

NORTH COASTAL WATERSHED 1997/1998 WATER QUALITY ASSESSMENT REPORT



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NORTH COASTAL WATERSHED
1997/1998 WATER QUALITY ASSESSMENT REPORT

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LIST OF ACRONYMS

7Q10	Seven Day Ten Year Low Flow
ACEC	Areas of Critical Environmental Concern
BPJ	Best Professional Judgement
CFS	Cubic Feet per Second
CMR	Code of Massachusetts Regulations
CNOEC	Chronic No Observed Effect Concentration
CWA	Clean Water Act
DDT	Dichlordiphenyltrichloroethane
DEM	Department of Environmental Management
DFWELE	Department of Fisheries, Wildlife, and Environmental Law Enforcement
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
MA DPH	Massachusetts Department of Public Health
DWM	Department of Watershed Management
EPA	United States Environmental Protection Agency
GIS (MassGIS)	Geographic Information System
GP	Gravel Packed
GPM (D)	Gallons per Minute (Day)
JTU	Jackson Turbidity Unit
LC ₅₀	Lethal Concentration to 50% of the Test Organisms
MDC	Metropolitan District Commission
DEP	Massachusetts Department of Environmental Protection
MEPA	Massachusetts Environmental Policy Act Unit
MGD	Million Gallons per Day
mg/L	Milligram per Liter
NCCW	Non-Contact Cooling Water
NH ₃ -N	Ammonia-Nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	Non Point Source
NTU	Nephelometric Turbidity Units
ORW	Outstanding Resource Waters
PAH	Polyaromatic Hydrocarbons
PALIS	Pond and Lake Information System
PCB	Polychlorinated Biphenols
PPM	Parts Per Million
PWS	Public Water Supply
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/ Quality Control
RBP	Rapid Bioassessment Protocol
SARIS	Stream and River Inventory System
SS	Suspended Solids
SU	Standard Units
SWQS	Massachusetts Surface Water Quality Standards
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TRC	Total Residual Chlorine
USFDA	United States Food and Drug Administration
USGS	United States Geological Survey
VOC	Volatile Organic Compound
WMA	Water Management Act
WWTP	Waste Water Treatment Plant

EXECUTIVE SUMMARY

NORTH COASTAL WATERSHED 1997/1998 WATER QUALITY ASSESSMENT REPORT

The assessment of current water quality conditions is a key step in the successful implementation of the Watershed Approach. This critical phase provides basic information needed to focus resource protection and remediation activities later in the watershed management planning process. Detailed information regarding individual river segments, estuaries, coastal embayments, marine waters and lakes in the North Coastal Watershed is presented in this assessment report. The Massachusetts Surface Water Quality Standards designate the most sensitive uses (Aquatic Life, Fish Consumption, Primary and Secondary Contact Recreation, Shellfishing and Aesthetics) for which surface waters shall be protected. The following is a brief summary of water quality conditions in the North Coastal Watershed in relation to their support of those designated uses.

RIVERS, ESTUARIES, COASTAL EMBAYMENTS, AND MARINE WATERS

A total of 37.3 river miles and 34.12 square miles of coastal/marine waters in the North Coastal Watershed are evaluated in this report. The status of each designated use is summarized below.

Aquatic Life Use

The *Aquatic Life Use* is supported when suitable habitat (including water quality) is available for sustaining a native, naturally diverse, community of aquatic flora and fauna. Impairment of the *Aquatic Life Use* (non-support or partial support) may result from anthropogenic stressors that include point and/or nonpoint source(s) of pollution and hydrologic modification. The status of the *Aquatic Life Use* in the North Coastal Watershed is as follows:

Aquatic Life Use Summary - Inland

- 1.9 river miles support
- 19.5 river miles partial support
- 3.9 river miles non-support
- 12.0 river miles not assessed

Aquatic Life Use Summary - Coastal and Marine

- 10.74 square miles support
- 0.8 square miles non-support
- 22.58 square miles not assessed

The *Aquatic Life Use* is supported for the entire length/area of six waterbodies in the North Coastal Watershed: Frost Fish Brook, Porter River, Waters River, Danvers River, Forest River, and Salem Sound. Additionally portions of the Bass and Crane rivers also support this use.

Multiple waterbodies in the North Coastal Watershed are not assessed for the *Aquatic Life Use* at this time including:

- Essex Bay System (Essex River and Essex Bay),
- Annisquam River System (Alewife Brook, Mill and Annisquam rivers, as well as Rockport and Gloucester harbors),
- Manchester Harbor,
- Bass River System (portions of the Bass River)
- Crane River System (portions of the Crane River),
- North River System (portions of Proctor Brook and the North River),
- Beverly Harbor,
- Salem Harbor,
- Marblehead Harbor,
- Nahant Bay,
- Saugus River System (portions of the Saugus River, Hawkes Brook, Pines River and Lynn Harbor).

The *Aquatic Life Use* is partially supported in three small streams (Cat Brook in the Manchester Harbor System, and Beaver and Crane brooks in the Crane River System) due low levels of dissolved oxygen (DO). The low pH in Cat Brook also impaired this use. Whether or not these conditions are naturally occurring merits further investigation.

The *Aquatic Life Use* in the North River System is not supported in portions of two brooks (Goldthwait and Proctor). In the upper portion of Goldthwait Brook, hydromodification and habitat degradation impair (partial support) this use. The combined effects of the Water Management Act (WMA) withdrawals (Eastman Gelatine Company, Peabody Water Department, Salem Country Club, Kearnwood Country Club) likely diminish instream flow thereby impacting aquatic communities. Downstream from the Eastman Gelatine Company's discharge, this use is not supported due to severe instream toxicity during stormwater events. The *Aquatic Life Use* in Proctor Brook is also assessed as non-support downstream from its confluence with Goldthwait Brook based on habitat quality limitations, nutrient enrichment, and a severely impaired benthic community.

Where assessed, the *Aquatic Life Use* in the Saugus River System is either partial or non-support. In the freshwaters of the Saugus River System, low DO, slightly elevated nutrients, and low flow (habitat limitations) were documented. The Saugus River and Beaverdam Brook are impaired by streamflow and/or habitat limitations that are likely related, in part, to water withdrawals. The Saugus River estuary is heavily influenced by several National Pollution Discharge Elimination System (NPDES) discharges: General Electric Lynn Company (GE Lynn), Refuse Energy Systems Company (RESCO) and the Lynn Water and Sewer Commission. While the cumulative impacts of the GE Lynn and RESCO facility salt water intakes and thermal discharges on the biota of the Saugus River estuary are unknown, the *Aquatic Life Use* is evaluated as non-support for the following reasons:

- the facilities are located on opposite shores of the estuary,
- impingement reduction mechanisms for at least one of the GE salt water intakes did not return the organisms to the river,
- the potential for thermal barriers to passage/migration resulting from the cumulative effects of intakes and thermal discharges, and
- biocide residuals in the discharges (concentrations unknown).

The impacts of water withdrawals and wastewater discharges (both municipal and industrial) as well as stormwater runoff to aquatic life in the North Coastal Watershed need further investigation. Investigations into the impacts of water withdrawals on streamflow should be conducted prior to WMA permit review and/or reissuance. For facilities which generate power via once-through cooling water systems, a comprehensive review of the present NPDES permit requirements should be performed to identify areas within the permits that may need modification, and/or specific issues that are not currently being addressed. In the North Coastal Watershed these facilities include the Eastman Gelatine Corporation, GE Company in Lynn, RESCOE, and USGenNE (formerly New England Power Salem Station). Since the quality of some aquatic resources (fish, shellfish, etc.) within receiving waters is declining rapidly, the impact of once-through cooling needs to be re-examined during the next NPDES permit review/reissuance. Analysis of the information gathered should include, at a minimum, review by the Environmental Protection Agency, Department of Environmental Protection, Division of Marine Fisheries, National Oceanographic and Atmospheric Administration and Coastal Zone Management. Local watershed groups, because of their intimate relationship with the receiving waters in question, should actively participate in the public review process.

Fish Consumption Use

The *Fish Consumption Use* is supported when there are no pollutants present that result in unacceptable concentrations in edible portions of marketable fish or shellfish or for the recreational use of fish, shellfish, other aquatic life or wildlife for human consumption. This use is assessed using the Department of Public Health's (MA DPH) Fish Consumption Advisory List. It should be noted, however, that in September 1994, the MA DPH issued a statewide Interim Freshwater Fish Advisory because of risks associated with elevated levels of mercury in certain species of freshwater fish. The interim advisory recommends that "Pregnant women should be advised of the possible health risk from eating fish taken from Massachusetts fresh-waterbodies in order to prevent exposure of developing fetuses to mercury." The interim advisory does not include stocked trout or farm-raised fish sold commercially. Because of the interim advisory, however, the assessment of the *Fish Consumption Use* is limited to those waterbodies specifically listed on the MA DPH Fish Consumption Advisory List where the use is non-support. The status of the *Fish Consumption Use* is the North Coastal Watershed is as follows:

Fish Consumption Use Summary - Inland

- 37.3 river miles not assessed

Fish Consumption Summary - Coastal and Marine

- 34.12 square miles not assessed

With the exception of Chebacco Lake (see Lakes/Ponds) there are no site-specific MA DPH fish consumption advisories in place in the North Coastal Watershed.

Recreational Uses

The *Primary Contact Recreational Use* is supported when conditions are suitable for any recreation or other water activity during which there is prolonged and intimate contact with the water with a significant risk of ingestion. Activities include, but are not limited to, wading, swimming, diving, surfing and water skiing. The status of the *Primary Contact Recreational Use* in the North Coastal Watershed is as follows:

Primary Contact Use Summary - Inland

- 3.8 river miles support
- 20.9 river miles non-support
- 12.6 river miles not assessed

Primary Contact Use Summary - Coastal and Marine

- 0.05 square miles partial support
- 12.92 square miles non-support
- 21.15 square miles not assessed

While 34% of the river miles and 62% of the coastal areas are not assessed for the *Primary Contact Recreational Use*, portions of only two rivers in the North Coastal Watershed were fully supported for this use. These two rivers are:

- the lower 0.3 miles of the Bass River between the outlet of upper Shoe Pond to the outlet of lower Shoe Pond, and
- the upper 3.5 miles of the Saugus River between the Lynn Water & Sewer Commission diversion canal and the confluence with Hawkes Brook (DEP/DWM data summary, Figure 1).

Multiple Combined Sewer Overflows (CSOs) have recently been removed from the North Coastal Watershed and water quality conditions are improving. However, CSOs and failing septic systems still impair the *Primary Contact Recreational Use* in Gloucester, Beverly and Lynn harbors, Nahant Bay, and the Saugus River. Two additional streams (Danvers River and Hawkes Brook) are suspected to receive flow from CSOs.

Fecal coliform bacteria levels were extremely elevated in the Saugus River Subwatershed. Current remediation activities such as the Lynn Water and Sewer Commission CSO Consolidation Conduit and Storage/Treatment – Stacey Brook State Revolving Fund (SRF) project continue to reduce bacteria levels. Post implementation monitoring of such projects is recommended to document whether or not water quality improvements are being realized. Organizations such as Salem Sound 2000 and the Saugus River Watershed Council have been instrumental in the identification of areas of concern.

Additionally, failing septic systems are known contributors of fecal coliform bacteria in the North Coastal Watershed. The City of Gloucester is currently conducting town-wide Title V repairs and the Department of Public works has been correcting sewage problems in the City of Salem since 1994 (Appendix D). Upon completion of these updates/upgrades additional fecal coliform bacteria sampling during wet and dry weather conditions is recommended.

The *Secondary Contact Recreational Use* is supported when conditions are suitable for any recreation or other water use during which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact incident to shoreline activities. The status of the *Secondary Contact Recreational Use* in the North Coastal Watershed is as follows:

Secondary Contact Use Summary - Inland

- 14.3 river miles support
- 9.1 river miles partial support
- 4.6 river miles non-support
- 9.3 river miles not assessed

Secondary Contact Use Summary - Coastal and Marine

- 11.99 square miles support
- 0.98 square miles non-support
- 21.15 square miles not assessed

Thirty-eight percent of the river miles and 35% of the coastal areas assessed in the North Coastal Watershed fully support the *Secondary Contact Recreational Use*. In addition to those areas that supported the *Primary Contact Recreational Use*, the *Secondary Contact Recreational Use* is supported in four streams and two coastal waterbodies:

- Beaver Brook and the majority of Crane Brook in the Crane River System,
- Beaverdam and Hawkes brooks in the Saugus River System,
- Nahant Bay, and
- Lynn Harbor.

In addition to elevated fecal coliform bacteria levels related to CSOs and failing septic systems, causes of impairment to the *Secondary Contact Recreational Use* include oil sheens, turbidity, and algae (mats blooms and filaments).

Aesthetics Use

The *Aesthetics Use* is supported when surface waters are free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life. The status of the *Aesthetics Use* in the North Coastal Watershed is as follows:

Aesthetics Use Summary - Inland

- 10.3 river miles support
- 7.8 river miles partial support
- 4.8 river miles non-support
- 14.4 river miles not assessed

Aesthetics Use Summary - Coastal and Marine

- 10.01 square miles support
- 0.9 square miles non-support
- 23.21 square miles not assessed

The *Aesthetics Use* is supported in four freshwater streams including Frost Fish Brook in the Bass River System, portions of Crane Brook in the Crane River System, as well as Beaverdam Brook and the Saugus River (from the diversion canal to the Saugus Iron Works) in the Saugus River System. The only coastal water assessed as supporting this use is Salem Sound.

The *Aesthetics Use* is impaired in a total of four freshwater streams and three coastal areas including:

- a portion of Crane Brook and the Crane River in the Crane River System,
- a portion of Proctor Brook in the North River System,
- the Saugus River from the outlet of Lake Quannapowitt to the diversion canal in the Saugus River System,
- a portion of the upper Porter River (from the Route 62 bridge to the Route 128 bridge) in the Bass River System,
- the Waters River in the Crane River System, and
- the Saugus River estuary (from the Iron Works to the Lynn Harbor) in the Saugus River System.

Common causes of impairment to the *Aesthetics Use* include sedimentation, turbidity/grey water, trash and debris and algal blooms (DEP/DWM data summary, Figure 1). Surface oil sheens related to the GE Lynn stormwater outfalls impair the *Aesthetics Use* in the Saugus River estuary.

Shellfishing Use

The *Shellfishing Use* is supported when shellfish harvested from approved Open Shellfish Areas (Class SA) are suitable for consumption without depuration and shellfish harvested from approved Restricted Shellfish Areas (Class SB) are suitable for consumption with depuration. The Division of Marine Fisheries (DMF) classifies shellfishing areas in the North Coastal Watershed. The *Shellfishing Use* for this report was assessed using the DMF shellfishing closure listing dated 1 January 1999. The status of the 132,742.1 acres of shellfishing beds in the entire North Coastal Watershed (including areas that extend into open-water not specifically included in this assessment report) is as follows:

DMF Classification Type	DEP Use Support Status	DMF Area (acres)	% of total acreage
Approved	Support	18777.44	14%
Conditionally Approved	Partial Support	2575.16	2%
Management Closure	Not assessed	45720.53	34%
Prohibited	Non-support	65668.92	49%

Individual DMF management area classifications are provided in Appendix F of this report. It should be noted that their areas are defined in acres of shellfishing habitat.

LAKES/PONDS

Overall use support status and trophic status of the lakes surveyed in the North Coastal Watershed are presented in Tables 1 and 2, respectively. It should be noted that lakes, or portions of lakes, are listed as undetermined when indicators were not readily observable. With this approach, the assessment of lakes in the North Coastal Watershed is limited to a "best case" picture (i.e., only the most obvious impairments are reported). Potentially more of the lake acreage would be listed as impaired or in a more enriched trophic status if more variables were measured and more criteria assessed.

Table 1. North Coastal Watershed Lakes Use Support Summary Summer, 1997. (In Acres)

USE/DEGREE SUPPORTED	SUPPORT (THREATENED)	PARTIAL SUPPORT	NON- SUPPORT	NOT ASSESSED
Aquatic Life	0	545	5	1550
Fish Consumption*	0	0	204	1896
Swimmable	0	593	249	1258
Secondary Contact	1252	593	249	6
Aesthetics	1252	593	249	6

* Fish Consumption results do not include the statewide consumption advisory (i.e., they are site-specific advisories as reported by the Department of Public Health (1998).

N.B. - These results represent the most recent assessments of lakes/ponds in the North Coastal Watershed. These data also represent about 48% (43 of 89) of the lakes/ponds in the North Coastal Watershed and about 87% (2,100 of 2,415) of the acreage.

Table 2. North Coastal Watershed Lakes Trophic Status Summary Summer, 1997.

TROPHIC STATUS	NUMBER OF LAKES	ACRES
Oligotrophic	0	0
Mesotrophic	4	177
Eutrophic	17	930
Hypereutrophic	4	44
Dystrophic	0	0
Undetermined/ Not Attainable	18	949
Total	43	2100

N.B. - These results represent the most recent assessments of lakes/ponds in the North Coastal Watershed. These data also represent about 48% (43 of 89) of the lakes/ponds in the North Coastal Watershed and about 87% (2,100 of 2,415) of the acreage.

Despite the "best case" scenario that is favored by the North Coastal Watershed lake assessment approach, 49% (representing 46% of the surveyed area) of the lakes showed severe (eutrophic or hypereutrophic) symptoms of succession. Presumably, additional testing of dissolved oxygen, chlorophyll, and/or nutrients would corroborate that trophic status conditions are this advanced.

Four non-native aquatic plant species were found infrequently in the lakes of the North Coastal Watershed. Neither South American waterweed nor water hyacinth are likely to be immediate threats to spread from their current locations. The estuarine environment and northern climate should keep them in check. Fanwort (*Cabomba caroliniana*) and curly leaf pondweed (*Potamogeton crispus*), however, are particularly invasive species that can spread vegetatively via cuttings that may float downstream or be transported mechanically between lakes.

The most frequently occurring non-native wetland species was purple loosestrife (*Lythrum salicaria*). Populations of this plant are pervasive throughout the entire watershed. Its presence was recorded at over three-quarters (77%) of the lakes. The other non-native wetland plant observed in the watershed is the reed grass (*Phragmites australis*). The two non-native wetland species were co-located at three lakes (Cape Pond, Rockport, Floating Bridge Pond, Lynn, and Niles Pond, Gloucester).

Based on the data collected by DEP DWM's fish contaminant survey, the MA DPH issued a fish consumption advisory for Chebacco Lake in Essex/Hamilton. Therefore the *Fish Consumption Use* is not supported for the entire 204 acres of this lake.

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NORTH COASTAL WATERSHED 1997/1998 DEP DWM Water Quality, Macroinvertebrate and Fish Consumption Station Data Summary

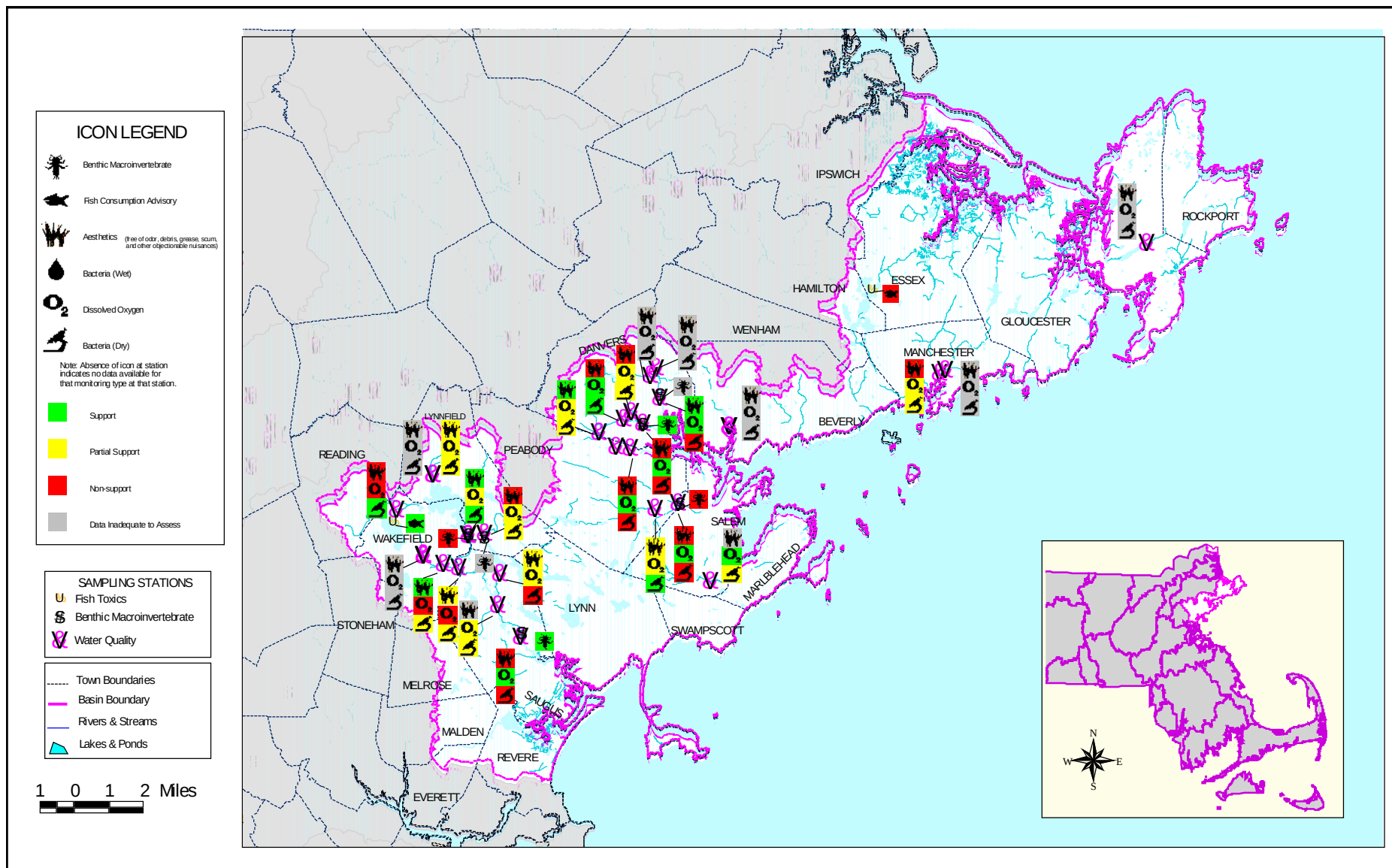


Figure 1. 1997/1998 DEP DWM water quality, macroinvertebrate and fish consumption station data summary in the North Coastal Watershed