94-AC-2

SOUTH SHORE COASTAL WATERSHEDS
2001 WATER QUALITY ASSESSMENT REPORT

COMMONWEALTH OF MASSACHUSETTS
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Prepared by:

Massachusetts Department of Environmental Protection
Division of Watershed Management

Report Number:

94-AC-2

DWM Control Number:

CN 93.0

Massachusetts Department of Environmental Protection
Division of Watershed Management
Worcester, Massachusetts

March 2006

ACKNOWLEDGEMENTS

Coordination of local, state and federal agencies and private organizations is fundamental to the success of the protecting and restoring water quality in Massachusetts.

Data and information used in this report was provided in part by the following agencies and organizations and/or studies funded through them:

State
Department of Environmental Protection (MassDEP)
- Bureau of Resource Protection (BRP)
- Bureau of Strategic Policy and Technology Wall Experiment Station (WES)
- Bureau of Waste Prevention (BWP)
- Bureau of Waste Site Cleanup (BWSC)

Department of Conservation and Recreation (MA DCR)
Department of Fish and Game (MA DFG)
- Division of Fisheries and Wildlife (MDFW)
- Division of Marine Fisheries (DMF)

Department of Public Health (MDPH)

Federal
United States Environmental Protection Agency (EPA)
United States Geological Survey (USGS)
- Water Resources Division

Army Corps of Engineers (ACOE)

Regional
Metropolitan Area Planning Council (MAPC)
Old Colony Planning Council (OCPC)
North River Commission
South Coastal Watershed Network (SCWNetwork)

Local
North and South River Watershed Association (NSRWA)
Eel River Watershed Association
Jones River Watershed Association
Billington Sea Association
Six Ponds Improvement Association
Plymouth Pondwatchers
The Gulf Association
Pembroke Watershed Association

It is impossible to thank everyone who contributed to the assessment report process: field, laboratory, data management, writing, editing, and graphics, as well as meetings, phone calls, and many e-mails. All of these contributions are very much appreciated.

Cover photo credit: Fishing vessel Rose Corey departing Green Harbor at sunrise, Jennifer DeCesare.

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LIST OF ACRONYMS

7Q10 ..... seven day, ten year low flow
ACEC ..... Area of Critical Environmental Concern
ACOE ..... Army Corps of Engineers (United States)
ANC ..... Acid Neutralizing Capacity
BDL ..... below detection limit
BMP ..... best management practice
BOD ..... biological oxygen demand
BPJ ..... best professional judgment
BRP ..... Bureau of Resource Protection
BUDGETS .... Balancing Uses with Demands and Generating Effective Techniques for Sustainability
CBOD ..... chemical biological oxygen demand
CFU ..... colony forming unit
CMR ..... Code of Massachusetts Regulations
CNOEC ..... chronic no observed effect concentration
CPR ..... Coastal Pollution Remediation Grant Program
CSO ..... combined sewer overflow
CWA ..... Clean Water Act
CZM ..... Coastal Zone Management
DDT ..... dichlorodiphenyltrichloroethane
DFG ..... Department of Fish and Game
DMF ..... Division of Marine Fisheries
DO ..... dissolved oxygen
DWM ..... Division of Watershed Management
DWP ..... Drinking Water Program
EOEA ..... Executive Office of Environmental Affairs
EPA ..... United States Environmental Protection Agency
GIS ..... geographic information system
LC_{50} ..... lethal concentration to 50% of the test organisms
L-EL ..... low effect level
MA DCR ..... Massachusetts Department of Conservation and Recreation
MA DEM ..... Massachusetts Department of Environmental Management (now MA DCR)
MassDEP ..... Massachusetts Department of Environmental Protection
MA DFG ..... Massachusetts Department of Fish and Game
MDFW ..... Massachusetts Division of Fisheries and Wildlife
MDL ..... method detection limit
MDPH ..... Massachusetts Department of Public Health
MEPA ..... Massachusetts Environmental Policy Act
MPN ..... most probable number
MS4 ..... Municipal Separate Stormwater System
MassGIS ..... Massachusetts Geographic Information System
MWI ..... Massachusetts Watershed Initiative
NCCW ..... non-contact cooling water
NH_3-N ..... Ammonia-nitrogen
NPDES ..... National Pollutant Discharge Elimination System
NPS ..... non-point source pollution
ORW ..... Outstanding Resource Water
PALIS ..... Pond and Lake Information System
PCB ..... polychlorinated biphenyls
PWS ..... public water supply
QA/QC ..... quality assurance/ quality control
QAPP ..... quality assurance project plan
SARIS ..... Stream and River Inventory System
S-EL ..... severe effect level
SMAST ..... University of Massachusetts School of Marine Science and Technology
SOP ..... standard operating procedure
SRF ..... State Revolving Fund
SWAP ..... Surface Water Assessment Program
SWQS ..... Surface Water Quality Standards
TMDL ..... total maximum daily load
TOXTD ..... MassDEP DWM Toxicity Testing Database
TOC ..... total organic carbon
TRC ..... total residual chlorine
TSS ..... total suspended solids
UST ..... underground storage tank
USGS ..... United States Geological Survey
VOC ..... volatile organic compound
WBID ..... waterbody identification code
WBS ..... waterbody system database
WMA ..... Water Management Act
WTP ..... water treatment plant
WWTP ..... wastewater treatment plant

LIST OF UNITS

cfs ..... cubic feet per second
cfu ..... colony forming unit
GPM (D) ... gallons per minute (day)
MGD ..... million gallons per day
µg/kg ..... microgram per kilogram
M ..... meter
ml ..... milliliters
mg/L ..... milligram per liter
MPN ..... most probable number
ng ..... nanograms
NTU ..... nephelometric turbidity units
ppb ..... parts per billion
ppm ..... parts per million
SU ..... standard units
TEQ/kg ..... toxic equivalents per kilogram
µeq/L ..... microequivalants per liter
µS/cm ..... micro seimens per centimeter

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EXECUTIVE SUMMARY
SOUTH SHORE COASTAL WATERSHEDS 2001 WATER QUALITY ASSESSMENT REPORT

The Massachusetts Surface Water Quality Standards (SWQS) designate the most sensitive uses for which surface waters in the state shall be protected. The assessment of current water quality conditions is a key step in the successful implementation of the Watershed Approach. This critical phase provides an assessment of whether or not the designated uses are supported or impaired, or are not assessed, as well as basic information needed to focus resource protection and remediation activities later in the watershed management planning process.

This report presents a summary of current water quality data/information in the South Shore Coastal Watersheds used to assess the status of the designated uses, as defined in the SWQS. The designated uses, where applicable, include: *Aquatic Life, Fish Consumption, Shellfish Harvesting, Drinking Water, Primary* and *Secondary Contact Recreation* and *Aesthetics*. Each use, within a given segment, is individually assessed as ***support*** or ***impaired***. When too little current data/information exists or no reliable data are available the use is ***not assessed***. However, if there is some indication of water quality impairment, which is not "naturally occurring", the use is identified with an "Alert Status". It is important to note that not all waters are assessed. Many small and/or unnamed rivers, lakes, and estuarine areas are currently ***unassessed***; the status of their designated uses has never been reported to the EPA in the Commonwealth's Summary of Water Quality Report (305(b) Report) nor is information on these waters maintained in the Waterbody System (WBS) or the new Assessment Database (ADB).

There are a total of 15 freshwater rivers, streams or brooks (the terms "rivers" will hereafter be used to include all), comprising 17 river segments in the South Shore Coastal Watersheds, presented in this report. These include: Aaron, Drinkwater, Eel, Green Harbor, Indian Head, Jones, and South rivers; Bound, Iron Mine, Herring, First Herring, Second Herring and Third Herring brooks; French Stream; and an unnamed tributary to Eel River. They account for approximately 32% (51.0 miles) of an estimated 159.2 named river miles. The remaining rivers are small and are currently *unassessed*. This report also presents information on 18 named estuarine segments (class SA or SB) totaling 28.93 square miles. These include: Cohasset Cove; Cohasset, Ellisville, Little, Green, Plymouth and Scituate harbors; Duxbury and Plymouth bays; Bluefish, Herring, Jones, North and South rivers; Second Herring Brook; Musquashcut Pond; and The Gulf. Additionally, there are a total of 78 lakes, ponds or impoundments (the term "lakes" will hereafter be used to include all) presented in this report. They account for 88% (4,242 of the 4,815 acres) of the lake acreage in the South Shore Coastal Watersheds.

SOUTH SHORE COASTAL WATERSHEDS – RIVERS AND ESTUARIES

The three largest systems in the South Shore Coastal Watersheds area are the Cohasset Harbor Subwatershed, the North and South Rivers Subwatershed and the Plymouth Bay Subwatershed including the Jones and Eel rivers. The smaller subwatershed areas include: Little Harbor, Scituate Harbor, the Green Harbor Subwatershed, and Ellisville Harbor. There is an area of unconsolidated small basins in the southern part of the South Shore Coastal Watersheds. Each of the three largest systems, the four smaller systems, and the area of unconsolidated small basins are briefly summarized below.

Cohasset Harbor Subwatershed - The surface watershed area for this subwatershed is approximately 17.6 mi^2. A total of 3.5 river miles along three rivers (Aaron River, Herring Brook, and Bound Brook) are contained in this system. This subwatershed includes 1.03 mi^2 of estuaries (Musquashcut Pond, The Gulf, Cohasset Cove, Cohasset Harbor) and 207.5 acres of lakes.

North and South Rivers Subwatershed - The surface watershed area for this subwatershed is approximately 76 mi^2. A total of 30.6 river miles along eight rivers (French Stream, Drinkwater River, Indian Head River, Iron Mine Brook, Third Herring Brook, Second Herring Brook, First Herring Brook, and the South River) are contained in this system. This subwatershed includes 1.57 mi^2 of estuaries (North River, South River, and the Herring River) and 1,026.1 acres of lakes.

Plymouth Bay Subwatershed - The surface watershed area for this subwatershed is approximately 73.8 mi^2. A total of 8.9 river miles along two rivers (Jones River and Eel River) are contained in this system. This subwatershed includes 25.68 mi^2 of estuaries (Jones River, Duxbury Bay, Plymouth Harbor, and Plymouth Bay) and 1,896.3 acres of lakes.

Smaller Subwatershed Areas - Little Harbor has a surface watershed area of approximately 1.7 mi^2 and 0.24 mi^2 of estuary. Scituate Harbor has a surface watershed area of approximately 3.5 mi^2 and 0.32 mi^2 of estuary. Green Harbor has a surface watershed area of approximately 7.7 mi^2, 5.6 miles of river, 0.08 mi^2 of estuary, and 53.5 acres of lakes. Ellisville Harbor has a surface watershed area of approximately 1.97 mi^2, 0.01 mi^2 of estuary, and 28.9 acres of lakes.

There is also an area of the South Shore Coastal Watersheds of approximately 61.23 mi^2 south of the Plymouth Bay subwatershed and excluding the Ellisville Harbor Subwatershed. This area consists of several small coastal basins that are not interconnected by any one river. This portion of the South Shore Coastal Watersheds does not have any river segments reported for it (although it contains the Herring River); however, there are approximately 1030.1 acres of lakes assessed in this report (many of which are kettle lakes) in this area.

The summary of the *Aquatic Life, Fish Consumption, Primary* and *Secondary Contact Recreation,* and *Aesthetics* uses in these waterbodies are provided below. Where sufficient data/current information was not available, the uses were not assessed.

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* may result from anthropogenic stressors that include point and/or non-point source(s) of pollution and hydrologic modification.

Aquatic Life Use – Rivers and Estuaries (Figure 1)

All or portions of eight freshwater river segments, totaling 23.4 miles (representing 46% of the assessed river mileage), and eight estuarine segments, totaling 24.6 mi^2 (85% of the assessed estuarine area), in the South Shore Coastal Watersheds are assessed as supporting the *Aquatic Life Use*. Forty-nine percent of the river segment mileage (all or portions of nine segments) and two estuary segments are impaired for the *Aquatic Life Use*. The remaining 5% of rivers and 6% of estuaries are not assessed for this use.

Aquatic Life Use Assessment
Rivers
(total length included in report – 51.0 miles)
Support – 23.4 miles (46%)
Impaired – 25.2 miles (49%)
Not Assessed – 2.4 miles (5%)

Estuaries
(total area included in report – 28.9 mi^2)
Support – 24.6 mi^2 (85%)
Impaired – 2.6 mi^2 (9%)
Not Assessed – 1.7 mi^2 (6%)

Lakes
(total area included in report – 4,242 acres)
Support – 22 acres (<1%)
Impaired – 1638 acres (39%)
Not Assessed – 2582 acres (61%)

In the Cohasset Harbor Subwatershed, all three freshwater river segments (Aaron River, Herring Brook and Bound Brook) and one estuarine segment (Musquashcut Pond) are impaired for the *Aquatic Life Use* (3.5 river miles and 0.11 mi^2 area). The poorly designed, deteriorating notched weir-pool fish ladder at Hunters Pond is impassable and this barrier to fish migration is the cause of impairment for the three upstream river segments (i.e., Aaron River, Herring Brook and Bound Brook). The dense infestation of non-native aquatic macrophytes in Herring Brook and in the lower 0.2 miles of Aaron River also impairs the *Aquatic Life Use* in these waterbodies. Causes of impairment in Musquashcut Pond include excess algal growth, elevated chlorophyll *α* and total phosphorus, dissolved oxygen saturation, and flow regime alterations (i.e., restricted tidal flushing). The known source of impairment in Musquashcut Pond is a change in tidal circulation/flushing as a result of poor operation of the tide gates. The remaining estuarine segments (The Gulf, Cohasset Cove and Cohasset Harbor), totaling 0.92 mi^2, are not assessed for the *Aquatic Life Use*.

In the North and South Rivers Subwatershed, only one segment (French Stream) and a portion of another (the lower 1.1 miles of the Drinkwater River) are impaired for the *Aquatic Life Use* (a total of 7.2 river miles). French Stream is assessed as impaired based primarily on best professional judgment (degraded in-stream habitat quality, toxicity issues). Causes of impairment in the Drinkwater River (downstream from its confluence with French Stream) include dissolved oxygen saturation and elevated total

phosphorus both of which are considered to result from the Rockland WWTP discharge. The remaining river and estuary segments (upper 2.4 miles of the Drinkwater River, Indian Head River, Iron Mine Brook, First, Second and Third Herring brooks, North and South rivers) are assessed as supporting the *Aquatic Life Use* (totaling 23.4 river miles and 1.49 mi^2 estuarine area), although First Herring Brook is identified with an Alert Status because of concerns regarding streamflow. The Herring River is the only segment not assessed for this use (0.08 mi^2). It should also be noted that the impact(s), if any, from the Fireworks Site on aquatic life in the Drinkwater River are currently being investigated as part of the Massachusetts Contingency Plan. These data should be available in the near future.

The Green Harbor River in the Green Harbor River Subwatershed is assessed as impaired for the *Aquatic Life Use* because of flow regime alterations from the tide gate structure and the fish passage barrier (5.6 river miles). Green Harbor is not assessed for the *Aquatic Life Use* (0.08 mi^2).

In the Plymouth Bay Subwatershed, three of the four freshwater river segments are impaired for the *Aquatic Life Use* (the upper two segments of the Jones River and the Eel River). An unnamed tributary to Eel River is not assessed (2.4 river miles). The *Aquatic Life Use* is assessed as impaired in the freshwater segments of the Jones River based primarily on the lack of streamflow, which is a chronic problem for the river. Extremely low dissolved oxygen levels and low dissolved oxygen saturation conditions were also documented. These problems result from flow regulation/modification associated with water withdrawals (including but not necessarily limited to the out of basin transfer of water from Silver Lake to the City of Brockton for public water supply). Barriers to fish migration are also present at the Silver Lake and Wapping Road dams and are another cause of impairment for the upstream segment of the Jones River (MA94-12; totaling 5.0 river miles). The *Aquatic Life Use* is assessed as impaired for the Eel River (3.9 river miles) because of the lack of anadromous fish passage upstream from the Russell Millpond dam and the heavy infestation of the non-native macrophyte *Cabomba caroliniana* in two small impoundments (i.e., Hayden Pond and Eel River Pond) in the lower portion of the river. Only one estuarine segment (Plymouth Harbor) in the Plymouth Bay Subwatershed is impaired for the *Aquatic Life Use* (2.53 mi^2). The cause of impairment in the harbor is the loss of eelgrass bed habitat; however, improvements are anticipated as a result of several pollution abatement actions. The remaining estuarine segments (Bluefish River, Jones River, Duxbury Bay, and Plymouth Bay are assessed as supporting the *Aquatic Life Use* (totaling 23.15 mi^2).

Three harbor segments are not associated with larger subwatershed systems in the South Shore Coastal Watersheds. Little Harbor, Scituate Harbor, and Ellisville Harbor are not assessed for the *Aquatic Life Use* (a total of 0.57 mi^2).

Aquatic Life Use – Lakes (Figure 1)

Only two lakes (Forge Pond in Plymouth and Tack Factory Pond in Scituate), representing less than 1% of the total assessed lake acreage, support the *Aquatic Life Use,* while many lakes (52) are not assessed for this use (2,582 acres representing 61%). Twenty-four lakes, however, totaling 1,638 acres (39% of the assessed lake acreage) are impaired for the *Aquatic Life Use*.

A total of 17 lakes representing 1,314.6 acres are impaired for the *Aquatic Life Use* solely because of the presence of non-native aquatic macrophytes: Beaver Dam Pond, Black Mountain Pond, Briggs Reservoir (MA94019 and MA94020), Cooks Pond, Island Creek Pond, Island Pond, Jacobs Pond, Long Island Pond, Lorings Bogs Pond, Lower Chandler Pond, Oldham Pond, Pembroke Street South Pond, Reeds Millpond, Smelt Pond, Torrey Pond, and Upper Chandler Pond. These lakes are located throughout the entire South Shore Coastal Watersheds and represent 80% of the lake area assessed as impaired for the *Aquatic Life Use*. There are four additional lakes (Forge, Lily, Old Oaken Bucket, and Wampatuck ponds) that are also infested with non-native aquatic macrophytes (an additional 143 acres); however these waterbodies are also impaired for other reasons. Additional impairments of the *Aquatic Life Use* are summarized by subwatershed below.

In the Cohasset Harbor Subwatershed, the poorly designed, deteriorating notched weir-pool fish ladder at Hunters Pond is impassable and this barrier to fish migration is the cause of impairment in both Aaron River Reservoir and Lily Pond (totaling 187 acres). Non-native aquatic macrophytes are also a problem Lily Pond.

In the North and South Rivers Subwatershed, three lakes are impaired for the *Aquatic Life Use* (a total of 87 acres). Forge Pond in Hanover is impaired because of elevated total phosphorus and chlorophyll *a* concentrations, dissolved oxygen saturation and non-native aquatic macrophytes. The Rockland Municipal WWTP discharge is a known source of total phosphorus and is considered to be the source of the nutrient-related impairment in Forge Pond. Old Oaken Bucket Pond in Scituate is impaired because of the non-native macrophyte infestation and elevated concentrations of total phosphorus, although the source(s) are currently unknown. Wampatuck Pond in Hanson is impaired for the *Aquatic Life Use* because of elevated total phosphorus, chlorophyll *a* concentrations, excess algal growth and non-native aquatic macrophytes. Specialty crop production (i.e., cranberry bog operations) is considered to be the source of nutrient-related impairments in Wampatuck Pond.

In the Plymouth Bay Subwatershed, the *Aquatic Life Use* is assessed as impaired for two lakes (totaling 659 acres). Silver Lake is impaired because of flow alteration associated with water withdrawals and diversions. Russell Millpond in Plymouth is impaired because of fish barrier (a fish ladder for herring that has not operated since 1996) and excess algal growth.

FISH CONSUMPTION USE

The *Fish Consumption Use* is supported when there are no pollutants present that result in unacceptable concentrations in edible portions (as opposed to whole fish - see *Aquatic Life Use*) of fish, other aquatic life or wildlife for human consumption. The assessment of the *Fish Consumption Use* is made using the most recent list of Fish Consumption Advisories issued by the Massachusetts Executive Office of Health and Human Services, Department of Public Health (MDPH), Bureau of Environmental Health Assessment (MDPH 2004a). The MDPH list identifies waterbodies where elevated levels of a specified contaminant in edible portions of freshwater species pose a health risk for human consumption; hence, the *Fish Consumption Use* is assessed as impaired in these waters. In July 2001 MDPH issued new consumer advisories on fish consumption and mercury contamination (MDPH 2001). Because of these statewide advisories no waters can be assessed as support for the *Fish Consumption Use*. These waters default to "not assessed". The statewide advisories read as follows.

> The MDPH "is advising pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age to refrain from eating the following marine fish; shark, swordfish, king mackerel, tuna steak and tilefish. In addition, MDPH is expanding its previously issued statewide fish consumption advisory which cautioned pregnant women to avoid eating fish from all freshwater bodies due to concerns about mercury contamination, to now include women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age." Additionally, MDPH "is recommending that pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age limit their consumption of fish not covered by existing advisories to no more than 12 ounces (or about 2 meals) of cooked or uncooked fish per week. This recommendation includes canned tuna, the consumption of which should be limited to 2 cans per week. Very small children, including toddlers, should eat less. Consumers may wish to choose to eat light tuna rather than white or chunk white tuna, the latter of which may have higher levels of mercury." MDPH's statewide advisory does not include fish stocked by the state Division of Fisheries and Wildlife or farm-raised fish sold commercially.

Fish Consumption Use - Rivers, Estuaries and Lakes (Figure 2)

Because of health concerns associated with exposure to mercury, MDPH has issued site-specific fish consumption advisories for several waterbodies in the South Shore Coastal Watersheds. One site-specific advisory encompasses three waterbodies in the North and South Rivers Subwatershed; the lower 0.5-mile reach of the Drinkwater River, Factory Pond, and the Indian Head River. The mercury contamination impairing the *Fish Consumption Use* (3.4 river miles and 51 lake acres) in these waters is associated with the former National Fireworks, Inc. waste site.

Site-specific advisories are also in place for three other lakes; Aaron River Reservoir, Great Herring Pond, and Great South Pond (835 lake acres). The source of mercury in these waterbodies is unknown, although atmospheric deposition is suspected.

***Fish Consumption Use* Assessment**
Rivers
(total length included in report – 51.0 miles)
Impaired – 3.4 miles (7%)
Not Assessed – 47.6 miles (93%)

Estuaries
(total area included in report – 28.9 mi^2)
Not Assessed – 28.9 mi^2 (100%)

Lakes
(total area included in report – 4,242 acres)
Impaired – 886 acres (21%)
Not Assessed – 3356 acres (79%)

No other site-specific fish consumption advisories exist for waterbodies in the South Shore Coastal Watersheds, so all estuarine and the remaining freshwater river and lake segments are not assessed for the *Fish Consumption Use* (the MDPH's statewide advisory for mercury that encompasses all Massachusetts waters precludes an assessment of support for this use).

DRINKING WATER USE

The term *Drinking Water Use* has been used to indicate sources of public drinking water. While this use is not assessed in this report, the state provides general guidance on drinking water source protection of both surface water and groundwater sources (available at http://www.mass.gov/dep/water/drinking.htm). These waters are subject to stringent regulation in accordance with the Massachusetts Drinking Water Regulations. MassDEP's Drinking Water Program has primacy for implementing the provisions of the federal Safe Drinking Water Act. The Drinking Water Program has also initiated work on its Source Water Assessment Program, which requires that the Commonwealth delineate protection areas for all public ground and surface water sources, inventory land uses in these areas that may present potential threats to drinking water quality, determine the susceptibility of water supplies to contamination from these sources, and publicize the results.

Public water suppliers monitor their finished water (tap water) for major categories of both naturally occurring and man-made contaminants such as: microbiological, inorganic, organic, pesticides, herbicides, and radioactive contaminants. Specific information on community drinking water sources, including Source Water Assessment Program activities and drinking water quality information, are updated and distributed annually by the public water system to its customers in a "Consumer Confidence Report". These reports are available from the public water system, the local boards of health, MDPH and MassDEP.

SHELLFISH HARVESTING USE

The *Shellfish Harvesting Use* is supported when shellfish harvested from Approved (Class SA or SB) or Conditionally Approved (Class SB) Shellfish Growing Areas are suitable for consumption without depuration and when shellfish harvested from Restricted (Class SB) Shellfish Growing Areas are suitable for consumption with depuration. The Division of Marine Fisheries (DMF) classifies shellfishing areas in the South Shore Coastal Watersheds. The *Shellfish Harvesting Use* for this report was assessed using the DMF shellfishing closure list dated 1 July 2000 and published on Massachusetts Geographic Information System (MassGIS) in October 2000, as well as updates provided by DMF personnel (Churchill 2005a, 2005b, and 2005c).

The status of the 128,199 acres of shellfishing beds in the South Shore Coastal Watersheds (including areas that extend into open-water and areas not designated as MassDEP assessment segments) is summarized below.

DMF Classification Type	MassDEP Designated Use Status	Area (Acres)	% of total DMF acreage
Approved	Support	113,449	88%
Conditionally Approved	SA Waters - Impaired	395	1%
	SB Waters - Support	0	0
Restricted	SA Waters - Impaired	0	0
	SB Waters - Support	0	0
Conditionally Restricted	Impaired	0	0
Prohibited	Not assessed	14,355	11%
Management Closure	Support	0	0

Individual DMF management area classifications are provided in Appendix G of this report. It should be noted that DMF's areas are defined in acres of potential shellfish habitat.

PRIMARY CONTACT RECREATIONAL USE

The *Primary Contact Recreational Use* is supported when conditions are suitable (fecal coliform bacteria densities, turbidity and aesthetics meet the SWQS and/or the MDPH Bathing Beaches State Sanitary Code and/or guidance) for any recreational or other water related activity during which there is prolonged and intimate contact with the water and there exists a significant risk of ingestion. Activities include, but are not limited to, wading, swimming, diving, surfing and water skiing.

Primary Contact Recreational Use – Rivers and Estuaries (Figure 3)

Six freshwater river segments, totaling 18.2 miles and representing 36% of the river segment mileage in the South Shore Coastal Watersheds, are assessed as supporting the *Primary Contact Recreational Use*. Ten estuarine segments and the majority of one other segment, representing a total of 27.4 mi^2 (95% of the assessed estuarine area), also support the *Primary Contact Recreational Use*. Ten river segments, totaling 29.6 miles and representing 58% of the river segment mileage, as well as one estuarine segment (Musquashcut Pond), and a portion of another (North River) are impaired for this use. The *Primary Contact Recreational Use* was impaired for less than 1% of the total estuarine area assessed in this report. Few waterbodies (a portion or all of two rivers and six estuarine areas representing 6 and 5% of river miles and estuarine area, respectively) are not assessed for the *Primary Contact Recreational Use*.

***Primary Contact Recreational Use* Assessments**

Rivers
(total length included in report – 51.0 miles)
Support – 18.2 miles (36%)
Impaired – 29.6 miles (58%)
Not Assessed – 3.2 miles (6%)

Estuaries
(total area included in report – 28.9 mi^2)
Support – 27.4 mi^2 (95%)
Impaired – 0.1 mi^2 (<1%)
Not Assessed – 1.4 mi^2 (5%)

Lakes
(total area included in report – 4,242 acres)
Support – 1057 acres (25%)
Impaired – 282 acres (7%)
Not Assessed – 2,903 acres (68%)

In the Cohasset Harbor Subwatershed, all of the freshwater river segments are impaired for the *Primary Contact Recreational Use* (Aaron River, Herring Brook and Bound Brook), with the exception of the upper 0.8-mile reach of Aaron River, which is not assessed. Causes of impairment include: in the lower 0.2-mile reach of Aaron River, excess algal growth and the dense growth of non-native aquatic macrophytes; in Herring Brook, dense non-native aquatic macrophyte growth; and, in Bound Brook, turbidity. The source(s), however, are currently unknown. Musquashcut Pond is the only estuarine segment impaired for the *Primary Contact Recreational Use*. Causes of impairment are excess algal growth and other flow regime alterations due to changes in tidal circulation/flushing resulting from poor operation of the tide gates. Cohasset Cove and Cohasset Harbor support the *Primary Contact Recreational Use* and The Gulf is not assessed.

Almost all of the river and estuarine segments in the North and South Rivers Subwatershed were assessed for the *Primary Contact Recreational Use*. Five river segments (both segments of the Indian Head River, Second Herring Brook, First Herring Brook, and South River), totaling 14.3 river miles support the *Primary Contact Recreational Use*. The lower 0.28 mi^2 of North River and the estuarine segments of Second Herring Brook and South River, totaling 0.91 mi^2, support this use. Four river segments (French Stream, Drinkwater River, Iron Mine Brook and Third Herring Brook), representing a total of 16.3 river miles, and the upper 0.02 square mile area of the North River estuary were found to have elevated fecal coliform bacteria counts, so these waters are assessed as impaired for the *Primary Contact Recreational Use*. The source(s) of bacteria are currently unknown. Excess algal growth and low Secchi disk transparency in the lower 1.1-mile reach of the Drinkwater River, which also cause impairment of the *Primary Contact Recreational Use*, is considered to be associated with the Rockland WWTP discharge. Two estuarine segments, the Herring River and one segment of the North River totaling 0.64 mi^2, are not assessed for the *Primary Contact Recreational Use*.

The Green Harbor River (5.6 river miles) is impaired for the *Primary Contact Recreational Use* due to turbidity and excess algal growth, although source(s) are unknown. Green Harbor is not assessed for this use.

In the Plymouth Bay Subwatershed, the Eel River (3.9 miles) and all of the estuarine segments (25.68 mi^2) support the *Primary Contact Recreational Use*. Both river segments of the Jones River, totaling 5.0 miles, are impaired for the *Primary Contact Recreational Use* because of excess algal and macrophyte growth and turbidity. These conditions appear to be exacerbated by the lack of flow in the river resulting from flow regulation/modification associated with water withdrawals (including but not necessarily limited to the out of basin transfer of water from Silver Lake to the City of Brockton for public water supply). An unnamed tributary to Eel River is the only segment in the Plymouth Bay Subwatershed not assessed for the *Primary Contact Recreational Use*.

Three harbor segments are not associated with larger subwatershed systems in the South Shore Coastal Watersheds. Little Harbor and Scituate Harbor (0.56 mi^2) are not assessed for the *Primary Contact Recreational Use* and Ellisville Harbor (0.01 mi^2) supports this use.

Primary Contact Recreational Use – Lakes (Figure 3)
Thirteen lakes, totaling 1,057 acres and representing 25% of the assessed lake acreage in the South Shore Coastal Watersheds, support the *Primary Contact Recreational Use*. They are Black Jimmy, Elbow, Fresh, Hedges, Little, and Savery ponds in Plymouth; Great Herring Pond in Bourne/Plymouth; Furnace, Hobomock, and Little Sandy Bottom ponds in Pembroke; Maquan Pond in Hanson; Oldham Pond in Pembroke/Hanson; and Tack Factory Pond in Scituate.

Eight lakes, totaling 282 acres and representing 7% of the assessed lake acreage, are impaired for the *Primary Contact Recreational Use*. Black Mountain Pond in Marshfield, Jacobs Pond in Norwell, and Old Oaken Bucket Pond in Scituate (totaling 85 acres) are impaired solely due to dense infestations of non-native aquatic macrophytes. Lily Pond in Cohasset (51 acres) is also impaired because of dense non-native aquatic macrophytes, as well as low Secchi disk transparency. In addition, three lakes in the North/South River Subwatershed are assessed as impaired for the *Primary Contact Recreational Use*. Studleys Pond in Rockland is impaired because of elevated fecal coliform bacteria, although source(s) are currently unknown. Forge Pond in Hanover is impaired because of elevated fecal coliform bacteria, excess algal growth, low Secchi disk transparency, elevated total phosphorus, and the presence of trash/debris. The Rockland Municipal WWTP discharge is a known source of total phosphorus to this pond, although additional suspected sources include stormwater and agricultural runoff. Wampatuck Pond in Hanson is impaired because of excess algal growth and low Secchi disk transparency. Specialty crop production (i.e., cranberry bog operations) is considered to be the source of nutrient-related impairments in Wampatuck Pond. Also, in the Plymouth Bay Subwatershed, Russell Millpond in Plymouth is impaired because of excess algal growth.

The remaining 57 lakes, representing 68% of the lake acreage, are not assessed for the *Primary Contact Recreational Use*.

SECONDARY CONTACT RECREATIONAL USE
The *Secondary Contact Recreational Use* is supported when conditions are suitable for any recreational 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 related to shoreline activities. For lakes, non-native aquatic macrophyte cover and/or transparency data (Secchi disk depth) are evaluated to assess the status of the recreational uses.

Secondary Contact Recreational Use – Rivers and Estuaries (Figure 4)
All or portions of ten river segments totaling 33.4 miles (representing 66% of the assessed river mileage) and 11 estuarine segments totaling 27.4 mi^2 (95% of the assessed estuarine area) in the South Shore Coastal Watersheds are assessed as supporting the *Secondary Contact Recreational Use.* Twenty-eight percent of the river segment mileage (all or portions of seven segments) and one estuarine segment is impaired for the *Secondary Contact Recreational Use*. The remaining 6% of rivers and 5% of estuaries are not assessed for this use.

In the Cohasset Harbor Subwatershed all of the freshwater river segments are impaired for the *Secondary Contact Recreational Use* (Aaron River, Herring Brook and Bound Brook), with the exception of the upper 0.8-mile reach of Aaron River, which is not assessed. Causes of impairment in the lower 0.2-mile reach of Aaron River are non-native aquatic macrophytes and excess algal growth; in Herring Brook non-native aquatic macrophytes; and in Bound Brook turbidity. Sources are unknown. Musquashcut Pond (MA94-33), in the Cohasset Harbor Subwatershed, is the only estuarine segment impaired for the *Secondary Contact Recreational Use*. Causes of impairment are excess algal growth and other flow regime alterations due to changes in tidal circulation/flushing resulting from poor operation of the tide gates. Cohasset Cove and Cohasset Harbor support this use and The Gulf is not assessed.

***Secondary Contact Recreational Use* Assessments**
Rivers
(total length included in report – 51.0 miles)
Support – 33.4 miles (66%)
Impaired – 14.4 miles (28%)
Not Assessed – 3.2 miles (6%)

Estuaries
(total area included in report – 28.9 mi^2)
Support – 27.4 mi^2 (95%)
Impaired – 0.1 mi^2 (<1%)
Not Assessed – 1.4 mi^2 (5%)

Lakes
(total area included in report – 4,242 acres)
Support – 1,070 acres (25%)
Impaired – 257 acres (6%)
Not Assessed – 2,915 acres (69%)

In the North and South Rivers Subwatershed most of the river and estuary segments (28.1 miles and 0.93 mi^2) are assessed as supporting the *Secondary Contact Recreational Use*. The lower 1.1-mile segment of the Drinkwater River is impaired for this use due to excess algal growth and low Secchi disk transparency associated with the Rockland WWTP discharge. The Herring River and lower estuarine segment of the North River, totaling 0.64 mi^2, are not assessed for the *Secondary Contact Recreational Use*.

The Green Harbor River is impaired for the *Secondary Contact Recreational Use* due to turbidity and excess algal growth with sources unknown. Green Harbor is not assessed for the same use.

In the Plymouth Bay Subwatershed, the Eel River (3.9 miles) and all of the estuarine segments (25.68 mi^2) support the *Secondary Contact Recreational Use*. Both river segments of the Jones River, totaling 5.0 miles, are impaired for the *Secondary Contact Recreational Use* because of excess algal and macrophyte growth and turbidity. These conditions appear to be exacerbated by the lack of flow in the river resulting from flow regulation/modification associated with water withdrawals (including but not necessarily limited to the out of basin transfer of water from Silver Lake to the City of Brockton for public water supply). An unnamed tributary to Eel River is the only segment in the Plymouth Bay Subwatershed not assessed for the *Secondary Contact Recreational Use*.

Three harbor segments are not associated with larger subwatershed systems in the South Shore Coastal Watersheds. Little Harbor and Scituate Harbor (0.56 mi^2) are not assessed for the *Secondary Contact Recreational Use* and Ellisville Harbor (0.01 mi^2) supports this use.

Secondary Contact Recreational Use – Lakes (Figure 4)
Fourteen lakes, totaling 1,070 acres and representing 25% of the assessed lake acreage in the South Shore Coastal Watersheds, support the *Secondary Contact Recreational Use*. They are Black Jimmy, Elbow, Forge, Fresh, Hedges, Little, and Savery ponds in Plymouth; Great Herring Pond in Bourne/Plymouth; Furnace, Hobomock, and Little Sandy Bottom ponds in Pembroke; Maquan Pond in Hanson; Oldham Pond in Pembroke/Hanson; and Tack Factory Pond in Scituate. Forge Pond in Plymouth also supports the *Secondary Contact Recreational Use*.

Seven lakes, totaling 257 acres and representing 6% of the assessed lake acreage, are impaired for the *Secondary Contact Recreational Use*. Black Mountain Pond in Marshfield, Jacobs Pond in Norwell, and Old Oaken Bucket Pond in Scituate (totaling 85 acres) are impaired solely due to dense infestations of non-native aquatic macrophytes. Lily Pond in Cohasset (51 acres) is also impaired because of dense non-native aquatic macrophytes and low Secchi disk transparency. Also, two lakes in the North/South River Subwatershed are assessed as impaired for the *Secondary Contact Recreational Use*. Forge Pond in Hanover is impaired for this use because of excess algal growth, low Secchi disk transparency,

elevated total phosphorus, and the presence of trash/debris. The Rockland Municipal WWTP discharge is a known source of total phosphorus to this pond, although additional suspected sources include stormwater and agricultural runoff. Wampatuck Pond in Hanson is impaired because of excess algal growth and low Secchi disk transparency. Specialty crop production (i.e., cranberry bog operations) is considered to be the source of nutrient-related impairments in Wampatuck Pond. In the Plymouth Bay Subwatershed, Russell Millpond in Plymouth is impaired because of excess algal growth.

The remaining 57 lakes, representing 69% of the lake acreage, are not assessed for the *Secondary Contact Recreational Use*.

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.

Aesthetics Use – Rivers and Estuaries (Figure 5)

All or portions of 9 freshwater river segments, totaling 29.5 miles and representing 58% of the river mileage in the South Shore Coastal Watersheds are assessed as supporting the *Aesthetics Use*. Ninety-nine percent of the estuarine segments support this use. Twenty-eight percent of the river miles (all or portions of 7 segments) are impaired for the *Aesthetics Use* and the remaining 14% are not assessed.

Aesthetics Use Assessments
Rivers
(total length included in report – 51.0 miles)
Support – 29.5 miles (58%)
Impaired – 14.4 miles (28%)
Not Assessed – 7.1 miles (14%)

Estuaries
(total area included in report – 28.9 mi^2)
Support – 28.6 mi^2 (99%)
Impaired – 0.1 mi^2 (<1%)
Not Assessed – 0.2 mi^2 (<1%)

Lakes
(total area included in report – 4,242 acres)
Support – 780 acres (18%)
Impaired – 257 acres (6%)
Not Assessed – 3,205 acres (76%)

In the Cohasset Harbor Subwatershed, all of the freshwater river segments are impaired for the *Aesthetics Use* (Aaron River, Herring Brook and Bound Brook), with the exception of the upper 0.8-mile reach of Aaron River, which is not assessed. Causes of impairment in the lower 0.2-mile reach of Aaron River include: excess algal growth and the dense growth of non-native aquatic macrophytes; in Herring Brook, dense non-native aquatic macrophyte growth; and in Bound Brook, turbidity. The source(s) of impairment, however, are currently unknown. Musquashcut Pond is the only estuarine segment impaired for the *Aesthetics Use*. Causes of impairment are excess algal growth and other flow regime alterations due to changes in tidal circulation/flushing resulting from poor operation of the tide gates. The remaining estuaries in this subwatershed area (the Gulf, Cohasset Cove and Cohasset Harbor), totaling 0.92 mi^2, support this use.

In the North and South Rivers Subwatershed, all river and estuary segments are assessed as supporting the *Aesthetics Use*, with the exception of the lower 1.1-mile segment of the Drinkwater River. This portion of the Drinkwater River is impaired for the *Aesthetics Use* because of excess algal growth and low Secchi disk transparency, both of which are considered to result from the Rockland WWTP discharge.

The Green Harbor River (5.6 river miles) is impaired for the *Aesthetics Use* due to turbidity and excess algal growth although source(s) are unknown. Green Harbor is not assessed for this use.

In the Plymouth Bay Subwatershed, almost all of the river and estuarine segments support the *Aesthetics Use*. Both freshwater river segments of the Jones River, totaling 5.0 river miles, are impaired for this use because of excess algal and macrophyte growth and turbidity. These conditions appear to be exacerbated by the lack of flow in the river resulting from flow regulation/modification associated with water withdrawals (including but not necessarily limited to the out of basin transfer of water from Silver Lake to the City of Brockton for public water supply). The Eel River and an unnamed tributary to Eel River (both totaling 6.3 river miles) are the only river and estuary segments not assessed in the Plymouth Bay Subwatershed for the *Aesthetics Use*.

Three harbor segments are not associated with larger subwatershed systems in the South Shore Coastal Watersheds. Little Harbor and Ellisville Harbor (0.25 mi^2) are not assessed for the *Aesthetics Use* and Scituate Harbor (0.32 mi^2) supports the *Aesthetics Use*.

Aesthetics Use – Lakes (Figure 5)
Five lakes, totaling 780 acres and representing 18% of the assessed lake acreage in the South Shore Coastal Watersheds, support the *Aesthetics Use*. They are Forge, Fresh, and Great South ponds in Plymouth; Great Herring Pond in Bourne/Plymouth; and Tack Factory Pond in Scituate.

Seven lakes, totaling 257 acres and representing 6% of the assessed lake acreage, are impaired for the *Aesthetics Use*. Black Mountain Pond in Marshfield, Jacobs Pond in Norwell, and Old Oaken Bucket Pond in Scituate (totaling 85 acres) are impaired solely due to dense infestations of non-native aquatic macrophytes. Lily Pond in Cohasset (51 acres) is also impaired because of dense non-native aquatic macrophytes as well as low Secchi disk transparency. Two lakes in the North/South River Subwatershed are assessed as impaired for the *Aesthetics Use*. Forge Pond in Hanover is impaired for this use because of excess algal growth, low Secchi disk transparency, elevated total phosphorus, and the presence of trash/debris. The Rockland Municipal WWTP discharge is a known source of total phosphorus to this pond although additional suspected sources include stormwater and agricultural runoff. Wampatuck Pond in Hanson is impaired because of excess algal growth and low Secchi disk transparency. Specialty crop production (i.e., cranberry bog operations) is considered to be the source of nutrient-related impairments in Wampatuck Pond. Lastly, in the Plymouth Bay Subwatershed, Russell Millpond in Plymouth is impaired because of excess algal growth.

The remaining 66 lakes, representing 76% of the lake acreage, are not assessed for the *Aesthetics Use*.

Figure 1. *Aquatic Life Use* Assessment – Rivers, Estuaries, and Lakes

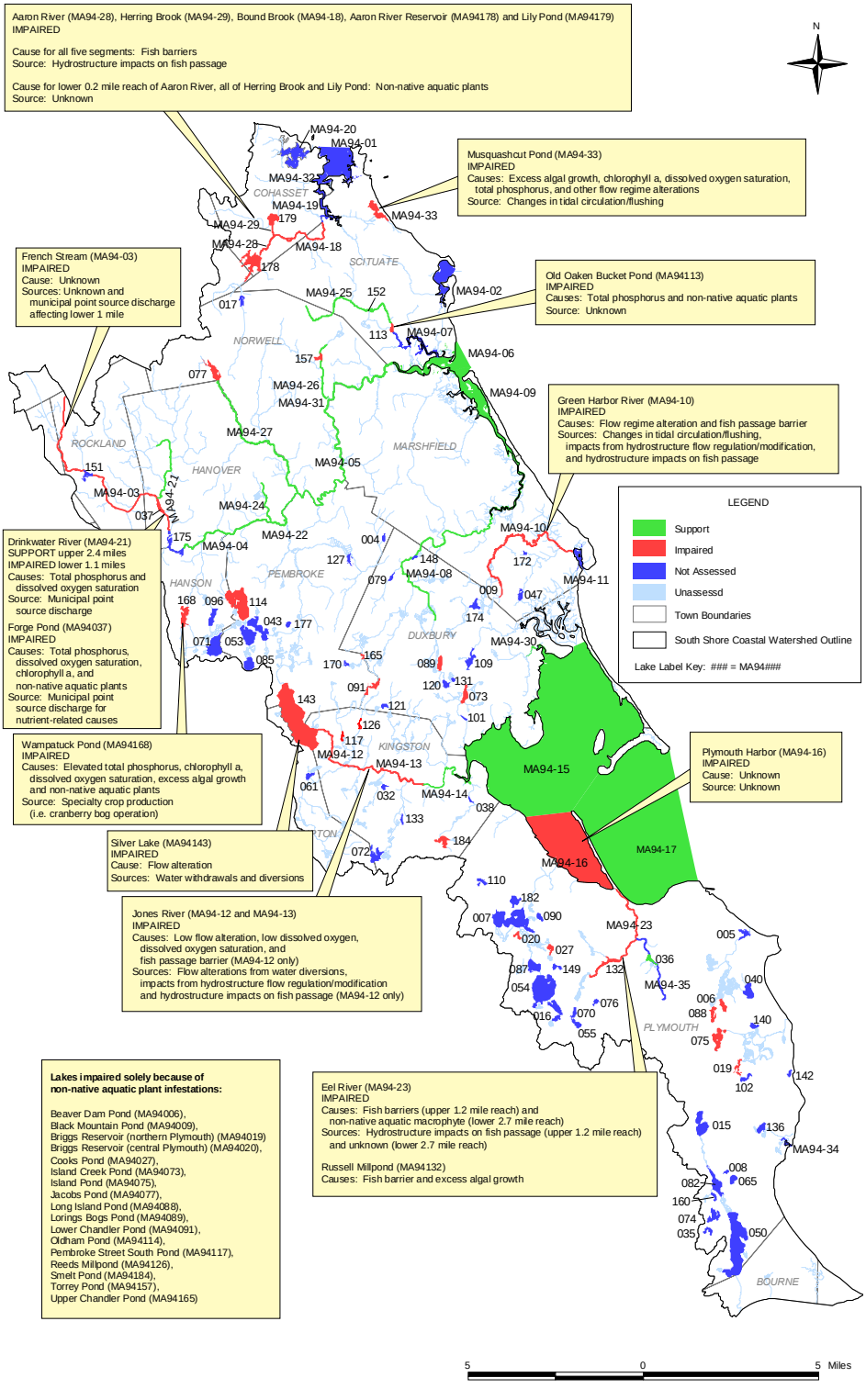
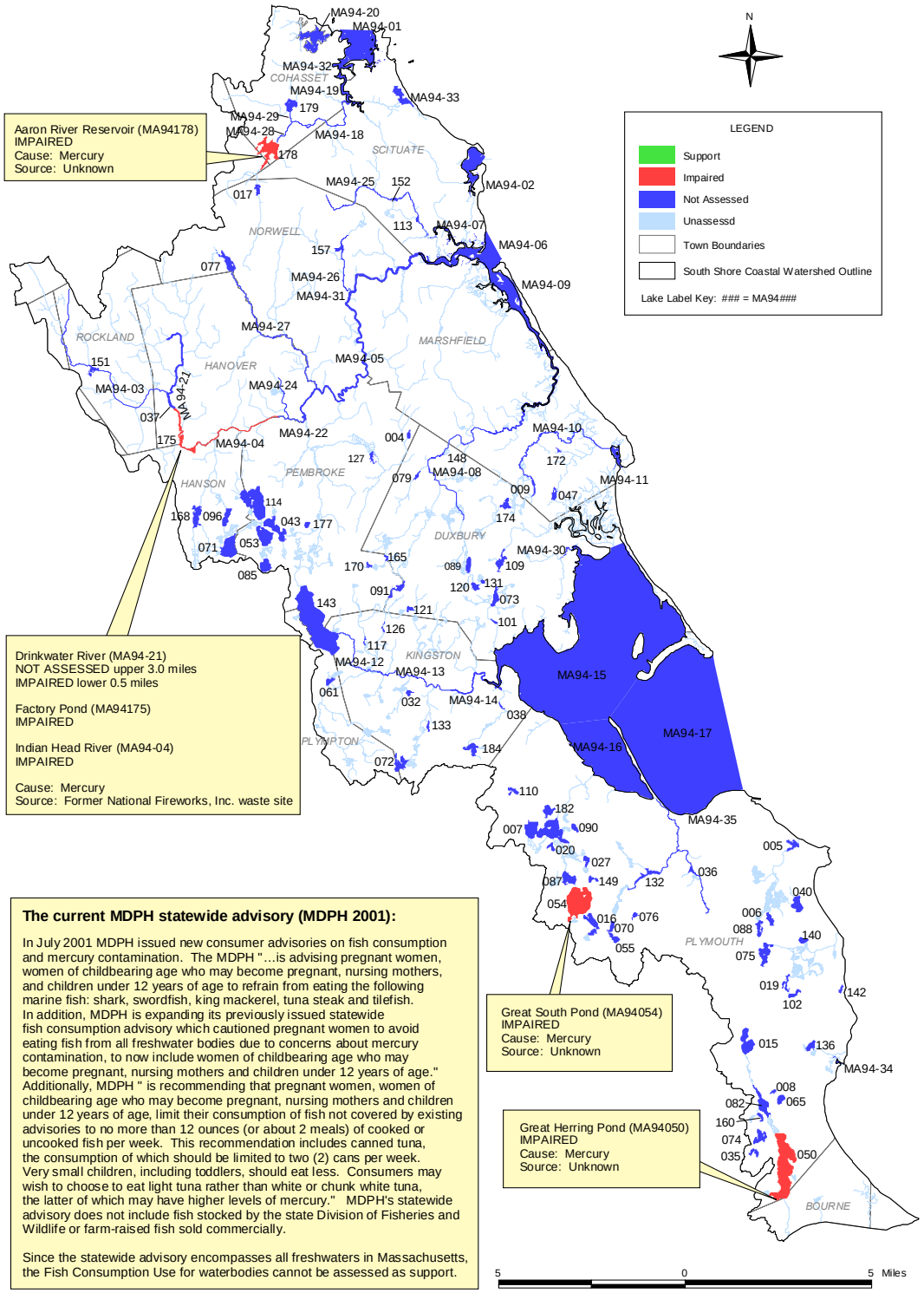


Figure 2. *Fish Consumption Use* Assessment – Rivers, Estuaries, and Lakes



The current MDPH statewide advisory (MDPH 2001):

In July 2001 MDPH issued new consumer advisories on fish consumption and mercury contamination. The MDPH "…is advising pregnant women, women of childbearing age who may become pregnant, nursing mothers, and children under 12 years of age to refrain from eating the following marine fish: shark, swordfish, king mackerel, tuna steak and tilefish. In addition, MDPH is expanding its previously issued statewide fish consumption advisory which cautioned pregnant women to avoid eating fish from all freshwater bodies due to concerns about mercury contamination, to now include women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age." Additionally, MDPH " is recommending that pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age, limit their consumption of fish not covered by existing advisories to no more than 12 ounces (or about 2 meals) of cooked or uncooked fish per week. This recommendation includes canned tuna, the consumption of which should be limited to two (2) cans per week. Very small children, including toddlers, should eat less. Consumers may wish to choose to eat light tuna rather than white or chunk white tuna, the latter of which may have higher levels of mercury." MDPH's statewide advisory does not include fish stocked by the state Division of Fisheries and Wildlife or farm-raised fish sold commercially.

Since the statewide advisory encompasses all freshwaters in Massachusetts, the Fish Consumption Use for waterbodies cannot be assessed as support.

Figure 3. P*rimary Contact Recreational Use* Assessment – Rivers, Estuaries, and Lakes

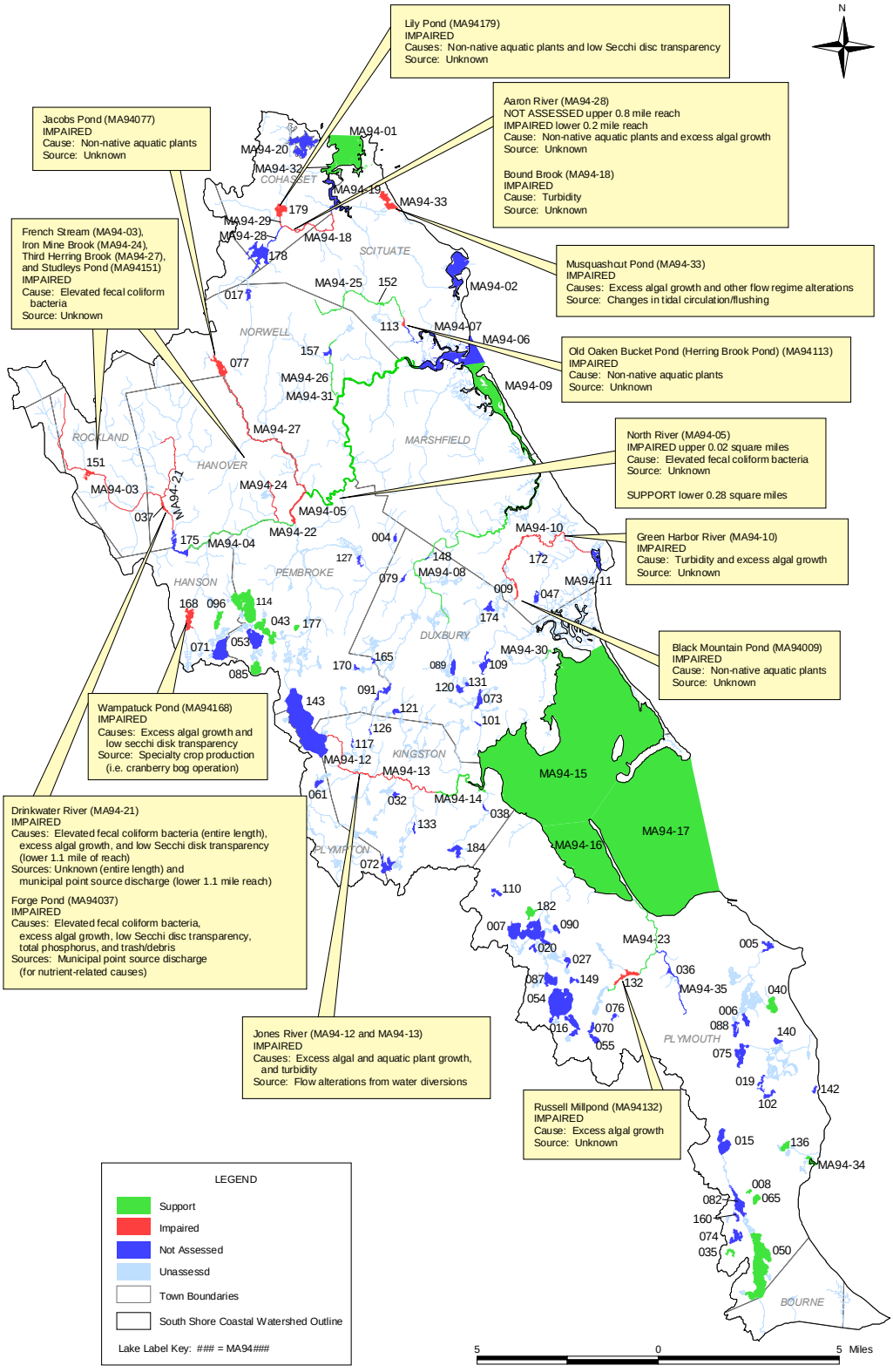


Figure 4. *Secondary Contact Recreational Use* Assessment – Rivers, Estuaries, and Lakes

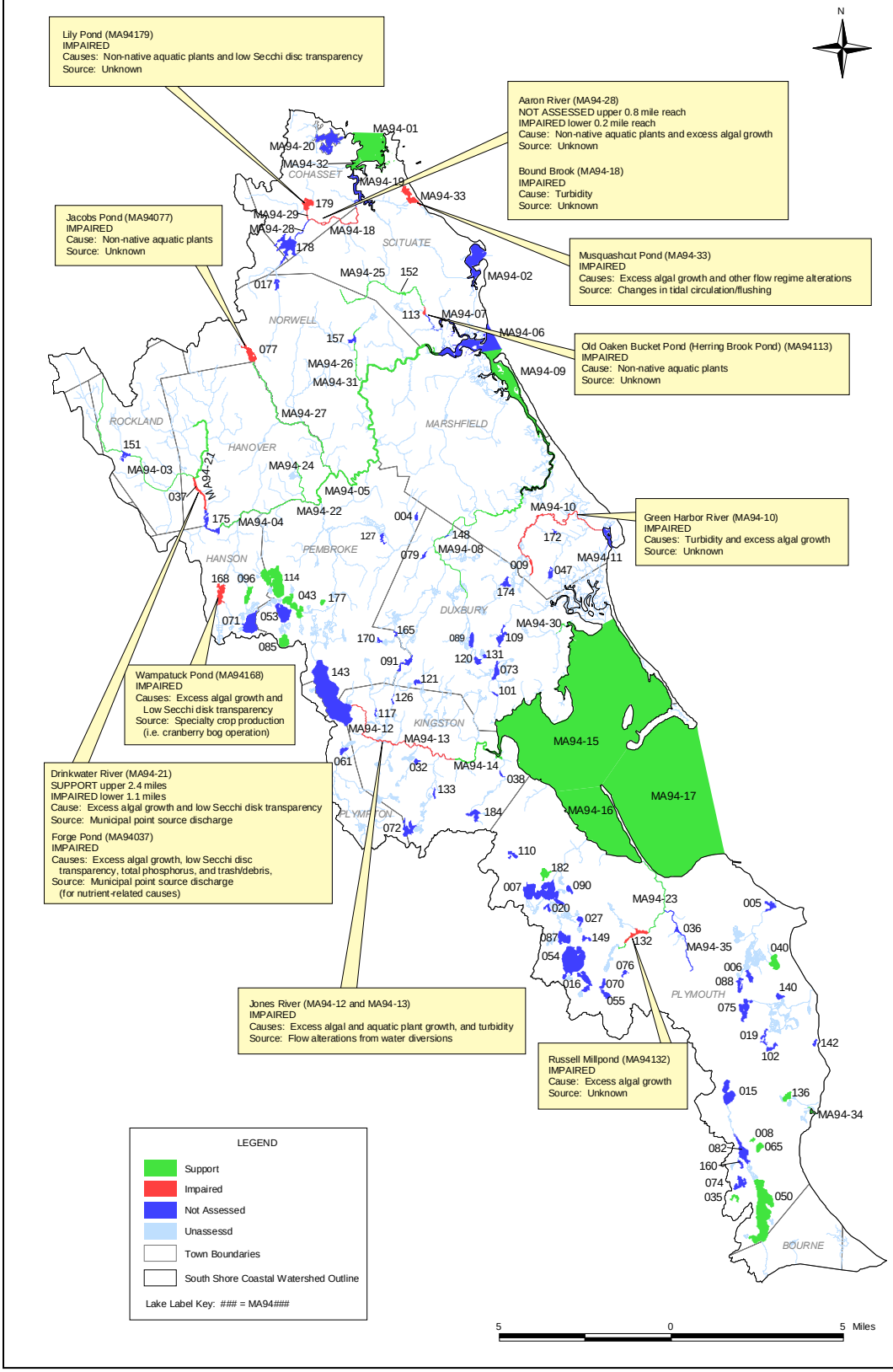


Figure 5. *Aesthetics Use* Assessment – Rivers, Estuaries, and Lakes