 91.4% of the assessed surface waters are fully supporting based on SSA and PA methods respectively. For rivers/streams the largest difference also occurs for aquatic life with approximately 2.9 and 72.5% reported as fully supporting based on SSA and PA respectively. For lakes the largest difference occurs for primary contact with approximately 37.8 and 95.3% reported as fully supporting based on SSA and PA respectively.

PAs are based on statistical principles; as such, an estimate of error can be computed. The error associated with the estuary, river/ stream, and lake PAs is estimated to be less than approximately 11, 13, and 6% respectively (see Appendix 23, Appendix 24, and Appendix 25). Even with the error, the PAs still suggest that a higher percentage of waters are fully supporting, as compared to SSA results, for most of the uses that were assessed.

Table 33: Estuaries: Comparison of Individual Use Support based on Site Specific (SSA) and Probabilistic Assessments (PA)

Designated Use	Total in State	Total Assessed	Fully Supporting (FS) = Attaining WQ Standards			Not Supporting (NS) = Not Attaining WQ Standards = Impaired			Threatened	Insufficient Data and Information
			FS - Good	FS - Marginal	FS - Total	NS - Marginal	NS - Poor	NS - Total		
Aquatic Life (SSA)										
Square Miles	18.0	16.7	0.1	0.0	0.2	0.8	15.7	16.5	6.3	1.3
% of Total	100.0%	92.8%	0.7%	0.2%	0.8%	4.4%	87.5%	91.9%	35.0%	7.2%
% of Assessed		100.0%	0.7%	0.2%	0.9%	4.8%	94.3%	99.1%	37.7%	
Aquatic Life (PA)										
Square Miles	18.0	16.7	3.9	0.0	3.9	12.8	0.0	12.8	0.0	1.3
% of Total	100.0%	92.7%	21.4%	0.0%	21.4%	71.3%	0.0%	71.3%	0.0%	7.3%
% of Assessed		100.0%	23.1%	0.0%	23.1%	76.9%	0.0%	76.9%	0.0%	
Primary Contact Recreation (SSA)										
Square Miles	18.0	15.3	1.8	1.8	3.6	6.1	5.6	11.7	0.0	2.7
% of Total	100.0%	85.0%	10.0%	9.8%	19.8%	34.1%	31.1%	65.2%	0.0%	15.0%
% of Assessed		100.0%	11.8%	11.6%	23.3%	40.1%	36.6%	76.7%	0.0%	
Primary Contact Recreation (PA)										
Square Miles	18.0	16.1	14.8	0.0	14.8	1.4	0.0	1.4	0.0	1.8
% of Total	100.0%	89.8%	82.1%	0.0%	82.1%	7.7%	0.0%	7.7%	0.0%	10.2%
% of Assessed		100.0%	91.4%	0.0%	91.4%	8.6%	0.0%	8.6%	0.0%	
Secondary Contact Recreation (SSA)										
Square Miles	18.0	15.8	11.5	0.0	11.5	4.0	0.3	4.3	0.0	2.2
% of Total	100.0%	87.6%	63.9%	0.0%	63.9%	22.0%	1.7%	23.7%	0.0%	12.4%
% of Assessed		100.0%	72.9%	0.0%	72.9%	25.1%	2.0%	27.1%	0.0%	
Secondary Contact Recreation (PA)										
Square Miles	18.0	16.6	16.6	0.0	16.6	0.0	0.0	0.0	0.0	1.4
% of Total	100.0%	92.3%	92.3%	0.0%	92.3%	0.0%	0.0%	0.0%	0.0%	7.7%
% of Assessed		100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	

Figure 30: Estuaries: Percent Assessed using Site Specific and Probabilistic Assessments

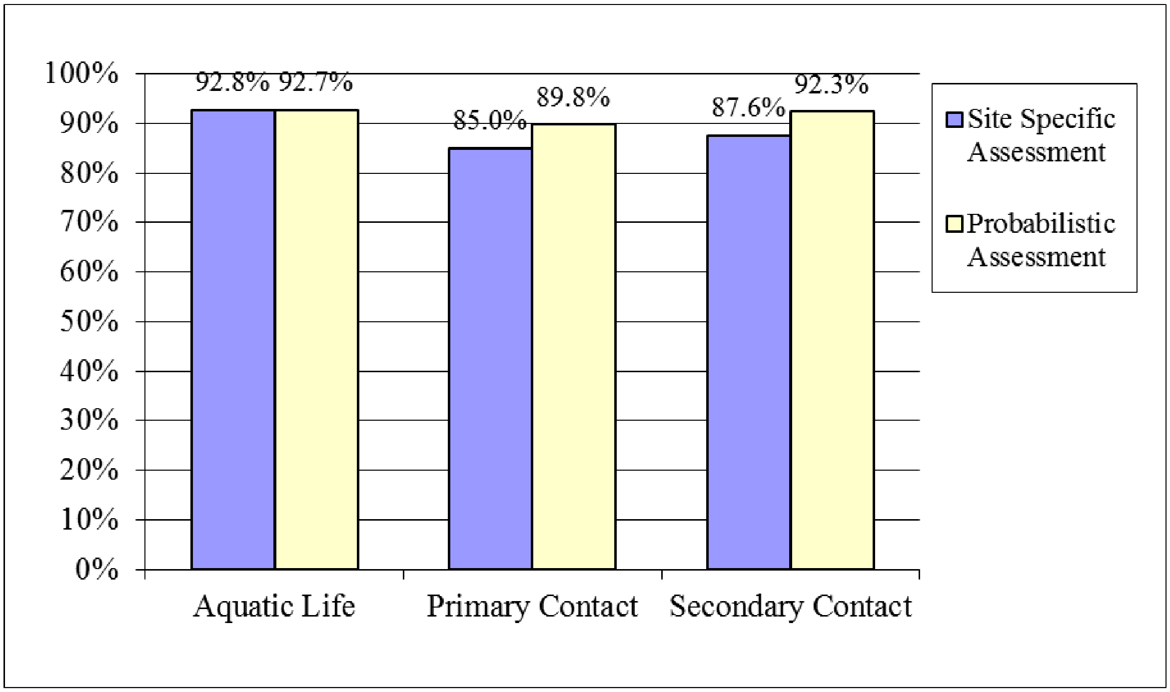


Figure 31: Estuaries: Comparison of Site Specific (SSA) to Probabilistic Assessments (PA) based on Percent Assessed

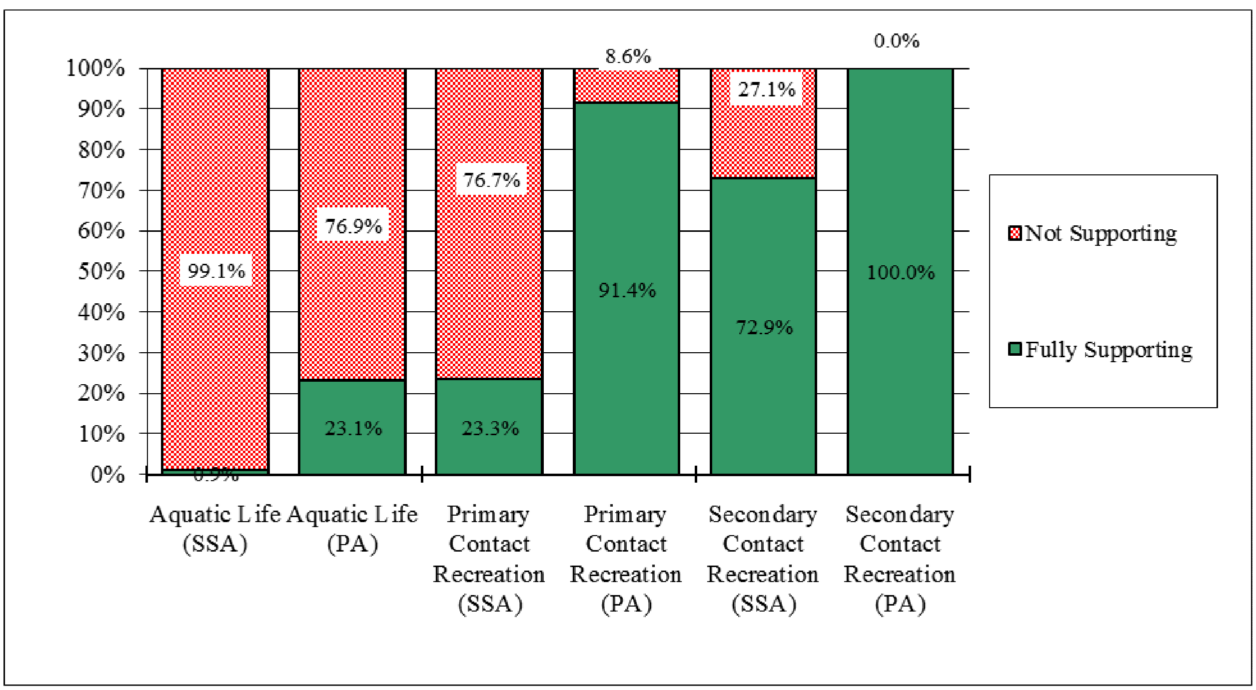
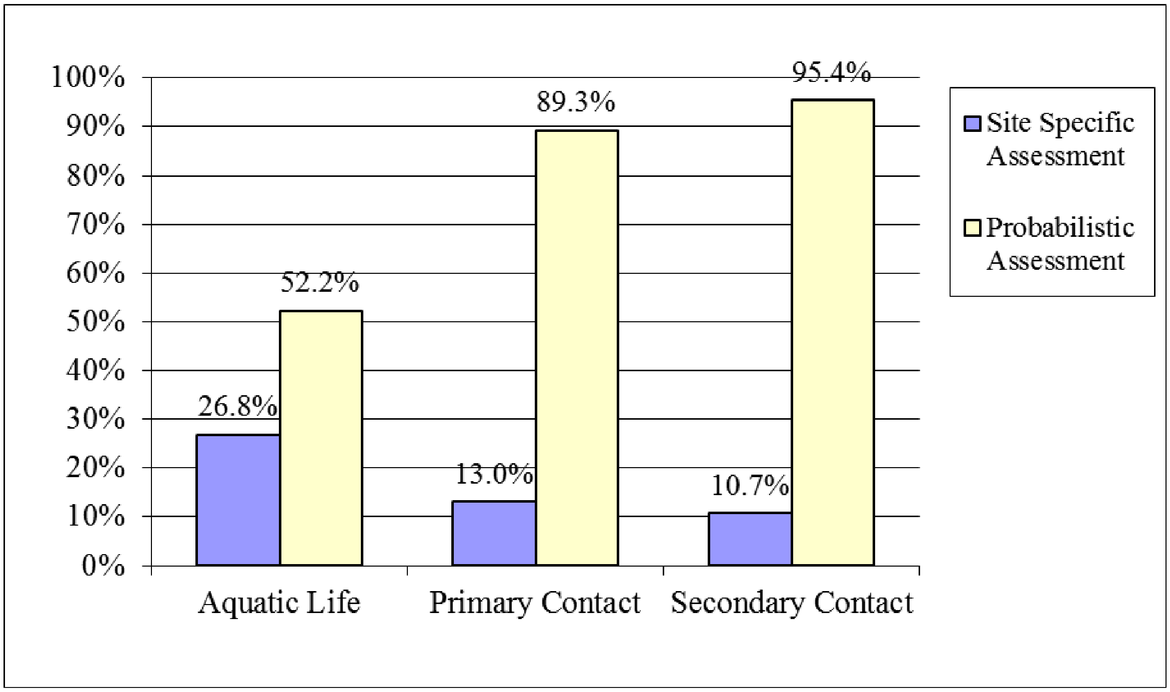


Table 34: Rivers / Streams: Comparison of Individual Use Support based on Site Specific (SSA) and Probabilistic Assessments (PA)

Designated Use	Total in State	Total Assessed	Fully Supporting (FS) = Attaining WQ Standards			Not Supporting (NS) = Not Attaining WQ Standards = Impaired			Threatened	Insufficient Data and Information
			FS - Good	FS - Marginal	FS - Total	NS - Marginal	NS - Poor	NS - Total		
Aquatic Life (SSA)										
Miles	16,961.8	4,542.3	78.5	51.0	129.5	2,374.1	2,038.6	4,412.8	6.3	12,419.5
% of Total	100.0%	26.8%	0.5%	0.3%	0.8%	14.0%	12.0%	26.0%	0.0%	73.2%
% of Assessed		100.0%	1.7%	1.1%	2.9%	52.3%	44.9%	97.1%	0.1%	
Aquatic Life (PA)										
Miles	9,050.0	4,727.0	3,429.0	0.0	3,429.0	1,298.0	0.0	1,298.0	0.0	4,323.0
% of Total	100.0%	52.2%	37.9%	0.0%	37.9%	14.3%	0.0%	14.3%	0.0%	47.8%
% of Assessed		100.0%	72.5%	0.0%	72.5%	27.5%	0.0%	27.5%	0.0%	
Primary Contact Recreation (SSA)										
Miles	16,961.8	2,208.8	635.9	250.6	886.5	440.5	881.7	1,322.2	0.0	14,753.0
% of Total	100.0%	13.0%	3.7%	1.5%	5.2%	2.6%	5.2%	7.8%	0.0%	87.0%
% of Assessed		100.0%	28.8%	11.3%	40.1%	19.9%	39.9%	59.9%	0.0%	
Primary Contact Recreation (PA)										
Miles	9,050.0	8,083.0	7,527.0	0.0	7,527.0	556.0	0.0	556.0	0.0	967.0
% of Total	100.0%	89.3%	83.2%	0.0%	83.2%	6.1%	0.0%	6.1%	0.0%	10.7%
% of Assessed		100.0%	93.1%	0.0%	93.1%	6.9%	0.0%	6.9%	0.0%	
Secondary Contact Recreation (SSA)										
Miles	16,961.8	1,806.9	1,177.1	431.5	1,608.7	112.4	85.8	198.2	0.0	15,154.9
% of Total	100.0%	10.7%	6.9%	2.5%	9.5%	0.7%	0.5%	1.2%	0.0%	89.3%
% of Assessed		100.0%	65.1%	23.9%	89.0%	6.2%	4.7%	11.0%	0.0%	
Secondary Contact Recreation (PA)										
Miles	9,050.0	8,637.0	8,637.0	0.0	8,637.0	0.0	0.0	0.0	0.0	413.0
% of Total	100.0%	95.4%	95.4%	0.0%	95.4%	0.0%	0.0%	0.0%	0.0%	4.6%
% of Assessed		100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	

Note: Site Specific Assessment (SSA) values are based on all rivers and streams at 1:24,000 mapping (16.896 total miles). Probabilistic Assessment (PA) values are based on rivers / streams that are 4th order or less (9,050 total miles). Though different scales of mapping, the 94% of the total miles of river/stream as 4th order or less is reasonable consistent between the 1:24,000 and 1:100,000 mapping.

Figure 32: Rivers / Streams: Percent Assessed using Site Specific and Probabilistic Assessments



Note: Site Specific Assessment (SSA) values are based on all rivers and streams at 1:24,000 mapping (16.896 total miles). Probabilistic Assessment (PA) values are based on rivers / streams that are 4th order or less (9,050 total miles). Though different scales of mapping, the 94% of the total miles of river/stream as 4th order or less is reasonable consistent between the 1:24,000 and 1:100,000 mapping.

Figure 33: Rivers / Streams: Comparison of Site Specific (SSA) to Probabilistic Assessments (PA) based on Percent Assessed

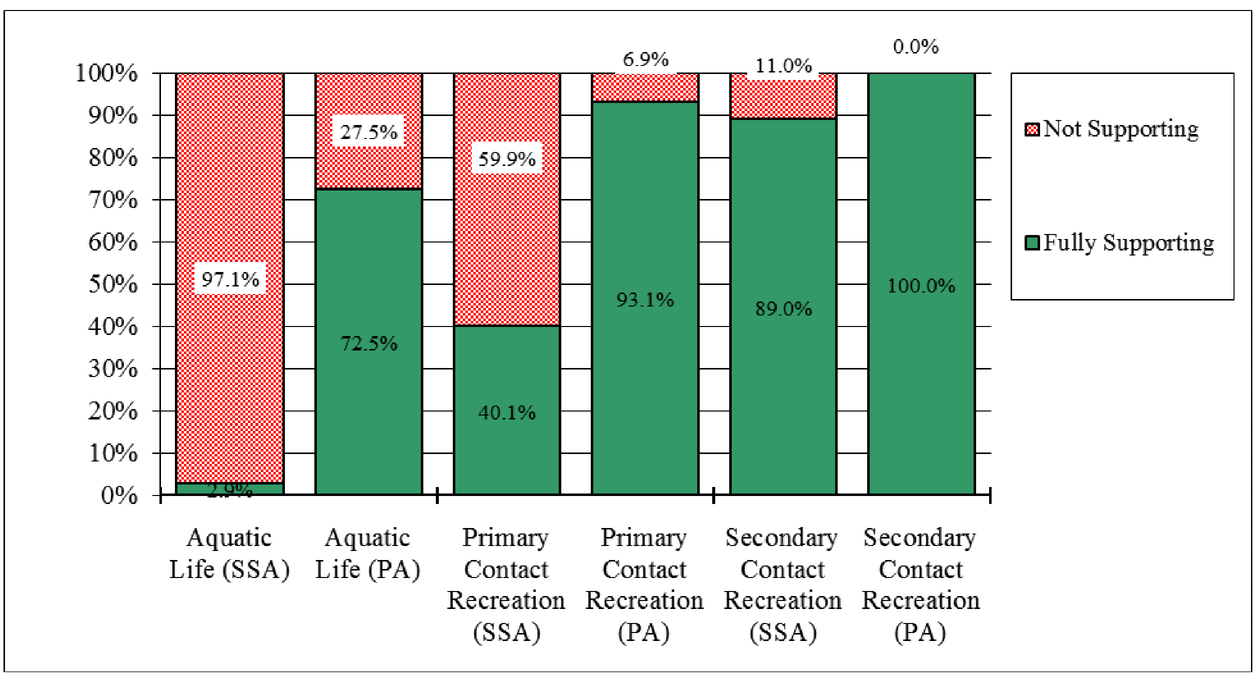
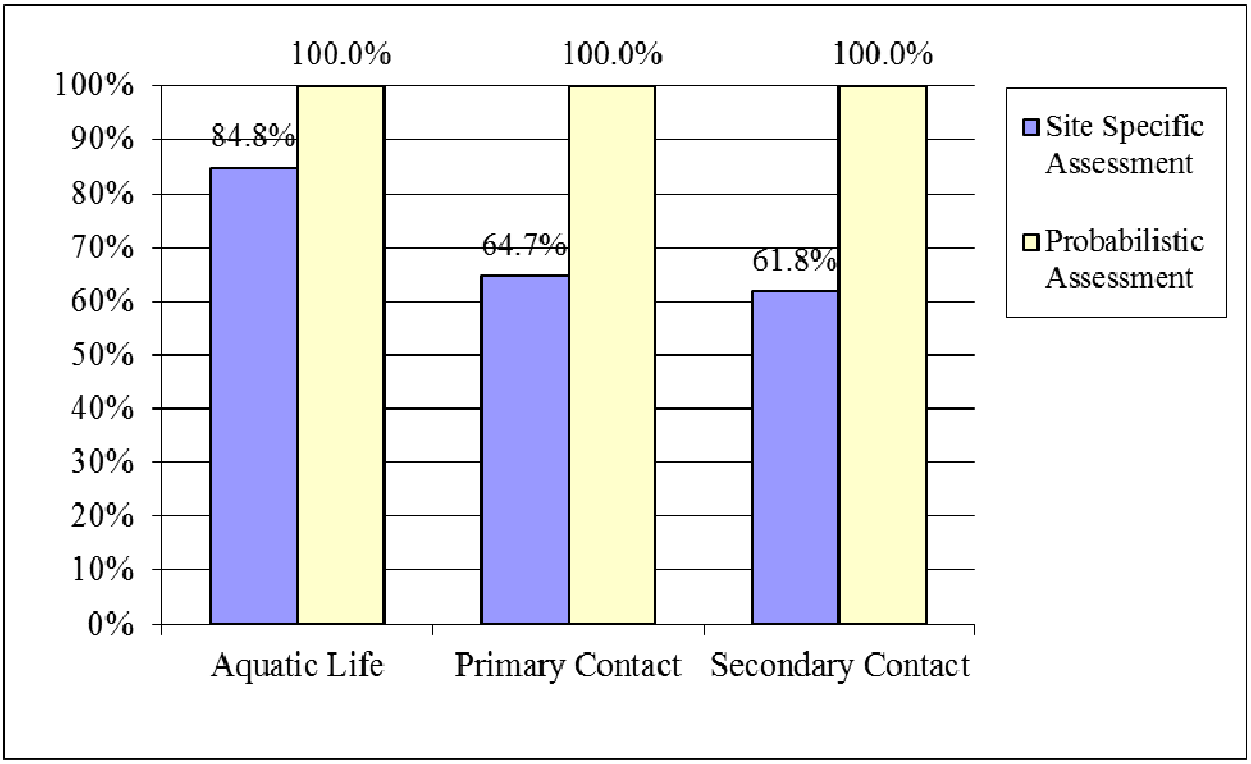


Table 35: Lakes: Comparison of Individual Use Support based on Site Specific (SSA) and Probabilistic Assessments (PA)

Designated Use	Total in State	Total Assessed	Fully Supporting (FS) = Attaining WQ Standards			Not Supporting (NS) = Not Attaining WQ Standards = Impaired			Threatened	Insufficient Data and Information
			FS - Good	FS - Marginal	FS - Total	NS - Marginal	NS - Poor	NS - Total		
Aquatic Life (SSA)										
Acres	162,742.9	137,963.0	0.0	0.0	0.0	102,709.9	35,253.0	137,963.0	7.9	24,779.9
% of Total	100.0%	84.8%	0.0%	0.0%	0.0%	63.1%	21.7%	84.8%	0.0%	15.2%
% of Assessed		100.0%	0.0%	0.0%	0.0%	74.4%	25.6%	100.0%	0.0%	
Aquatic Life (PA)										
Number of Lakes > 10 Acres	1,004	1,004	38	0	38	966	0	966		0
% of Total	100.0%	100.0%	3.8%	0.0%	3.8%	96.2%	0.0%	96.2%	0.0%	0.0%
% of Assessed		100.0%	3.8%	0.0%	3.8%	96.2%	0.0%	96.2%	0.0%	
Primary Contact Recreation (SSA)										
Acres	162,742.9	105,302.8	21,219.6	18,541.8	39,761.3	63,638.5	1,903.0	65,541.5	0.0	57,440.1
% of Total	100.0%	64.7%	13.0%	11.4%	24.4%	39.1%	1.2%	40.3%	0.0%	35.3%
% of Assessed		100.0%	20.2%	17.6%	37.8%	60.4%	1.8%	62.2%	0.0%	
Primary Contact Recreation (PA)										
Number of Lakes > 10 Acres	1,004	1,004	957	0	957	47	0	47		0
% of Total	100.0%	100.0%	95.3%	0.0%	95.3%	4.7%	0.0%	4.7%	0.0%	0.0%
% of Assessed		100.0%	95.3%	0.0%	95.3%	4.7%	0.0%	4.7%	0.0%	
Secondary Contact Recreation (SSA)										
Acres	162,742.9	100,619.0	83,948.6	15,656.1	99,604.7	1,014.3	0.0	1,014.3	0.0	62,123.9
% of Total	100.0%	61.8%	51.6%	9.6%	61.2%	0.6%	0.0%	0.6%	0.0%	38.2%
% of Assessed		100.0%	83.4%	15.6%	99.0%	1.0%	0.0%	1.0%	0.0%	
Secondary Contact Recreation (PA)										
Number of Lakes > 10 Acres	1,004	1,004	1,004	0	1,004	0	0	0		0
% of Total	100.0%	100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% of Assessed		100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	

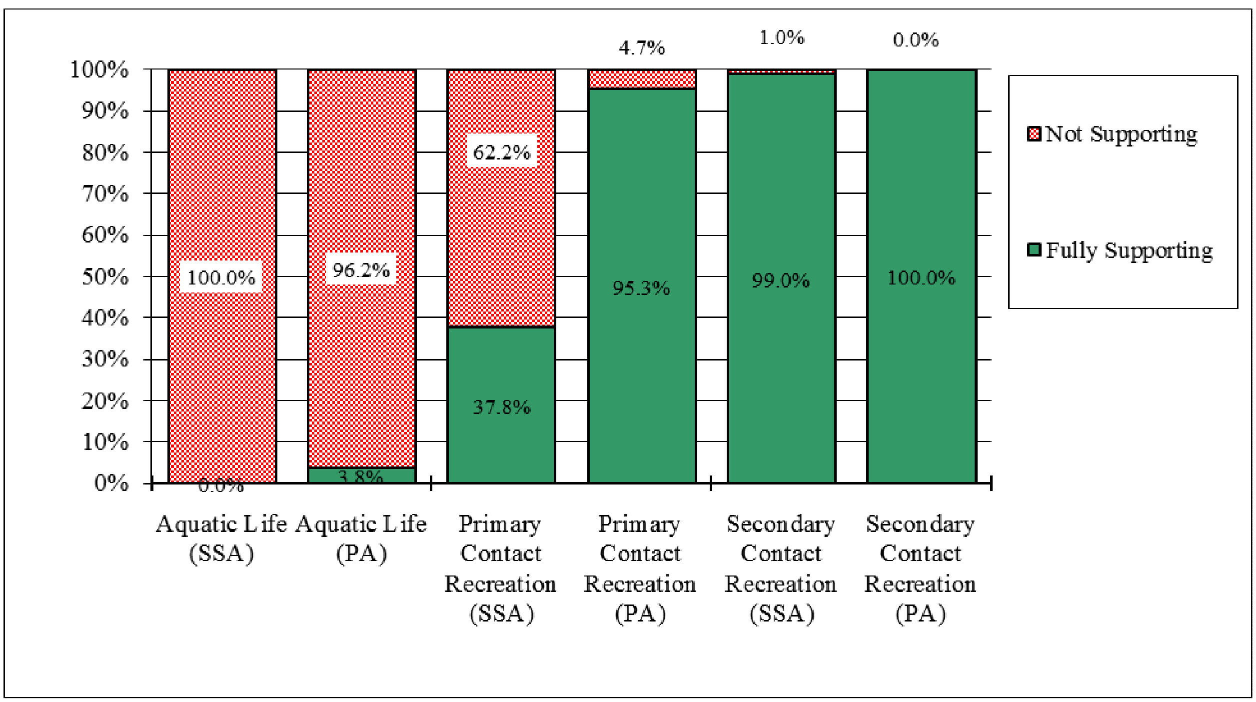
Note: Site Specific Assessment (SSA) values are based on the acres of all lakes (162,783.5 total acres). Probabilistic Assessment (PA) values are based on the number of lakes > 10 acres in size (n = 1,004).

Figure 34: Lakes: Percent Assessed using Site Specific and Probabilistic Assessments



Note: Site Specific Assessment (SSA) values are based on the acres of all lakes (162,783.5 total acres). Probabilistic Assessment (PA) values are based on the number of lakes > 10 acres in size (n = 1,004).

Figure 35: Lakes: Comparison of Site Specific (SSA) to Probabilistic Assessments (PA) based on Percent Assessed



Note: Site Specific Assessment (SSA) values are based on the acres of all lakes (162,783.5 total acres). Probabilistic Assessment (PA) values are based on the number of lakes > 10 acres in size (n = 1,004).

D.5 TREND ANALYSES FOR SURFACE WATERS

A summary of trend analysis studies completed by DES for estuaries, lakes and rivers is provided in the following sections. A copy of the studies are provided in Appendix 25: Probabilistic Assessment Details for Lakes

Appendix 26unless they are available on the Internet, in which case a website is provided.

D.5.1 TRENDS IN ESTUARIES

Every three years, the Piscataqua Region Estuaries Partnership (PREP) publishes a State of the Estuaries report that communicates the status and trends of key environmental indicators for the Great Bay and Hampton-Seabrook estuaries and the Piscataqua Region watersheds. The 2009 report concludes that the environmental quality of the Piscataqua Region estuaries is declining. Eleven of 12 environmental indicators show negative or cautionary trends – up from seven indicators classified this way in 2006.

The most pressing threats to the estuaries relate to population growth and the associated increases in nutrient loads and non-point source pollution.

- Watershed-wide development has created new impervious surfaces at an average rate of nearly 1,500 acres per year. In 2005, there were 50,351 acres of impervious surfaces in the watershed, which is 7.5% of the watershed's land area. Nine of the 40 subwatersheds contained over 10% impervious cover, indicating the potential for degraded water quality and altered stormwater flow. Land consumption per person, a measure of sprawling growth patterns, continues to increase.
- The total nitrogen load to the Great Bay Estuary increased by 42% in the past five years. In Great Bay, the concentrations of dissolved inorganic nitrogen, a major component of total nitrogen, have increased by 44% in the past 28 years. The symptoms of eutrophication are evident in the decline of water clarity, eelgrass habitat loss, and failure to meet water quality standards for dissolved oxygen concentrations in tidal rivers.

The negative or cautionary trends for other indicators also are troubling.

- Oyster and clam populations have increased from historic lows a few years ago but remain depressed compared to historic abundance.
- Toxic contaminants affect nearly one-quarter of estuarine sediments, and concentrations of compounds associated with petroleum products are increasing in the tissues of shellfish from the Piscataqua River. However, concentrations of other toxic contaminants in shellfish tissue are declining.
- Migratory fish returns to the estuary are limited by factors including water quality, passage around dams, and flooding.
- Bacteria concentrations declined significantly in the 1990s but have more recently leveled off, and water quality standards for swimming and shellfishing are not being met in all areas.

To counteract these trends, PREP and others have worked to conserve land, restore habitats, and eliminate pollution sources in the coastal watershed. Considerable progress has been made toward PREP's land conservation goal of protecting 15% of the watershed area by 2010 and salt marsh restoration goal of 300 acres. By the end of 2008, 76,269 acres (11.3% of the watershed) were permanently protected from development and 280 acres of salt marsh were restored in New Hampshire. However, despite significant efforts, restoration goals for submerged habitats (oyster reefs and eelgrass) are far below target levels.

The 2009 State of the Estuaries report (PREP, 2009) is available at http://www.prep.unh.edu/resources/soe_report.htm.

D.5.2 TRENDS IN LAKES

Acid rain related trends and trophic trends for lakes and ponds are presented in section D.3.6.3. In addition DES has completed three other reports related to trend analysis in lakes (all within Appendix 26: Trend Reports for Lakes and Rivers) the primary purpose of the reports was to evaluate the statistical power for trend detection with the existing sampling design. In some of the reports, the trends in water sampling data were evaluated to confirm the power analysis results. The main conclusions and recommendations from these reports are listed below.

Power Analysis for the Acid Lake Outlet Monitoring Program (7/17/03)

- Using the existing sampling scheme of collecting two samples each year, pH, conductivity, calcium, and sulfate have sufficient power to detect "important trends" with 10 years of data.
- Lakes that are sampled once per year will have sufficient power to detect "important trends" after 20 years.
- None of the parameters have sufficient power to detect trends after 5 years.
- Increasing the sample size to three samples per year does not add enough statistical power to justify the additional laboratory and personnel costs.
- Trend analysis on the 20 year datasets for 20 lakes identified significant trends for all parameters. In general:
    - Most lakes do not have a significant trend for pH, but the majority of those that do have increasing trends.
    - Alkalinity is increasing in most lakes and decreasing only in Granite Lake.
    - An equal number of lakes have increasing and decreasing trends for conductivity. Several lakes have strongly increasing trends.
    - Most lakes do not have a significant trend for calcium, but the majority of those that do have increasing trends.
    - Almost all of the lakes have decreasing trends for sulfate, but sulfate is increasing in Granite Lake.

Power Analysis for the Volunteer Lake Assessment Program (6/30/04)

- The current sampling design is only capable of detecting trends of chlorophyll-a and phosphorus if the concentrations have doubled over a decade. Monitoring

- these parameters five times per year instead of three would allow for managers to detect trends on the order of 50% increase over ten years.
- Conversely, alkalinity, Secchi depth, pH, and specific conductivity could be monitored for trend detection as effectively with one sample per year instead of three per year. However, multiple samples per year may be needed for these parameters for 305(b) assessment purposes or lake studies.

Power Analysis for the Fish Mercury Trend Monitoring Program (7/29/03)

- After the next five years of sampling, it will be possible to test for changes over time at the individual lakes. The experimental design has sufficient power to detect changes as small as 10% change over 5 years.

D.5.3 TRENDS IN RIVERS AND STREAMS

DES has completed two reports related to trend analysis in rivers (both within Appendix 26: Trend Reports for Lakes and Rivers) The primary purpose of the reports was to evaluate the statistical power for trend detection with the existing sampling design. In some of the reports, the trends in water sampling data were evaluated to confirm the power analysis results. The main conclusions and recommendations from these reports are listed below.

Power Analysis for the Ambient Rivers Monitoring Program (6/30/03)

- The ARMP should consider recording flow at the time of each sample collected. Flow has been shown by the USGS to be a significant covariate for concentration in river samples. If the variability caused by changes in flow were removed, the ARMP monitoring would have more power to detect trends.
- Using the existing sampling scheme of collecting three samples each summer season, only dissolved oxygen, hardness, temperature, total solids, and turbidity have sufficient power to detect the "important trend" with 10 years of data. None of the parameters have sufficient power to detect trends over 5 years with the existing sampling scheme.
- If it is important to be able to detect trends after 5 years, the existing sampling scheme will have to be changed to monthly sampling throughout the year. However, this sampling design will not provide sufficient power for trend detection in all the parameters. Monthly sampling throughout the year could also mask trends that only occur in the summer. For each parameter, the ARMP should decide whether summertime trends or year-round trends are the most important indicators of water quality.

Power Analysis for the Ambient Rivers Monitoring Program (8/4/04)

- There are statistically significant linear relationships between flow and 10 of the 20 ARMP parameters.
- For parameters that experience decreasing concentrations with increasing flow due to dilution, the variability in the concentrations can be reduced by approximately 45% if changes in stream flow are taken into account.
- The existing sampling design for ARMP (3 summer samples per year) has sufficient power for detecting important trends for five parameters using raw

concentrations. Using flow-adjusted concentrations, the program would have sufficient power for two more parameters (plus two others that are close). Therefore, on balance, stream flow coincident with ARMP trend station sampling should be measured or extrapolated from existing stream gages. The effort to gather these data for the 17 trend stations for 1990 to present is worth the effort because it will make it possible to detect trends for some of the parameters at these stations at least 5 years earlier than they would be otherwise.
- Alkalinity and hardness could be measured less frequently while still retaining sufficient power for trend detection. Only one sample per year is needed for these parameters so long as the concentrations are adjusted for flow. Hardness samples should be collected at the same frequency as metals samples. If metals are not being measured, there is no need to measure hardness.
- A longer list of metals should be monitored if low detection limits can be achieved through clean techniques. The current list of metals misses mercury which is a Gulf of Maine priority pollutant. The RCRA 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) would provide better coverage of the toxic metals. The increased cost of monitoring the additional metals could be offset by reducing the sampling frequency for metals to once per year. In addition, total organic carbon and important ions such as chlorides, calcium, magnesium, and sulfate should be considered for the ARMP in order to better understand the effects acid rain and roadway salt application.
- At station 01-SAC, the only trends that were apparent in the 1990-2003 dataset were increasing dissolved oxygen saturation, specific conductivity, and temperature, and decreasing turbidity and zinc. The trends were apparent in both the raw and flow-adjusted concentrations.

D.6 PUBLIC HEALTH ISSUES

D.6.1 WATERS AFFECTED BY DRINKING WATER RESTRICTIONS

In 2008, a boil order was issued in the town of Newport. The cause of the boil order was never confirmed, however, sampling error may have been a factor. No boil orders were issued in 2009. Boil orders are usually not issued because of deteriorating source water quality. Most, if not all, surface waters contain bacteria in concentrations that exceed the stringent Safe Drinking Water Act (SDWA) standards. Rather, inadequate disinfection of the source water or the distribution system due either to mechanical or operator failure or unique occurrences such as major flooding, are usually the reason why bacteria is occasionally detected and why boil orders have to be occasionally issued.

D.6.2 WATERS AFFECTED BY BATHING BEACH ADVISORIES

Each year, the DES Public Beach Inspection Program inspects approximately 155 freshwater and 17 tidal beaches for sanitary facilities, safety violations, and water quality. Two to three bacteria samples are collected from each beach to assess bacteria levels for public health. Freshwater beaches are monitored for cyanobacteria (also see section C.4.13) and samples collected when floating scums or colored waters are observed. Bacteria levels exceeding state standards are issued a beach advisory informing the public that the beach may not be safe for swimming due to elevated bacteria levels. The beach is re-sampled until bacteria counts meet acceptable state standards for designated beaches at which time the beach advisory is removed. A beach is closed only by the discretion of the owner.

Annual beach reports are available on the DES beach website at: http://des.nh.gov/organization/divisions/water/wmb/beaches/beach_reports/index.htm

In the 2004 Section 305(b)/303(d) Report, beaches were assessed for primary contact recreation based on the issuance of beach advisories. For the 2006 through 2012 cycles, beaches were assessed based on the exceedance of both the single sample maximum and geometric mean bacteria criteria. Freshwater beaches were also assessed based on the presence of a potentially toxic cyanobacteria scum.

DES considers cyanobacteria (formerly referred to as blue-green algae) a significant public health risk to people who recreate in infected waters. Animal mortality and disease likely increase with increased exposure and ingestion of highly concentrated cells. Dogs are especially at risk as they ingest high volumes of concentrated cells in the water.

Nutrient enriched waterbodies increase the potential for nuisance cyanobacteria scums that are potentially toxic to the aquatic ecology. Historically scums occurred in New Hampshire when treated sewage effluent was discharged to lakes (e.g., Winnisquam, Kezar, and Glen). Cyanobacteria begin their annual cycle by sediment derived nutrients before their rise to the surface for sunlight. When favorable growth conditions exist, cyanobacteria reproduction is rapid, forming surface scums that accumulate along downwind shores. Scums can be fatal to all animals that consume the water and can cause severe illness or skin rashes if ingested or contacted by humans.

To protect the public and environmental health, DES has taken a proactive approach by issuing advisories for designated public bathing beaches impacted by cyanobacteria and issuing press releases to warn shoreland owners that cyanobacteria scums are present around the waterbody. DES has also been active through public education of veterinarians, doctors, volunteer monitors and local lake associations. In 2009, DES hosted two workshops in Concord to share recent research and DES practices with beach managers, veterinarians, doctors, and other concerned citizens.

A new procedure was developed for the summer of 2008 to alert lake users of cyanobacteria blooms on lakes without designated beaches or for areas of a lake away from the designated beach. The DES began issuing lake specific cyanobacteria warnings if total cell concentration contained greater than 50% cyanobacteria or if the cyanobacteria cell count was over 70,000 cells/100mL. Fifteen cyanobacteria warnings were issued in 2008 and ten were issued in 2009 (**Error! Reference source not found.**). Only Lake Monomonac in Rindge had a warning in both 2008 & 2009.

Additional cyanobacteria resources are available at http://des.nh.gov/organization/divisions/water/wmb/beaches/cyano_bacteria.htm.

D.6.3 WATERS AFFECTED BY FISH / SHELLFISH ADVISORIES DUE TO TOXICS

Surface waters identified as having aquatic life and/or public health impacts due to fish consumption advisories are presented in Table 36. In New Hampshire, fish consumption advisories are issued by the Environmental Health Program of the New Hampshire Department of Environmental Services. A copy of a pamphlet entitled Fish Facts – A Guide to New Hampshire's Fish Advisory is provided in Appendix 27 and is available on the web at http://des.nh.gov/organization/divisions/air/pehb/ehs/ehp/documents/fish_advisory.pdf. The brochure provides information on the benefits of eating fish and how individuals can reduce their health risk by selecting fish that are low in mercury. As shown in Table 36 and discussed below, there are currently nine waterbody specific fish consumption advisories in New Hampshire.

Androscoggin River Advisory due to Dioxin

Downstream of the Pulp and Paper of America (PPA - formerly Crown Vantage, Inc.) paper mill in Berlin, an advisory has been in effect on the Androscoggin River since 1989 due to elevated levels of dioxin found in fish tissue samples taken in 1988. The primary source of dioxin was the PPA paper mills in Berlin (dismantled 2007) and Gorham (still operating but dioxin free). The advisory recommends that pregnant and nursing women avoid consumption of all fish species. All other consumers are advised to limit consumption of all fish species to one to two, eight ounce meals per year, prepared according to guidelines (DHHS, 1989). In 1994, the PPA converted its bleaching process to a much cleaner, elemental chlorine free process or ECF. As a result, dioxin measurements in mill discharge have dropped below the minimum detection level.

In accordance with conditions in their federal (NPDES) and State discharge permits, the PPA has conducted numerous fish sampling efforts since 1994, the latest of which occurred in 2004. Unfortunately, the limited number of composite samples and the inclusion of stocked fish resulted in data that is of limited usefulness for fish consumption advice. The Maine Dioxin Monitoring Program monitors the fish in the Androscoggin in segments above and below the New Hampshire portion of the river. Evidence gathered to date suggests that fish tissue dioxin concentrations are declining but are still above a level of concern. Until such time that Maine gathers sufficient evidence to lift the fish consumption advisory, New Hampshire will maintain the fish consumption advisory for the Androscoggin River below Berlin.

Tidal Waters Advisory for Bluefish and Striped Bass due to PCBs

In 2009, New Hampshire, and six other Northeastern states, issued a joint health advisory regarding consumption of striped bass and large bluefish which may contain harmful levels of polychlorinated biphenyls (PCBs). DES' advisory stems from the multi-state report finalized in 2008, which documented the PCB content of striped bass and bluefish from Maine to Georgia. The report can be found at http://www.maine.gov/dhhs/eohp/fish/PCBSTBhome.htm. According to the current advisory, pregnant women, women who may get pregnant, nursing mothers and children under six should avoid eating striped bass and bluefish greater than 25 inches. Everybody else is being warned to limit consumption to no more than one meal of the fish per month.

Great Bay Estuarine System Advisory for Lobster Tomalley due to PCBs

New Hampshire also issued an advisory in 1991 because of PCBs found in lobsters from the Great Bay Estuarine System (GBES), which is intended to cover all estuaries north and west of Rye Harbor. According to the advisory, pregnant and nursing women should limit their consumption of lobsters and avoid the tomalley, and all other consumers should limit their consumption of the tomalley. This advisory was issued as a result of two studies. The first study (USFW, 1989) was a joint effort by the New Hampshire Division of Public Health Services and the U.S. Fish and Wildlife Service in which soft shelled clams (160 specimens), and blue mussels (300 specimens) were collected from 18 sampling locations. Lobsters (nine specimens) were collected from the Pierce Island area in the Piscataqua River. Sediment samples were taken from four locations. The shellfish samples were analyzed for heavy metals (cadmium, chromium, copper, lead, mercury, nickel and zinc) and organic compounds (PCBs and poly aromatic hydrocarbons). The results indicated that with few exceptions the levels of contaminants detected in shellfish and sediment were within the range of contaminants found elsewhere in New England, and other regions of the United States and the world. In clams and mussels however, lead was the only contaminant found to approach or exceed the National Shellfish Program alert level of 5.0 ppm. Lobsters also displayed elevated levels of PCBs and PAHs in the viscera (tomalley). The findings of this report however were not considered sufficient to support a consumption advisory because of the limited number of samples, the observation that the contaminant levels were similar to other regions in New England, and because of the many assumptions used in the risk assessment, which probably overestimated the actual risks. Further monitoring was recommended. In response, the New Hampshire Department of Health and Human Services, Division of Public Health Services and the U.S. Food and Drug Administration (FDA) conducted a follow up study in 1989-1991 (DHHS, 1991) to further study how GBES shellfish may impact human health. In 1989, 30 pounds of lobsters were collected from Little Bay. Lobster tissue and tomalley were analyzed for PCBs and pesticides. Results indicated that concentrations of PCBs in the tomalley were similar to those observed in the first study for lobsters taken from the Pierce Island area. Based on a risk assessment, it was concluded that there might be an increased cancer risk for individuals who consume approximately 50 lobsters (meat only) per year and that the estimated risk increases substantially for those persons who regularly consume the tomalley portion. Based on these considerations, it was decided that an advisory should be issued.

Table 36: Waterbodies Affected by Fish Consumption Advisories

Name Of Waterbody	Size Affected	Type Of Fishing Advisories				Cause(s) (Pollutants of Concern)
		Avoid Consumption		Limited Consumption		
		General Population	Sub-Population	General Population	Sub-Population	
Androscoggin River (from Berlin to the Maine border)	18.2 miles of rivers & streams, 384.1 acres of impoundments	-	Yes	Yes	-	Dioxin (All species of fish)
All Inland Freshwater Bodies	16,896.18 miles of rivers & streams and 162,784 acres of lakes & ponds and 22,493 acres of impoundments	-	-	Yes	Yes	Mercury (All species of fish)
		-	-	Yes	Yes	Mercury (Bass, Pickerel, White Perch, Yellow Perch) 12 inch threshold
Comerford and Moore Reservoirs	2,840 acres	-	Yes	Yes	-	Mercury (All species of fish)
Ashuelot Pond (Washington)	366.7 acres	-	Yes	Yes	-	Mercury (All species of fish)
Crystal Lake (Gilmanton)	385 acres					
Dubes Pond (Hooksett)	94 acres					
Jackman Reservoir (Hillsboro)	482 acres					
Mascoma Lake (Enfield)	1,155 acres					
May Pond (Washington)	152 acres					
Tower Hill Pond (Candia)	186 acres					
All tidal waters in NH	17.98 square miles of estuaries and 81.29 square miles of ocean	Yes	Yes	-	-	PCBs and Dioxins (in Lobster Tomalley)
		-	-	Yes	Yes	PCBs (in Bluefish and Striped Bass)
		-	Yes	Yes	-	Mercury (Swordfish, Shark, Tilefish, King Mackerel)
		-	-	-	Yes	Mercury (All other species of fish)

All Inland Freshwater Bodies Advisory due to Mercury

The latest New Hampshire fish consumption advisory, issued in 2008, is based on the mercury levels in freshwater fish collected from New Hampshire Lakes and Streams between 1995 and 2007. For all inland freshwater bodies in New Hampshire there is a general advisory for pregnant women, women who may get pregnant, nursing mothers and children under seven to limit their freshwater fish consumption to one meal per month, and that all other consumers limit their consumption to four meals per month. For bass, pickerel, and yellow and white perch the general consumption advisory recommends limiting consumption to fish less than twelve inches in length. As indicated in Table 36, additional mercury consumption advisories have been issued for Ashuelot Pond, the Comerford and Moore Reservoirs on the Connecticut River, Crystal Lake, Dubes Pond, the Jackman Reservoir, Mascoma Lake, May Pond, and Tower Hill Pond. For details regarding these advisories please see the document entitled “Technical Background for the 2008 Update to the New Hampshire Statewide Mercury Fish Consumption Advisory” which can be found at http://des.nh.gov/organization/commissioner/pip/publications/ard/documents/r-ard-08-1.pdf. Fish sampling and mercury analysis has continued since the report was issued and the consumption advisories will be updated as necessary.

D.6.4 WATERS AFFECTED BY SHELLFISH ADVISORIES DUE TO BACTERIA

The state’s coastal and estuarine waters’ suitability for shellfish harvesting are evaluated in accordance with the National Shellfish Sanitation Program (NSSP). Over the last several years much effort has been expended in examining the sanitary quality of the state’s tidal waters, in order to accurately classify these areas for shellfish harvest and expand harvesting opportunities. The acreage of unclassified estuarine waters has been reduced from 6,777 acres in 2000 to 1,330 in 2007. Unclassified waters have remained at 1,330 acres through 2011. Almost 46% (5,300 acres) of estuarine waters available for harvest are now open for harvest, up from 36% in 2000 but slightly less than the 2007 figure of 47%. More recent trends in classification acreage changes (2005 to 2007 to 2009 to 2011) are depicted in Table 37.

Table 37: Changes in Shellfish Water Classifications, 2005-2007-2009-2011

Location	2005 Acres	2007 Acres	2009 Acres	2011 Acres	2005 Percent	2007 Percent	2009 Percent	2011 Percent
COASTAL								
Approved	39,272.2	39,354.1	49,171.9	49,171.9	93.3	93.5	94.9	94.9
Conditionally Approved	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Restricted	268.4	184.6	184.6	184.6	0.6	0.4	0.4	0.4
Prohibited	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prohibited/Safety Zone	2,567.3	2,546.5	2,430.8	2,430.8	6.1	6.0	4.7	4.7
Prohibited/Unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	42,107.9	42,085.2	51,787.3*	51,787.3*	100	100	100	100
ESTUARINE								
Approved	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Conditionally Approved	5,127.0	5,399.0	5,298.2	5,298.2	44.2	46.6	45.7	45.7
Restricted	676.5	445.0	445.0	445.0	5.8	3.8	3.8	3.8
Prohibited	160.7	910.8	1013.1	1013.1	1.4	7.9	8.7	8.7
Prohibited/Safety Zone	3,386.0	3,503.5	3,503.4	3,503.4	29.2	30.2	30.2	30.2
Prohibited/Unclassified	2,247.1	1,330.2	1,330.2	1,330.2	19.4	11.5	11.5	11.5

Location	2005 Acres	2007 Acres	2009 Acres	2011 Acres	2005 Percent	2007 Percent	2009 Percent	2011 Percent
TOTAL	11,597.2	1,1588.5	11,590.1	11,590.1	100	100	100	100

* Atlantic acreage increased due to GIS correction on the extent of the state's 3-nautical mile jurisdiction in tidal waters.

Classification Definitions:

Approved means a classification used to identify a growing area where direct harvest and/or marketing (i.e., no additional treatment processes such as relay and depuration) is allowed.

Conditionally Approved means a classification used to identify a growing area, which meets the criteria for the approved classification except under certain conditions described in a management plan.

Restricted means a classification used to identify a growing area subject to pollution conditions that would make direct harvest and marketing inappropriate. Regulated commercial harvesting can be allowed by special license provided shellstock is subjected to a suitable and effective post-harvest treatment process, such as through relaying and/or depuration.

Prohibited means a classification used to identify a growing area where the harvest of shellstock for any purpose, except depletion or gathering of seed for aquaculture, is not permitted because a sanitary survey indicates the presence of public health risks that require further study and evaluation.

Prohibited/Safety Zone means a classification used to identify a growing area where the harvest of shellstock for any purpose, except depletion or gathering of seed for aquaculture, is not permitted because of proximity to a significant source of pollution such as a wastewater treatment facility or a marina.

Prohibited/Unclassified means a classification used to identify a growing area where the harvest of shellstock for any purpose, except depletion or gathering of seed for aquaculture, is not permitted because a sanitary survey of the area has not been completed.

Although gains in estuarine acreage available for harvest have been realized, most areas open for harvest continue to be subject to temporary harvesting closures, primarily due to risk of sewage contamination. Most of these temporary closures are related to contamination following rainfall events, although other issues such as risk of sewage contamination during boating season also accounts for some closures.

The DES Shellfish Program measures the degree to which estuarine waters are actually available for harvest by tracking "acre-days," which is the product of the acres of shellfish growing waters and the number of days that these waters are open for harvest. The acre-days indicator is reported as the percentage of the total possible acre-days of harvesting for which the shellfish waters are actually open, and is a good integrative measure of the degree to which a harvesting area meets standards for shellfish harvesting.

The acre-day statistic shows a net increase in harvesting opportunities between 2005 and 2007 and 2009 (44% to 48% to 44%) for estuarine waters. The attached table shows that the greatest gains were made in the Hampton/Seabrook estuary, where the combination of new acreage open and a less-restrictive rainfall closure criterion led to a doubling of harvest opportunities.

Table 38: Changes in Shellfishing Days and Percent Acre-Days Open (2005 – 2011)

Location	2005 Days Open*	2005 % Acre-Days Open	2007 Days Open*	2007 % Acre-Days Open	2009 Days Open*	2009 % Acre-Days Open	2011 Days Open*	2011 % Acre-Days Open	Comments
COASTAL (Atlantic Ocean)	170 of 365 days open	43.4	295 of 365 days open	75.6	209 of 365 days open	54.4	345 of 365 days open	94.5	Severe "red tide" event in 2009 accounts for most of the closures
ESTUARY (all areas)	variable	44.0	variable	48.0	variable	43.9	variable	41.8	
Rye Harbor	0 of 40 days open	0.0	0 of 38 days open	0.0	0.0	0.0	0.0	0.0	Area is not classified, and therefore closed to harvest
Little Harbor	15 of 40 days open	8.2	22 of 38 days open	12.9	18 of 38 days open	10.5	19 of 38 days open	11.1	Area closed May-October.
Bellamy River	0 of 303 days open	0.0	139 of 303 days open	29.0	110 of 303 days open	14.5	46 of 303 days open	6.1	None
Great Bay	253 of 303 days open	56.4	263 of 303 days open	58.6	227 of 303 days open	50.6	218 of 303 days open	48.6	None
Little Bay	27 of 40 days open	60.0	22-26 of 38 days open	45.4	227 of 303 days open	53.3	218 of 303 days open	51.2	None
Hampton/Seabrook	15 of 40 days open	15.7	22 of 38 days open	35.3	21 of 38 days open	33.7	of 38 days open	35.3	Area closed June-October.
Lower Piscataqua River	0 of 40 days open	0.0	0 of 38 days open	0.0	0 of 38 days open	0.0	0	0	Area is not classified, and therefore closed to harvest

*Where oysters are the primary shellfish resource, the number of possible days open is 303 days (areas are closed for harvest in July and August for resource conservation reasons). Where softshell clams are the primary shellfish resource, the number of possible days open is 38-40 (for resource conservation reasons, harvesting is only allowed on Saturdays during the September-May harvesting season).

PART E. GROUND WATER MONITORING AND ASSESSMENT

E.1 NEW HAMPSHIRE GROUNDWATER PROTECTION PROGRAMS

Table 39 provides a summary of the myriad of State and Federal groundwater protection programs that are currently in place in New Hampshire. New Hampshire was one of the first four States in the Nation to receive EPA's endorsement of its comprehensive approach to groundwater protection. This endorsement is an acknowledgment that the state has an array of local, state and federal groundwater protection programs in place which are sufficiently coordinated to effectively protect groundwater. The state routinely engages all stakeholders in a process to identify and jointly address groundwater issues of concern.

Wellhead protection continues to be a major focus of groundwater protection efforts, with wellhead protection measures having been implemented for 90 percent of the wells used by non-transient public water systems in New Hampshire. Groundwater availability issues are of increasing concern. This concern has led to the passage of statutes and the development of regulations that require any adverse impact to surrounding water resources from a large groundwater withdrawal be assessed and mitigated. The state has also recently adopted laws and regulations that establish water conservation standards for the state.

Table 39: Summary of state Groundwater Protection Programs

Programs or Activities	Check (✓) (1)	Implementation Status (2)	Responsible State Agency (3)
Active SARA Title III Program	✓	Fully Established	OEM
Ambient groundwater monitoring system	✓	Under Development	DES
Aquifer vulnerability assessment	Not Applicable	Not Applicable	Not Applicable
Aquifer mapping	✓	Fully Established	USGS, DES
Aquifer characterization	✓	Fully Established	USGS, DES
Comprehensive data management system	✓	Continuing Efforts	DES, GRANIT
EPA-endorsed Core Comprehensive State Groundwater Protection Program (CSGWPP)	✓	Fully Established	DES*
Groundwater discharge permits	✓	Fully Established	DES
Groundwater Best Management Practices	✓	Fully Established	DES
Groundwater legislation	✓	Fully Established	DES
Groundwater classification	✓	Fully Established	DES
Groundwater quality standards	✓	Fully Established	DES
Interagency coordination for groundwater protection initiatives	✓	Fully Established	DES
Nonpoint source controls	✓	Fully Established	DES
Pesticide State Management Plan	✓	Fully Established	DES
Pollution Prevention Program	✓	Continuing Efforts	DES
Resource Conservation and Recovery Act (RCRA) Primacy	✓	Fully Established	DES
State Superfund	✓	Fully Established	DES
State RCRA Program incorporating more stringent requirements than RCRA Primacy	✓	Fully Established	DES

Programs or Activities	Check (✓) (1)	Implementation Status (2)	Responsible State Agency (3)
state septic system regulations	✓	Fully Established	DES
Underground storage tank installation requirements	✓	Fully Established	DES
Underground Storage Tank Remediation Fund	✓	Fully Established	DES
Underground Storage Tank Permit Program	✓	Fully Established	DES
Underground Injection Control Program	✓	Fully Established	DES
Vulnerability assessment for drinking water/wellhead protection	✓	Fully Established	DES
Well abandonment regulations	✓	Fully Established	DES
Wellhead Protection Program (EPA-approved)	✓	Fully Established	DES
Well installation regulations	✓	Fully Established	DES

E.2 SUMMARY OF GROUNDWATER QUALITY

Although New Hampshire does not have an ambient water quality sampling network for groundwater natural groundwater quality is considered generally good. The predominant crystalline rock formations produce groundwater of low mineral content, hardness, and alkalinity. Although the majority of groundwater can be used as a drinking water source, most groundwater is highly corrosive to water supply distribution systems. Ambient groundwater quality from stratified drift aquifers can be impacted by such aesthetic concerns as iron, manganese, taste, and odor. Bedrock well water quality is sometimes impacted by naturally occurring contaminants including fluoride, arsenic, mineral radioactivity, and radon gas. Elevated concentrations of radon gas occur frequently in bedrock wells.

In addition to naturally occurring contaminants, there are many areas of localized contamination due primarily to releases of petroleum and volatile organic compounds from petroleum facilities, commercial and industrial operations and landfills. Due to widespread winter application of road salt, sodium is also a contaminant of concern in New Hampshire groundwater.

The five highest priority sources of groundwater contamination are:

1. Inappropriate land uses in close proximity to water supply wells;
2. Chemical use and storage;
3. Highways and railroads;
4. Urban stormwater; and
5. Septic systems and sewer lines.

A copy of the Ambient Groundwater Quality Standards for New Hampshire (Env-Wq 1500 & Env-Wq 402) is available at http://des.nh.gov/organization/commissioner/legal/rules/index.htm.

PART F. PUBLIC PARTICIPATION

F.1 PUBLIC PARTICIPATION - REQUEST FOR DATA

DES constantly solicits data from within and outside of DES. In 2003, DES created the Environmental Monitoring Database (EMD), the purpose of which is to serve as a warehouse for all types of environmental data. On August 17, 2011, DES made a formal request for data to be included in the 2012 assessment and requested that any such data be submitted by October 3, 2011. Whenever DES is aware of monitoring being conducted, it attempts to obtain the data and preferably in a form which can be automatically uploaded into the EMD. Any data in the EMD or submitted to the DES water quality assessment coordinator by December 21, 2011 was considered in the 2012 assessment process. Examples of the more than 100 distinct data sources used in the 2012 cycle are provided in the below:

Table 40: Examples of Data Sources Used in 2010 Assessment

ORGANIZATION TYPE	ORGANIZATION NAME	PROJECT NAME
PRIVATE INDUSTRY	SEABROOK STATION	SEABROOK STATION WATER QUALITY MONITORING
PRIVATE NON-INDUSTRIAL	LOON MOUNTAIN RECREATION CORPORATION	LOON BIOMONITORING PROJECT
PUBLIC UNIVERSITY/COLLEGE	N.H. ESTUARIES PROJECT	GREAT BAY ESTUARY TIDAL TRIBUTARY MONITORING PROGRAM
		NHEP LAMPREY RIVER DISSOLVED OXYGEN STUDY
	UNIVERSITY OF NEW HAMPSHIRE	GREAT BAY ESTUARINE RESTORATION COMPENDIUM
		GROUND TRUTH MEASUREMENTS FOR 2007 HYPERSPECTRAL IMAGERY OF THE GREAT BAY ESTUARY
		LAMPREY RIVER HYDROLOGIC OBSERVATORY (LRHO)
		LAY LAKES MONITORING PROGRAM-LAKE WINNIPESUAKEE PHOSPHORUS MODELING DATA
		NEW HAMPSHIRE STREAM CLASSIFICATION PROJECT
		OPEN OCEAN AQUACULTURE ENVIRONMENTAL MONITORING PROGRAM
		UNH CENTER FOR FRESHWATER BIOLOGY-LAY LAKES MONITORING PROGRAM
		UNH CENTER FOR FRESHWATER BIOLOGY-MENDUMS POND WATERSHED ASSESSMENT
		UNH CENTER FOR FRESHWATER BIOLOGY-NEWFOUND LAKE WATERSHED ASSESSMENT
		UNH DATASONDE PROGRAM
		UNH TIDAL WATER QUALITY MONITORING PROGRAM
		UNIVERSITY OF NEW HAMPSHIRE CENTER FOR FRESHWATER BIOLOGY
US GOVERNMENT/FEDERAL	USGS NEW HAMPSHIRE WATER SCIENCE CENTER	ASSESSMENT OF NITROGEN IN THE UPPER CONNECTICUT RIVER BASIN IN NEW HAMPSHIRE
		I-93 HIGHWAY DEICING EFFECTS ON GROUND-WATER QUALITY
		INTEGRATION OF HYDROACOUSTIC AND WATER-QUALITY ASSESSMENTS FOR IDENTIFYING SUSCEPTIBLE AREAS FOR INVASIVE SPECIES
		NITROGEN TRANSPORT AND ATTENUATION IN THE CONNECTICUT RIVER BASIN IN NEW HAMPSHIRE

ORGANIZATION TYPE	ORGANIZATION NAME	PROJECT NAME
		STREAM GAGING DATA
		USGS SURFACE WATER DATA
US GOVERNMENT/LOCAL	CITY OF LACONIA	NON-POINT SOURCE POLLUTION SAMPLING REPORT FOR PAUGUS BAY, LAKE WINNIPESAUKEE
	CITY OF MANCHESTER	MHD WATER QUALITY BEACH SAMPLING PROJECT
	PIONEER VALLEY PLANNING COMMISSION	CONNECTICUT RIVER INITIATIVE BACTERIA SAMPLING PROJECT
	SOUTHERN NEW HAMPSHIRE REGIONAL PLANNING COMMISSION	MERRIMACK RIVER ALUMINUM SAMPLING PROJECT
	TOWN OF EXETER	EXETER RIVER STUDY
	TOWN OF SALEM	CANOBIE LAKE TP TMDL (CONDUCTED BY TOWN OF SALEM)
US GOVERNMENT/STATE	GREAT BAY NATIONAL ESTUARINE RESEARCH RESERVE	GBNERR DATASONDE PROGRAM
		GBNERR DIEL WATER QUALITY MONITORING PROGRAM
		GBNERR TIDAL WATER QUALITY MONITORING PROGRAM
	N.H. FISH AND GAME DEPARTMENT	YORK POND -FISH AND GAME FISH HATCHERY BERLIN
	NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES	2005 FLOOD RESPONSE
		2006 FLOOD RESPONSE
		2006 RIVER PERIPHYTON STUDY
		401 WATER QUALITY CERTIFICATION
		ACID OUTLETS
		AMBIENT RIVER MONITORING PROGRAM (ARMP)
		ASHUELOT RIVER TMDL PROJECT
		BABOOSIC LAKE CLEAN LAKES PROJECT
		BEACH BACTERIA SOURCE STUDY- PHASE 1
		BEACH BACTERIA SOURCE STUDY- PHASE 2
		BEACH DATA
		BEACH SAND STUDY
		BEAVER LAKE GALLIEN'S BEACH
		BIOLOGY SPECIAL STUDY - KEZAR LAKE
		BIOLOGY SPECIAL STUDY - SILVER LAKE STORMWATER PROJECT

ORGANIZATION TYPE	ORGANIZATION NAME	PROJECT NAME
		CAMP ANNE JACKSON SWMIMMING AREA
		CAMP LINCOLN
		CANAAN STREET LAKE DRINKING WATER PROJECT
		CHLORIDE TMDL STUDY IN THE VICINITY OF I-93 IN SOUTHERN NH
		CHLORIDE TMDLS IN NH WATERSHEDS
		COASTAL INVESTIGATIONS
		COASTAL RESTORATION
		COBBETTS POND, WAS SECTION 319
		COMPLAINT INVESTIGATIONS
		CONTAMINATED SITE REMEDIATION AND STATE SITES
		CONTOOCOOK RIVER 2002 TMDL PROJECT
		CONTOOCOOK RIVER 2004 TMDL PROJECT
		DES PARKING LOT STUDY
		GOLF CLUB OF NEW ENGLAND
		GREAT BAY HIGH TIDE STUDY
		I-93 CHLORIDE STUDY
		INTERSTATE 93 LONG-TERM CHLORIDE MONITORING
		KITTERY ME WWTF STUDY
		LAKE SURVEY-PROBABLISTIC BASED STUDY
		LAKE TROPHIC SURVEYS
		LAMPREY PROTECTED INSTREAM FLOW STUDY
		LITTLE HARBOR TMDL
		MERRIMACK INVESTIGATIONS
		MIRROR LAKE
		MPSB WATERSHED MANAGEMENT PLAN - SECTION 319
		NATIONAL COASTAL ASSESSMENT OFFSHORE COASTAL WATERS SAMPLING
		NATIONAL COASTAL ASSESSMENT PROBABILITY BASED MONITORING
		NATIONAL COASTAL ASSESSMENT RIVER DISSOLVED OXYGEN STUDY
		NATIONAL COASTAL ASSESSMENT TIDAL WATER QUALITY MONITORING
		NATIONAL RIVERS AND STREAMS ASSESSMENT

ORGANIZATION TYPE	ORGANIZATION NAME	PROJECT NAME
		NEW HAMPSHIRE ESTUARIES PROBABILITY BASED MONITORING PROGRAM
		NPDES-ANTIDEGREDATION PROJECT
		PARTRIDGE LAKE CLEAN LAKES PROJECT
		PAWTUCKAWAY LAKE DRAWDOWN STUDY
		PERKINS POND CLEAN LAKES PROJECT
		PESTICIDE WATER QUALITY
		PLEASANT LAKE CLEAN LAKES PROJECT
		POTENTIAL POLLUTION SOURCES TO BEACHES
		POTENTIALLY NOT SUPPORT BECAUSE OF CHLOROPHYLL
		RECEIVING H2O WHOLE EFFLUENT TOXICITY TEST RESULTS FOR METAL
		REMOTE PONDS
		RUST POND CLEAN LAKES PROJECT
		SALMON FALLS TMDL
		SHELLFISH AUTUMN DRY SAMPLING PROJECT
		SHELLFISH BASELINE TISSUE SAMPLING PROJECT
		SHELLFISH EMERGENCY CLOSURE SAMPLING PROJECT
		SHELLFISH OPEN STATUS SAMPLING PROJECT
		SHELLFISH POST RAINFALL SAMPLING PROJECT
		SHELLFISH POST WASTEWATER DISCHARGE SAMPLING PROJECT
		SHELLFISH PROGRAM AND BEACH PROGRAM DYE STUDY FOR LITTLE RIVER, NORTH HAMPTON
		SHELLFISH PROGRAM COMPARISON OF MPN AND MTEC METHODS
		SHELLFISH PROGRAM INVESTIGATION INTO VARIATION IN OPEN STATUS AMBIENT DATA
		SHELLFISH RAINFALL STUDY SAMPLING PROJECT
		SHELLFISH SHORELINE DRY WEATHER SAMPLING
		SHELLFISH SHORELINE WET WEATHER SAMPLING
		SHELLFISH SOURCE IMPACT EVALUATION SAMPLING PROJECT
		SHELLFISH SUMMER WATER QUALITY SAMPLING PROJECT
		SHELLFISH SYSTEMATIC RANDOM SAMPLING PROJECT

ORGANIZATION TYPE	ORGANIZATION NAME	PROJECT NAME
		SHELLFISH TIDAL STUDY SAMPLING PROJECT
		SOUHEGAN RIVER TMDL PROJECT
		SOUTH BRANCH ASHUELOT RIVER TMDL PROJECT
		SUPERFUND SITES
		VOLUNTEER LAKE ASSESSMENT PROGRAM
		VOLUNTEER RIVER MONITORING PROGRAM (VRAP)
		WAL*MART DISTRIBUTION CENTER RAYMOND
		WAUKEWAN WATERSHED PROJECT
		WEBSTER LAKE
	NH DEPARTMENT OF TRANSPORTATION	I-93 EXPANSION BMP EFFICIENCY TREND MONITORING PLAN
		TAYLOR RIVER POND DAM FEASIBILITY STUDY
VOLUNTEER	GREAT BAY COAST WATCH	GREAT BAY COAST WATCH WATER QUALITY MONITORING PROGRAM
	GREEN MOUNTAIN CONSERVATION GROUP	GREEN MOUNTAIN CONSERVATION GROUP - OLT PROJECT
		GREEN MOUNTAIN CONSERVATION GROUP - RIVERS PROJECT
	MERRIMACK RIVER WATERSHED COUNCIL	MERRIMACK RIVER WATER QUALITY MONITORING, ANALYZING, PROTECTING AND PROMOTING (MAPP) PROJECT
	PENNICHUCK WATER WORKS	PENNICHUCK WATER WORKS PRE VRAP
	SOUHEGAN WATERSHED ASSOCIATION	SOUHEGAN WATERSHED ASSOCIATION WATER MONITORING PROJECT
	UPPER MERRIMACK RIVER LOCAL ADVISORY COMMITTEE	UPPER MERRIMACK MONITORING PROGRAM

F.2 PUBLIC PARTICIPATION - CALM

On July 22, 2011, the New Hampshire Department of Environmental Services requested comments on the 2010 Consolidated Assessment and Listing Methodology (CALM) which served as a draft of the CALM for the 2012 Section 305(b) and 303(d) Surface Water Quality Report (i.e., the 2012 CALM). The request for comments was accompanied by a list and description of possible revisions being considered by DES at the time. Downloadable copies of the 2010 CALM and list of possible revisions were made available on the DES website for review (http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm). The following organizations/agencies were also notified by email:

- Appalachian Mountain Club
- Audubon Society
- Connecticut River Joint Commissions
- Conservation Law Foundation
- County Conservation Districts
- Designated River Local Advisory Committees
- Lake and River Local Management Advisory Committees
- Maine Department of Environmental Protection
- Manchester Conservation Commission
- Massachusetts Department of Environmental Protection
- Merrimack River Watershed Council
- National Park Service
- New England Interstate Water Pollution Control Commission
- NH Department of Health and Human Services
- NH Coastal Program
- NH Rivers Council
- North Country Council
- Regional Planning Commissions
- Society for the Protection of National Forests
- Natural Resources Conservation Service
- The Nature Conservancy
- US Environmental Protection Agency
- US Geological Survey
- US Fish and Wildlife Service
- US Forest Service
- University of New Hampshire
- Vermont Department of Environmental Conservation
- Volunteer Lakes Assessment Program
- Volunteer Rivers Assessment Program
- Water Quality Standards Advisory Committee

The public comment period ended on August 22, 2011. A copy of the request and guidance for submitting comments is provided in Appendix 29

Appendix 30 includes a summary of comments received on the draft CALM and the DES's response to the comments. This document is also available on the DES website (http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm).

F.3 PUBLIC PARTICIPATION - 303(D) LIST

On April 20, 2012, the New Hampshire Department of Environmental Services released the draft 2012 Section 303(d) List of impaired waters for public comment. Downloadable copies of the draft list were made available on the DES website for review (http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm). In addition, the following organizations/agencies were notified by email:

- Appalachian Mountain Club
- Audubon Society
- Connecticut River Joint Commissions
- Conservation Law Foundation
- County Conservation Districts
- Designated River Local Advisory Committees
- Lake and River Local Management Advisory Committees
- Maine Department of Environmental Protection
- Manchester Conservation Commission
- Massachusetts Department of Environmental Protection
- Merrimack River Watershed Council
- National Park Service
- New England Interstate Water Pollution Control Commission
- NH Department of Health and Human Services
- NH Coastal Program
- NH Rivers Council
- North Country Council
- Regional Planning Commissions
- Society for the Protection of National Forests
- Natural Resources Conservation Service
- The Nature Conservancy
- US Environmental Protection Agency
- US Geological Survey
- US Fish and Wildlife Service
- US Forest Service
- University of New Hampshire
- Vermont Department of Environmental Conservation
- Volunteer Lakes Assessment Program
- Volunteer Rivers Assessment Program
- Water Quality Standards Advisory Committee

The public comment period ended on May 18, 2012, however comments were accepted through July 5, 2012 to accommodate all interested parties.

An additional comment period was added for impairments removed between the April 20, 2012 Draft and July 19, 2013 Final 2012 303(d). That additional comment period ended November 18, 2013.

On February 12, 2014, DES re-submitted the Final 2012 303(d) to EPA for formal approval.

A copy of the request and guidance for submitting comments is provided in Appendix 31. The comments received are provided in Appendix 32 and the department's response to comments are in Appendix 33.

PART G. REFERENCES

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Appendix 1: Methodology for Creating Assessment Units (AUs)

Appendix 2: Non-Point Source Management Annual Reports

http://des.nh.gov/organization/divisions/water/wmb/was/categories/publications.htm.

Appendix 3: NH Monitoring Strategy

Appendix 4: Consolidated Assessment and Listing Methodology (CALM)

Appendix 5: Technical Support Document: Assessments of Aquatic Life Use Support in the Great Bay Estuary for Chlorophyll-a, Dissolved Oxygen, Water Clarity, Eelgrass Habitat, and Nitrogen

Appendix 6: List of All Impaired Waters

Appendix 7: Map of All Impaired Waters

Appendix 8: Section 303(d) List of Impaired Waters

Appendix 9: Map of Section 303(d) Impaired Waters

Appendix 10: Waters Removed from the 2010 Section 303(d) List

Appendix 11: Spreadsheet of Assessment Unit IDs (MS EXCEL)

Appendix 12: GIS Files of Assessment Unit IDs

ftp://pubftp.nh.gov/DES/wmb/WaterQuality/SWQA/2012/GIS/

Appendix 13: Status of Each Estuarine Assessment Unit

Appendix 14: Status of Each Impoundment Assessment Unit

Appendix 15: Status of Each Lake / Pond Assessment Unit

Appendix 16: Status of Each Ocean Assessment Unit

Appendix 17: Status of Each River / Stream Assessment Unit in the Androscoggin Basin

Appendix 18: Status of Each River / Stream Assessment Unit in the Saco Basin

Appendix 19: Status of Each River / Stream Assessment Unit in the Coastal Basin

Appendix 20: Status of Each River / Stream Assessment Unit in the Merrimack Basin

Appendix 21: Status of Each River / Stream Assessment Unit in the Connecticut Basin

Appendix 22: Status of Each Assessment Unit (MS EXCEL)

Appendix 23: Probabilistic Assessment Details for Estuaries

Appendix 24: Probabilistic Assessment Details for Rivers / Streams

Appendix 25: Probabilistic Assessment Details for Lakes

Appendix 26: Trend Reports for Lakes and Rivers

Appendix 27: New Hampshire Fish Consumption Guidelines

http://des.nh.gov/organization/commissioner/pip/factsheets/ard/documents/ard-ehp-25.pdf

Appendix 28: Data Request – Public Notice and Guidance for Submitting Data

Appendix 29: CALM – Public Notice, Guidance, and Extension for Submitting Comments

Appendix 30: CALM – Public Comments and DES Response

Appendix 31: 303(d) – Public Notice and Guidance for Submitting Comments

Appendix 32: 303(d) – List - Public Comments

ftp://pubftp.nh.gov//DES/WMB/WaterQuality/SWQA/2012/Comments_303d

Appendix 33: 303(d) – DES Response to Public Comments

Appendix 34: Substantive differences between the Draft and Final 2012 Section 303(d) List of Threatened or Impaired Waters

Appendix 35: Response to comments on the changes between the Draft and Final Section 303(d) List of Threatened or Impaired Waters

Appendix 36: Macroinvertebrate Community Type Classification Report

http://des.nh.gov/organization/divisions/water/wmb/biomonitoring/documents/r-wd-11-24.pdf

Appendix 37: Fish Indexes of Biotic Integrity

Coldwater Indicator Fish Species Report
http://des.nh.gov/organization/divisions/water/wmb/biomonitoring/documents/r-wd-07-38.pdf
Coldwater Fish Assemblage IBI
http://des.nh.gov/organization/divisions/water/wmb/biomonitoring/documents/r-wd-07-33.pdf
Transitional Water Fish Assemblage IBI
http://des.nh.gov/organization/divisions/water/wmb/biomonitoring/documents/r-wd-11-6.pdf

Appendix 38: Level 1 Landscape Level Wetlands Assessment (Version2)