CAPE COD COASTAL DRAINAGE AREAS
2004 - 2008 SURFACE WATER QUALITY ASSESSMENT REPORT

COMMONWEALTH OF MASSACHUSETTS
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CAPE COD COASTAL DRAINAGE AREAS

2004-2008 SURFACE WATER QUALITY ASSESSMENT REPORT

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Division of Watershed Management

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Division of Watershed Management
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- Division of Marine Fisheries (DMF)

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Cover Photo Credit: Cape Cod Aerial - May 2003, Tom Cambareri, Cape Cod Commission

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List of Acronyms and Abbreviations

A	Class A waterbody
ACOE	Army Corps of Engineers (United States)
B	Class B waterbody
BMP	best management practice
CMR	Code of Massachusetts Regulations
CNOEC	chronic no observed effect concentration
CSO	combined sewer overflow
CWA	Clean Water Act
DO	dissolved oxygen
DPW	Department of Public Works
DMF	Division of Marine Fisheries
DWM	Division of Watershed Management
EPA	United States Environmental Protection Agency
EPT	Ephemeroptera, Plecoptera, and Tricoptera
LC_{50}	lethal concentration to 50% of the test organisms
MA DFG	Massachusetts Department of Fish and Game
MA DPH	Massachusetts Department of Public Health
MassDEP	Massachusetts Department of Environmental Protection
MEP	Massachusetts Esturaries Project
MS4	Municipal Separate Stormwater System
NPDES	National Pollutant Discharge Elimination System
NPS	non-point source pollution
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyls
RBP	rapid bioassessment protocol
PWS	Public Water Supply
SMAST	UMass Dartmouth's School of Marine Science and Technology
SWQS	Surface Water Quality Standards
TIE/TRE	toxicity identification evaluation/toxicity reduction evaluation
TMDL	total maximum daily load
TOXTD	MassDEP DWM Toxicity Testing Database
USGS	United States Geological Survey
WBS	Waterbody System database
WMA	Water Management Act
WWTP	wastewater treatment plant

List of Units

cfs	cubic feet per second
cfu	colony forming unit
fps	foot per second
MGD	million gallons per day
m	meters
ml	milliliters
mg/L	milligram per liter
ppm	parts per million
ppt	parts per thousand
SU	standard units
µS/cm	micro seimens per centimeter

Table of Fish Scientific Names

Common Name	Latin name	Common Name	Latin name
American brook lamprey	*Lampetra appendix*	golden shiner	*Notemigonus crysoleucas*
black crappie	*Pomoxis nigromaculatus*	green sunfish	*Lepomus cyanellus*
blacknose dace	*Rhinichthys atratulus*	largemouth bass	*Micropterus salmoides*
bluegill	*Lepomis macrochirus*	longnose dace	*Rhinichthys cataractae*
brook trout	*Salvelinus fontinalis*	northern pike	*Esox lucius*
brown bullhead	*Ameiurus nebulosus*	pumpkinseed	*Lepomis gibbosus*
brown trout	*Salmo trutta*	redfin pickerel	*Esox americanus*
chain pickerel	*Esox niger*	tesselated darter	*Etheostoma olmstedi*
common carp	*Cyprinus carpio*	white catfish	*Ameiurus catus*
common shiner	*Luxilus cornutus*	white perch	*Morone americana*
creek chubsucker	*Erimyzon oblongus*	white sucker	*Catostomus commersonii*
fallfish	*Semotilus corporalis*	yellow bullhead	*Ameiurus natalis*
fathead minnow	*Pimephales promelas*	yellow perch	*Perca flavescens*

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EXECUTIVE SUMMARY

CAPE COD COASTAL DRAINAGE AREAS 2004-2008 SURFACE 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 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 for the Cape Cod surface waters 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, Primary and Secondary Contact Recreation and Aesthetics*. Each use, within a given assessment 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 considered to be "naturally-occurring", the use is identified with an "Alert Status".

The summary of the assessments for the *Aquatic Life, Fish Consumption, Shellfish Harvesting, Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* for Cape Cod streams/rivers, ponds, and estuaries/embayments defined as segments in this report are illustrated in Figures 1 through 6, respectively.

The status of the *Drinking Water Use* is not assessed in this report since the most current information on drinking water source protection and finish water quality is available at http://www.mass.gov/dep/water/drinking.htm and from local public water suppliers.

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The following estuarine segments are assessed as impaired for the Aquatic Life Use primarily as a result of the Massachusetts Estuary Program (MEP) analysis (waters are impaired due to elevated total nitrogen and a few segments [denoted with *] also impaired by low dissolved oxygen) and many of which have loss of eelgrass bed habitat (estuarine bioassessment). According to the TMDLs developed for these waters, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen. The controllable local sources of total nitrogen identified by the TMDLs are provided below.

Barnstable Harbor (MA96-01)
Bass River (MA96-12)
Swan Pond River (MA96-14)
Town Cove (MA96-68)
Sources: Unknown (TMDLs not developed yet)

Oyster Pond River (MA96-46)
Sources: Subsurface wastewater disposal (septic) systems, and fertilizers [yard maintenance].

Prince Cove (MA96-07)
Sources: Subsurface wastewater disposal (septic) systems, and fertilizers [yard maintenance, agriculture].

Paw Wah Pond (MA96-72)
Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater], and fertilizers [yard maintenance].

Namequoit River (MA96-71)
Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater], and fertilizers [yard maintenance, agriculture].

Popponesset Creek (MA96-39)
Frost Fish Creek (MA96-49)
Ryder Cover (MA96-50)
Muddy Creek (MA96-51)
Perch Pond (MA96-53)
Hamblin Pond (MA96-58)
Great River (MA96-60)
Little River (MA96-61)
Oyster Pond (MA96-62)*
Pochet Neck (MA96-73)
Quanset Pond (MA96-74)
Round Cove (MA96-75)
Little Pleasant Bay (MA96-78)
Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance].

Centerville River (MA96-04)
Lewis Bay (MA96-36)
Taylors Pond (MA96-42)
Harding Beach Pond (MA96-43)
Bucks Creek (MA96-44)
Areys Pond (MA96-70)
The River (MA96-76)
Mill Creek (MA96-80)
Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture].

Oyster Pond (MA96-45)
Mill Pond (MA96-52)
Little Pond (MA96-56)
Jehu Pond (MA96-59)
West Bay (MA96-65)
Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, golf courses].

Shoestring Bay (MA96-08)
Quashnet River (MA96-20)*
Waquoit Bay (MA96-21)
Mashpee River (MA96-24)
Popponesset Bay (MA96-40)
Great Pond (MA96-54)
Green Pond (MA96-55)
Bournes Pond (MA96-57)
Cotuit Bay (MA96-63)
North Bay (MA96-66)
Pleasant Bay (MA96-77)
Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture, golf courses].

Hyannis Inner Harbor (MA96-82)
Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance], and municipal point source.

Aquatic Life Use Assessments
Cape Cod Coastal Drainage Areas

Rivers
(Total mileage included in report: 15.4 miles)
Support: 8.4 miles (55%)
Impaired: 3.6 miles (23%)
Not Assessed: 3.4 miles (22%)

Lakes
(Total area in report: 5649 acres)
Support: 551 acres (10%)
Impaired: 2496 acres (44%)
Not Assessed: 2602 acres (46%)

Estuaries
(Total area in report: 42.363 square miles)
Support: 6.467 square miles (15%)
Impaired: 21.218 square miles (50%)
Not Assessed: 14.678 square miles (35%)

Ryder Pond (MA96268)
Cause(s): Low dissolved oxygen
Source(s): Unknown

Herring River (MA96-67 and MA96-33)
Causes: low pH , aluminum, fish kills, other flow regime alterations, fish passage barrier and loss of eelgrass bed habitat (estuarine bioassessment) in estuarine segment
Sources: Changes in tidal circulation and flushing, hydrostructure impacts on fish passage, and unknown

Lower Mill Pond (MA96188)
Cause(s): Excess Algal Growth, elevated chlorophyll a
Source(s): Unknown

Walkers Pond (MA96331)
Cause(s): Excess Algal Growth, elevated total phosphorus
Source(s): Unknown

Great Pond (MA96115)
Causes: Low dissolved oxygen, elevated chlorophyll-a
Sources: Unknown

Cedar Pond (MA96-88)
Causes: Low dissolved oxygen, elevated chlorophyll a, supersaturation DO
Sources: Unknown

Bearse Pond (MA96012)
Wequaquet Lake (MA96333)
Long Pond (MA96184)
Cause(s): Non-native aquatic macrophyte(s)
Source(s): Introduction of non-native organism(s)

Crystal Lake (MA96050)
Cause(s): Low dissolved oxygen
Source(s): Internal nutrient recycling

Mystic Lake (MA96218)
Cause(s): Non-native aquatic macrophyte(s), low dissolved oxygen
Source(s): Introduction of non-native organism(s), source unknown

Hamblin Pond (MA96126)
Long Pond (MA96183)
Middle Pond (MA96198)
Cause(s): Low dissolved oxygen
Source(s): Unknown

Red Lily Pond (MA96257)
Cause(s): Nutrient/eutrophication biological indicators
Source(s): Unknown

Lovells Pond (MA96185)
Cause(s): Low dissolved oxygen, elevated chlorophyll a, elevated total phosphorus
Source(s): Internal nutrient recycling, unknown

Ashumet Pond (MA96004)
Cause(s): Low DO, elevated total phosphorus , abnormal fish histology (lesions), abnormal fish deformities, erosions, lesions, tumors (DELTS)
Source(s): NPS Pollution from military base facilities (other than port facilities), contaminated groundwater, Cercla NPL (Superfund) Sites

Santuit Pond (MA96277)
Cause(s): Excess algal growth, elevated chlorophyll a, nutrient/eutrophication biological indicators, elevated total phosphorus, high pH, abnormal fish histology (lesions), abnormal fish deformities, erosions, lesions, tumors (DELTS)
Source(s): Internal nutrient recycling, unknown

LEGEND
Support
Impaired
Not Assessed
Other Waters
Town Boundaries
Buzzards Bay Drainage Area
Lake Segment Label: ### = MA96###
River and Estuary Segment Label: -## = MA96-##

N W E S 0 1.25 2.5 5 7.5 10 Miles

Figure 1. *Aquatic Life Use* assessment summary for Cape Cod Coastal Drainage Area Surface Waters. Note: 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 sources of pollution and hydrologic modification. Causes and/or sources of impairments, when known, are noted in the callouts.

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MA DPH June 2009 news release: Fish Consumption Advisory for Marine and Fresh Water Bodies (MA DPH 2009b)

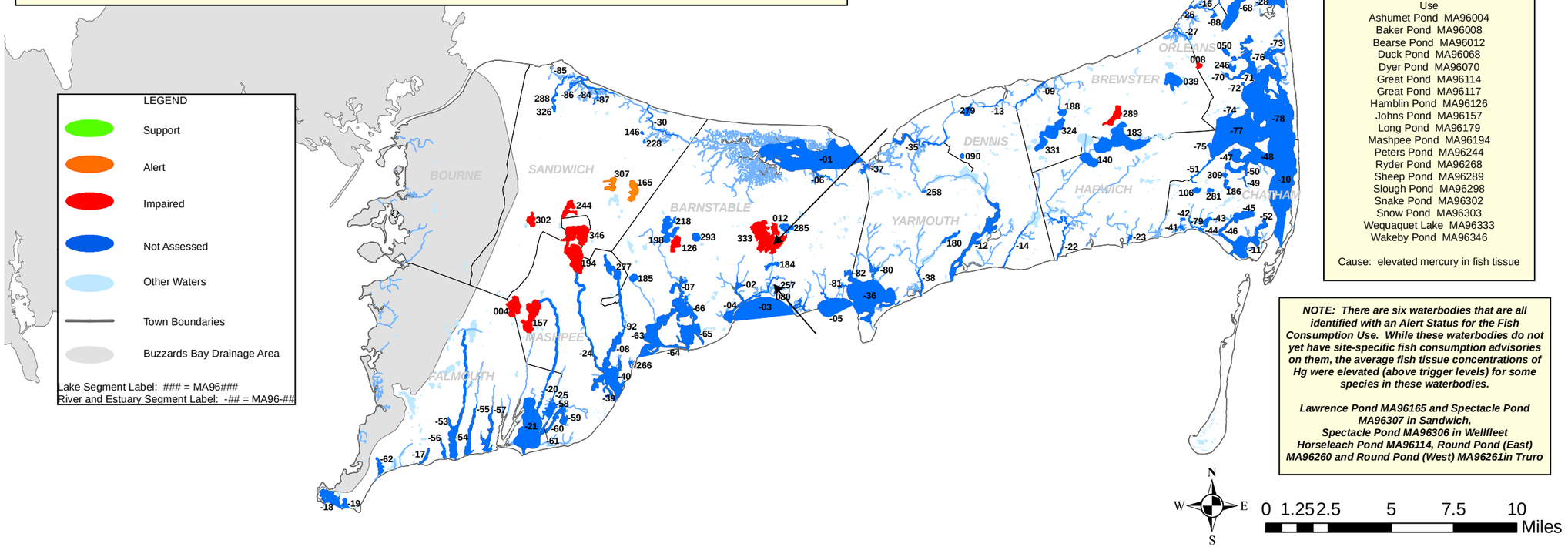
Fish is good for you and your family. It is a good source of protein and it is low in fat. It may also protect you against heart disease.
If you may become pregnant or are pregnant or nursing, you and your children under 12 years old may safely eat 12 ounces (about 2 meals) per week of fish or shellfish not covered in this advisory. 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. Otherwise, it is important to follow the Safe Eating Guidelines included in this advisory.

Safe eating guidelines for pregnant women, women who may become pregnant, nursing mothers and children under 12 years old: (contaminants of concern in parenthetical as noted by MA DPH and MassDEP)
Do Not Eat: Freshwater fish caught in streams, rivers, lakes, and ponds in Massachusetts* (Hg)
Safe To Eat: Fish that are stocked in streams, rivers, lakes, and ponds in Massachusetts
Safe To Eat: Cod, haddock, flounder and pollock in larger amounts
Do Not Eat: Lobster from New Bedford Harbor (PCB)
Do Not Eat: Swordfish, shark, king mackerel, tilefish, and tuna steak (Hg)
Do Not Eat: Bluefish caught off the Massachusetts coast (PCB)
Do Not Eat: Lobsters, flounder, soft-shell clams and bivalves from Boston Harbor (PCB and other contaminants)
NOTE: For assessment purposes Boston Harbor is broadly defined to include all coastal waters that drain into it.
Safe eating guidelines for everyone:
Do Not Eat: Fish and shellfish from the closed areas of New Bedford Harbor (PCB)
Do Not Eat: Lobster tomalley (PCB)

*More specific consumption advice is available for certain freshwater bodies that have been tested at: http://www.mass.gov/dph/fishadvisories (MA DPH 2009a) or by calling the Massachusetts Department of Public Health, Bureau of Environmental Health at 617-624-5757.

A varied diet, including safe fish, will lead to good nutrition and better health.

NOTE: Northeast Regional Mercury TMDL: On 20 December 2007 the U.S. EPA approved the Northeast Regional Mercury Total Maximum Daily Load (TMDL). This TMDL is a Federal Clean Water Act mandated document that identifies pollutant load reductions necessary for regional waterbodies to meet and maintain compliance with state and federal water quality standards. It was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers inland waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010



Fish Consumption Use Assessments
Cape Cod Coastal Drainage Areas

Rivers
(Total mileage included in report: 15.4 miles)
Not Assessed: 15.4 miles (100%)

Lakes
(Total area in report: 5649 acres)
Impaired: 2539 acres (45%)
Alert: 264 acres (5%)
Not Assessed: 2845 acres (50%)

Estuaries
(Total area in report: 42.363 square miles)
Not Assessed: 42.363 mi2 (100%)

The following waterbodies on the Cape are impaired for the Fish Consumption Use
Ashumet Pond MA96004
Baker Pond MA96008
Bearse Pond MA96012
Duck Pond MA96068
Dyer Pond MA96070
Great Pond MA96114
Great Pond MA96117
Hamblin Pond MA96126
Johns Pond MA96157
Long Pond MA96179
Mashpee Pond MA96194
Peters Pond MA96244
Ryder Pond MA96268
Sheep Pond MA96289
Slough Pond MA96298
Snake Pond MA96302
Snow Pond MA96303
Wequaquet Lake MA96333
Wakeby Pond MA96346

Cause: elevated mercury in fish tissue

NOTE: There are six waterbodies that are all identified with an Alert Status for the Fish Consumption Use. While these waterbodies do not yet have site-specific fish consumption advisories on them, the average fish tissue concentrations of Hg were elevated (above trigger levels) for some species in these waterbodies.

Lawrence Pond MA96165 and Spectacle Pond MA96307 in Sandwich,
Spectacle Pond MA96306 in Wellfleet
Horseleach Pond MA96114, Round Pond (East) MA96260 and Round Pond (West) MA96261in Truro

Figure 2. *Fish Consumption Use* assessment summary for Cape Cod Coastal Drainage Area Surface Waters. Note: The *Fish Consumption Use* is supported when there are no unacceptable concentrations of pollutants in edible portions 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 (MA DPH). The MA DPH list identifies waterbodies where elevated levels of a specified contaminant in edible portions of freshwater/marine species pose a health risk for human consumption; hence, the Fish Consumption Use is assessed as impaired in these waters.

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Estuarine segments assessed as impaired for the Shellfish Harvesting Use were made using the Department of Fish and Game's Division of Marine Fisheries (DMF) Shellfish Status Report of October 2009. The cause of impairment for all of these segments is presumed to be the result of elevated fecal coliform bacteria. As a direct result of the TMDLs developed for these waters, the sources of bacteria to these impaired waters are listed below. Waters identified with an asterik * only have a portion of the segment area impaired.

Mashpee River (MA96-24)
Hyannis Harbor
Source(s): Waterfowl, pet waste, and stormwater discharges from the municipal stormwater systems

Santuit River (MA96-92)
Snows Creek (MA96-81)
Halls Creek (MA96-93)
Stewarts Creek (MA96-94)
Swan Pond River (MA96-14)
Source(s): Waterfowl, pet waste, on-site (septic) systems and stormwater discharges from the municipal stormwater systems

Cotuit Bay (MA96-63)*
Source(s): Upstream source, illicit marina/boating pumpout releases, waterfowl

Seapuit River (MA96-64)*
Source(s): Illicit marina/boating pumpout releases, waterfowl

Shoestring Bay (MA96-08)
Prince Cove (MA96-07)

North Bay (MA96-66)
Centerville River (MA96-04)
Mill Creek (MA96-80)
Hyannis Inner Harbor (MA96-82)*
Bass River (MA96-12)
Herring River (MA96-22)
Source(s): Illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and stormwater discharges from the municipal stormwater systems, upstream sources

Bumps River (MA96-02)
Saquatucket Harbor (MA96-23)
Source(s): Illicit marina/boating pumpout releases, waterfowl, and stormwater discharges from the municipal stormwater systems

Lewis Bay (MA96-36)
Parkers River (MA96-38)*
Source(s): Illicit marina/boating pumpout releases, waterfowl, pet waste, and stormwater discharges from the municipal stormwater systems

Old Harbor Creek (MA96-84)
Springhill Creek (MA96-87)
Quivett Creek (MA96-09)
Source(s): Waterfowl, stormwater discharges from the municipal stormwater systems

Mill Creek (MA96-85)
Source(s): Waterfowl, pet waste, and stormwater discharges from the municipal stormwater systems

Scorton Creek (MA96-30)
Dock Creek (MA96-86)
Mill Creek (MA96-37)
Source(s): Waterfowl, pet waste, on-site (septic) systems and stormwater discharges from the municipal stormwater systems

Barnstable Harbor (MA96-01)*
Source(s): Illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and stormwater discharges from the municipal stormwater systems

Maraspin Creek (MA96-06)
Sesuit Creek (MA96-13)
Source(s): Illicit marina/boating pumpout releases, waterfowl, and stormwater discharges from the municipal stormwater systems

Chase Garden Creek (MA96-35)
Source(s): Waterfowl, upstream source(s)

East Harbor (Pilgrim Lake) (MA96-83)
Source(s): Waterfowl, unspecified urban stormwater

Provincetown Harbor (MA96-29)*
Herring River (MA96-33)
Source(s): Illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and unspecified urban stormwater

Pamet River (MA96-31)
Source(s): Waterfowl, pet waste, unspecified urban stormwater

Duck Creek (MA96-32)*
Source(s): Waterfowl, pet waste, on-site (septic) systems and stormwater discharges from the municipal stormwater systems

Boat Meadow River (MA96-15)
Little Namskaket Creek (MA96-26)
Namskaket Creek (MA96-27)
Source(s): Waterfowl, stormwater discharges from the municipal stormwater systems

Rock Harbor Creek (MA96-16)
Source(s): Illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and stormwater discharges from the municipal stormwater systems

Town Cove (MA96-68)*
Source(s): Waterfowl, stormwater discharges from the municipal stormwater systems

Pochet Neck (MA96-73)*
Source(s): Waterfowl, wildlife other than waterfowl, unspecified urban stormwater

The River (MA96-76)*
Source(s): Illicit marina/boating pumpout releases, waterfowl, and stormwater discharges from the municipal stormwater systems

Paw Wah Pond (MA96-72)
Source(s): Waterfowl, pet waste, unspecified urban stormwater

Little Pleasant Bay (MA96-78)*
Source(s): Waterfowl, upstream source(s)

Frost Fish Creek (MA96-49)
Muddy Creek (MA96-51)
Round Cove (MA96-75)
Harding Beach Pond (MA96-43)
Bucks Creek (MA96-44)
Source(s): Waterfowl, pet waste, on-site (septic) systems and stormwater discharges from the municipal stormwater systems

Ryder Cove (MA96-50)*
Source(s): Illicit marina/boating pumpout releases, upstream source

Mill Creek (MA96-41)
Source(s): Waterfowl, pet waste, unspecified urban stormwater

Taylors Pond (MA96-42)
Source(s): Illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and stormwater discharges from the municipal stormwater systems

Cockle Cove Creek (MA96-79)
Source(s): Waterfowl, pet waste, on-site (septic) systems and unspecified urban stormwater

Oyster Pond (MA96-45)*
Source(s): Illicit marina/boating pumpout releases, waterfowl, pet waste, and stormwater discharges from the municipal stormwater systems

Stage Harbor (MA96-11)*
Oyster Pond River (MA96-46)*
Source(s): Illicit marina/boating pumpout releases

Little Harbor (MA96-19)
Source(s): Illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and unspecified urban stormwater

Great Harbor (MA96-18)*
Source(s): Illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and stormwater discharges from the municipal stormwater systems

Bournes Pond (MA96-57)
Source(s): Stormwater discharges from the municipal stormwater systems

Quashnet River (MA96-20)*
Source(s): Waterfowl, stormwater discharges from the municipal stormwater systems

Green Pond (MA96-55)
Little Pond (MA96-56)
Oyster Pond (MA96-62)
Source(s): Waterfowl, pet waste, on-site (septic) systems and stormwater discharges from the municipal stormwater systems

Hamblin Pond (MA96-58)*
Source(s): Waterfowl

LEGEND
Support
Impaired
Not Assessed
Other Waters
Town Boundaries
Buzzards Bay Drainage Area
Lake Segment Label: ### = MA96###
River and Estuary Segment Label: -## = MA96-##

Shellfish Harvesting Use Assessments
Cape Cod Coastal Drainage Areas

Estuaries
(Total area in report: 42.363 square miles)
Support: 33.64 square miles (79%)
Impaired: 8.693 square miles (21%)
Not Assessed: 0.03 square miles (<1%)

PROVINCETOWN
TRURO
WELLFLEET
EASTHAM
ORLEANS
BREWSTER
DENNIS
HARWICH
CHATHAM
YARMOUTH
BARNSTABLE
SANDWICH
BOURNE
FALMOUTH
MASHPEE

0 1.25 2.5 5 7.5 10 Miles

Figure 3. *Shellfish Harvesting Use* assessment summary for Cape Cod Coastal Drainage Area Surface Waters. Note: The *Shellfish Harvesting Use* is supported in Class SA waters when MA Department of Fish and Game classifies the shellfish growing area as Approved or in Class SB waters when the area is classified as Approved, Conditionally Approved, or Restricted. SA waters that are classified by DMF as Conditionally Approved, Conditionally Restricted or Prohibited and Class SB waters that are classified by DMF as Conditionally Restricted or Prohibited are assessed as impaired for the *Shellfish Harvesting Use*.

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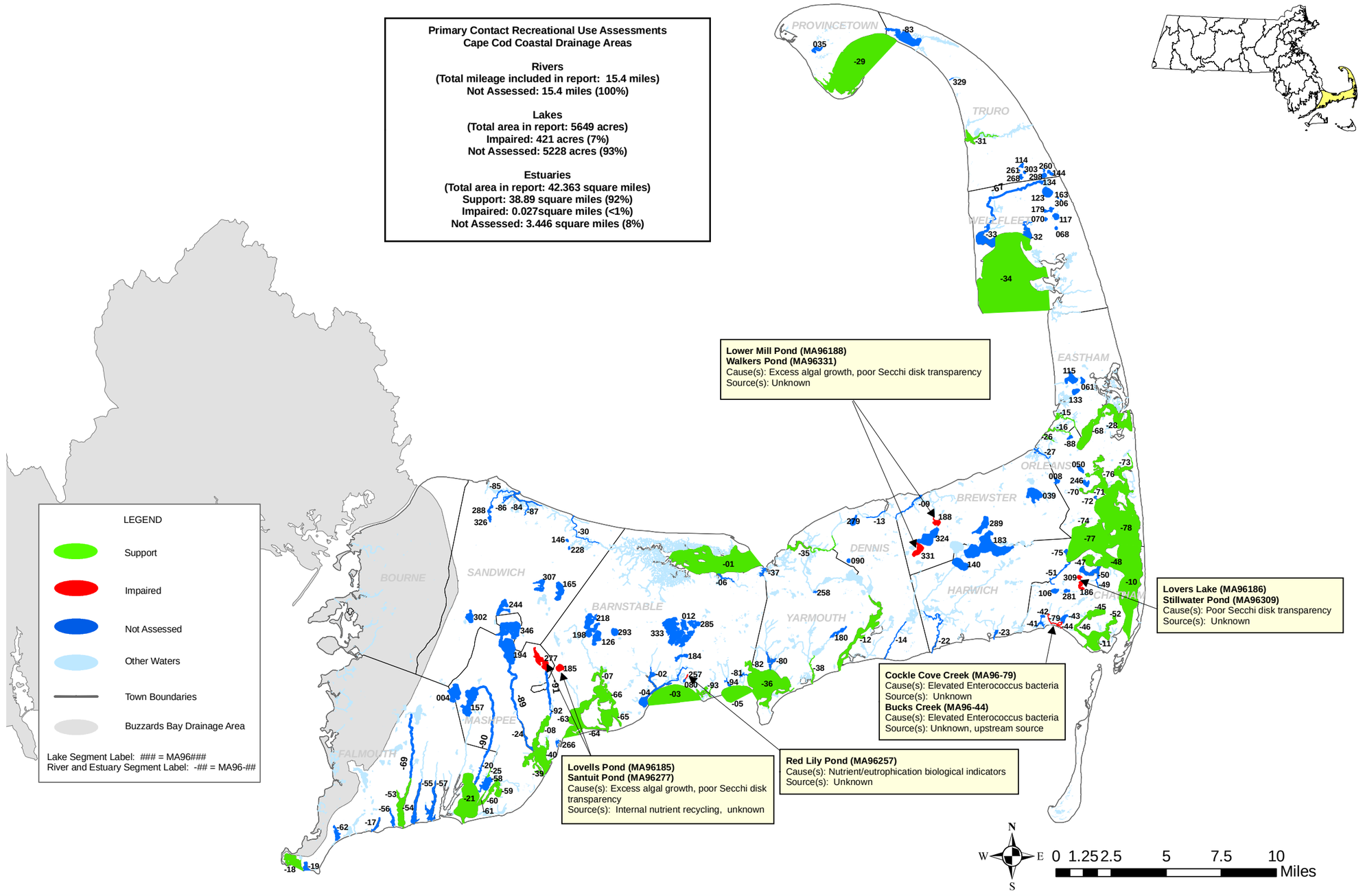

Figure 4. *Primary Contact Recreational Use* assessment summary for Cape Cod Coastal Drainage Area Surface Waters. Note: The *Primary Contact Recreational Use* is supported when conditions are suitable (bacteria densities, turbidity and aesthetics meet the SWQS and/or the MA DPH Bathing Beaches State 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. Causes and/or sources of impairments, when known, are noted in the callouts.

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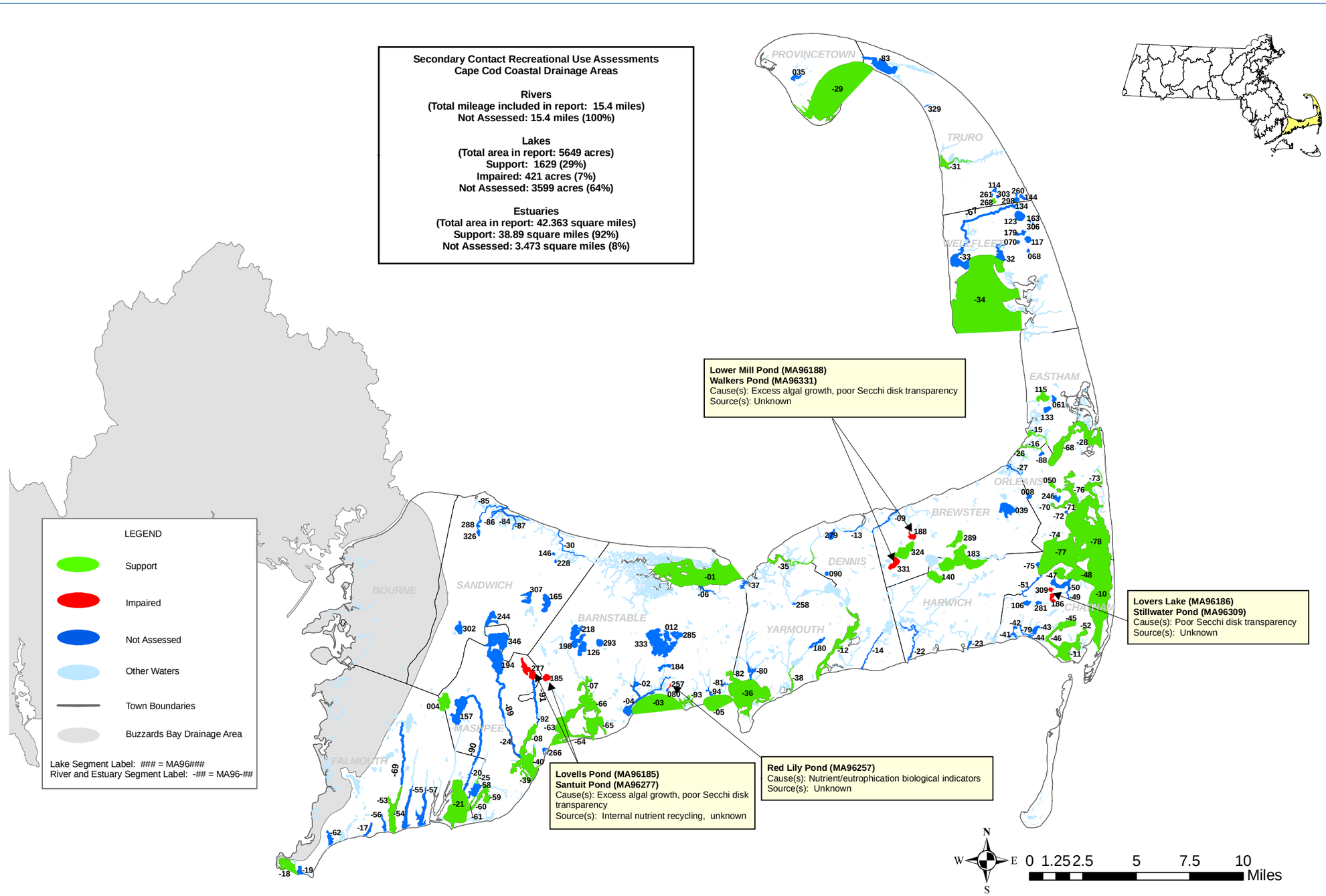

Figure 5. *Secondary Contact Recreational Use* assessment summary for Cape Cod Coastal Drainage Area Surface Waters. Note: The *Secondary Contact Recreational Use* is supported when conditions are suitable for any recreational or other water use during which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact related to shoreline activities. Causes and/or sources of impairments, when known, are noted in the callouts.

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Aesthetics Use Assessments
Cape Cod Coastal Drainage Areas

Rivers
(Total mileage included in report: 15.4 miles)
Not Assessed: 15.4 miles (100%)

Lakes
(Total area in report: 5649 acres)
Support: 1426 (25%)
Impaired: 421 acres (7%)
Not Assessed: 3802 acres (67%)

Estuaries
(Total area in report: 42.363 square miles)
Not Assessed: 42.363 square miles (100%)

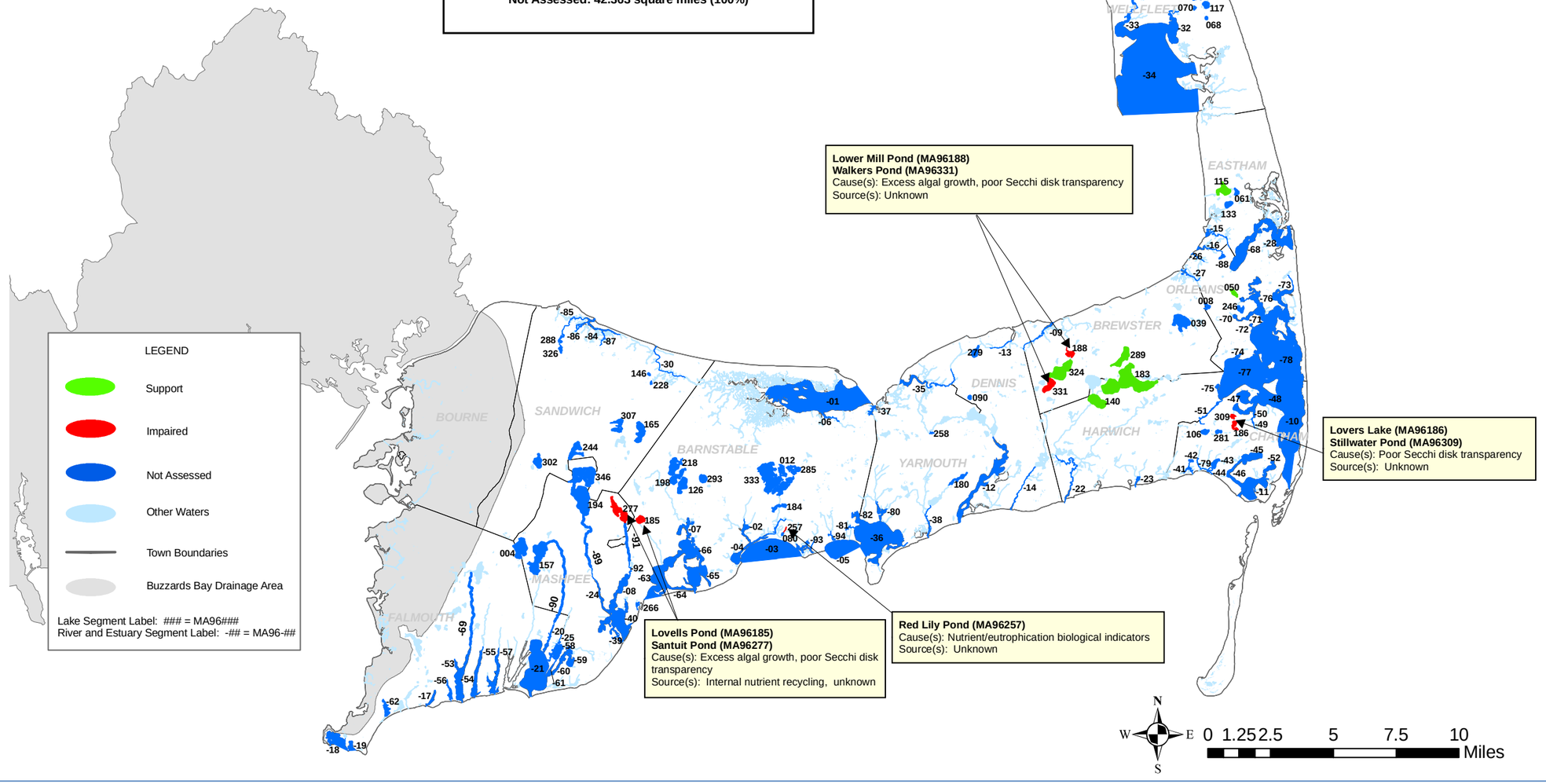

Figure 6. *Aesthetics Use* assessment summary for Cape Cod Coastal Drainage Area Surface Waters. Note: The *Aesthetics Use* is supported when surface waters are freee from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life. Causes and/or sources of impairments, when known, are noted in the callouts.

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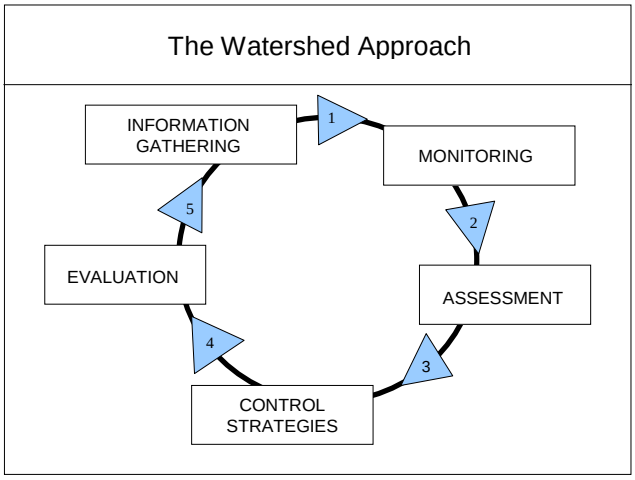
INTRODUCTION

The goal of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters (Environmental Law Reporter 1988). To meet this objective, the CWA requires states to develop information on the quality of the Nation's water resources and report this information to the U.S. Environmental Protection Agency (EPA), the U.S. Congress, and the public. Together, these agencies are responsible for implementation of the CWA mandates. Under Section 305(b) of the Federal Clean Water Act, every two years MassDEP must submit a statewide report which describes the status of water quality in the Commonwealth to the EPA. Until 2002 this was accomplished as a statewide summary of water quality (the 305(b) Report). States are also required to submit, under Section 303(d) of the CWA, a list of impaired waters requiring a total maximum daily load (TMDL) calculation. In 2002, however, EPA required the states to combine elements of the statewide 305(b) Report and the Section 303(d) List of Impaired Waters into one "Integrated List of Waters" (Integrated List). This statewide list is based on the compilation of information for the Commonwealth's 27 watersheds. Massachusetts has opted to write individual watershed surface water quality assessment reports and use them as the supporting documentation for the Integrated List. The assessment reports utilize data compiled from a variety of sources and provide an evaluation of water quality, progress made towards maintaining and restoring water quality, and the extent to which problems remain at the watershed level. Quality assured biological, habitat, physical/chemical, toxicity data and other information are evaluated to assess the status of water quality conditions. This analysis follows a standardized process described in Appendix A (Assessment Methodology) of this report.



This report presents the current assessment of water quality conditions for Cape Cod coastal drainage area surface waters. This report summarizes information generated about the Cape Cod coastal drainage area surface waters since the last water quality assessment report that was published in September 2002 (DeCesare and Connors 2002). The new assessments are based on the most currently available validated water quality data/information developed by Massachusetts Department of Environmental Protection (MassDEP) as well as more recent data collected by external data sources in the watershed in partial fulfillment of MassDEP's federal mandate to report on the status of the Commonwealth's waters under the CWA. The Massachusetts Estuaries Project (MEP), a major collaborative project between MassDEP and the School of Marine Science and Technology (SMAST) at the University of Massachusetts Dartmouth, along with their project partners including Coastal Zone Management, the Cape Cod Commission, municipalities, Applied Coastal Research and Engineering, Inc., and USGS has generated water quality, nutrient loading, and hydrodynamic information for many of the Cape's estuarine areas. Other major sources of information include the MA Division of Marine Fisheries (DMF) shellfish classification area status, and reporting of beach closure information required by the Beaches Bill. It should be noted here that one large dataset, the 2009 MassDEP DWM Cape Cod surface water quality surveys, was unfortunately not available for use for this assessment cycle primarily because data validation procedures have not yet been completed. These data will be utilized as part of the next reporting cycle.

MASSACHUSETTS INTEGRATED LIST OF WATERS

Section 303(d) of the CWA requires states to periodically identify and list those waterbodies for which existing controls on point and nonpoint sources of pollutants are not stringent enough to attain or maintain compliance with applicable surface water quality standards. The Massachusetts Year 2008 Integrated List of Waters (MassDEP 2008a) was approved by the EPA in May 2009 (Moraff 2009). In that report each waterbody segment was placed in one of five major categories. Category 1 included those waters that were meeting all designated uses. No Massachusetts waters were listed in Category 1 because a statewide health advisory pertaining to the consumption of fish precludes any waters from being in full support of the *Fish Consumption Use*. Waters listed in Category 2 were found to support some of the uses for which they were assessed but other uses were not

assessed. Category 3 contained those waters for which insufficient or no information was available to assess any uses.

Waters exhibiting impairment for one or more uses were placed in either Category 4 (impaired but not requiring a TMDL) or Category 5 (impaired and requiring one or more TMDLs) according to the EPA guidance. Category 4 was further divided into three sub-categories – 4A, 4B and 4C – depending upon the reason that TMDLs were not needed. Category 4A included waters for which the required TMDL(s) had already been completed and approved by the EPA. However, since segments could only appear in one-category waters that had an approved TMDL for some pollutants, but not others, remained in Category 5. Category 4B was to include waters for which other pollution control requirements were reasonably expected to result in the attainment of the designated use before the next listing cycle (i.e., 2010). Because of the uncertainty related to making predictions about conditions in the future the MassDEP made a decision not to utilize Category 4B in the 2008 Integrated List. Finally, waters impaired by factors such as flow modification or habitat alteration, that are not subjected to TMDL calculations because the impairment is not related to one or more pollutants, were included in Category 4C.

Massachusetts has opted to write individual watershed surface water quality assessment reports and use them as the supporting documentation for the Integrated List. The assessment reports utilize data compiled from a variety of sources and provide an evaluation of water quality, progress made towards maintaining and restoring water quality, and the extent to which problems remain at the watershed level. Quality assured in-stream biological, habitat, physical/chemical, toxicity data and other information are evaluated to assess the status of water quality conditions.

OBJECTIVES

This report summarizes information generated for the Cape Cod surface waters since the last water quality assessment report that was published in October 2002 (DeCesare and Connors 2002). The new assessments are based on the most currently available validated water quality data/information for the Cape's waterbodies. The methodology used to assess the status of water quality conditions the rivers, ponds, and estuaries/embayments, in accordance with EPA's and MassDEP's use assessment methods, is provided in Appendix A. Appendix B provides a summary of MassDEP's fish toxics monitoring data for Cape Cod waterbodies from 2001 through 2009. Appendix C provides a summary of Water Management Act (WMA) Registration and Permitting Information and Appendix D provides the National Pollutant Discharge Elimination System (NPDES) permitting information for the Cape Cod coastal drainage areas. Lastly, a list of permitted groundwater discharges, along with their discharge flows and type of treatment, is provided in Appendix E.

The objectives of this water quality assessment report are as follows.

1. evaluate whether or not surface waters, defined as segments in the MassDEP/EPA databases, currently support their designated uses (i.e., meet surface water quality standards),
2. identify stressors impairing designated uses and any confirmed sources of those stressors [e.g., water withdrawals (habitat quality/water quantity) and/or major point (e.g., wastewater discharges, storm sewer system) and non-point (e.g., land-use practices, overland runoff, etc.) sources of pollution that may impair water quality conditions],
3. identify the presence of any non-native organisms,
4. identify waters (or segments) of concern that require additional data to fully assess water quality conditions, and
5. recommend additional monitoring needs and/or remediation actions in order to better determine the level of impairment or to improve/restore water quality.

There are a total of five river segments, 63 lake segments, and 89 estuarine/embayment segments representing 15.4 miles, 5649 acres, and 42.363 mi^2, respectively in this report (Figure 7). The information/data and assessments are provided for each segment in the following pages of this report. The general order of the report is from the inner to the outer Cape and segments are grouped by drainage area where possible. Figure 7 also illustrates the reporting areas.

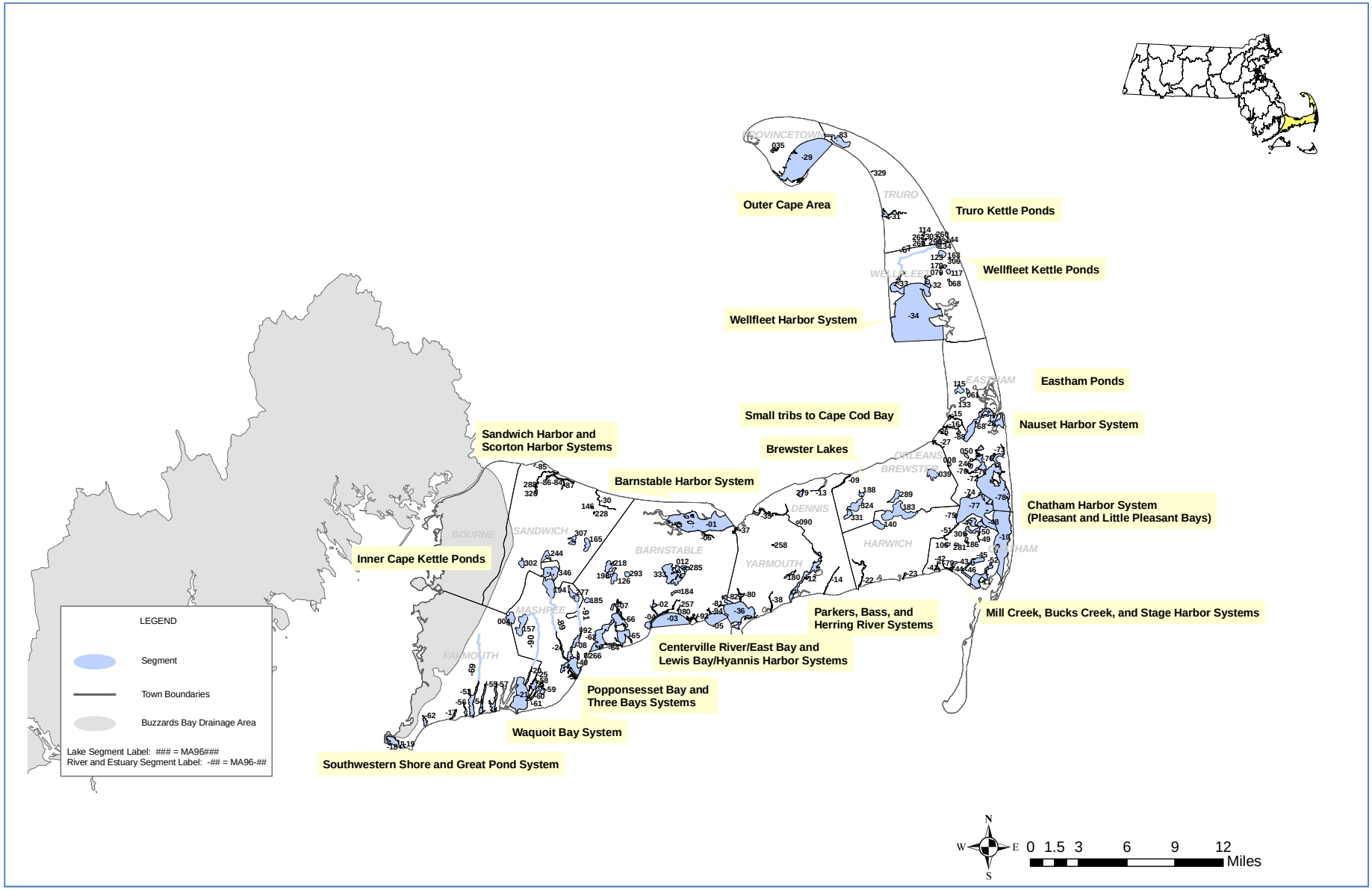


Figure 7. River, lake, and estuary segments in the Cape Cod Coastal Drainage Area.

INNER CAPE KETTLE PONDS

Ashumet Pond (MA96004)

Location:	Mashpee/Falmouth
AU Size:	203 Acres
Classification:	B
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

NPDES Discharges (Appendix D, Table D2)
Town of Sandwich (MAR041155)
Town of Falmouth (MAR041114)
Town of Mashpee (MAR041129)
Other: Superfund OTIS AIR NATIONAL GUARD BASE/CAMP EDWARDS information below excerpted online from http://www.epa.gov/region1/mmr/resources.html
http://yosemite.epa.gov/r1/npl_pad.nsf/f52fa5c31fa8f5c885256adc0050b631/EFABE4BC615B22288525692D0061823F?OpenDocument
"The Otis Air National Guard Base/Camp Edwards site covers approximately 22,000 acres and is more commonly known as the Massachusetts Military Reservation (MMR). Although the occupants and property boundaries have changed several times since MMR was established in 1935, the primary mission has always been to provide training and housing to Air Force and/or Army units. A review of past and present operations and waste disposal practices identified numerous potentially contaminated areas, including several areas located on the southern portion of MMR. These contaminated areas are the result of historic chemical/fuel spills, fire training activities, landfills, and drainage structures. Additionally, effluent from the former sewage treatment plant was historically discharged into sand beds where it seeped into the groundwater. In 1984, the U.S. Geological Survey detected contaminants in monitoring wells downgradient of this former plant. In 1983 and 1984, the Air Force detected volatile organic compounds (VOCs) in on-site monitoring wells near the Base Landfill and a Fire Training Area. Monitoring had also detected VOCs in several hundred private wells (all of which are now on municipal water) and in one town well (which is shut down). The EPA has designated the Sagamore Lens underlying MMR as a sole source aquifer under the Safe Drinking Water Act.
Numerous remediation projects addressing both the soil and groundwater contamination at MMR have been implemented since the mid to late 1990's. Approximately 100,000 tons of soil have been treated at MMR, while to date, there are numerous treatment plants in place which treat approximately 18 million gallons a day of contaminated groundwater. All treated groundwater is returned to the aquifer or discharged to surface water. The groundwater is contaminated with VOCs, including trichloroethene, tetrachloroethylene, ethylene dibromide (EDB), carbon tetrachloride, and dichloroethylene. Ethylene dibromide has been found to be upwelling in two separate locations, outside the MMR property boundaries, within cranberry bogs in Mashpee and Falmouth. People could be at risk if they accidentally drink or come into direct contact with contaminated groundwater. Contaminated groundwater could also pose a threat to the environment within several ponds and streams used for recreational purposes. Soil contaminated with heavy metals, polycyclic aromatic hydrocarbons (PAHs), pesticides, PCBs, and petroleum hydrocarbons has been removed in cleanup actions in 2001-2002. Other principle threats such as contaminants in drainage structures and underground storage tanks have been removed thus eliminating potential future sources of groundwater contamination.
MMR was placed on NPL in 1989; a Federal Facility Agreement (FFA) was signed in 1991 (and subsequently amended in March 2000) governing the Superfund cleanup. Signatories to the FFA include the National Guard Bureau, the Air Force and EPA (Commonwealth of Massachusetts did not sign original FFA, and U.S. Coast Guard was recently removed as a signatory). An Interim Record of Decision (IROD) was signed in September 1995 describing the cleanup decision for seven groundwater plumes; subsequent design issues. Public input required modifications to these cleanup decisions prior to implementation. Final RODs are currently being planned for each of these groundwater plumes.
Twelve groundwater treatment systems are currently in operation on 11 groundwater plumes; combined treatment system rate exceeds 18 million gallons per day. Three recent groundwater RODs call for additional treatment systems on five contaminated plumes; enforceable milestone dates for treatment system start ups are planned for 2005 and 2006. Cleanups at approximately 25 separate source areas have recently been completed. The cleanup included excavation-offsite disposal and soil vapor extraction/biosparging. Site Investigations/Remedial

Investigations at several additional source areas are continuing; future disposition of these source areas is uncertain at this time.
Contaminants frequently found in the MMR plumes are volatile organic compounds (VOCs). Examples include solvents used in metal degreasing such as tetrachloroethylene (PCE), trichloroethylene (TCE), and carbon tetrachloride (CCl4), as well as fuel constituents and an aviation gasoline additive, ethylene dibromide (EDB)".

DESIGNATED USE ASSESSMENT

Aquatic Life Use

Habitat and Flow

According to CH2M HILL (2009) "*Ashumet Pond is a kettle pond with a maximum depth of 19 meters (62.3 feet [ft]) and is located near the Massachusetts Military Reservation (MMR) on Cape Cod. The pond is fed primarily by groundwater seepage and has no surface water outlet…The WWTP began operation in 1936 and it was closed in 1995. Although the discharge of secondarily treated wastewater to the aquifer ceased in 1995, a large mass of residual phosphorus remains adsorbed to the aquifer matrix between the WWTP and the pond. This residual phosphorus has continued to feed the phosphorus plume that is discharging to the pond. Without further remedial action, this plume was expected to continue to contribute to the external phosphorus load of the pond (in the range of 48 to 110 kilograms [kg] per year) for decades* (McCobb et al. 2003; AFCEE 2002a)."

Biology

Several studies by the Installation Restoration Program (IRP) at the MMR in the 1990s identified the presence of tumors on brown bullhead in Ashumet Pond (Baumann *et al*. 2008). The IRP's technical advisory group recommended that future evaluations of the problem include a statistically based prevalence study that sampled more fish from the lakes of concern and similar reference lakes. USGS conducted a study of the prevalence of tumors in brown bullhead in Ashumet Pond and two reference lakes, Santuit and Great Herring Ponds in cooperation with USEPA and MassWildlife. As part of this study brown bullhead were collected from Ashumet Pond between May and July 2002. The following findings were reported (Baumann *et al*. 2008) *"Brown bullhead from Ashumet Pond, which has been subjected to contamination from the Massachusetts Military Reservation, had a high prevalence of raised lesions, which included histopathologically verified papillomas and squamous cell carcinoma, an elevated incidence of liver neoplasms, and an elevated level of genetic damage to red blood cell nuclei. Because red blood cells in fish have a lifespan of about 100 days, these results indicate an ongoing exposure to genotoxins in Ashumet Pond…The high prevalence of melanistic lesions on Ashumet Pond brown bullhead, combined with the tumor pathology and genetic damage, implicates chemical carcinogens as one of the causal factors in that lake. Because many of the brown bullhead were large and ages may have been underestimated, chemical exposure contributing to the pathology may have occurred as long ago as the early 1990s. An additional prevalence survey would help to clarify whether the causal factors are still active*".

It should also be noted that a blue-green algal bloom occurred in the pond in July 2008 (CH2M HILL 2009).

Water Chemistry

According to CH2M HILL (2007a), "In an effort to address the effects of the phosphorus plume on the trophic state of Ashumet Pond, AFCEE developed the following three-phase remedial strategy: (1) implement a targeted phosphorus inactivation of the pond sediments in the deepest area of the pond to reduce the internal phosphorus load in the pond; (2) install a geochemical barrier within the plume discharge area in the pond to reduce the external phosphorus loading from groundwater seepage; and (3) continue the on-going water quality monitoring program for Ashumet Pond. Consistent with this strategy, a targeted phosphorus inactivation (alum treatment) of the hypolimnion was conducted in September 2001 using aluminum sulfate and sodium aluminate solutions. A geochemical barrier consisting of zero-valent iron (ZVI) filings mixed with the native sandy shoreline sediments was installed in August 2004 along that part of the shoreline where the highest concentrations of phosphorus are discharging.

The barrier is 300 ft long, approximately three ft thick, and extends approximately 40 ft offshore from the mean shoreline of Ashumet Pond. Barrier performance data collected in 2004 and 2005 indicated that the barrier was effectively removing phosphorus from the targeted part of the plume (AFCEE 2006). During 2006, the USGS collected barrier performance data from a permanent barrier monitoring network and from approximately 200 temporary drive point sampling locations. The 2006 USGS data indicate that phosphorus is being removed from that part of the wastewater plume discharging to the pond through the barrier and that most of the removal is occurring within the interior of the barrier, well before reaching the interface between the barrier and the pond. These data suggest that the barrier is effectively reducing the external phosphorus load to the pond.

In 2006, AFCEE collected general water quality and phosphorus concentration data from five temporary drive point locations within the barrier and sediment data from 13 locations within or in the vicinity of the barrier. The general groundwater chemistry data indicate that highly reducing (e.g., denitrifying, sulfate reducing, and methanogenic) conditions have developed within the interior of the barrier where the majority of the phosphorus removal is occurring. These data suggest that the precipitation of a ferrous iron phase (vivianite) and/or a mixed valent iron-based layered double hydroxide phase (green rust) are the primary mechanisms of phosphorus removal by the barrier. The relatively low levels of phosphorus associated with oxidized iron-rich surface sediment samples of the barrier collected by AFCEE in 2006 support the conclusion that phosphorus is being removed from groundwater within the reducing interior of the barrier and before it can reach, and be adsorbed by, the thin oxidized iron-rich layer at the interface of the barrier and the pond."

Monthly depth profiles for DO and temperature and Secchi disc depth monitoring has been conducted at the deep hole of Ashumet Pond by CH2M HILL personnel between 2005 and 2008 for the Air Force Center for Engineering and the Environment (AFCEE) at the Massachusetts Military Reservation on Cape Cod (CH2M HILL 2009). DO depletion (i.e., <1.0 to 5.0 mg/L) often occured at depths greater than 7.5 m during August and September. The maximum temperature was 27.7℃. None of the Secchi disk transparency measurements were below the bathing beach guidelines (<1.2 m).

According to MA DPH (2010) there are two groundwater plumes (CS-10 and Ashumet Valley) that were found to be upwelling in the northwest portion of Ashumet Pond. No plume-related contaminants have been detected in the pond, however, since 2000. The treatment system/cleanup plan for CS-10 is summarized as follows (AFCEE 2010): "*The Chemical Spill 10 (CS-10) groundwater plume resulted from spills and releases from multiple sources. The primary source area originated from the former Boeing Michigan Aerospace Research Center Missile Site (from 1960 to 1973) and Unit Training Equipment Site (UTES). From 1996 through 2005, several source area cleanup actions were conducted at the site, including 15 drainage structure removals, and soil treatment with soil vapor extraction. More than 1,500 tons of contaminated soil were excavated and taken off site for disposal. Groundwater concentrations in monitoring wells located in the source area no longer exceed cleanup levels and the plume is detached from its primary source area. Studies have shown that portions of the CS-10 plume no longer discharge to Ashumet and Johns Ponds. Surface water sampling from both ponds in 2009 showed zero detections of contaminants associated with CS-10. The primary contaminants in the CS-10 plume are the cleaning solvents PCE and TCE, which have been detected above the state and federal MCLs of 5 µg/L. Long-term remediation is occurring with a treatment system comprised of a series of extraction wells, treatment plants, reinjection wells, and infiltration galleries. The treatment plants use granular activated carbon to remove the solvents from the groundwater and the treated water is returned to the aquifer through the infiltration galleries and reinjection wells. An additional extraction well to address the southern trench contamination, an additional reinjection well to improve hydraulic capture of the plume, and revised flow rates in several extraction wells were completed in February 2009. The CS-10 Plume final ROD, signed in 2009, specified continued operation and monitoring of the existing treatment system along with land use controls."*

The treatment system/cleanup plan for Ashumet Valley plume is summarized as follows (AFCEE 2010): "*The Ashumet Valley plume has two sources: the former firefighter-training area 1 (FTA-1) and the former MMR Sewage Treatment Plant (CS-16 and CS-17). Firefighter-training exercises were held from 1958 to 1985 at FTA-1, during which time flammable waste liquids were burned and extinguished, some of which entered the sandy soil and eventually reached the groundwater aquifer. The former sewage treatment plant, which operated from 1936 to 1995, released treated water to a series of sand infiltration beds. Sludge materials were kept on site. Treatment of contaminated soils at FTA-1 was completed in September 1997. A total of 42,531 tons of soil were treated at FTA-1 using a thermal treatment process. In 2001 and 2002, contaminated soil was removed from the CS-16 and CS-17 sites and taken off base for proper disposal. The primary contaminants in the Ashumet Valley plume are the cleaning solvents PCE and TCE, which have been detected above the state and federal MCLs of 5µg/L. The Ashumet Valley plume is currently in long-term remediation. Remediation is occurring with two treatment systems, each comprised of a single extraction well, treatment plant, and infiltration galleries/river discharge. The treatment plants use granular activated carbon to remove the solvents from the groundwater and the treated water is returned to the aquifer through the infiltration galleries in the central portion of the plume, and to a bog ditch along the Backus River in the southern area. The Ashumet Valley Plume final ROD, which was signed in 2009, specified continued operation of the existing treatment system plus additional treatment for the southern portion of the plume. The southern treatment system has been installed. The ROD also required land use controls. AFCEE does not believe that any portion of the plume is currently discharging into Ashumet Pond. Surface water sampling from Ashumet Pond in 2009 showed that no plume contaminants were detected."*

The *Aquatic Life Use* is assessed as impaired for Ashumet Pond based on the severe oxygen depletion that occured below about 7.5 m representing approximately 40% of the lake's surface area. While remediation efforts are underway, a phosphorus-rich groundwater plume, originating from the MMR wastewater treatment plant (WWTP) that operated between 1936 and 1995, has been discharging to Ashumet Pond for more than 20 years. A large mass of easily mobilized phosphorus remains adsorbed to the aquifer matrix between the former WWTP and Ashumet Pond and "*is expected to continue discharging (in the range of 48 to 110 kilograms [kg] per year) to the pond for decades*" (CH2M Hill 2007a). This use is also assessed as impaired based on the high prevalence of melanistic lesions on Ashumet Pond brown bullhead, combined with the tumor pathology and genetic damage. Chemical carcinogens are implicated as one of the causal factors (Baumann *et al*. 2008).

Fish Consumption Use
Fish toxics monitoring was conducted in Ashumet Pond in June 1999 and edible fillets were analyzed for select metals, PCBs, and organochlorine pesticides (data reported in DeCesare and Connors 2002). Due to the presence of mercury in largemouth bass, MA DPH issued the following advisory (MA DPH 2009c) recommending: "Children under 12 years of age, pregnant women, nursing mothers, and women of childbearing age who may become pregnant should refrain from consuming largemouth bass from Ashumet Pond" and "The general public should limit consumption of largemouth bass to two meals per month".

Because of the site-specific fish consumption advisory for Ashumet Pond due to Mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Primary and Secondary Contact Recreational and Aesthetics Uses
Monthly Secchi disc depth monitoring has been conducted at the deep hole of Ashumet Pond by CH2M HILL personnel between 2005 and 2008 for the Air Force Center for Engineering and the Environment (AFCEE) at the Massachusetts Military Reservation on Cape Cod (CH2M HILL 2009). None of the Secchi disk transparency measurements were below the bathing beach guidelines (<1.2 m). It should be noted that a blue-green algal bloom occurred in the pond in July 2008.

There are several public bathing beaches along the shoreline of Ashumet Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary Contact Recreational Use* is not assessed for Ashumet Pond due to the lack of quality assured bacteria data. The *Secondary Contact Recreational Use* is assessed as support since none of the Secchi disk transparency measurements were below the bathing beach guidelines (<1.2 m). The *Aesthetics Use* is not assessed. All of these uses, however, are identified with an Alert Status because of the blue-green algal bloom which occurred in July 2008.

Ashumet Pond (MA96004)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Low DO, elevated total phosphorus, abnormal fish histology (lesions), abnormal fish deformities, erosions, lesions, tumors (DELTS) Source: NPS Pollution from Military Base Facilities (Other than Port Facilities), Contaminated Groundwater, Cercla NPL (Superfund) Sites
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED*
Secondary Contact		SUPPORT*
Aesthetics		NOT ASSESSED*

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

According to CH2M HILL (2009), *"while the trophic health of the pond improved as the result of the alum treatment and the installation of the geochemical barrier, it was recognized prior to the alum application, however, that the effectiveness of the alum treatment would likely be temporary (e.g., three to five years). It was hoped that the installation of the geochemical barrier would extend the length of time before an additional alum treatment was necessary. The available data suggests that the barrier has been effective, but the decrease in water clarity, and the notably higher TP and ammonium in the tropholytic zone in 2008, suggests that the trophic health of the pond may be beginning to decline. The Ashumet Pond data collected in 2009 will be evaluated to determine if the signs of decreasing water quality and clarity observed in 2008 represent the beginning of a trend toward poorer water quality conditions. If the 2009 data further indicate that the pond is beginning to decline, further remedial actions will be evaluated for implementation".*

Baumann et al. (2008): *"The high prevalence of melanistic lesions on Ashumet Pond brown bullhead, combined with the tumor pathology and genetic damage, implicates chemical carcinogens as one of the causal factors in that lake. Because many of the brown bullhead were large and ages may have been underestimated, chemical exposure contributing to the pathology may have occurred as long ago as the early 1990s. An additional prevalence survey would help to clarify whether the causal factors are still active".*

Snake Pond (MA96302)

Location:	Sandwich
AU Size:	81 Acres
Classification:	B
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

NPDES Discharges (Appendix D, Table D2)
Town of Sandwich (MAR041155)

DESIGNATED USE ASSESSMENT
Fish Consumption Use
In 1992 fish were collected by MA DFG from Snake Pond and edible fillets were analyzed for mercury. Due to the presence of elevated mercury, MA DPH issued the following advisory (MA DPH 2009c): *"Children under 12 years of age, pregnant women, nursing mothers, and women of childbearing age who may become pregnant should refrain from consuming any fish from Snake Pond, the general public should limit consumption of all fish caught from Snake Pond to two meals per month, and the general public should not consume any smallmouth bass from Snake Pond."*

Because of the site-specific fish consumption advisory for Snake Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Primary and Secondary Contact Recreational and Aesthetics Uses
There are public bathing beaches along the shoreline of Snake Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody. MA DPH (2010) reports that no ethylene dibromide (EDB) or royal demolition explosive (RDX) were detected in surface water samples from these beach areas in Snake Pond (MA DPH 2010). Historically low levels of perchlorate (<0.1 ppb) were sporadically detected but none has been detected recently.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Snake Pond.

Snake Pond (MA96302)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Support improvement of freshwater Beaches Bill data quality and reporting.

Peters Pond (MA96244)

Location:	Sandwich
AU Size:	123 Acres
Classification:	B
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

NPDES Discharges (Appendix D, Table D2)
Town of Sandwich (MAR041155)

DESIGNATED USE ASSESSMENT
Fish Consumption Use
Fish were collected from Peters Pond by the Cape Cod Commission in 2001 (DeCesare and Connors 2002 and Michaud 2008). Three species were collected: smallmouth bass, yellow perch, and largemouth bass. Due to the presence of mercury in smallmouth bass, MA DPH issued the following advisory (MA DPH 2009c):
"Children under 12 years of age, pregnant women, nursing mothers, and women of childbearing age who may become pregnant should refrain from consuming smallmouth bass from Peters Pond" and the general public should limit consumption of smallmouth bass caught from Peters Pond to two meals per month".

In May 2009 fish were collected by DWM biologists from Peters Pond and edible fillets of smallmouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), a pumpkinseed (*Lepomis gibbosus*)/bluegill (*Lepomis macrochirus*) composite and largemouth bass (*Micropterus salmoides*) were analyzed for mercury (Maietta *et al*. 2010 and Appendix B, Table B10). Mercury concentrations were above the MA DPH trigger level in all but the pumpkinseed/bluegill composite.

Because of the site-specific fish consumption advisory for Peters Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. It should be noted that the single largemouth bass collected in 2001 also contained elevated mercury; however this species was not included in the advisory because only one fish was analyzed. The most recent data, however, is still under review by MA DPH and an updated advisory may be forthcoming.

The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Primary and Secondary Contact Recreational and Aesthetics Uses
There are several public bathing beaches along the shoreline of Peters Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody. It should be noted, however, that there was a blue green algal bloom that occurred in Cliff Pond in 2009 which is of concern.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Peters Pond.

Peters Pond (MA96244)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Update the fish consumption advisory if warranted after MA DPH review.

Support improvement of freshwater Beaches Bill data quality and reporting.

SOUTHWESTERN SHORE

Great Harbor (MA96-18)

Location:	The waters north of an imaginary line drawn east from Penzance Point to Devils Foot Island and southeast from Devils Foot Island to Juniper Point (excludes Eel Pond), Falmouth.
AU Size:	0.31 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Falmouth (MAR041114)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Great Harbor by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 14.3 acres (~7% of the segment area) of eelgrass bed habitat present in 1951. In 1995 there were 65 acres (33% of the segment area), and an estimated 51.7 acres (~26% of the segment area) in 2001. No mapping was done in 2006.

The *Aquatic Life Use* is assessed as support for Great Harbor based on the stable and expanding presence of eelgrass bed habitat, an indicator of good water quality conditions.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~13% of this segment area (portion of SC2.1) is *Prohibited* and ~87% of this segment area (SC2.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support for 0.27 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.04 square miles (~13% of the segment area) because it is *Prohibited* for shellfish harvesting. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Frequent testing for Enterococci bacteria during the swimming seasons was conducted at Falmouth Yacht Club Beach in Falmouth located along the shoreline of Great Harbor from 2002– 2007 (MA DPH 2009a). The beach was not reportedly posted in any year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Great Harbor based on the very lack of any beach closures at Falmouth Yacht Club Beach in Falmouth and the *Approved* shellfishing area classification in the majority of the segment. The *Aesthetics Use* in not assessed due to the absence of data.

Great Harbor (MA96-18)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.27 square miles IMPAIRED 0.04 square miles Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Little Harbor (MA96-19)

Location:	The waters north of an imaginary line drawn from Juniper Point, Falmouth east to Nobska Beach, Falmouth.
AU Size:	0.07 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Little Harbor by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 23.5 acres (~55% of the segment area) of eelgrass bed habitat present in 1951. In 1995 there were 19.8 acres (46% of the segment area), and an estimated 20.2 acres (~47% of the segment area) in 2001. No mapping was done in 2006.

The *Aquatic Life Use* is assessed as support for Little Harbor based on the stable presence of eelgrass bed habitat, an indicator of good water quality conditions.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~13% of this segment area (portion of SC4.2) is *Prohibited* and ~87% of this segment area (SC4.2 and a portion of SC4.2) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because all of the segment area is either *Probihited* or *Conditionally Approved* for shellfish harvesting. Based on the TMDL for pathogens (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and/or unspecified urban stormwater.

Little Harbor (MA96-19)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, unspecified urban stormwater
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Oyster Pond (MA96-62)

Location:	east of Fells Road, Falmouth.
AU Size:	0.1 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Falmouth (MAR041114)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback et al. (2004), *"this salt pond on the Vineyard Sound shore of Falmouth is spawning/nursery habitat for a population of river herring. Shoaling of the stream outlet has been a constant issue for fish passage, requiring frequent dredging. Recently rebuilt jetties appear to have alleviated this problem. In 2000, a weir was constructed at the pond outlet in order to reduce salt water intrusion and eliminate an anoxic water zone that had formed. A small notch was incorporated into the weir to allow fish passage while still limiting tidal impacts. This appears to have been accomplished and good numbers of river herring and white perch have been observed entering the pond. A noteworthy fact regarding the Oyster Pond river herring population is the earliness of the spawning run. Reliable reports have the first fish arriving at the stream mouth in February and, on at least one occasion, in January)."*

Oyster Pond differs from most embayments in that it has been intentionally tidally restricted as part of a management plan to provide ecological stability and support an anadromous fish run as described above. Salinity in the pond typically ranges between 2-4 ppt (UMass Dartmouth SMAST and MassDEP 2006c).

Eelgrass Bed Habitat
According to the MEP project technical report *"the low salinity waters of Oyster Pond are not supportive of eelgrass bed formation. The DEP Eelgrass Mapping Program has conducted no surveys in Oyster Pond. However, observations have been made by PondWatch from 1987 to present which support the lack of eelgrass in this system. Similarly, a complete system data collection and analysis effort conducted in the 1960's throughout the main basin of Oyster Pond did not indicate the presence of eelgrass (Emery 1997). This latter effort included a census of submerged aquatic vegetation, which did not indicate eelgrass, but did indicate that the dominant SAV in 2004, Ceratophyllum demersum, was also dominant in the 1960's"* (UMass Dartmouth SMAST and MassDEP 2006c).

Biology
Low numbers of both individuals and species were found in the samples collected in Oyster Pond (UMass Dartmouth SMAST and MassDEP 2006c). *"Due to its brackish waters, Oyster Pond sediments supported both freshwater and estuarine invertebrate populations. The freshwater species were generally insect larvae and these tended to dominate the community... Also notable was that almost half of the samples (5 of 11) had only (few) individuals, indicative of an impoverished community"* (UMass Dartmouth SMAST and MassDEP 2006c).

Water Chemisty
"Oyster Pond showed a relatively consistent pattern of low oxygen in its bottom waters throughout its basins…the deep, southern basin (6 meters) is consistently anoxic during summer months due to its salinity stratification which persists for months to years…represents only ~10% of the pond bottom. The remaining areas, <4 meters depth are only periodically anoxic or hypoxic. The northern basin was periodically anoxic between1998-2004. However, this basin is enclosed and this anoxia is driven mainly by stratification. The majority of the sediments in the pond (~80%) are represented by the oxygen levels observed in the upper and lower main basin…more open to winddriven mixing and showed oxygen levels 3 mg/L or above in 96% of samplings and 2 mg/L as a minimum level" (UMass Dartmouth SMAST and MassDEP 2006c). According to the MEP project technical report the geometric mean of the chlorophyll a concentration data reported for Oyster Pond was 4.9 µg/L although periodic phytoplankton blooms were present (UMass Dartmouth SMAST and MassDEP 2006c).

The *Aquatic Life Use* is assessed as impaired for Oyster Pond based on the MEP analysis. According to the Final Oyster Pond Embayment System Total Maximum Daily Loads for Total Nitrogen, any impairment in this waterbody is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2008c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC6.0) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because all of the segment area is Probihited for shellfish harvesting. According to the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) no data were available for this segment area. The TMDL does imply that restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Oyster Pond (MA96-62)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause(s): Estuarine bioaassessment, low dissolved oxygen Source(s): Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems.
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Falmouth Inner Harbor (MA96-17)

Location:	Waters included north of Falmouth Inner Harbor Light, Falmouth.
AU Size:	0.05 Square Miles
Classification:	SB
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009). It should be noted that the proposed 2010 Integrated List of Waters has this segment in Catgory 2.

NPDES Discharges (Appendix D, Table D2)
Town of Falmouth (MAR041114)

DESIGNATED USE ASSESSMENT
Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC9.0) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because all of the segment area is *Conditionally Approved* for shellfish harvesting.

Falmouth Inner Harbor (MA96-17)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Little Pond (MA96-56)

Location:	west of Vista Boulevard, Falmouth outlet to Vineyard Sound, Falmouth.
AU Size:	0.07 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients). It should be noted that the proposed 2010 Integrated List of Waters has this segment in Catgory 4a.

NPDES Discharges (Appendix D, Table D2)
Town of Falmouth (MAR041114)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al.* (2004) there are no obstructions to fish passage. A new outlet and jetty system have allowed salinities in this salt pond to increase to the point where it is probably not suitable spawning/nursery habitat.

Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Little Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 26.0 acres (~61% of the segment area) of eelgrass bed habitat present in 1951. In 1995 there were an estimated 14.8 acres (~35% of the segment area) and only 6.1 acres (~14%) in 2001. No mapping has been done for 2006.

The *Aquatic Life Use* is assessed as impaired for Little Pond based on the apparent loss of eelgrass bed habitat. According to the Final Little Pond Embayment System Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2008d). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC10.0) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because all of the segment area is Probihited for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Little Pond. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Little Pond (MA96-56)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, golf courses].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

GREAT POND SYSTEM

Coonamessett River (MA96-69)

Location:	Headwaters, outlet of Coonamessett Pond, Falmouth to the inlet of Great Pond, Falmouth.
AU Size:	3.4 Miles
Classification:	B
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [7/18/2007, CN181.0]). According to the FINAL Great, Green and Bournes Pond Embayment Systems Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers. In order to restore water quality in Great Pond, nitrogen loadings from the Coonamessett River needed to be controlled; however, the freshwater river itself was not shown to be impaired by total nitrogen during the MEP sampling effort (UMass Dartmouth SMAST and MassDEP 2005b).

WMA Withdrawal (Appendix C)
TOWN OF FALMOUTH (registration 42209610)

NPDES Discharges (Appendix D, Table D2)
Town of Falmouth (MAR041114)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al*. (2004), there are three obstructions fitted with fish passage structures along this stream. Anadromous species present include alewife, blueback, white perch, and trout. The river flows through a complex system of cranberry bogs and their related structures and reservoirs. The first obstruction is a concrete bog flume which has been modified so that its spillway functions as a weir-pool ladder. From this point migrating herring can travel to Pond 14, a bog reservoir which was fitted with a 30 foot prefabricated aluminum steeppass fishway in 2000. The final obstruction is actually caused by shoaling of the stream below the headwater pond. This and persistent low water levels in the pond itself have made juvenile and adult out-migration difficult in many years. To overcome this, a new outlet structure was installed in 2002 which deepened the outlet stream and is capable of functioning as a fishway. The extensive riverside cranberry bogs on this system create the potential for conflict with river herring management. Water diversions, particular for picking, which often coincides with juvenile out-migration, can cause severe losses of young fish.

Biology
In September 2005 DFG biologists conducted backpack electrofishing in the Coonamessett River downstream from John Parker Road (site 1424) in the main ditch of the cranberry bog near the lower end of the river segment (MA DFG 2008). Nine species were present and in order of abundance included American eel, tessellated darter, chain pickerel, fourspine stickleback, two yellow bullhead, and an individual each of banded killifish, largemouth bass, pumpkinseed, and yellow perch. The dominance by American eel is most likely associated with the close proximity to the ocean. Although this sampling station was located within a cranberry bog, the relatively high number of tessellated darter is indicative of a stable flow regime. The few macrohabitat generalists that were present are most likely originating in the ponds and small impoundments in this system.

Water Chemistry
According to MA DPH (2010) no ethylene dibromide (EDB) has been detected in samples collected from the Coonamessett River proper. EDB is sporadically detected in samples collected from one bog ditch associated with the river. MA DPH concluded that infrequent contact with these EDB levels in these bogs is not likely to present a health hazard. Remediation efforts of the FS-28 plume (defined by the extent of groundwater containing EDB at concentrations exceeding the MMCL of 0.02 µg/L) are ongoing (CH2MHILL 2007b). The report states *"The plume is detached from an unknown source area on MMR and extends from just north of Boxberry Hill Road to north of the intersection of Sandwich Road and Turner Road".* The treatment system/cleanup plan is

summarized as follows (AFCEE 2010): *"Portions of the FS-28 plume were first discovered in 1993 beneath the leading edge of the CS-4 plume. In 1996, groundwater investigations found EDB upwelling into the Coonamessett River in Falmouth. No EDB is presently detected in the Coonamessett River. The FS-28 plume is currently in long-term remediation with a groundwater extraction-and-treatment system. A treatment plant is located in a bog area just south of Hatchville Road and treated water is discharged to the Coonamessett River through two oxygenating bubblers. Shallow wellpoint extraction wells operated for several years but are no longer being used. In 2007 a new extraction well was installed to the south to address a deep lobe of EDB. The FS-28 plume underflows Coonamessett Pond and has not affected the pond or a nearby Town of Falmouth municipal well. In 2002 AFCEE funded a $5.2 million wellhead treatment system to ensure a safe water supply for the Falmouth well. A ROD was issued in October 2000."*

Too limited data are available so the *Aquatic Life Use* is not assessed. This use is identified with an Alert Status however because of the anadromous fish passage issues of concern noted by DMF biologists.

Coonamessett River (MA96-69)

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Screening techniques which have been developed by DMF and disseminated to growers through the Cape Cod Cranberry Growers Association should be employed where possible in this system (Reback *et al*. 2004).

Great Pond (MA96-54)

Location:	From inlet of Coonamessett River, Falmouth to Vineyard Sound (excluding Perch Pond), Falmouth.
AU Size:	0.40 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients [7/18/2007, CN181.0], Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Falmouth (MAR041114)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Great Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 171.1 acres (~67% of the segment area) of eelgrass bed habitat present in 1951. There were only 19.6 acres (~8% of the segment area) in 1995 and none was found in 2001. No mapping has been done for 2006.

The *Aquatic Life Use* is assessed as impaired for Great Pond based on the apparent significant loss of eelgrass bed habitat. According to the FINAL Great, Green and Bournes Pond Embayment SystemsTotal Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (portion of SC11.3) is *Approved* for shellfish harvesting (MA DFG 2009). It should be noted that a TMDL for pathogens was recently completed and approved for this segment (MassDEP, USEPA Region 1, and ENSR 2009).

The *Shellfish Harvesting Use* is assessed as support because all of the segment area is *Approved* shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
Frequent testing for Enterococci bacteria during the swimming seasons was conducted at Shorewood Beach Association Beach in Falmouth located along the shoreline of Great Pond from 2003 – 2008 (MA DPH 2009a and MA DPH 2009b). The beach was reportedly posted once in 2006, 28 days in 2007 (~39% of the season), and once in 2008. No postings were reported in any other year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Great Pond based on the generally low frequency of beach closures at Shorewood Beach Association Beach in Falmouth and the *Approved* status of the *Shellfish Harvesting Use*. The *Primary Contact Recreational Use* is identified with an Alert Status because of the unusual high frequency of beach postings in 2007. The *Aesthetics Use* in not assessed due to the absence of data.

Great Pond (MA96-54)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture, golf courses].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT*
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

Perch Pond (MA96-53)

Location:	Connects to northwest end of Great Pond, west of Keechipam Way, Falmouth.
AU Size:	0.03 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients [7/18/2007, CN181.0], Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Falmouth (MAR041114)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Perch Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

Biology
According to the MEP project technical report the benthic community in Perch Pond was “dominated by opportunistic stress tolerant species, but at much lower numbers of organisms distributed among fewer species indicating a higher level of stress in this system. It is likely that the poor habitat quality stems in part from the geomorphology of the Perch Pond basin, which is made from an enclosed deep kettle basin with a shallow tidal inlet. This structure increases the sensitivity of this tributary basin to nitrogen enrichment as it provides for periodic stratification and low oxygen levels in bottom waters. The sediments within this basin are sulfidic, with either a thin or absent oxidized surface layer” (UMass Dartmouth SMAST and MassDEP 2005b).

Water Chemistry
According to the MEP project technical report anoxic conditions (<0.5 mg/L at 0.5m depth) and high chlorophyll a concentrations (39.2 µg/L) were measured in Perch Pond in mid-August 2001*(*UMass Dartmouth SMAST and MassDEP 2005b).

The *Aquatic Life Use* is assessed as impaired for Perch Pond based on the MEP analysis. According to the FINAL Great, Green and Bournes Pond Embayment SystemsTotal Maximum Daily Loads for Total Nitrogen, any impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (portion of SC11.3) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because all of the segment area is *Approved* shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Perch Pond based on the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

Perch Pond (MA96-53)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Green Pond (MA96-55)

Location:	east of Acapesket Road, Falmouth outlet to Vineyard Sound, Falmouth.
AU Size:	0.21 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients [7/18/2007, CN181.0], Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Falmouth (MAR041114)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Green Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 40.5 acres (~30% of the segment area) of eelgrass bed habitat present in 1951. None was found in 1995 or 2001. No mapping has been done for 2006.

The *Aquatic Life Use* is assessed as impaired for Green Pond based on the apparent significant loss of eelgrass bed habitat. According to the FINAL Great, Green and Bournes Pond Embayment SystemsTotal Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC12.0) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because all of the segment area is *Conditionally Approved* shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009),*"During 2000- 2002, 3 stations had elevated geometric means: 1) station #3, at Karyn Jane, 13.3 CFU/100 ml; 2) station #2 at Weatherglass, 6.59 CFU/100 ml; 3) station #4, at Partridge Lane, 4.53 CFU/100 ml. During 2003- 2004, 3 stations having elevated geometric means: 1) station #1, at Route 28, 12.06 CFU/100 ml; 2) station #2, at Weatherglass, 7.60 CFU/100 ml; 3) station #3 at Karyn Jane, 4.65 CFU/100 ml. The DMF conducted a shoreline survey in November, 2004, and concluded: (1) that up to 20 stormdrains may have a potentially negative bacteria impact throughout; (2) migratory bird populations throughout (ducks, geese, and cormorants), but particularly in the cranberry bogs that drain into the pond (at stations 1, 2); (3) Marinas and boats (some 64 boat docks counted in survey). The boats and moorings do not seem to be the culprit, as the town has an aggressive patrol and pump-out program in place. The town of Falmouth should sample, some of the identified stormdrains, (particularly any dry weather flows), that discharge directly into Green Pond. But it would appear that DMF suggests that the bird population problem is the probable priority pollutant factor in this segment."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Green Pond (MA96-55)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture, golf courses].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Bournes Pond (MA96-57)

Location:	West of Central Avenue, Falmouth to Vineyard Sound, including Israels Cove, Falmouth.
AU Size:	0.24 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients [7/18/2007, CN181.0], Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Falmouth (MAR041114)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Bournes Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 76.2 acres (~50% of the segment area) of eelgrass bed habitat present in 1951. There were 46.5 acres (~31% of the segment area) in 1995 and an estimated 26.7 acres (~18% of the segment area) in 2001. No mapping has been done for 2006.

The *Aquatic Life Use* is assessed as impaired for Bournes Pond based on the apparent loss of eelgrass bed habitat. According to the FINAL Great, Green and Bournes Pond Embayment Systems Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~74% of this segment area (SC13.0) is *Approved* and ~26% of this segment area (SC13.1) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support for 0.18 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.06 square miles because it is *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"The shoreline survey notes indicate that a structural change in the design and location of the entrance to Nantucket Sound in 1987 significantly improved the water quality (due to more efficient tidal flushing), and also resulted in an improvement in shellfish resources. Bottom muds have been gradually replaced with sands. There are approximately 13 houses around the pond, but they are all set back from the shoreline. All septic systems appeared to be functioning properly as of the 2004 survey. The very north end of the pond, to Falmouth Road, has at least several stormwater pollution sources that are apparent problems, so that area is classified as prohibited. The rest of the pond is seasonally open for both recreational and commercial shellfishing, and the DMF is suggesting consideration for this portion to be approved year- round."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated stormwater discharges from the municipal stormwater systems.

Bournes Pond (MA96-57)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture, golf courses].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.18 square miles IMPAIRED 0.06 sqaure miles Cause: Elevated fecal coliform bacteria Sources: Discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

WAQUOIT BAY SYSTEM

Johns Pond (MA96157)

Location:	Mashpee
AU Size:	316 Acres
Classification:	B
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

WMA Withdrawal (Appendix C)
Town of Mashpee Conservation Commission (registration 42217205)

NPDES Discharges (Appendix D, Table D2)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al.* (2004) the control structure at the Johns Pond outlet is the final obstruction to anadromous fish passage in the Quashnet River system. The wooden Denil ladder was noted to be badly in need of a replacement and a design had been developed. Reback *et al*. (2004) also noted "*the most critical issue affecting the anadromous fish production of this system is diversion of water for cranberry bog irrigation. Johns Pond water is used to irrigate bogs on two outlet streams often resulting in lower than adequate pond levels for both adult and juvenile migration. In some instances juveniles have been stranded on bog surfaces after dewatering. In order to reach the potential that the headwater pond's 317 acres provides, cranberry bog operations must be coordinated with needs of the river herring population."*

Biology
Several studies by the Installation Restoration Program (IRP) at the MMR in the 1990s identified the presence of tumors on brown bullhead in Ashumet and Johns ponds (Baumann *et al*. 2008). The IRP's technical advisory group recommended that future evaluations of the problem include a statistically based prevalence study that sampled more fish from the lakes of concern and similar reference lakes. USGS conducted a study of the prevalence of tumors in brown bullhead in Ashumet Pond and two reference lakes, Santuit and Great Herring Ponds in cooperation with USEPA and MassWildlife with sampling occurring between May and July 2002. Although Johns Pond was originally part of this study fishing was suspended in Johns Pond due to the limited number of bullhead caught in the spring sampling effort (Senior Management Board Meeting 2002). The following findings were reported (Baumann *et al*. 2008) *"Brown bullhead from Ashumet Pond, which has been subjected to contamination from the Massachusetts Military Reservation, had a high prevalence of raised lesions, which included histopathologically verified papillomas and squamous cell carcinoma, an elevated incidence of liver neoplasms, and an elevated level of genetic damage to red blood cell nuclei. Because red blood cells in fish have a lifespan of about 100 days, these results indicate an ongoing exposure to genotoxins in Ashumet Pond…The high prevalence of melanistic lesions on Ashumet Pond brown bullhead, combined with the tumor pathology and genetic damage, implicates chemical carcinogens as one of the causal factors in that lake. Because many of the brown bullhead were large and ages may have been underestimated, chemical exposure contributing to the pathology may have occurred as long ago as the early 1990s. An additional prevalence survey would help to clarify whether the causal factors are still active*".

Water Chemistry
According to MA DPH (2010) there are two groundwater plumes (SD-5 and CS-10) that were found to be upwelling in the northwest portion of Johns Pond. No plume-related contaminants have been detected in the pond, however, since 2000. The SD-5 plume is one case where the groundwater contamination no longer meets the definition of a plume, and it is in long-term monitoring (AFCEE 2010). The treatment system/cleanup plan for CS-10 is summarized as follows (AFCEE 2010): "*The Chemical Spill 10 (CS-10) groundwater plume resulted from spills and releases from multiple sources. The primary source area originated from the former Boeing Michigan Aerospace Research Center Missile Site (from 1960 to 1973) and Unit Training Equipment Site (UTES). From 1996 through 2005, several source area cleanup actions were conducted at the site, including 15 drainage*

structure removals, and soil treatment with soil vapor extraction. More than 1,500 tons of contaminated soil were excavated and taken off site for disposal. Groundwater concentrations in monitoring wells located in the source area no longer exceed cleanup levels and the plume is detached from its primary source area. Studies have shown that portions of the CS-10 plume no longer discharge to Ashumet and Johns Ponds. Surface water sampling from both ponds in 2009 showed zero detections of contaminants associated with CS-10. The primary contaminants in the CS-10 plume are the cleaning solvents PCE and TCE, which have been detected above the state and federal MCLs of 5 µg/L. Long-term remediation is occurring with a treatment system comprised of a series of extraction wells, treatment plants, reinjection wells, and infiltration galleries. The treatment plants use granular activated carbon to remove the solvents from the groundwater and the treated water is returned to the aquifer through the infiltration galleries and reinjection wells. An additional extraction well to address the southern trench contamination, an additional reinjection well to improve hydraulic capture of the plume, and revised flow rates in several extraction wells were completed in February 2009. The CS-10 Plume final ROD, signed in 2009, specified continued operation and monitoring of the existing treatment system along with land use controls."

Too limited data are available so the the *Aquatic Life Use* is not assessed. This use is identified with an Alert Status however, based on the anadromous fish passage issues of concern noted by DMF biologists and the prevelance of tumors on brown bullhead in Johns Pond.

Fish Consumption Use
Fish toxics monitoring was conducted in Johns Pond in 1992 and again in June 1999 (Maietta 2007). Edible fillets of fish collected in June 1999 were analyzed for select metals, PCBs, and organochlorine pesticides (data reported in DeCesare and Connors 2002). Due to the presence mercury, MA DPH issued the following advisory (MA DPH 2009c): *"Children under 12 years of age, pregnant women, nursing mothers, and women of childbearing age who may become pregnant should refrain from consuming any fish from Johns Pond, the general public should not consume smallmouth bass caught from Johns Pond, and the general public should limit consumption of non-affected fish from this water body to two meals per month."*

Because of the site-specific fish consumption advisory for Johns Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Primary and Secondary Contact Recreational and Aesthetics Uses
There are several public bathing beaches along the shoreline of Johns Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no *Primary Contact Recreational Use* assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Johns Pond.

Johns Pond (MA96157)

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

A permanent fishway should be incorporated into the new outlet structure to be built at Johns Pond on the Quashnet River (Reback *et al*. 2004).

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Support improvement of freshwater Beaches Bill data quality and reporting.

Quashnet River (MA96-90)

Location:	Headwaters, outlet Johns Pond, Mashpee to just south of Route 28, Falmouth.
AU Size:	4.1 Miles
Classification:	B
2008 303(d) List:	This is a new segment so it does not appear on the list.

NPDES Discharges (Appendix D, Table D2)
Town of Mashpee (MAR041129)
Town of Falmouth (MAR041114)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
The following is excerpted from Reback *et al.* (2004):
"*Although not the original outlet stream from Johns Pond, the Quashnet River now provides river herring with the only access to that spawning area. The stream is lined with cranberry bogs for much of its length and consequently numerous bog related obstructions affect fish passage. The first obstruction, however, is not associated with a bog. A small log dam intended to improve stream conditions for trout is passable but creates some difficulty for migrating adult herring. This structure could be easily modified to correct this. Some distance above this is an old concrete flume which was part of an abandoned bog system. A dilapidated wooden weir-pool fishway provides passage at this point but will soon become unusable. Since there is absolutely no need to maintain this dam and there is virtually no impoundment behind it, removal of the stoplogs is a simple and cost effective alternative to replacement of the fishway. This section of the river is owned and maintained as a catch and release trout fishery by the Division of Fisheries and Wildlife. Removal of the dam would provide several benefits to this resource as well. Immediately upstream of this first impoundment is a second bog flume in the process of collapsing into the stream. While currently passable under high flow conditions, further deterioration could create a barrier to fish movement. Other obstructions include several bog flumes and a small wooden stoplog dam at a golf course, all of which are passable when properly adjusted. The final obstruction is the control structure at the Johns Pond outlet. A wooden Denil ladder which has provided passage at this point is badly in need of a replacement and, as of this writing, a design has been developed. The most critical issue affecting the anadromous fish production of this system is diversion of water for cranberry bog irrigation. Johns Pond water is used to irrigate bogs on two outlet streams often resulting in lower than adequate pond levels for both adult and juvenile migration. In some instances juveniles have been stranded on bog surfaces after dewatering. In order to reach the potential that the headwater pond's 317 acres provides, cranberry bog operations must be coordinated with needs of the river herring population."*

Biology
In August 2005 DFG biologists conducted backpack electrofishing in the Quashnet River "Section 7) (site 1400) (MA DFG 2008). Six species were present and in order of abundance included brook trout (multiple age classes), American eel, tessellated darter, white sucker, fourspine stickleback, and alewife. The sample was dominated by and comprised primarily by pollution intolerant, fluvial specialist/dependant species. The Quashnet River is on the Massachusetts Department of Fish and Game's Cold Water Fishery Resource List (MA DFG 2007).

Water Chemistry
According to MA DPH (2010) ethylene dibromide (EDB) has been detected in samples collected from the Quashnet River between two adjacent bogs (K2 and K6 bogs). MA DPH concluded that infrequent contact with these EDB levels in these bogs is not likely to present a health hazard. Remediation efforts of the FS-1 plume (defined by the extent of groundwater containing EDB at concentrations exceeding the MMCL of 0.02 µg/L) are ongoing (CH2MHILL 2007b). The report states *"the FS-1 plume is detached from its source area on MMR and flows in a southeasterly direction. The plume remains deep in the aquifer until just upgradient of the upper reaches of the Quashnet River where the plume begins to rise in the aquifer and eventually discharges into the river."* The treatment system/cleanup plan is summarized as follows (AFCEE 2010): *"The FS-1 plume is currently in long-term remediation with a groundwater extraction-and-treatment system in the Quashnet River cranberry bog area, just northeast of Johns Pond. The system was designed to prevent upwelling of EDB contamination into the Quashnet River and associated cranberry bogs. The treatment plant uses granular activated carbon to remove EDB from the groundwater, which is then discharged to the Quashnet River through a series of oxygenating bubblers. The latest test results showed that the FS-1 treatment system has been successful in*

reducing both the amount of EDB in the FS-1 plume and the EDB concentrations in the surface water of the Quashnet River and associated bogs. A 2000 ROD specifies active treatment of the plume along with monitoring."

The *Aquatic Life Use* is assessed as support based on the fish population. The presence and dominance by a reproducing brook trout population is indicative of excellent water and habitat quality conditions. This use is identified with an Alert Status however, based on the anadromous fish passage issues of concern noted by DMF biologists and the presence of EDB in the river.

Quashnet River (MA96-90)

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

The Quashnet River should be protected as a cold water fishery. In light of the presence of reproducing brook trout, the river should also be considered for reclassification as a Class B Cold Water in the next revision of the Massachusetts Surface Water Quality Standards.

Implement DMF biologist's recommendations to remedy anadromous fish passage issues of concern.

Quashnet River (MA96-20)

Location:	Just south of Route 28, Falmouth to mouth at Waquoit Bay, Falmouth.
AU Size:	0.07 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients [11/7/2007, CN218.0], Organic enrichment/Low DO [11/7/2007, CN218.0], Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Falmouth (MAR041114)

Note: There are two private WWTfs on individual on-site septic systems that discharge in the upper watershed area of the Quashnet River: Southport and Mashpee High School. Both are reportedly providing nitrogen removal from their wastewater flows (UMass Dartmouth SMAST and MassDEP 2005a).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
The local residence time for the Quashnet River estuary was calculated to be 1.63 days (UMass Dartmouth SMAST and MassDEP 2005a).

Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for the Quashnet River by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

Biology
According to the MEP project technical report the benthic community in the estuarine portion of the Quashnet River was severely degraded given the virtual absence of an infaunal community (one species and few individuals) at three sampling locations. Large macroalgal accumulations are also problematic and are "*indicative of severe degradation by nitrogen enrichment*" (UMass Dartmouth SMAST and MassDEP 2005a).

Water Chemistry
According to the MEP project technical report the DO concentrations in the Quashnet River frequently dropped below 4.0 mg/L during the night (10% of time) and were supersaturated during the day (daily excursion as high as 15 mg/L in the bottom water). The chlorophyll *a* concentrations were >20 µg/L for approximately 19% of the deployed period (UMass Dartmouth SMAST and MassDEP 2005a). The report also states that "*chlorophyll a levels in the upper and mid regions averaged >20 µg/L*". The average nitrogen concentration reported for the three sampling locations in this segment of the Quashnet River (upper to lower) were 0.830, 0.771, and 0.546 mg/L N (UMass Dartmouth SMAST and MassDEP 2005a).

The *Aquatic Life Use* is assessed as impaired for this segment of the Quashnet River based on the MEP analysis. It should be noted that according to the FINAL Quashnet River, Hamblin Pond, Little River, Jehu Pond, and Great River in the Waquoit Bay System Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~96% of this segment area (SC15.3) is *Prohibited* and ~4% of this segment area (SC15.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support for 0.002 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.068 square miles because it is *Prohibited* for shellfish harvesting. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl and/or stormwater discharges from the municipal stormwater systems.

Quashnet River (MA96-20)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen, low dissolved oxygen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture, golf courses].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.002 square miles IMPAIRED 0.068 square miles Cause: Elevated fecal coliform bacteria (400) Sources: Waterfowl (134), discharges from municipal separate storm sewer systems (34)
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Waquoit Bay (MA96-21)

Location:	From mouths of Seapit River, Quashnet River (also known as Moonakis River), Falmouth and Great River, Mashpee to confluence with Vineyard Sound, Falmouth/Mashpee.
AU Size:	1.4 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients, Organic enrichment/Low DO, Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Falmouth (MAR041114)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Waquoit Bay by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 146.0 acres (~16% of the segment area) of eelgrass bed habitat present in 1951 approximately half of which was noted as having high confidence. None was found in the bay in 1995, 2001, or 2006.

The *Aquatic Life Use* is assessed as impaired for Waquoit Bay based on the apparent loss of eelgrass bed habitat. According to the FINAL Quashnet River, Hamblin Pond, Little River, Jehu Pond, and Great River in the Waquoit Bay System Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (portion of SC15.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because all of the segment area is *Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"In the 1999 - 2001 survey, two stations had elevated mean values: 1) station #6 at Mouth of Moonakiss, 5.4 CFU/100 ml (with 2 readings >28 CFU/100 ml); 2) station 7A at culvert under Meadows Neck, 5.2 CFU/100 ml (with 2 readings >28 CFU/100 ml). The area was rated by DMF as having overall excellent water quality, with three small closures along the eastern side of the bay due to birds and stormwater runoff."*

Primary and Secondary Contact Recreational and Aesthetics Uses
Frequent testing for Enterococci bacteria during the swimming seasons was conducted at both the Seconsett Island Causeway (2002 to 2007) and Callies Beach (2003 – 2007) in Mashpee located along the shoreline of Waquoit Bay (MA DPH 2009b). The Seconsett Island Causeway Beach was reportedly posted once in 2004 and no other postings were reported for either beach in any other year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Waquoit Bay based on the very low frequency of beach closures at Seconsett Island Causeway and Callies beaches in Mashpee and the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

Waquoit Bay (MA96-21)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture, golf courses].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Red Brook (MA96-25)

Location:	From dam at Red Brook Road, Falmouth/Mashpee to Hamblin Pond, Falmouth/Mashpee.
AU Size:	0.01 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 2

This segment is on the 2008 Integrated List of Waters in Category 2 - Attaining Some Uses (Shellfishing, Primary Contact, Secondary Contact); Others Not Assessed.

NPDES Discharges (Appendix D, Table D2)
Town of Falmouth (MAR041114)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (portion of SC16.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because all of the segment area is *Approved* shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Red Brook based on the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

Red Brook (MA96-25)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Hamblin Pond (MA96-58)

Location:	From inlet of Red Brook, Falmouth/Mashpee to outlet of Little River, Mashpee and inlet/outlet of Waquoit Bay west of Meadow Neck Road, Falmouth/Mashpee.
AU Size:	0.19 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients [11/7/2007, CN218.0], Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Falmouth (MAR041114)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Hamblin Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 88.2 acres (~73% of the segment area) of eelgrass bed habitat present in 1951. In 1995 there was an estimated 24.7 acres (~21% of the segment area and in 2001 there were an estimated 4.2 acreas (~3.5% of the segment area). In 2006 there were ~0.6 acres (0.5% of the segment area).

The *Aquatic Life Use* is assessed as impaired for Hamblin Pond based on the apparent loss of eelgrass bed habitat. According to the FINAL Quashnet River, Hamblin Pond, Little River, Jehu Pond, and Great River in the Waquoit Bay System Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~7% of this segment area (SC16.2) is *Prohibited* and ~93% of this segment area (portion of SC16.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support for 0.18 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.01 square miles because it is *Prohibited* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"The DMF collected fecal coliform samples in sanitary surveys at two stations (71 Monomscoy Rd; Mouth of Hamblin), fifteen to twenty times during 2004- 2005. Fecal coliform geometric mean values were 3.97 and 2.56 CFU/100 ml at each, with one reading at each station > 28 CFU/100 ml. A shoreline survey conducted in 2004 revealed that septic systems, marinas and boats, and stormdrains did not appear to be important pollution source factors. However, large flocks of birds appeared to inhabit the areas near the two stations, (as well as throughout the Little and Great Rivers Complex, including all of Hamblin Pond)."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl.

Hamblin Pond (MA96-58)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.18 square miles IMPAIRED 0.01 square miles Cause: Elevated fecal coliform bacteria Sources: Waterfowl
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Little River (MA96-61)

Location:	From outlet of Hamblin Pond, Mashpee to the Great River, Mashpee.
AU Size:	0.03 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients [11/7/2007, CN218.0], Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for the Little River by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 6.1 acres (~37% of the segment area) of eelgrass bed habitat present in 1951 but none was found in 1995, 2001, or 2006.

The *Aquatic Life Use* is assessed as impaired for the Little River based on the apparent significant loss of eelgrass bed habitat. According to the FINAL Quashnet River, Hamblin Pond, Little River, Jehu Pond, and Great River in the Waquoit Bay System Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (portion of SC16.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because all of the segment area is *Approved* shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), "*A shoreline survey conducted in 2004 revealed that septic systems, marinas and boats, and stormdrains did not appear to be important pollution source factors. Rather, large flocks of birds appeared to inhabit the areas near all the stations, (as well as throughout the Little and Great Rivers Complex, including all of Hamblin Pond).*"

Primary and Secondary Contact Recreational and Aesthetics Uses
The *Primary* and *Secondary Contact Recreational* uses are assessed as support for the Little River based on the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

Little River (MA96-61)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Great River (MA96-60)

Location:	From inlet of Abigails Brook, Mashpee to Waquoit Bay (excluding Jehu Pond), Mashpee.
AU Size:	0.16 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [11/7/2007, CN218.0]).

NPDES Discharges (Appendix D, Table D2)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for the Great River by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 62.8 acres (~60% of the segment area) of eelgrass bed habitat present in 1951. In 1995 there was an estimated 26.0 acres (~25% of the segment area and in 2001 there were an estimated 3.3 acreas (~3.1% of the segment area). In 2006 there were ~3.7acres (3.5% of the segment area).

The *Aquatic Life Use* is assessed as impaired for the Great River based on the apparent significant loss of eelgrass bed habitat. According to the FINAL Quashnet River, Hamblin Pond, Little River, Jehu Pond, and Great River in the Waquoit Bay System Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (portion of SC16.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because all of the segment area is *Approved* shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
The *Primary* and *Secondary Contact Recreational* uses are assessed as support for the Great River based on the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

Great River (MA96-60)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Jehu Pond (MA96-59)

Location:	Mashpee.
AU Size:	0.09 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [11/7/2007, CN218.0]).

NPDES Discharges (Appendix D, Table D2)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Jehu Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 48.4 acres (~88% of the segment area) of eelgrass bed habitat present in 1951. In 1995 there was an estimated 17.6 acres (~32% of the segment area) and in 2001 there were an estimated 9.4 acreas (~17% of the segment area). In 2006 there were ~10.5 acres (19% of the segment area).

The *Aquatic Life Use* is assessed as impaired for the Jehu Pond based on the apparent significant loss of eelgrass bed habitat. According to the FINAL Quashnet River, Hamblin Pond, Little River, Jehu Pond, and Great River in the Waquoit Bay System Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (portion of SC16.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because all of the segment area is *Approved* shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Jehu Pond based on the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

Jehu Pond (MA96-59)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, and golf course].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

SANDWICH HARBOR SYSTEM

Upper Shawme Lake (MA96326)

Location:	Sandwich
AU Size:	21 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed. It should be noted that the proposed 2010 Integrated List of Waters has this segment in Catgory 5 due to nutrient/eutrophication biological indicators.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
The earthen dam at Upper Shawme Lake which no longer had fish passage (Reback *et al*. 2004) was replaced by a concrete structure and spillway in 2008/early 2009. The new dam was also equipped with an aluminum fish ladder.

No other data are available so all uses are not assessed.

Upper Shawme Lake (MA96326)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Evaluate the efficiency/success of the new fishway at the dam.

Shawme Lake Lower (MA96288)

Location:	Sandwich
AU Size:	25 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed. It should be noted that the proposed 2010 Integrated List of Waters has this segment in Catgory 5 due to nutrient/eutrophication biological indicators.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
A fishway into Lower Shawme Pond was reconstructed by DMF in 1993 and currently provides adequate passage (Reback *et al*. 2004).

No other data are available so all uses are not assessed.

Shawme Lake Lower (MA96288)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Mill Creek (MA96-85)

Location:	Headwaters, outlet Shawme Lake Lower, Sandwich to confluence with Old Harbor Creek, Sandwich.
AU Size:	0.02 Square Miles
Classification:	SA
2008 303(d) List:	This is a new segment – no prior listing.

NPDES Discharges (Appendix D, Table D2)
Town of Sandwich (MAR041155)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Mill Creek is largely a tidal stream that drains Upper and Lower Shawme lakes. This stream historically supported a small American shad run in its lower reaches (Reback *et al*. 2004).

Too limited data are available so the *Aquatic Life Use* is not assessed.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~40% of this segment area (portion of CCB37.0) is *Conditionally Approved* for shellfish harvesting and ~60% (CCB37.1) is *Prohibited* (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the entire segment is either *Conditionally Approved* or *Prohibited*. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Mill Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Bacteria source tracking efforts in the Sandwich Harbor Subwatershed area including several sites along Mill Creek were conducted by MassDEP Southeast Regional Office staff in the summers of 2007 and 2008. No significant dry weather bacteria sources were found upstream of Cranberry Highway (Route 6A) while sampling results at stations downstream from Route 6A in 2007 were inconclusive (Beasley and Sheppard 2008). A submersed stormdrain pipe was identified as a possible dry weather contributor of bacteria, however followup sampling in the summer of 2008 indicated low bacteria concentrations and led investigators to conclude that this stormdrain was not a significant human source of bacteria to Mill Creek (Beasley and Sheppard 2009).

Too limited data are available so the *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed.

Mill Creek (MA96-85)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Dock Creek (MA96-86)

Location:	From railroad crossing northeast of Route 6A, Sandwich to confluence with Old Harbor Creek, Sandwich.
AU Size:	0.02 Square Miles
Classification:	SA
2008 303(d) List:	This is a new segment – no prior listing.

NPDES Discharges (Appendix D, Tables D1 and D2)
Division of Fisheries and Wildlife Sandwich State Fish Hatchery (MA0110027)
Sandwich Public Schools, Henry T. Wing School (MA0101656)
Town of Sandwich (MAR041155)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Whole effluent toxicity
The Henry T. Wing School effluent exhibited variable levels of acute and/or chronic toxicity to the test organisms in the 13 test events conducted between May 2002 and May 2004. LC_{50}s ranged from 22.6 to >100% effluent (5 tests indicated acute whole effluent toxicity) while CNOECs ranged from <6.25 to 100% effluent (10 test events indicated chronic whole effluent toxicity). Ammonia-nitrogen concentrations reported in the whole effluent toxicity reports between May 2002 and May 2004 ranged from 21 to 44 mg/L (n=13) and Total Residual Chlorine (TRC) concentrations were variable ranging from $\leq$0.05 mg/L (n=9) to as high as 3.5 mg/L (n=4 measurements >0.05 mg/L). The NPDES permit was inactivated by EPA in June 2005 because the facility no longer has a surface water discharge (they now have a groundwater discharge).

Too limited data are available so the *Aquatic Life Use* is not assessed.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~73% of this segment area (portion of CCB37.0) is *Conditionally Approved* for shellfish harvesting and ~27% (CCB37.2) is *Prohibited* (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the entire segment is either *Conditionally Approved* or *Prohibited*. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Dock Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Bacteria source tracking efforts in the Sandwich Harbor Subwatershed area were conducted by MassDEP Southeast Regional Office staff between July and September 2007 including two sites along Dock Creek. Possible significant dry weather bacteria sources were considered likely including mammals and birds feeding on fish waste present at one site (Beasley and Sheppard 2008). Additional source tracking work in the upper watershed of Dock Creek was conducted in 2008 and 2009. The Sandwich State Fish Hatchery discharge and the Henry T. Wing School were both ruled out as contributing sources (Beasley and Sheppard 2009 and 2010). Additional source tracking work is recommended for the wetland area behind the Sandwich Shopping Mall between Main Street and Route 6A. A review of septic/cesspool sources associated with homes in this area is also recommended (Beasley and Sheppard 2010).

Too limited data are available so the *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed.

Dock Creek (MA96-86)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Springhill Creek (MA96-87)

Location:	From railroad crossing northeast of Route 6A, Sandwich to confluence with Old Harbor Creek, Sandwich.
AU Size:	0.01 Square Miles
Classification:	SA
2008 303(d) List:	This is a new segment – no prior listing.

NPDES Discharges (Appendix D, Table D2)
Town of Sandwich (MAR041155)

Note: Bacteria source tracking efforts in the Sandwich Harbor Subwatershed area were conducted by MassDEP Southeast Regional Office staff between July and September 2007 including three sites in the upper watershed area of Springhill Creek. Significant dry weather bacteria sources were considered present in this system although no evidence of human sources were found at the site with the highest bacteria counts (Beasley and Sheppard 2008). Followup sampling was conducted in the summer of 2008 but bacteria counts were low at all stations in May & August and it was concluded that there were no significant dry weather human sources of bacteria (Beasley and Sheppard 2009).

DESIGNATED USE ASSESSMENT
Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that almost all of this segment area (CCB37.6) is *Prohibited* for shellfish harvesting and a small portion (CCB37.0) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the segment is either *Conditionally Approved* or *Prohibited* for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Springhill Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl and/or stormwater discharges from the municipal stormwater systems.

Springhill Creek (MA96-87)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Old Harbor Creek (MA96-84)

Location:	From Foster Road, Sandwich to Sandwich Harbor, Sandwich.
AU Size:	0.06 Square Miles
Classification:	SA
2008 303(d) List:	This is a new segment – no prior listing.

NPDES Discharges (Appendix D, Table D2)
Town of Sandwich (MAR041155)

Note: Bacteria source tracking efforts in the Sandwich Harbor Subwatershed area were conducted by MassDEP Southeast Regional Office staff between July and September 2007 including sites upstream of Foster Road in the upper watershed area of Old Harbor Creek. This tributary was dry during all August and September sampling events so was not considered a significant dry weather bacteria source (Beasley and Sheppard 2008). Followup sampling was conducted in the summer of 2008 and bacteria counts were low at all stations in May & August. There was evidence of detergent at one station, however it was concluded that while there may be an intermittent dry weather bacteria source to Old Harbor Creek, it wasn't considered to be significant (Beasley and Sheppard 2009).

DESIGNATED USE ASSESSMENT
Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~76% of this segment area (portion of CCB37.0) is *Conditionally Approved* for shellfish harvesting and ~24% (CCB37.7) is *Prohibited* (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the entire segment is either *Conditionally Approved* or *Prohibited*. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Old Harbor Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl and/or stormwater discharges from the municipal stormwater systems.

Old Harbor Creek (MA96-84)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

SCORTON HARBOR SYSTEM

Nye Pond (MA96228)

Location:	Sandwich
AU Size:	6 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

NPDES Discharges (Appendix D, Table D2)
Town of Sandwich (MAR041155)

DESIGNATED USE ASSESSMENT
No recent quality assured data are available so all uses are not assessed.

Nye Pond (MA96228)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Hoxie Pond (MA96146)

Location:	Sandwich
AU Size:	8 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

WMA Withdrawal (Appendix C)
THE SCORTON COMPANY (registration 42226110)

NPDES Discharges (Appendix D, Table D2)
Town of Sandwich (MAR041155)

DESIGNATED USE ASSESSMENT
Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beach along the shoreline of Hoxie Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Hoxie Pond.

Hoxie Pond (MA96146)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Scorton Creek (MA96-30)

Location:	Jones Lane, Sandwich to mouth at Cape Cod Bay, Sandwich.
AU Size:	0.03 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Sandwich (MAR041155)

DESIGNATED USE ASSESSMENT
Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (CCB36.0) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the entire segment is *Prohibited* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"The only indication as to pollution sources in DMF reports are the presence of large numbers of birds from time to time. Species include several varieties of ducks, as well as Canadian geese, crmorants, seagulls, and terns. A sanitary survey conducted in 2001, and a triennial report in 2005 both indicate the possibility of bacteria sources from outhouses, cesspools or septic systems throughout the entire Barnstable Harbor area (including Scorton Creek). DMF recommends that the town of Barnstable Board of Health should check out these possible sources."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
The Torrey Beach Community Association Beach is located along the coast at the mouth of Scorton Creek. The Association conducts frequent *Enterococci* bacteria testing at their beach during the swimming season. Between 2002 and 2007 the beach has been reported to be open for all but one day each in the 2003 and 2004 swimming seasons (MA DPH 2009a).

Although the Torrey Beach Community Association Beach was almost never posted, the beach is not along the shore of Scorton Creek but rather along the Atlantic Coast so it does not provide good spatial representativeness of the Scorton Creek segment area. Therefore too limited data are considered to be available so the *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed.

Scorton Creek (MA96-30)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

BARNSTABLE HARBOR SYSTEM

Maraspin Creek (MA96-06)

Location:	From Commerce Road, Barnstable to confluence with Barnstable Harbor at Blish Point, Barnstable.
AU Size:	0.03 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

Note: MA DFG biologists conducted backpack electrofishing in Maraspin Creek just upstream from Commerce Road in July 2003. Their sampling effort resulted in the collection of four American eel, a ninespine stickleback and a fourspine stickleback (MA DFG 2008).

DESIGNATED USE ASSESSMENT
Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that this segment area (CCB32.0) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the entire segment is *Prohibited* for shellfish harvesting. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, and/or stormwater discharges from the municipal stormwater systems.

Maraspin Creek (MA96-06)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Barnstable Harbor (MA96-01)

Location:	From the mouths of Scorton and Spring Creeks, Barnstable east to an imaginary line drawn from Beach Point to the western edge of the Mill Creek estuary, Barnstable.
AU Size:	3.2 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

Note: MA DFG biologists conducted backpack electrofishing at two locations (upstream from Willow Street and upstream from Route 6A in Barnstable) in an unnamed tributary to Boat Cove Creek, a tributary to Barnstable Harbor. Their sampling efforts resulted in the collection of several American eel, as well as three and fourspine stickleback (MA DFG 2008).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Barnstable Harbor by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 60.3 acres (~3% of the segment area) of eelgrass bed habitat present in 1951 offshore of Millway Beach and Cobbs Village but none was found in the harbor in 1995 or 2001. No mapping was done in 2006.

The *Aquatic Life Use* is assessed as impaired for Barnstable Harbor based on the apparent significant loss of eelgrass bed habitat.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~17% of this segment area (portions of CCB31.1 and CCB33.0 and all of CCB31.2) is *Conditionally Approved* for shellfish harvesting and ~83% (CCB31.0 and CCB31.2) is *Approved* (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support for 2.7 square miles because they are *Approved* for shellfish harvesting. The *Shellfish Harvesting Use* is assessed as impaired 0.5 square miles (~17%) of the segment area since it is *Conditionally Approved* for shellfish harvesting. According to the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009), "*A special DMF sanitary survey conducted in 2001, involving six stations from several creeks and streams at the Barnstable Yacht Club, found elevated fecal coliform levels ranging form 290 > 1,000; CFU/100 ml, and is speculated to be the result of Yacht Club related activities. A shoreline survey to identify pollution sources was conducted between October and November 2001. Most of the area is on septic systems, and although there were no breakouts observed, DMF recommended that the Board of Health inspect a number of systems, particularly in the summer area of Sandy Neck. Several other pipes coming from houses and sides of roads showed signs of a discharge and it was recommended that they be evaluated by the town."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Barnstable Harbor is heavily used for water-based recreation with four public beaches. Frequent testing for Enterococci bacteria during the swimming season was conducted at these beaches from 2002 – 2007 (MA DPH 2009a). Closure data for individual Barnstable Harbor beaches are summarized below:

Scudder Lane Beach: Was posted one day each in 2003 and 2004 and no postings were reported in any other year.
Millway Beach: Was posted one day each in 2004 and 2007 and no postings were reported in any other year.
Indian Trail/Neck Beach: No postings were reported in any year.
Bone Hill Beach: Was posted one day in 2006 and no postings were reported in any other year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Barnstable Harbor based on the very low frequency of beach closures at Scudder Lane, Millway, Indian Trail and Bone Hill beaches in Barnstable. The *Aesthetics Use* in not assessed due to the absence of data.

Barnstable Harbor (MA96-01)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Unknown
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 2.7 square miles IMPAIRED 0.5 square miles Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

SMALL TRIBUTARIES TO CAPE COD BAY

Mill Creek (MA96-37)

Location:	From Keveney Lane/Mill Lane, Barnstable/Yarmouth north to confluence with Cape Cod Bay, Barnstable/Yarmouth.
AU Size:	0.03 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)
Town of Yarmouth (MAR041176)

DESIGNATED USE ASSESSMENT
Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that this segment area (portion of CCB29.0) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the entire segment is *Prohibited*. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Mill Creek (MA96-37)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Chase Garden Creek (MA96-35)

Location:	New Boston Road, Dennis to mouth at Cape Cod Bay, Dennis/Yarmouth.
AU Size:	0.13 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Tables D1 and D2)
Aquaculture Research Corporation is (MA005576)
Town of Dennis (MAR041103)
Town of Yarmouth (MAR041176)

Note: Whites Brook is a tributary to Chase Garden Creek. The headwater of Whites Brook, Matthews Pond, provides 35.7 acres of alewife spawning habitat and is accessed by a 24 foot Denil fishway. Other than fishway regulation and maintenance, there is little room for anadromous fish passage improvement (Reback *et al*. 2004).

DESIGNATED USE ASSESSMENT
Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that 33% of this segment area (CCB27.1) is *Prohibited* and 67% of the segment area (CCB27.0) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the segment is either *Prohibited* or *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"In the above data sets a station at the Mouth of White's Brook had the highest geometric average at 6.5 CFU/100 ml, but no readings were > 28 CFU/100 ml. A shoreline survey was conducted in April 2001. Several pipes from houses (apparently sump pumps from cellars) reported in a 1992 shoreline survey were sampled, but were not found to be a problem. There was no indication of the cause(s) of relatively elevated levels at the Mouth of White's Brook. However, it was observed that abundant waterfowl populations (ducks and geese) have been observed in the Creek during the shoreline survey and during routine sampling runs. In follow-up survey work in 2003, the station at the Mouth of White's Brook continued to have the highest geometric average at 6.5 CFU/100 ml, with 2 readings > 28 CFU/100 ml. Also, the station across from the Windmill have a geometric average of 4.1 CFU/100 ml, with 1 reading >28 CFU/100 ml, and the station at the Mouth of Clays Creek had a geometric average of 4.7 CFU/100 ml, with 1 reading > 28CFU/100 ml. Another follow-up shoreline survey was conducted during March 2004. Whites Brook (which has a fresh water source) and Clays Creek have fairly extensive drainage areas, and bacteria levels at the classification station at the base of each are consistently elevated. No sources are identified for either of these. An aquaculture operation was sampled, with no apparent problems. Stormwater runoff, septic systems, and boats do not appear to be contributors either. As in the 2001 shoreline survey, large populations of birds were evident throughout the marsh areas."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl and/or upstream source(s).

Primary and Secondary Contact Recreational and Aesthetics Uses
Frequent testing for Enterococci bacteria during the swimming seasons was conducted at Gray's Beach in Yarmouth located along the shoreline of Chase Garden Creek from 2002 – 2007 (MA DPH 2009a). The beach was reportedly posted once in 2005.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Chase Garden Creek since Gray's Beach in Yarmouth was only posted once in six years. The *Aesthetics Use* in not assessed due to the absence of data.

Chase Garden Creek (MA96-35)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, upstream source
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Flax Pond (MA96090)

Location:	Dennis
AU Size:	15 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

DESIGNATED USE ASSESSMENT
Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beach along the shoreline of Flax Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Flax Pond.

Flax Pond (MA96090)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Scargo Lake (MA96279)

Location:	Dennis
AU Size:	54 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

NPDES Discharges (Appendix D, Table D2)
Town of Dennis (MAR041103)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Shoaling at the outlet of Scargo Lake was identified as one of the most pressing fish passage problems in this system. The town attempted to overcome this with the installation of a concrete outlet retention structure which reportedly provided a measure of relief (Reback *et al*. 2004).

Too limited data are available so the *Aquatic Life Use* is not assessed.

Primary and Secondary Contact Recreational and Aesthetics Uses
There are public bathing beaches along the shoreline of Scargo Lake. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Scargo Lake.

Scargo Lake (MA96279)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Sesuit Creek (MA96-13)

Location:	Approximately 625 feet east of Route 6A, Dennis to mouth at Sesuit Harbor, Cape Cod Bay, Dennis.
AU Size:	0.01 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Dennis (MAR041103)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Sesuit Creek flows between Scargo Lake and Cape Cod Bay. Two issues were identified as posing anadromous fish passage problems: shoaling at the outlet of Scargo Lake and the deteriorating culvert under Route 6A (Reback *et al*. 2004). Anadromous species listed as present are alewife and rainbow smelt. To remedy this problem the town installed a concrete outlet retention structure at Scargo Lake which has reportedly provided a measure of relief and a restoration project was implemented at the Route 6A culvert (see below).

The Sesuit Creek Restoration Project, the largest salt marsh restoration completed to date in Massachusetts, was completed in June 2008 (MassCZM 2008). "*For more than 80 years the Bridge Street crossing of Sesuit Creek had choked off upstream wetlands from natural tidal flows, causing severe degradation of the marsh and obstructing fish passage. The project replaced a failing two-foot diameter pipe beneath the road with two 10-foot by 12-foot concrete culverts, which increased flow capacity by 60 times and restored natural tidal conditions to the 65-acre marsh. Combined with the recent enlargement of other road culverts along the creek by the Massachusetts Highway Department, this project also restored fish passage to important spawning habitat in upstream Scargo Lake... Led by the town of Dennis and its citizens, the project was supported by the following partners: CZM, the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service, the Natural Resources Conservation Service, and the U.S. Fish & Wildlife Service. Significant funding was also provided by the Massachusetts Legislature through the efforts of Senator Robert O'Leary and Representative Cleon Turner.*" (MassCZM 2008).

Natural tidal conditions and anadromous fish passage are now restored in Sesuit Creek. However, no water quality data are available so the *Aquatic Life Use* is not assessed.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (portion of CCB25.0) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the segment is *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"A sanitary survey was conducted whereby 3 stations (culverts) were sampled April 30, 2003, with all readings 10 CFU/100 ml or less. Six stations (culverts and stormdrains) were sampled on July 29, 2003. A steady rainfall was reported to be occurring during the sampling. Elevated readings were observed at several stations including: Bridge St. stormdrain, 2,880 CFU/100 ml; Bridge St. culvert, 3,380 CFU/100 ml; Marina Parking Area drain, 460 CFU/100 ml; and Cold Storage culvert, 400 CFU/100 ml. The DMF identified the Bridge St. and Marina Parking area stormdrains as stormwater sources of pollution, however, no sources were identified. Follow-up monitoring indicated no problems. Additionally, 3 stations (culverts) were sampled December 5, 2005, with the range of readings between <10 and 30 CFU/100 ml. On January 18, 2006, five stations (culverts, etc., similar to July 29, 2003 survey above) were sampled. All readings were low this time (as compared to July 29, 2003), with ranges between <10 - 30 CFU/100 ml."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, and/or stormwater discharges from the municipal stormwater systems.

Sesuit Creek (MA96-13)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Quivett Creek (MA96-09)

Location:	Outlet of unnamed pond just south of Route 6A, Brewster/Dennis to the mouth at Cape Cod Bay, Brewster/Dennis.
AU Size:	0.04 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Brewster (MAR041096)
Town of Dennis (MAR041103)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Primarily a tidal stream, Quivett Creek drains a 4.2 acre impoundment on the Brewster/Dennis line. A stone notched weir-pool ladder provides passage into the pond. Available habitat is limited and other than fishway regulation and maintenance there is limited opportunity for further development (Reback *et al*. 2004).

Too limited data are available so the *Aquatic Life Use* is not assessed.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (CCB24.0) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the segment is *Probihited* for shellfish harvesting. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
There are two semi-public beaches along the shoreline at the mouth of Quivett Creek: Crowes Beach in Dennis and Wing Island Beach in Brewster. No *Enterococci* testing or beach closure information has been reported for either of these beaches (MA DPH 2009a).

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Quivett Creek due to the absence of data.

Quivett Creek (MA96-09)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Namskaket Creek (MA96-27)

Location:	Source west of Route 6, Orleans to mouth at Cape Cod Bay, Brewster/Orleans.
AU Size:	0.03 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Brewster (MAR041096)
Town of Orleans (MAR041146)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat
According to the Massachusetts Estuaries Project final report for the Namskaket Marsh Estuarine System (UMass Dartmouth SMAST and MassDEP 2008b), *"The Namskaket Estuary is showing high habitat quality throughout its salt marsh reach. The upper reach appears to be a fully functional tidal salt marsh with deeply incised narrow creeks surrounded by extensive emergent marsh. This reach is typical of New England "pocket" marshes, with smaller tidal creeks and a marsh plain dominated by low marsh and high marsh plant communities with patches of fringing brackish marsh vegetation. The lower reach of the marsh supports a large wetland area to the west along with larger tidal creeks. The lower portion of the system is also heavily influenced by sand transport via nearshore coastal processes associated with adjacent Cape Cod Bay. Plant communities in the lower reach are similar to the upper reach except that there is less fringing brackish water species and the marsh grades to barrier beach/dune vegetation near the tidal inlet. All of the key habitat indicators are consistent within Namskaket Marsh, and particularly its tidal creeks, supporting high quality habitat in line with the system's salt marsh structure and function."*

Biology
The infauna surveys were conducted at seven sites along Namskaket Creek (UMass Dartmouth SMAST and MassDEP 2008b). According to the final report "*The communities within the upper reach had moderate to high numbers of individuals, and low species numbers, with lower numbers of individuals and species within the transitional environment of the lower reach. The communities generally contained some organic enrichment tolerant species. However, species like Capitella and Streblospio, typically observed in impaired embayment habitats…did not dominate while there were also significant numbers of crustaceans and polychaetes. The absence of macroalgal accumulations and algal mats within the creek bottoms were also indicative of healthy conditions* "(UMass Dartmouth SMAST and MassDEP 2008b).

It is best professional judgement that the *Aquatic Life Use* be assessed as support for Namskaket Creek based on the indicators of healthy habitat and biological conditions described in the Massachusetts Estuary Project final report (UMass Dartmouth SMAST and MassDEP 2008b).

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that this segment area (CCB21.0) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the segment is *Probihited* for shellfish harvesting. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl and/or stormwater discharges from the municipal stormwater systems.

Namskaket Creek (MA96-27)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Little Namskaket Creek (MA96-26)

Location:	Source to mouth at Cape Cod Bay, Orleans.
AU Size:	0.01 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Orleans (MAR041146)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat
According to the Massachusetts Estuaries Project final report for the Little Namskaket Marsh Estuarine System (UMass Dartmouth SMAST and MassDEP 2008a), *"The Little Namskaket Estuary is showing high habitat quality throughout its salt marsh reach. The upper reach appears to be a fully functional tidal salt marsh with deeply incised narrow creeks surrounded by extensive emergent marsh. This reach is typical of New England "pocket" marshes, with smaller tidal creeks and a marsh plain dominated by low marsh and high marsh plant communities with patches of fringing brackish marsh vegetation. The lower reach of the central tidal creek supports bordering marsh plain that is similar to, but less expansive than, the upper tidal reach. The lower tidal reach is influenced by sand transport via nearshore coastal processes associated with adjacent Cape Cod Bay. Plant communities in the lower reach are similar to the upper reach except that there is less fringing brackish water species and the marsh grades to barrier beach/dune vegetation near the tidal inlet. All of the key habitat indicators support the assessment that Little Namskaket Marsh, and particularly its tidal creeks, are supporting high quality habitat relative to the system's salt marsh structure and function."*

Biology
The infauna surveys were conducted at three sites along Little Namskaket Creek (UMass Dartmouth SMAST and MassDEP 2008a). According to the final report "*The communities within the upper reach had moderate to high numbers of individuals, and low species numbers, with lower numbers of individuals and species within the transitional environment of the lower reach…The communities generally contained some organic enrichment tolerant species. However, species like Capitella and Streblospio, typically observed in impaired embayment habitats…did not dominate. The communities were composed of polychaetes, crustaceans and mollusks, with polychaetes being the predominant taxa…The absence of macroalgal accumulations and algal mats within the creek bottoms were also indicative of healthy conditions* "(UMass Dartmouth SMAST and MassDEP 2008a).

It is best professional judgement that the *Aquatic Life Use* be assessed as support for Little Namskaket Creek based on the indicators of healthy habitat and biological conditions described in the Massachusetts Estuary Project final report (UMass Dartmouth SMAST and MassDEP 2008a).

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that this segment area (CCB19.0) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the segment is Probihited for shellfish harvesting. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Frequent testing for *Enterococci* bacteria during the swimming seasons was conducted at Skaket Beach in Orleans located along a shoreline at the mouth of Little Nemskaket Creek from 2002 – 2007 (MA DPH 2009a). The beach was only posted once in 2003 and twice in 2004.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Little Nemskaket Creek since posting of Skaket Beach in Orleans has been neither frequent nor prolonged. The *Aesthetics Use* in not assessed due to the absence of data.

Little Namskaket Creek (MA96-26)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl , discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Boat Meadow River (MA96-15)

Location:	Headwaters east of old railway grade, Eastham to mouth at Cape Cod Bay, Eastham.
AU Size:	0.05 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients, Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Eastham (MAR041110)

DESIGNATED USE ASSESSMENT
Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that this segment area (CCB16.0) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the segment is *Probihited* for shellfish harvesting. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is one public beach along the shoreline of Boat Meadow River. Frequent testing for *Enterococci* bacteria during the swimming seasons was conducted at Boat Meadow Beach in Eastham from 2003 – 2007 (MA DPH 2009a). Boat Meadow Beach was posted once each year in 2004 and 2006.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Boat Meadow River since posting of Boat Meadow Beach has been neither frequent nor prolonged. The *Aesthetics Use* in not assessed due to the absence of data.

Boat Meadow River (MA96-15)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

ROCK HARBOR SYSTEM

Cedar Pond (MA96-88)

Location: Orleans (in Inner Cape Cod Bay ACEC).
AU Size: 0.03 Square Miles
Classification: SA
2008 303(d) List: This is a new segment – no prior listing.

NPDES Discharges (Appendix D, Table D2)
Town of Orleans (MAR041146)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Tidal exchange in Cedar Pond has recently been changed with the clearing of the marsh channel and the removal of the weir restriction (Schlezinger and Howes 2009).

Water Chemistry
Two YSI 6600 sondes were deployed in the deep hole of Cedar Pond between 16 June and 10 September 2009 by UMass Dartmouth SMAST personnel (Schlezinger and Howes 2009). One probe was deployed ~ 1 m above the bottom and the 2nd meter ~ 2.5 meters above the bottom. Throughout the study period, the pond was stratified and the bottom waters were anoxic. Supersaturation and elevated chlorophyll *a* concentrations (measured as fluorescence) were also documented and are indicative of highly enriched conditions (Schlezinger and Howes 2009).

The *Aquatic Life Use* is assessed as impaired for Cedar Pond based on the low DO, supersaturation, and elevated chlorophyll a concentrations -- all indicative of highly enriched conditions. Tidal influence and exchange since clearing of the channel and removal of the weir restricition has also fairly recently been changed.

Cedar Pond (MA96-88)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Low dissolved oxygen, elevated chlorophyll *a*, supersaturation DO Source: Unknown Suspected sources: Changes in ordinary stratification and bottom water hypoxia/anoxia, changes in tidal circulation/flushing, internal nutrient recycling
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		NOT ASSESSED --no shellfish harvesting area associated with this waterbody.
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Rock Harbor Creek (MA96-16)

Location:	Outlet Cedar Pond, Orleans to mouth at Cape Cod Bay, Eastham/Orleans.
AU Size:	0.03 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Orleans (MAR041146)
Town of Eastham (MAR041110)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al*. (2004), Rock Harbor Creek has supported small river herring and white perch runs in the past. Two obstructions currently affect fish passage. A small culvert under Rock Harbor Road is partially filled with sediments making movement through it difficult. A second obstruction is the Route 6 culvert which is associated with the Cedar Pond outlet control structure. The culvert was not designed with fish passage in mind and consequently it is difficult to adjust the outlet flows for optimal passage. While some fish do reach the pond, this is an important factor in limiting the population (Reback *et al*. 2004).

Eelgrass Bed Habitat
No eelgrass bed habitat (1951 – 2001) was mapped in Rock Harbor Creek.

Too limited data are available so the *Aquatic Life Use* is not assessed for Rock Harbor Creek. This use is identified with an Alert Status however because of the anadromous fish passage issues of concern noted by DMF biologists.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that this segment area (CCB18.0) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the segment is Probihited for shellfish harvesting. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
There are two public beaches along the shoreline of Rock Harbor Creek. Frequent testing for *Enterococci* bacteria during the swimming seasons was conducted at Dyer Prince Beach in Eastham and Rock Harbor Beach in Orleans from 2002 – 2007 (MA DPH 2009a). Dyer Prince Beach was posted once each year in 2004, 2006 and 2007 and twice in 2005. Rock Harbor Beach in Orleans was posted once in 2004 and 2005, twice in 2006 and four times in 2007 although the maximum number of days it was posted in a given beach season was only 4.8%.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Rock Harbor Creek since postings of Dyer Prince and Rock Harbor beaches have been neither frequent nor prolonged. The *Aesthetics Use* in not assessed due to the absence of data.

Rock Harbor Creek (MA96-16)

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

POPPONSESSET BAY SYSTEM

Wakeby Pond (MA96346)

Location:	Mashpee/Sandwich
AU Size:	353 Acres
Classification:	B
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

WMA Withdrawal (Appendix C)
WAKEBY BOG AND SANDWICH BOG (registration 42226102)

NPDES Discharges (Appendix D, Table D2)
Town of Sandwich (MAR041155)

NOTE: Although Wakeby and Mashpee ponds are listed as separate waterbodies in PALIS, the two are at the same elevation and are hydrologically connected. There is no culvert or any other physical barrier between these two waterbodies.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Perhaps the greatest impediment to this system reaching the production potential afforded by its 700 plus acres of spawning area is the uncontrolled regulation of flows from Mashpee-Wakeby Pond by unauthorized individuals. According to Reback *et al*. (2004), the outlet control structure at Mashpee-Wakeby Pond has frequently been vandalized to adjust pond levels for self-serving purposes, which has resulted in fish kills numbering in the hundreds of thousands. Even though the outlet structure is on Mashpee Pond, any impediments to fish passage will also affect this waterbody.

Water Chemistry
It should be noted that according to MA DPH (2010) a groundwater contamination plume, the J. Braden Thompson plume from the former Crocker Junkyard in Sandwich, is discharging to the Pickerel Cove area of Wakeby Pond. Low concentrations of contaminants attributable to the Crocker property (trichloroethyle (TCE) and 1,1,2,2-tetrachloroethane (1,1,2,2-TeCA) have been detected in bottom waters of the pond.

Too limited data are available so the *Aquatic Life Use* is not assessed. This use is identified with an Alert Status however due to anadromous fish passage issues of concern noted by DMF biologists and the presence of chlorinated solvents in the pond from the contaminated groundwater plume.

Fish Consumption Use
Fish toxics monitoring was conducted in Mashpee/Wakeby Pond in October 1994 and edible fillets were analyzed for select metals, PCBs, and organochlorine pesticides (data reported in DeCesare and Connors 2002). Due to the presence of mercury in smallmouth Bass, MA DPH issued the following advisory (MA DPH 2009c) recommending: "*Children under 12 years of age, pregnant women, nursing mothers, and women of childbearing age who may become pregnant should refrain from consuming smallmouth bass from Mashpee/Wakeby Pond" and "The general public should limit consumption of smallmouth bass caught from Mashpee/Wakeby Pond to two meals per month".*

Because of the site-specific fish consumption advisory for Mashpee/Wakeby Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater

reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Primary and Secondary Contact Recreational and Aesthetics Uses
There are public bathing beaches along the shoreline of Wakeby Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Wakeby Pond.

Wakeby Pond (MA96346)

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS
Security measures to discourage tampering with the outlet control structure of Mashpee-Wakeby Pond should be increased and local and state enforcement agencies should be apprised of the problem (Reback *et al*. 2004).

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Support improvement of freshwater Beaches Bill data quality and reporting.

Mashpee Pond (MA96194)

Location:	Mashpee/Sandwich
AU Size:	377 Acres
Classification:	B
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

NPDES Discharges (Appendix D, Table D2)
Town of Mashpee (MAR041129)

NOTE: Although Wakeby and Mashpee ponds are listed as separate waterbodies in PALIS, the two are at the same elevation and are hydrologically connected. There is no culvert or any other physical barrier between these two waterbodies.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Perhaps the greatest impediment to this system reaching the production potential afforded by its 700 plus acres of spawning area is the uncontrolled regulation of flows from Mashpee-Wakeby Pond by unauthorized individuals. According to Reback *et al.* (2004), the outlet control structure at Mashpee-Wakeby Pond has frequently been vandalized to adjust pond levels for self-serving purposes, which has resulted in fish kills numbering in the hundreds of thousands.

Too limited data are available so the *Aquatic Life Use* is not assessed. This use is identified with an Alert Status however due to anadromous fish passage issues which may result "from uncontrolled regulation of flows" that have been reported at the outlet control structure of the pond (Reback *et al*. 2004).

Fish Consumption Use
Fish toxics monitoring was conducted in Mashpee/Wakeby Pond in October 1994 and edible fillets were analyzed for select metals, PCBs, and organochlorine pesticides (data reported in DeCesare and Connors 2002). Due to the presence of mercury in smallmouth Bass, MA DPH issued the following advisory (MA DPH 2009c) recommending: *"Children under 12 years of age, pregnant women, nursing mothers, and women of childbearing age who may become pregnant should refrain from consuming smallmouth bass from Mashpee/Wakeby Pond" and "The general public should limit consumption of smallmouth bass caught from Mashpee/Wakeby Pond to two meals per month".*

Because of the site-specific fish consumption advisory for Mashpee/Wakeby Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Primary and Secondary Contact Recreational and Aesthetics Uses
There are several public bathing beaches along the shoreline of Mashpee Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Mashpee Pond.

Mashpee Pond (MA96194)

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Security measures to discourage tampering with the outlet control structure of Mashpee-Wakeby Pond should be increased and local and state enforcement agencies should be apprised of the problem (Reback *et al*. 2004).

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Support improvement of freshwater Beaches Bill data quality and reporting.

Mashpee River (MA96-89)

Location:	Headwaters, outlet Mashpee Pond, Mashpee to Quinaquisset Avenue, Mashpee.
AU Size:	2.7 Miles
Classification:	B
2008 303(d) List:	This is a new segment – no prior listing.

NPDES Discharges (Appendix D, Table D2)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al.* (2004), the outlet control structure at Mashpee-Wakeby Pond has frequently been vandalized to adjust pond levels for self-serving purposes, which has resulted in fish kills numbering in the hundreds of thousands. Downstream from the outlet control structure there are two areas that also present as impediments to anadromous fish passage on the Mashpee River. A small impoundment at Route 130 is made accessible by a concrete and wood weir-pool ladder. The lower section of the fishway was modified and the upper section completely replaced by DMF in 1997. This ladder now functions very well with proper flow adjustment. A short section of stream connects this impoundment to the outlet of Mashpee-Wakeby Pond. The control structure at the outlet is equipped with wooden baffles to allow fish to access the pond. Jetties were installed at the outlet to reduce sand build up in the stream, a condition which had prevented juvenile out migration on a number of occasions. Further downstream there is an obstruction at an old wooden bog sluice just downstream of Washburn Pond. Wooden stoplogs allowed fish to pass this point but in recent years erosion created a bypass channel which the herring used. At Washburn Pond itself, boards are removed from the outlet structure to permit fish to pass through. Just upstream of the pond is a small town-owned, weir-pool fishway. The need for this structure is questionable and it may in fact function more as a barrier than a fish ladder. Consideration should be given to removing it (Reback *et al*. 2004).

Biology
MA DFG biologists conducted backpack electrofishing in the Mashpee River off of Ashers Path east of Great Neck Road North in Mashpee (sample id 1624) in September 2006. Their sampling effort resulted in the collection of 69 fish including, in order of dominance, multiple ages of brook trout, American eel, white sucker, blueback herring, chain pickerel and a largemouth bass (MA DFG 2008). The sample was dominated by fluvial specialists/dependant species indicative of excellent water and habitat quality conditions. The Mashpee River is on the Massachusetts Department of Fish and Game's Cold Water Fishery Resource List (MA DFG 2007).

The *Aquatic Life Use* is assessed as support based on the fish population data. The presence of a reproducing brook trout population and the dominance by fluvial specialists/dependant species is indicative of excellent habitat and water quality conditions. This use is identified with an Alert Status however due to anadromous fish passage issues noted as concerns by DMF biologists. Note that certain "uncontrolled regulation of flows" (e.g., reducing flow at the outlet structure) will also impact this river.

Mashpee River (MA96-89)

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Security measures to discourage tampering with the outlet control structure of Mashpee-Wakeby Pond should be increased and local and state enforcement agencies should be apprised of the problem (Reback *et al*. 2004).

The Mashpee River should be protected as a cold water fishery. In light of the presence of reproducing brook trout, the river should also be considered for reclassification as a Class B Cold Water in the next revision of the Massachusetts Surface Water Quality Standards.

Mashpee River (MA96-24)

Location:	Quinaquisset Avenue, Mashpee to mouth at Shoestring Bay (formerly to mouth at Popponesset Bay), Mashpee.
AU Size:	0.08 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients, Pathogens). The TMDL for Total Nitrogen (MassDEP 2006a) was *Approved* by EPA in January 2008 [1/22/2008-CN217.0]. The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for the Mashpee River by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 0.9 acres (~1.6% of the segment area) of eelgrass bed habitat present in 1951 near the mouth of this segment area off of Mashpee Neck but none was found in this portion of the river in 1995, or 2001. No mapping was conducted in this area in 2006.

The *Aquatic Life Use* is assessed as impaired for the Mashpee River based on the apparent loss of eelgrass bed habitat. According to the Final Popponesset Bay Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006a). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that 58% of this segment area (CCB20.4) is *Prohibited* and 42% of the segment area (portion of CCB20.3) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the segment is either *Prohibited* or *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"Additional sampling was carried out between April 2004 and April 2006 (12 times) for six stations with the range between <2 to 6 CFU/100 ml. The geometric means for all these stations ranged between 2.01 to 4.71 CFU/100 ml. Sources of bacteria were not identified by DMF monitoring staff. Boating activity is evident in summer, with boat pump-out facilities provided at the one marina. The existence of bird populations are also noted. The reports indicate that all septic systems appear to be functioning properly."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, and/or stormwater discharges from the municipal stormwater systems.

Mashpee River (MA96-24)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture, golf courses]
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Santuit Pond (MA96277)

Location:	Mashpee
AU Size:	164 Acres
Classification:	B
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients, Noxious aquatic plants).

WMA Withdrawal (Appendix C)
CHOP CHAQUE CRANBERRIES INC (registration 42217204)

NPDES Discharges (Appendix D, Table D2)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al.* (2004) the dam at the outlet Santuit Pond was fitted with a new wooden Denil fishway by DMF in 1997. The ladder functions adequately, however, the dam is leaking badly and, if replaced, should be equipped with a more permanent fish passage structure. The report also mentioned a bog impact unique to the Santuit system is the diversion of thousands of juvenile herring to Lovells Pond due to withdrawals from Santuit Pond. Lovells Pond is essentially land locked and the loss to the Santuit population may be significant. This situation is also correctable with proper screening (Reback *et al*. 2004). Since the report was written some bogs in this area were abandoned so concerns regarding herring losses are now likely limited (Chase 2010).

Biology
Several studies by the Installation Restoration Program (IRP) at the MMR in the 1990s identified the presence of tumors on brown bullhead in Ashumet Pond (Baumann *et al*. 2008). The IRP's technical advisory group recommended that future evaluations of the problem include a statistically based prevalence study that sampled more fish from the lakes of concern and similar reference lakes. USGS conducted a study of the prevalence of tumors in brown bullhead in Ashumet Pond and two reference lakes, Santuit and Great Herring Ponds in cooperation with USEPA and MassWildlife. As part of this study brown bullhead were collected from Santuit Pond between May and July 2002. The following findings were reported (Baumann *et al*. 2008) *"Brown bullhead from Santuit Pond also had elevated prevalences of raised lesions and liver neoplasms, although the prevalences of large and multiple lesions were significantly lower than that in Ashumet Pond fish. These differences, along with additional differences in internal pathology, may point to differing causes of the raised lesions in the two lakes*".

No non-native macrophytes were noted in Santuit Pond during the 21 September 2004 macrophyte and density mapping survey conducted by DWM biologists (Mass DEP 2004). Moderate to dense algal blooms were observed by DWM personnel in the pond during the three sampline events (one day each in June, July, and August 2004) (Mass DEP 2004).

Water Chemistry
DO and temperature measurements were recorded at the deep hole in the mid pond "narrows" at 15 minute intervals by an unattended multiprobe meter deployed at a depth of 1.2 meters between 1100 hours on 24 August 2004 and 1900 hours on 26 August 2004. DO ranged from 8.4 to 12.1 mg/L and temperature from 22.7 to 25.1℃. A depth profile for DO was also made by DW M personnel on 24 August 2004. There was no evidence of stratification but supersaturation was present (109 to 114%) at all depths (0.5 - 2.0 m) and pH was exrememly high (9.1 – 9.2 SU). Water quality sampling at the deep hole of Santuit Pond was also conducted by DWM personnel (one day each in June, July, and August 2004). Chlorophyll *a* measurements were elevated ranging from 13.5 - 70 mg/m^3 on the three sampling dates. Reportable total phosphorus concentrations ranged from 0.08 to 0.35 mg/L. The Secchi disk transparency was highest in June (1.6 m) but was below the bathing beach guideline (i.e., was <1.2 m) on both the July and August sampling dates (0.7 and 0.6 m, respectively).

The *Aquatic Life Use* is assessed as impaired for Santuit Pond based on the biological indicators of nutrient enrichment/eutrophication including excess algal growth (blooms), elevated chlorophyll *a,* elevated total phosphorus, and high pH, as well as the prevalence of melanistic lesions on Santuit Pond brown bullhead. Internal nutrient recycling in the pond is one identified source of the enriched conditions. The potential impact to the river herring population is noted as a concern.

Primary and Secondary Contact Recreational and Aesthetics Uses
There are several public bathing beaches along the shoreline of Santuit Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody. Moderate to dense algal blooms were observed by DWM personnel in the pond during the three sampling events (one day each in June, July, and August 2004) (Mass DEP 2004). Secchi disk transparency measurements ranged from 0.6 - 1.6 m on the three dates, with two dates below the bathing beach guidelines (<1.2 m). It should also be noted that there was a cyanobacteria bloom that occurred in Santuit Pond in 2009.

The *Primary* and *Secondary Contact Recreational* and *Aesthetic Uses* are assessed as impaired for Santuit Pond based on the presence of moderate to dense algal blooms and the poor Secchi disk transparency. Internal nutrient recycling in the pond is one identified source of the enriched conditions.

Santuit Pond (MA96277)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause(s): Excess algal growth, elevated chlorophyll *a* , nutrient/eutrophication biological indicators, elevated total phosphorus, high pH, abnormal fish histology (lesions), abnormal fish deformities, erosions, lesions, tumors (DELTS) Source(s): Internal nutrient recycling, unknown
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Excess algal growth, poor secchi disk transparency Source(s): Internal nutrient recycling, unknown
Secondary Contact		IMPAIRED Cause: Excess algal growth, poor secchi disk transparency Source(s): Internal nutrient recycling, unknown
Aesthetics		IMPAIRED Cause: Excess algal growth, poor secchi disk transparency Source(s): Internal nutrient recycling, unknown

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Santuit River (MA96-91)

Location:	Headwaters, outlet Santuit Pond, Mashpee to confluence with tidal portion south of Old Mill Road, Mashpee.
AU Size:	1.6 miles
Classification:	B
2008 303(d) List:	This is a new segment – no prior listing.

WMA Withdrawal (Appendix C)
CRANBERRY COVE FARM (registration 42202026)

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al.* (2004), there is one obstruction to anadromous fish passage along this segment of the Santuit River in addition to the dam at the outlet of Santuit Pond. There is a wooden bog flume upstream and off of Route 130. Boards are placed in the flume and serve as a weir-pool fishway but passage was noted to be extremely inefficient and it was recommended that the structure be redesigned and rebuilt. Cranberry bog operations were noted to have had an impact on the Santuit River herring population. A number of fish kills occurred due to stranding on dewatered bogs. This situation could be remedied if bog owners would utilize the screening system developed by DMF and follow BMP (Best Management Plan) practices (Reback *et al*. 2004). Since the writing of the report many of the cranberry bogs in the area have been abandoned and therefore fish kills due to stranding are likely of limited concern (Chase 2010).

Biology
MA DFG biologists conducted backpack electrofishing in the Santuit River upstream from Sampsons Mill Road Road, Mashpee/Barnstable (site 933) in September 2003. Their sampling effort resulted in the collection of multiple age classes of brook trout (n=30), nine golden shiner, three each of largemouth bass and brown bullhead, and two each of alewife, American eel, and chain pickerel (MA DFG 2008). The Santuit River is on the Massachusetts Department of Fish and Game's Cold Water Fishery Resource List (MA DFG 2007).

The *Aquatic Life Use* is assessed as support based on the presence of multiple age classes of brook trout which are indicative of good water and habitat quality. This use is identified with an Alert Status however because of the inefficient fish passage at the bog flume and the issues identified by DMF biologists associated with the cranberry bog operations (e.g., fish kills due to stranding).

Santuit River (MA96-91)

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

The Sanutit River should be protected as a cold water fishery. In light of the presence of reproducing brook trout, the river should also be considered for reclassification as a Class B Cold Water in the next revision of the Massachusetts Surface Water Quality Standards.

Cranberry bog owners should utilize the screening system developed by DMF and follow BMP practices to protect anadromous fish utilizing the Santuit River (Reback *et al*. 2004).

Anadromous fish passage at the bog flume upstream from Route 130 shoud be redesigned and rebuilt to improve function (Reback *et al.* 2004).

Santuit River (MA96-92)

Location:	From confluence with fresh water portion south of Old Mill Road, Mashpee to mouth at Shoestring Bay, Mashpee/Barnstable.
AU Size:	0.008 Square Miles
Classification:	SA
2008 303(d) List:	This is a new segment – no prior listing.

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that this segment area (portion of SC20.3) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish area within the segment is *Conditionally Approved* for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for the Santuit River. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Santuit River (MA96-92)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Shoestring Bay (MA96-08)

Location:	Quinaquisset Avenue, Mashpee/Barnstable to Popponesset Bay (line from Ryefield Point, Barnstable to Punkhorn Point, Mashpee, including Gooseberry Island), Barnstable/Mashpee.
AU Size:	0.31 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients, Pathogens). The TMDL for Total Nitrogen (MassDEP 2006a) was *Approved* by EPA in January 2008 [1/22/2008-CN217.0]. The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Shoestring Bay by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 17.1 acres (~8.5% of the segment area) of eelgrass bed habitat (described largely as patchy coverage) present in 1951 in the southernmost area of this segment along Crocker Neck/Ryfield Point/Gooseberry Island but none was found in the bay in 2001 or 2006.

The *Aquatic Life Use* is assessed as impaired for Shoestring Bay based on the apparent significant loss of eelgrass bed habitat. According to the Final Popponesset Bay Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006a). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that 100% of this area (SC20.3) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish area encompassed by this segment is *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"Only 3 stations had one reading each >28 CFU/100 ml. These overall figures are fairly low, indicating good to excellent water quality. A one time sanitary survey on January 30, 2002, involving ten different stations (data included in Table 4-8 above) in adjoining ponds, bogs, and streams all had levels < 11 CFU/100 ml, except two stations: 1) coming from Mashpee Pond, flowing to Mashpee River with a level of 137 CFU/100 ml; 2) Pond off River Road on west side of Mashpee River with a reading of 36 CFU/100 ml. The sanitary survey in the winter of 2002 found no problems with septic systems in the area. There are only two possible stormwater contributors: 1) off the town landing on the southwest end of the Santuit River; and, 2) foot of Narrows Road. There is one existing marina called Half Tide Marina, with 57 slips and no overnight use. Waterfowl observed include Canada geese, white swans, seagulls, terns, and piping plovers. The DMF recommendation is to keep much of Shoestring Bay classified as Conditionally Approved, with one portion, SC:20-4 remaining closed."*
Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses

Frequent testing for Enterococci bacteria during the swimming seasons was conducted at the Mashpee Neck Road Landing Beach in Mashpee located along the shoreline of Shoestring Bay from 2002 – 2007 (MA DPH 2009a). The beach was not reported as posted during that time period. No data were reported for the semi-public beach, Sansuit Beach in Barnstable, also located along the shoreline of this segment.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Shoestring Bay based on the lack of beach closures at the Mashpee Neck Road Landing Beach in Mashpee. The *Aesthetics Use* in not assessed due to the absence of data.

Shoestring Bay (MA96-08)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture, golf courses].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Popponesset Creek (MA96-39)

Location:	All waters west of Popponesset Island (from Popponesset Island Road bridge at the north to a line extended from the southeastern most point of the island southerly to Popponesset Beach), Mashpee.
AU Size:	0.05 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Popponesset Creek by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 0.3 acres (~0.9% of the segment area) of eelgrass bed habitat present (described as continous coverage) in 1951 off of the shore east of Bowsprit Point Road in Mashpee but none was found in the creek in 2001 or 2006.

The *Aquatic Life Use* is assessed as impaired for Popponesset Creek based on the apparent loss of eelgrass bed habitat. According to the Final Popponesset Bay Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006a). The controllable local sources of total nitrogen identified in the TMDL (note Popponesett Creek was considered as part of Popponesett Bay in the linked watershed embayment model) include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this area (portion of SC19.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because the shellfish area encompassed by this segment is *Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), "*All levels were well within the established NSSP parameters for approved classification. Prime potential pollution sources in the Creek area appear to be stormwater runoff from a fairly densely packed housing area in the immediate vicinity. There were no observed failing septic systems. A considerable number of birds were observed during monitoring activities and shoreline surveys. Species included: several varieties of ducks, Canada geese, white swans, cormorants, seagulls, terns, and piping plovers. The area should be revisited by DMF, and if conditions remain satisfactory for continued full "Approval" for shellfishing, this segment could be de- listed from the 303(d) list for pathogen impairments."*

Primary and Secondary Contact Recreational and Aesthetics Uses
There is a small area of one public beach, Popponesset Spit Beach, along the shoreline of the southern edge of Popponesset Creek. Popponesset Spit Beach in Mashpee was tested (weekly) for *Enterococci* bacteria in 2002 and 2004-2007. It was only posted one day in 2007 and no postings were reported in any other year (MA DPH 2009a).

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Popponesset Creek based on the status of the shellfish classication (*Approved*) as well as the extremely low frequency of beach closures at Popponesset Spit Beach. The *Aesthetics Use* in not assessed due to the absence of data.

Popponesset Creek (MA96-39)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Popponesset Bay (MA96-40)

Location:	From line connecting Ryefield Point, Barnstable and Punkhorn Point, Mashpee to inlet of Nantucket Sound (including Ockway Bay and Pinquickset Cove), Mashpee/Barnstable.
AU Size:	0.68 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients). The TMDL for Total Nitrogen (MassDEP 2006a) was *Approved* by EPA in January 2008 [1/22/2008-CN217.0].

NPDES Discharges (Appendix D, Table D2)
Town of Mashpee (MAR041129)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Popponesset Bay by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 78.4 acres (~18.1% of the segment area) of eelgrass bed habitat (described largely as patchy coverage) present in 1951: in the area off of Gooseberry Island, two small beds between Daniels and Popponsett Island, and a large area at the mouth of this segment between Popponsett Island and Meadow Point in Barnstable. No eelgrass beds were found in the bay in 2001 or 2006.

The *Aquatic Life Use* is assessed as impaired for Popponesset Bay based on the apparent significant loss of eelgrass bed habitat. According to the Final Popponesset Bay Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2006a). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this area (SC19.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because the shellfish area encompassed by this segment is *Approved* for shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
There are two public beaches along the shoreline of Popponesset Bay. Frequent testing (weekly) for Enterococci bacteria during the swimming season was conducted at Crocker's Neck Beach in Barnstable from 2003 – 2007 (MA DPH 2009a). This beach was posted one day each in 2004, 2005, 2006, and 2007. Popponesset Spit Beach in Mashpee was tested (weekly) in 2002 and 2004-2007. It was only posted one day in 2007 and no postings were reported in any other year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Popponesset Bay based on the status of the shellfish classication (*Approved*) as well as the very low frequency of beach closures at Crocker's Neck and Popponesset Spit beaches. The *Aesthetics Use* in not assessed due to the absence of data.

Popponesset Bay (MA96-40)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture, golf courses].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Lovells Pond (MA96185)

Location:	Barnstable
AU Size:	54 Acres
Classification:	B
2008 303(d) List:	This is a new segment – no prior listing.

WMA Withdrawal (Appendix C)
SAGAMORE CRANBERRY CORPORATION (registration 42226103)

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

Note: According to MA DMF, Little River drains Lovells Pond by way of a submerged culvert. The culvert and the stream below it are clogged with debris and very little flow actually occurs in the stream. Although 54 acres of potential habitat are available in the pond, the cost of providing adequate passage and the question of adequate outflow make development questionable (Reback *et al*. 2004).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Water has been pumped from Santuit to Lovells Pond (Reback *et al*. 2004).

Biology
A dense green algal bloom was observed by DWM personnel in the pond during the July 2004 sampling event (Mass DEP 2004).

Water Chemistry
DO and temperature measurements were recorded at the deep hole in Lovells Pond at 15 minute intervals by an unattended multiprobe meter deployed at a depth of 1.2 meters between 1415 hours on 24 August 2004 and 1130 hours on 26 August 2004 (Haque and Mattson 2009). DO ranged from 7.6 to 8.6 mg/L and temperature from 23.1 to 24.2℃. A depth profile for DO was al so made on 24 August 2004. There was evidence of stratification with oxygen depletion occurring at depths below 4m. Water quality sampling at the deep hole of Lovells Pond was also conducted by DWM personnel (one day each in June, July, and August 2004). Chlorophyll *a* measurements were elevated ranging from 10.7 - 27 mg/m^3 on the three sampling dates. Total phosphorus concentrations ranged from 0.024 to 0.54 mg/L with the highest concentrations measured in samples collected near the bottom. The Secchi disk transparency was highest in June (4.4 m) but was below the bathing beach guideline (i.e., was <1.2 m) on the July sampling date (0.7m) with improved visibility in the August sampling event (1.8 m) (Haque and Mattson 2009).

Severe oxygen depletion is apparent below about 4.5 m based on the 24 August 2004 profile data. This translates into more than 50% of the pond surface area being affected and represents impairment of the *Aquatic Life Use*. In addition, lower Secchi disk transparency measurements and moderately high chlorophyll *a* concentrations were recorded on two of the three dates, which is indicative of high primary productivity. High concentrations of phosphorus were measured in the samples taken near the bottom of the water column indicative of a release from the sediments and an internal source of nutrients to the pond.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beach along the shoreline of Lovells Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody. An algal bloom was observed by DWM personnel in Lovells Pond during the July 2004 sampling event (MassDEP 2004). The water was described as highly turbid. The Secchi disk transparency was highest in June (4.4 m) but was below the bathing beach guideline (i.e., was <1.2 m) on the July sampling date (0.7 m) with improved visibility in the August sampling event (1.8 m) (Haque and Mattson 2009). No other objectionable odors, deposits, macrophyte growths, or scums were noted. It should also be noted that there was a cyanobacteria bloom that occurred in Lovells Pond in 2009.

The *Primary* and *Secondary Contact Recreational* and *Aesthetic* uses are assessed as impaired for Lovells Pond based on the presence of moderate to dense algal blooms and the poor Secchi disk transparency.

Lovells Pond (MA96185)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause(s): Low DO, elevated chlorophyll *a*, elevated total phosphorus Source(s): Internal nutrient recycling, unknown
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause(s): Excess algal growth, poor Secchi disk transparency Source(s): Internal nutrient recycling, unknown
Secondary Contact		IMPAIRED Cause(s): Excess algal growth, poor Secchi disk transparency Source(s): Internal nutrient recycling, unknown
Aesthetics		IMPAIRED Cause(s): Excess algal growth, poor Secchi disk transparency Source(s): Internal nutrient recycling, unknown

RECOMMENDATIONS

Support improvement of freshwater Beaches Bill data quality and reporting.

Rushy Marsh Pond (MA96266)

Location: Barnstable
AU Size: 14 Acres
Classification: B
2008 303(d) List: This is a new segment – no prior listing.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al*. (2004), this pond drains directly into Nantucket Sound by way of a long 12 inch plastic pipe. River herring and white perch had access to the pond via a tide gate which became inoperable due to coastal erosion. As of this writing, a design for a new outlet structure is being developed and will include provisions for fish passage (Reback *et al*. 2004).

The *Aquatic Life Use* is not assessed for Rushy Marsh Pond. Although fish passage into this waterbody is a problem since there is no natural channel between the pond and Nantucket Sound, it is not considered to be an impairment of the *Aquatic Life Use*.

Rushy Marsh Pond (MA96266)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

THREE BAYS SYSTEM

Spectacle Pond (MA96307)

Location: Sandwich
AU Size: 93 Acres
Classification: B
2008 303(d) List: This is a new segment – no prior listing.

DESIGNATED USE ASSESSMENT
Fish Consumption Use
In May 2009 fish were collected by DWM biologists from Spectacle Pond and edible fillets of smallmouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), and largemouth bass (*Micropterus salmoides*) were analyzed for mercury (Maietta *et al*. 2010 and Appendix B, Table B10). Mercury concentrations were below the MA DPH trigger level in the yellow perch sample but were above the trigger level in the largemouth bass and smallmouth bass samples (0.58 to 1.1 mg/kg).

The *Fish Consumption Use* is not assessed for Spectacle Pond since there is currently no MA DPH site-specific advisory for this waterbody. However it is DWM staff's best professional judgement that this use be identified with an Alert Status since the average mercury concentration in the composite largemouth bass and smallmouth bass samples exceeds the MA DPH trigger level.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public beach (Camp Hayward) along the shoreline of Spectacle Pond in Sandwich. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no *Primary Contact Recreational Use* assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Spectacle Pond.

Spectacle Pond (MA96307)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED*
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Update the *Fish Consumption Use* if warranted after MA DPH review.

Lawrence Pond (MA96165)

Location:	Sandwich
AU Size:	138 Acres
Classification:	B
2008 303(d) List:	This is a new segment – no prior listing.

NPDES Discharges (Appendix D, Table D2)
Town of Sandwich (MAR041155)

DESIGNATED USE ASSESSMENT
Fish Consumption Use
In May 2009 fish were collected by DWM biologists from Lawrence Pond and edible fillets of smallmouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), pumpkinseed (*Lepomis gibbosus),* chain pickerel (*Esox niger*), and largemouth bass (*Micropterus salmoides*) were analyzed for mercury (Maietta *et al*. 2010 and Appendix B, Table B10). Mercury concentrations were below the MA DPH trigger level in all but the largemouth bass composite sample (0.97 mg/kg).

The *Fish Consumption Use* is not assessed for Lawrence Pond since there is currently no MA DPH site-specific advisory for this waterbody. However it is DWM staff's best professional judgement that this use be identified with an Alert Status since the average mercury concentration in the composite largemouth bass sample exceeds the MA DPH trigger level.

Primary and Secondary Contact Recreational and Aesthetics Uses
There are public beaches along the shoreline of Lawrence Pond in Sandwich. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no *Primary Contact Recreational Use* assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Lawrence Pond.

Lawrence Pond (MA96165)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED*
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Update the *Fish Consumption Use* if warranted after MA DPH review.

Mystic Lake (MA96218)

Location:	Barnstable
AU Size:	146 Acres
Classification:	B
2008 303(d) List:	This is a new segment – no prior listing.

WMA Withdrawal (Appendix C)
CRANBERRY COVE FARM (registration 42202026)
HENRY H LAMPI (registration 42202004)

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
There were reports of a mussel kill in Mystic Lake in August/September 2009 (Anderson 2009). At this same time a cyanobacteria bloom was also occurring in the lake.

Isolated patches of the non-native aquatic macrophyte *Hydrilla verticillata* were found in Mystic Lake in 2010. Indian Ponds Association members, trained in manual removal techniques, removed the plants and placed benthic barriers over the patches to prevent further growth (Still II 2009).

Water Chemistry
Temperature and dissolved oxygen profile data were collected in Mystic Lake 10 times between May and November 2004 (Eichner *et al*. 2006). Low dissolved oxygen levels were reported to occur in the hypolimnion of Mystic Lake during the sampling representing ~ 47% of the lake area (Eichner *et al*. 2006, McVoy 2009a, and McVoy 2009b).

The *Aquatic Life Use* is assessed as impaired based on the low dissolved oxygen concentrations in the hypolimnion of Mystic Lake affecting approximately 47% of the lake area and the presence of the non-native aquatic macrophyte. While the cyanobacteria bloom and mussel kill that occurred in Mystic Lake in 2009 is also of concern, the lake was treated with alum in September 2010 in an effort to inactivate phosphorus (Wagner 2010).

Primary and Secondary Contact Recreational and Aesthetics Uses
There are several public beaches along the shoreline of Mystic Lake in Barnstable. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Mystic Lake. These uses are identified with an Alert Status however because of the cyanobacteria bloom which occurred in the pond in 2009. While the cyanobacteria bloom that occurred in Mystic Lake in 2009 is also of concern, the lake was treated with alum in September 2010 in an effort to inactivate the phosphorus in the lake.

Mystic Lake (MA96218)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Low dissolved oxygen, non-native aquatic plant infestion Source: Introduction of non-native organism(s), unknown, Suspected source: Phosphorus release from anoxic sediments
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED*
Secondary Contact		NOT ASSESSED*
Aesthetics		NOT ASSESSED*

* Alert Status issues identified, see details in use assessment.

RECOMMENDATIONS

Support improvement of freshwater Beaches Bill data quality and reporting.

Continue vigilant monitoring and manual removal of *H. verticillata* as necessary.

Middle Pond (MA96198)

Location:	Barnstable
AU Size:	104 Acres
Classification:	B
2008 303(d) List:	This is a new segment – no prior listing.

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
There were reports of a mussel kill and a cyanobacteria bloom that occurred in Middle Pond in 2009 (Hurley 2009).

Water Chemistry
Temperature and dissolved oxygen profile data were collected in Middle Pond 10 times between May and November 2004 (Eichner *et al*. 2006). Low dissolved oxygen levels were reported to occur in the hypolimnion of Middle Pond representing ~22% of the lake area (Eichner *et al*. 2006, McVoy 2009a, and McVoy 2009b).

The *Aquatic Life Use* is assessed as impaired based on the low dissolved oxygen concentrations in the hypolimnion of Middle Pond affecting approximately 22% of the lake area. The cyanobacteria bloom that occurred in Middle Pond in 2009 and reports of a mussel kill are also of concern.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public beach along the shoreline of Middle Pond in Barnstable. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody. It should be noted, however, that there was a cyanobacteria bloom that occurred in Middle Pond in 2009 which is of concern.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Middle Pond. These uses are identified with an Alert Status however because of the cyanobacteria bloom which occurred in the pond in 2009.

Middle Pond (MA96198)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Low dissolved oxygen Source: Unknown Suspected source: phosphorus release from anoxic sediments
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED*
Secondary Contact		NOT ASSESSED*
Aesthetics		NOT ASSESSED*

* Alert Status issues identified, see details in use assessment.

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Hamblin Pond (MA96126)

Location:	Barnstable
AU Size:	114 Acres
Classification:	B
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

WMA Withdrawal (Appendix C)
SAGAMORE CRANBERRY CORPORATION (registration 42226103)

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Water Chemistry
Temperature and dissolved oxygen profile data were collected in Hamblin Pond 10 times between May and November 2004 (Eichner *et al*. 2006). Low dissolved oxygen levels were reported to occur in the hypolimnion of Hamblin Pond representing ~26% of the lake area (Eichner *et al*. 2006, McVoy 2009a, and McVoy 2009b).

The *Aquatic Life Use* is assessed as impaired based on the low dissolved oxygen concentrations in the hypolimnion of Hamblin Pond affecting approximately 26% of the lake area.

Fish Consumption Use
Fish were collected from Hamblin Pond by the Cape Cod Commission in 2001 (DeCesare and Connors 2002 and Michaud 2008). Species analyzed included smallmouth bass and yellow perch. Although three of the four samples analyzed were below the MA DPH trigger level of 0.5 mg/kg, mercury was highly elevated in the individual smallmouth bass sample. Due to the presence of mercury in the individual smallmouth bass sample, MA DPH issued the following advisory (MA DPH 2009c): *"Children under 12 years of age, pregnant women, nursing mothers, and women of childbearing age who may become pregnant should refrain from consuming smallmouth bass from Hamblin Pond" and "The general public should limit consumption of smallmouth bass to two meals per month".*

Because of the site-specific fish consumption advisory for Hamblin Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public beach along the shoreline of Hamblin Pond in Barnstable. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Hamblin Pond.

Hamblin Pond (MA96126)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Low dissolved oxygen Source: Unknown Suspected source: phosphorus release from anoxic sediments
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Support improvement of freshwater Beaches Bill data quality and reporting.

Shubael Pond (MA96293)

Location:	Barnstable
AU Size:	55 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Fish Consumption Use
In 1987, fish were collected from Shubael Pond and the samples were analyzed for metals (Maietta 2007). Fish were also collected and analyzed in 2001 as part of the Cape Cod Commission study (Michaud 2008). Species analyzed included yellow perch, smallmouth bass, and pumpkinseed. Mercury concentrations were below the MA DPH trigger level of 0.5 mg/kg. There is no site-specific fish consumption advisory in place for this waterbody (MA DPH 2009c).

Since no site-specific fish consumption advisory was issued by the MA DPH, the *Fish Consumption Use* is not assessed.

Primary and Secondary Contact Recreational and Aesthetics Uses
There are two public beaches along the shoreline of Shubael Pond in Barnstable. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Shubael Pond.

Shubael Pond (MA96293)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Prince Cove (MA96-07)

Location:	Also includes areas east of Prince Cove which are locally known as "Warren Cove" and "Prince Cove Channel", Barnstable.
AU Size:	0.14 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients, Pathogens). The TMDL for Total Nitrogen (MassDEP 2007a) was *Approved* by EPA in February 2008 [2/13/2008-CN242.0].

DESIGNATED USE ASSESSMENT

Aquatic Life Use

Eelgrass Bed Habitat

Eelgrass surveys and analysis of historical data was conducted for Prince Cove by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 19.5 acres (~22% of the segment area) of eelgrass bed habitat (described largely as patchy coverage) present in 1951 in three areas around Baxter Neck but only 1.5 acres (~1.7% of the segment area) in the same three areas was found in 1995. No beds were found in 2001 and no mapping has been done for 2006.

The *Aquatic Life Use* is assessed as impaired for Prince Cove based on the apparent significant loss of eelgrass bed habitat. According to the Final Three Bays System Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007a). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use

The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~69% of this area (SC23.1, portion of SC23.2) is *Conditionally Approved* and 31% of this area (SC23.3) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish area encompassed by this segment is either *Conditionally Approved* or *Prohibited* for shellfish harvesting. A TMDL for pathogens was recently completed and approved for the Three Bays Watershed including this segment area (MassDEP and USEPA Region 1 2009). According to the pathogen TMDL, the Marstons Mills River, an upstream tributary, was identified as an important source of the bacterial contamination in both dry and wet weather conditions. The technical analysis indicated the most likely sources of fecal coliform bacteria that need to be evaluated are: stormwater inflows from paved areas, boat discharges in the cove, transport of fecal coliform via the Marstons Mills River into the cove via tidal exchange and waterfowl/wildlife. Illicit sewer connections, failing septic systems, and/or other sanitary sources need to be identified and eliminated. Stormwater discharges from the municipal stormwater systems, as well as unspecified urban stormwater will also need to be addressed.

Primary and Secondary Contact Recreational and Aesthetics Uses

There is one public beach along the shoreline of Prince Cove. Frequent testing (weekly) for Enterococci bacteria during the swimming season at Prince Cove Beach in Barnstable was conducted from 2003 – 2006 while only one sample was collected in 2007 and none were reportedly collected in 2008 (MA DPH 2009a). This beach was reported to be posted for 17 days in 2003 (20.2% of season) and 4, 5, and 5 days, respectively in 2004, 2005, and 2006, representing 4.7 to 5.8% of each of those seasons.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Prince Cove based on the generally low frequency of beach closures (<10% of season) at Prince Cove Beach during the three most recent years sampled. The *Primary Contact Recreational Use* is identified with an Alert Status however due to the high frequency of closures in 2003. The *Aesthetics Use* in not assessed due to the absence of data.

Prince Cove (MA96-07)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, and fertilizers [yard maintenance, agriculture].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems, upstream sources
Primary Contact		SUPPORT*
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Implement recommendations identified in the TMDLs.

North Bay (MA96-66)

Location:	From Fox Island to just south of Bridge Street and separated from Cotuit Bay at a line from Point Isabella, Barnstable southward to the opposite shore (including Dam Pond), Barnstable.
AU Size:	0.47 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients, Pathogens). The TMDL for Total Nitrogen (MassDEP 2007a) was approved by EPA in February 2008 [2/13/2008-CN242.0]. The TMDL for pathogens (MassDEP and USEPA Region 1 2009) was approved by EPA in August 2009.

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for North Bay by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 17.1 acres (~6% of the segment area) of eelgrass bed habitat (described largely as continous coverage) present in 1951 in two areas: one off the western shore along Pine and Saint Marys Islands, and the second in the southwest cove near Little Island. However there were only 4.4 acres (~1.5% of the segment area) found in 1995 in the cove near Little Island. No beds were found in 2001 and no mapping has been done for 2006.

The *Aquatic Life Use* is assessed as impaired for North Bay based on the apparent significant loss of eelgrass bed habitat. According to the Final Three Bays System Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007a). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this area (SC23.2) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish area encompassed by this segment is *Conditionally Approved* for shellfish harvesting. A TMDL for pathogens was recently completed and approved for the Three Bays Watershed including this segment area (MassDEP and USEPA Region 1 2009). According to the TMDL, the Marstons Mills River, an upstream tributary, was identified as an important source of the bacterial contamination in both dry and wet weather conditions. Illicit sewer connections, failing septic systems, and/or other sanitary sources need to be identified and eliminated. Stormwater discharges from the municipal stormwater systems, as well as unspecified urban stormwater will also need to be addressed.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is one semi-public beach along the shoreline of North Bay. Frequent testing (weekly) for Enterococci bacteria during the swimming season at the Cotuit Bay Shore Association Beach, Barnstable was conducted from 2003 – 2007 (MA DPH 2009a). This beach was reported to be posted only once in 2004.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for North Bay based on the low frequency of beach closures (<10% of season) at the Cotuit Bay Shore Association Beach. The *Aesthetics Use* in not assessed due to the absence of data.

North Bay (MA96-66)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture, golf courses].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems, upstream sources
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Implement recommendations identified in the TMDLs.

Cotuit Bay (MA96-63)

Location:	From North Bay at Point Isabella, Barnstable oceanward to a line extended along Oyster Harbors Beach, Barnstable.
AU Size:	0.85 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients, Pathogens). The TMDL for Total Nitrogen (MassDEP 2007a) was approved by EPA in February 2008 [2/13/2008-CN242.0].

DESIGNATED USE ASSESSMENT

Aquatic Life Use

Eelgrass Bed Habitat

Eelgrass surveys and analysis of historical data was conducted for Cotuit Bay by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 27.1 acres (~5% of the segment area) of eelgrass bed habitat present in 1951 in four areas however the confidence in these areas was described as low. No beds were found in 1995, 2001 and no mapping has been done for 2006. The MEP technical report stated the following: *"it is likely that disturbance related to activities in North and Cotuit Bays associated with training during WWII played a role in the …pattern of beds in the 1951 assessment…the lack of eelgrass in the lowermost portion of Cotuit Bay and the Seapuit River is likely associated with the documented highly dynamic coastal processes in this area"* (UMass Dartmouth SMAST and MassDEP 2006b).

Biology

According to the MEP project technical report the benthic community in Cotuit Bay "generally had a good numbers of individuals and species…while stress indicator species were present in numbers (generally Capitella or Streblospio) there were other species that were indicative of a healthy environment…all sites showed some level of degradation" (UMass Dartmouth SMAST and MassDEP 2006b).

Water Chemistry

According to the MEP project technical report the DO concentrations in Cotuit Bay were generally >5.0 mg/L athough there were periodic low oxygen events (3.0 - 4.0 mg/L). The average chlorophyll *a* concentration reported for Cotuit Bay was 8.8 µg/L. The average nitrogen concentrations reported for the two sampling stations were as follows: in north Cotuit Bay 0.438 mg/L N and 0.389 mg/L N in south Cotuit Bay (UMass Dartmouth SMAST and MassDEP 2006b).

The *Aquatic Life Use* is assessed as impaired for Cotuit Bay based on the MEP analysis. According to the Final Three Bays System Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007a). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use

The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~7% of this area (SC21.1 and SC21.2) is *Conditionally Approved* and ~90% of this area (SC21.0) is *Approved* for shellfish harvesting (MA DFG 2009). A TMDL for pathogens was recently completed and approved for this segment (MassDEP and USEPA Region 1 2009). According to the TMDL, which was based on an extensive data review and analysis, the geometric mean fecal coliform bacteria standard of 14 organisms/100 ml was not exceeded in Cotuit Bay.

The *Shellfish Harvesting Use* is assessed as support for 0.79 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.06 square miles because it is *Conditionally Approved* for shellfish harvesting. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) restrictions

are likely due to elevated fecal coliform bacteria counts associated with inputs from the Marston Mills River (upstream tributary), as well as other illicit marina/boating pumpout releases, and/or waterfowl.

Primary and Secondary Contact Recreational and Aesthetics Uses
Cotuit Bay in Barnstable is heavily used for water-based recreation with five public and two semi-public beaches. Frequent testing for Enterococci bacteria during the swimming season was conducted at these beaches from 2003 – 2007 (MA DPH 2009a). Closure data for individual Cotuit Bay beaches are summarized below:
Cordwood Road Beach: Was posted for two days in 2003 and one day in 2004 and no postings were reported in any other year.
Little River Road Beach: No postings were reported in any year.
Oyster Harbors Club Beach: Posted one day in 2004 and no postings were reported in any other year (sampling was also conducted in 2002 for this beach).
Ropes Beach: Posted four days in 2003 (4.8% of season), one day in 2004, and one day in 2006. No postings were reported in any other year.
Oyster Place Beach: Posted six days in 2003, eight days in 2005 (9.5% of season), and one day in 2006. No postings were reported in other years.
Cross Street Beach: Posted one day each in 2003 and 2007. No postings were reported in any year.
Loops Beach: Posted one day each in 2003 and 2007. No postings were reported in any year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Cotuit Bay based on the very low frequency of beach closures at the seven beaches along the shoreline of this segment. The *Aesthetics Use* in not assessed due to the absence of data.

Cotuit Bay (MA96-63)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater], and fertilizers [yard maintenance, agriculture, golf courses].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.79 square miles IMPAIRED 0.06 square miles Cause: Elevated fecal coliform bacteria Sources: Upstream source, marina/boating pumpout releases, waterfowl
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Seapuit River (MA96-64)

Location:	south of Osterville Grand Island, Barnstable to Cotuit Bay and West Bay, Barnstable.
AU Size:	0.06 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). Note: According to the Final Three Bays System Total Maximum Daily Loads for Total Nitrogen, the Seapuit River was not found to be impaired for nitrogen, but it was determined that a "pollution prevention" TMDL for nitrogen was needed since this waterbody segment is linked to the larger embayment system and any future impairment of this segment could further contribute to impairment of the segments at issue in this TMDL…A "pollution prevention" TMDL on this waterbody segment will encourage the maintenance and protection of existing water quality and help prevent further degradation to waterbodies that are downstream or linked. This pollution prevention TMDL will serve as a guide to help ensure that this waterbody does not become impaired for nitrogen (MassDEP 2007a). The TMDL for Total Nitrogen (MassDEP 2007a) was approved by EPA in February 2008 [2/13/2008-CN242.0].

DESIGNATED USE ASSESSMENT

Aquatic Life Use

Eelgrass Bed Habitat

Eelgrass surveys and analysis of historical data was conducted for the Seapuit River by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area. The lack of eelgrass bed habitat in this segment area was considered to be likely associated with the documented highly dynamic coastal processes (physical disturbance including sand transport, overwash, etc.).

Habitat and Flow

According to the MEP project technical report "flow through the Seapuit River is driven by the time difference (lag) of the tide stage between Cotuit Inlet and West Bay Inlet. When the tide is flooding, the river will flow from east to west (the "upstream" direction), and vice versa for an ebbing tide. Both model and measurements show that peak flows at the west end of the river are less than peak flows at the east end…for the Seapuit River, a large portion of the flow into the river during a flooding tide does not exit the other end because it stays within the river basin, resulting in an increase in water elevation."

Water Chemistry

The average nitrogen concentrations reported for the sampling station in the Seapuit River was 0.322 mg/L N (UMass Dartmouth SMAST and MassDEP 2006b).

Too limited data are available so the *Aquatic Life Use* is not assessed for the Seapuit River.

Shellfish Harvesting Use

The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~10% of this area (SC21.2) is *Conditionally Approved* and ~90% of this area (SC21.0) is *Approved* for shellfish harvesting (MA DFG 2009). A TMDL for pathogens was recently completed and approved for this segment (MassDEP and USEPA Region 1 2009). According to the TMDL, which was based on an extensive data review and analysis, the geometric mean fecal coliform bacteria standard of 14 organisms/100 ml was not exceeded in the Seapuit River.

The *Shellfish Harvesting Use* is assessed as support for 0.054 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.006 square miles because it is *Conditionally Approved* for shellfish harvesting. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases and/or waterfowl.

Seapuit River (MA96-64)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.054 square miles IMPAIRED 0.006 square miles Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

West Bay (MA96-65)

Location:	South of the Bridge Street bridge, Barnstable to Nantucket Sound including Eel River, Barnstable.
AU Size:	0.52 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients). The TMDL for Total Nitrogen (MassDEP 2007a) was approved by EPA in February 2008 [2/13/2008-CN242.0].

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for West Bay by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 47.6 acres (~14% of the segment area) of eelgrass bed habitat present in 1951 in six areas, however confidence was high in only one 8.7 acre area in the northwestern side between Little and Osterville Grand islands. This same area had 4.8 acres (~1.5% of the segment area) in 1995. No beds were found in 2001 and no mapping has been done for 2006.

The *Aquatic Life Use* is assessed as impaired for West Bay based on the apparent loss of eelgrass bed habitat. According to the Final Three Bays System Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007a). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this area (SC22.0) is *Approved* for shellfish harvesting (MA DFG 2009). It should be noted that West Bay is included in the Final Pathogen TMDL for Three Bays Watershed, Barnstable, MA since it is part of that system (MassDEP and USEPA Region 1 2009).

The *Shellfish Harvesting Use* is assessed as support because all of this segment's shellfish area is *Approved* for shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
There are two public beaches along the shoreline of West Bay in Barnstable. Frequent testing for Enterococci bacteria during the swimming season was conducted at Wianno Club's Beach from 2002 – 2007 (MA DPH 2009a). This beach was not posted. Bridge Street Beach was tested (weekly) from 2003 - 2007. It was posted one day each in 2003 and 2006 and two days in 2004. It was not posted in any other year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for West Bay based on the status of the shellfish classication (*Approved*) as well as the very low frequency of beach closures at Wianno Club and Bridge Street beaches. The *Aesthetics Use* in not assessed due to the absence of data.

West Bay (96-65)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, golf courses].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Shallow Pond (MA96285)

Location: Barnstable
AU Size: 76 Acres
Classification: B
2008 303(d) List: Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beach along the shoreline of Shallow Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Shallow Pond.

Shallow Pond (M96285)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Bearse Pond (MA96012)

Location:	Barnstable
AU Size:	64 Acres
Classification:	B
2008 303(d) List:	Category 4c

This segment is on the 2008 Integrated List of Waters in Category 4c - Impairment Not Caused by a Pollutant (Exotic species*). * denotes a non-pollutant.

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
The non-native aquatic macrophyte *Cabomba caroliniana* is reported to infest Bearse Pond (DeCesare and Connors 2002).

The *Aquatic Life Use* is assessed as impaired for Bearse Pond due to the non-native aquatic macrophyte infestation.

Fish Consumption Use
Bearse Pond is openly connected to Wequaquet Lake. Although the most current MA DPH fish consumption advisory list does not specifically mention Bearse Pond, it is DWM staff's best professional judgement that the fish consumption advisory for Wequaquet Lake should also be applied to Bearse Pond. The advisory for Wequaquet Lake is as follows: Due to the presence of mercury in largemouth bass, MA DPH issued the following advisory (MA DPH 2009c): *"Children under 12 years of age, pregnant women, nursing mothers, and women of childbearing age who may become pregnant should refrain from consuming largemouth bass from Wequaquet Lake" and "The general public should limit consumption of largemouth bass caught from Wequaquet Lake to two meals per month".*

Because of the site-specific fish consumption advisory for Wequaquet Lake due to mercury contamination, which is considered to be applicable to Bearse Pond since they are openly connected; the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beach along the shoreline of Bearse Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Bearse Pond.

Bearse Pond (M96012)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-native aquatic plant infestion Source: Introduction of non-native organism(s)
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Support improvement of freshwater Beaches Bill data quality and reporting.

Wequaquet Lake (MA96333)

Location:	Barnstable
AU Size:	576 Acres
Classification:	B
2008 303(d) List:	Category 4c

This segment is on the 2008 Integrated List of Waters in Category 4c - Impairment Not Caused by a Pollutant (Metals [12/20/2007NEHgTMDL], Exotic species*). * denotes a non-pollutant.

WMA Withdrawal (Appendix C)
J A JENKINS & SON CRANBERRY COMPANY (registration 42202006)

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al*. (2004), the weir-pool fishway at the Wequaquet Lake control structure is in fair condition and provides inefficient passage for alewife. Access to Lake Wequaquet is provided by a long, artificial ditch excavated privately in the 19th century in order to establish a herring fishery. The fact that this is not a natural stream is the source of most of the problems limiting the production of this population. Shoaling of the pond outlet, erosion of stream banks and conflicting thoughts on how water flow should be regulated have all led to a resource which is far below the potential size afforded by the acres of habitat available in the pond. In order to increase the size of this run it will be necessary to install outlet retention structures which provide a deeper outlet channel without constant sediment removal. Of greatest importance to the management of this resource is to establish a strict protocol which has the upstream and downstream passage of herring as its primary purpose (Reback *et al*. 2004).

Biology
The non-native aquatic macrophyte *Cabomba caroliniana* is reported to infest Wequaquet Lake (DeCesare and Connors 2002). Herbicide applications were made to the lake in 2004, 2006 and 2008 (McVoy 2008).

The *Aquatic Life Use* is assessed as impaired for Wequaquet Lake due to the non-native aquatic macrophyte infestation. The inefficient anadromous fish passage as described by DMF is also of concern.

Fish Consumption Use
Mercury concentrations in largemouth bass collected from Wequaquet Lake in Barnstable were found to be elevated based on sampling conducted by MassDEP in October 1994 (Appendix B in DeCesare and Connors 2002). Subsequent sampling of fish from Wequaquet Lake was conducted in 2001, 2002, 2004, 2006, and 2008 as part of the MassDEP ORS Mercury Research Project (analysis of edible fillets conducted for Hg) (MassDEP 2006d, Maietta 2007, MassDEP 2008e, Rose 2008) (see Appendix B, Table B1). Due to the presence of mercury in largemouth bass, MA DPH issued the following advisory (MA DPH 2009c): "*Children under 12 years of age, pregnant women, nursing mothers, and women of childbearing age who may become pregnant should refrain from consuming largemouth bass from Wequaquet Lake" and "The general public should limit consumption of largemouth bass caught from Wequaquet Lake to two meals per month".*

Because of the site-specific fish consumption advisory for Wequaquet Lake due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Primary and Secondary Contact Recreational and Aesthetics Uses
There are several public bathing beaches along the shoreline of Wequaquet Lake. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Wequaquet Lake.

Wequaquet Lake (MA96333)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-native aquatic plant infestion Source: Introduction of non-native organism(s)
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
A protocol for release of water and outlet dredging at Wequaquet Lake, directed toward insuring the upstream and downstream movement of river herring, should be established and implemented (Reback *et al*. 2004).

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Support improvement of freshwater Beaches Bill data quality and reporting.

Long Pond (MA96184)

Location:	Barnstable
AU Size:	48 Acres
Classification:	B
2008 303(d) List:	Category 4c

This segment is on the 2008 Integrated List of Waters in Category 4c - Impairment Not Caused by a Pollutant (Exotic species*). * denotes a non-pollutant.

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al.* (2004), access to Long Pond is provided by a long, artificial ditch excavated privately in the 19th century in order to establish a herring fishery. The fact that this is not a natural stream is the source of most of the problems limiting the production of this population. Shoaling of the pond outlet, erosion of stream banks and conflicting thoughts on how water flow should be regulated have all led to a resource which is far below the potential size afforded by the acres of habitat available in the pond.

Biology
The non-native aquatic macrophyte *Hydrilla verticillata* is reported to infest Long Pond (DeCesare and Connors 2002). Herbicide applications were made to the lake in 2002- 2005, 2007 and 2008 (McVoy 2008).

The *Aquatic Life Use* is assessed as impaired for Long Pond due to the non-native aquatic macrophyte infestation. The inefficient anadromous fish passage as described by DMF biologists is also of concern.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beach along the shoreline of Long Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Long Pond.

Long Pond (MA96184)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-native aquatic plant infestion Source: Introduction of non-native organism(s)
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
A protocol for release of water and outlet dredging at Long Pond, which is directed toward insuring the upstream and downstream movement of river herring into these habitats, and to take measures to reduce erosion in the section of stream below Long Pond, should be established and implemented (Reback *et al*. 2004).
Support improvement of freshwater Beaches Bill data quality and reporting.

Red Lily Pond (MA96257)

Location:	Barnstable
AU Size:	4 Acres
Classification:	B
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients, Pathogens, Noxious aquatic plants).

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al*. (2004) Red Lily Pond is connected to Lake Elizabeth by a corrugated metal culvert that should be passable although the extent to which herring utilize it is unknown.

Biology
No non-native aquatic macrophytes were noted in Red Lily Pond during the 21 September 2004 macrophyte and density mapping survey conducted by DWM biologists (Mass DEP 2004). Aquatic macrophytes density, however, was noted to be excessive thoughout most of the pond (floating and submerged vegetation. Algal mats were observed by DWM personnel in the extreme northern portion of the pond (Mass DEP 2004).

Water Chemistry
A "depth profile" in this shallow waterbody for DO was made on 9 September 2004 (Haque and Mattson 2009). There was no evidence of stratification but slight supersaturation was present (104%) at depth (0.8m). Water quality sampling at the deep hole of Red Lily Pond was also conducted by DWM personnel (one day each in June, July, and September 2004). Chlorophyll *a* measurements were low ranging from 1.5 – 3.5 mg/m^3 on the three sampling dates. Total phosphorus concentrations ranged from 0.009 to 0.015 mg/L. The Secchi disk transparency was at the bottom during both the June and Septemer surveys but was below the bathing beach guideline (i.e., was <1.2 m) on the July sampling date (1.0 m) (Haque and Mattson 2009).

The *Aquatic Life Use* is assessed as impaired based on the biological indicators of nutrient/eutrophication (dense/very dense aquatic macrophyte growth) in the pond.

Primary and Secondary Contact Recreational and Aesthetics Uses
No objectionable odors, deposits, scums, or turbidity were noted during the June, July, and September 2004 sampling events (MassDEP 2004). The Secchi disk transparency was at the bottom during both the June and September surveys but was below the bathing beach guideline (i.e., was <1.2 m) on the July sampling date (1.0 m) (Haque and Mattson 2009). Aquatic macrophytes density, however, was noted to be excessive thoughout most of the pond (floating and submerged vegetation.

The *Primary* and *Secondary Contact Recreational* and *Aesthetic* uses are assessed as impaired due to the Biological Indicators Nutrient/Eutrophication excessive aquatic macrophyte growth.

Red Lily Pond (MA96257)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Nutrient/eutrophication biological indicators Source: Unknown
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Nutrient/eutrophication biological indicators Source: Unknown
Secondary Contact		IMPAIRED Cause: Nutrient/eutrophication biological indicators Source: Unknown
Aesthetics		IMPAIRED Cause: Nutrient/eutrophication biological indicators Source: Unknown

Lake Elizabeth (MA96080)

Location:	Barnstable
AU Size:	6 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
River herring access Lake Elizabeth by means of a small, wooden notched weir-pool ladder which is noted to be in poor condition (Reback *et al*. 2004).

The *Aquatic Life Use* is not assessed (too limited data). This use is identified with an Alert Status, however, because of the inefficient passage for anadromous fish.

Lake Elizabeth (MA96080)

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS
The dam at Lake Elizabeth is deteriorating and, if replaced, a more efficient fishway should be incorporated into it (Reback *et al*. 2004).

Bumps River (MA96-02)

Location:	From outlet of pond at Bumps River Road, Barnstable through Scudder Bay to South Main Street bridge (confluence with Centerville River), Barnstable.
AU Size:	0.07 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

Note: MA DFG biologists conducted backpack electrofishing in the freshwater portion of the Bumps River upstream from Route 28 (sample ID 926) in July 2003. Their sampling effort resulted in the collection of four chain pickerel and an American eel although it was noted that some eels were missed (MA DFG 2008).

DESIGNATED USE ASSESSMENT
Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~26% of this area (SC25.0) is *Restricted* and 74% of this area (SC25.1) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because this segment's shellfish areas are either *Restricted* or *Prohibited* for shellfish harvesting. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, and/or stormwater discharges from the municipal stormwater systems.

Bumps River (MA96-02)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Centerville River (MA96-04)

Location:	Approximately 300 feet west of Elliot Road, Barnstable to confluence with Centerville Harbor, including East Bay, Barnstable.
AU Size:	0.24 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients, Pathogens). The TMDL for Total Nitrogen (MassDEP 2007b) was *Approved* by EPA in December 2007 [12/18/2007, CN248.0]. The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Centerville River by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 50.1 acres (~33% of the segment area) of eelgrass bed habitat present in 1951 in the region seaward from the confluence with the Bumps River but none was found in the river in 1995, or 2001 and no mapping has been done for 2006.

The *Aquatic Life Use* is assessed as impaired for Centerville River based on the apparent significant loss of eelgrass bed habitat. According to the Final Centerville River - East Bay System Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~19% of this segment area (SC24.2) is *Prohibited* and ~81% of this segment area (SC24.0) is *Restricted* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because all of the segment area is either *Probihited* or *Restricted* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"Of special note was a sanitary survey conducted by DMF between May and June 1997. This surveys focus was on the Bumps River- Scudder Bay MA 96-02, which drains directly into this segment at its western end. Six stations were sampled following rain events of 1.00" and 0.70". Fecal coliform levels ranged between 10 - 4,200 CFU/100 ml (the town is aware of the problem at this park, and has replaced the stormwater drain system along that section of Main St.). As part of this survey, ten additional ambient stations directly within this segment (Centerville River MA 96-04) were sampled fifteen times. Fecal coliform geometric means ranged between 10 - 86 CFU/100 ml, with only one reading > 260 CFU/100 ml, (at #291 Bay Lane). Scudder Bay - Bumps River receives drainage from several cranberry bogs to the north and west, which warrants further analysis. A considerable portion of Scudder bay is prohibited to shellfishing as of the date of this report. The DMF conducted a follow up sanitary survey between 2004 and 2005 at six stations (fifteen times) sampled in the 1997 survey (above). Geometric means ranged between 17 - 49.6 CFU/100 ml. An additional four stations (including culverts and catchment basins) were sampled fifteen times during the same time period. Geometric means were also high with fecal coliform ranges between 22.1 - 29.2 CFU/100 ml. The reports don't identify pollution sources except to indicate that populations of birds are evident in the area. Since bacteria problems persist, much of this segment remains closed to the taking of all shellfish. It appears that bacteria pollution has worsened over ten years, since much of the area was at one time conditionally open for shellfishing. Starting in 1997, much of the area proceeded to be rated as closed to all shellfishing, and further area closures were ordered by DMF in 2005."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal

coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Frequent testing for Enterococci bacteria during the swimming seasons was conducted at Dowses Beach in Barnstable located along the southern most seaward shoreline of the Centerville River from 2003 – 2007 (MA DPH 2009a). The beach was reportedly posted once in 2005. There were no postings in any other year.

Too limited data are available so the *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for the Centerville River. While there is a very low frequency of beach closures at Dowses Beach, this beach does not spatially represent much of this segment area.

Centerville River (MA96-04)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Centerville Harbor (MA96-03)

Location:	From an imaginary line that extends from Dowses Beach, Barnstable to Hyannis Point including all waters north to the shore, Barnstable.
AU Size:	1.5 Square Miles
Classification:	SA
2008 303(d) List:	Category 2

This segment is on the 2008 Integrated List of Waters in Category 2 - Attaining Some Uses (Shellfishing, Primary Contact, Secondary Contact); Others Not Assessed.

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Centerville Harbor by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 75.3 acres (~8% of the segment area) of eelgrass bed habitat present in 1951 in two areas: near the mouth of the Centerville River and near Squaw Island. These same two general areas had 56.6 acres in 1995 (~6% of the segment area) and 42.1 acres in 2001 (~4.5% of the segment area). No mapping has been done for 2006.

The *Aquatic Life Use* is assessed as support for Centerville Harbor based on the fairly stable presence of the eelgrass bed habitat, an indicator of good water quality conditions. Although the percentage of eelgrass appears to be declining in the segment area, since the beds are expanding into adjacent areas where none was mapped in 1951 it is best professional judgement that the changes are not indicative of water quality problems at this time.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC18.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because the shellfish area is *Approved* for shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
Centerville Harbor is heavily used for water-based recreation with four public/semi-public beaches. Frequent testing for Enterococci bacteria during the swimming season was conducted at these beaches from 2002 – 2007 (MA DPH 2009a). Closure data for individual Centerville Harbor beaches are summarized below:
Dowses Beach: Was posted one day in 2005 and no postings were reported in any other year (no data reported for 2002).
Craigville Beach Club: No postings reported 2006 or 2007 (none or too limited data other years).
Craigville Beach: Was posted one day in 2006 and no postings were reported in any other year.
Covell's Beach: Was posted one day in 2006 and no postings were reported in any other year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Centerville Harbor based on the very low frequency of beach closures at Dowses, Craigville Beach Club, Craigville, and Covell's beaches in Barnstable and the *Approved* status of the *Shellfish Harvesting Use*. The *Aesthetics Use* in not assessed due to the absence of data.

Centerville Harbor (MA96-03)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Halls Creek (MA96-93)

Location:	Estuarine portion, from Craigville Beach Road, Barnstable to mouth at Centerville Harbor, Barnstable.
AU Size:	0.07 Square Miles
Classification:	SA
2008 303(d) List:	This is a new segment – no prior listing.

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

Halls Creek is one recipient of treated (denitrified prior to sand filter bed) wastewater effluent from the Barnstable Water Pollution Control Facility (WPCF) located in the village of Hyannis. Modelling of this groundwater discharge has shown it contributes to four waterbodies (UMass Dartmouth SMAST and MassDEP 2008c).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Flushing for the Halls Creek system, typical of marsh systems, is very good (estimated as less than one day).

Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Halls Creek by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

Biology
According to the MEP project technical report the benthic community in Halls Creek was "typical of organic rich New England salt marshes…comprised of moderate numbers of individuals and species…generally contained some organic enrichment tolerant species…with some crustaceans and mullusks among the dominant polychaetes…species present were typical of high quality salt marsh habitats" (UMass Dartmouth SMAST and MassDEP 2006c). The report also states that there was an absence of macroalgal accumulations and algal mats on the creek bottom.

Water Chemistry
According to the MEP project technical report the average nitrogen concentration reported for the three stations (order most inland to seaward) in Halls Creek were as follows: 1.213, 0.454, and 0.431 mg/L N (UMass Dartmouth SMAST and MassDEP 2008c).

The *Aquatic Life Use* is assessed as support for the Halls Creek tidal salt marsh based on the MEP analysis.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that this segment (classification area SC26.0) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish classification area is *Probihited* for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Halls Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Halls Creek is used for water-based recreation with one semi-public beach. Frequent testing for Enterococci bacteria during the swimming season was conducted at Seaside Park Improvement Association Beach between 2002 and 2007. There were no reported posting at this beach in any year (MA DPH 2009a).

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Halls Creek based on the lack of any beach closures at Seaside Park Improvement Association Beach in Barnstable. The *Aesthetics Use* is not assessed due to the absence of data.

Halls Creek (MA96-93)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Snows Creek (MA96-81)

Location:	East of Old Colony Road, Barnstable to mouth at Lewis Bay, Barnstable.
AU Size:	0.02 Square Miles
Classification:	SA
2008 303(d) List:	This is a new segment – no prior listing.

Snows Creek is in the Lewis Bay subwatershed. Snows Creek is one recipient of treated (denitrified prior to sand filter bed) wastewater effluent from the Barnstable Water Pollution Control Facility (WPCF) located in the village of Hyannis. Modelling of this groundwater discharge has shown it contributes to four waterbodies (UMass Dartmouth SMAST and MassDEP 2008c). According to the DRAFT Lewis Bay System and Halls Creek Total Maximum Daily Loads for Total Nitrogen, any impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2010). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to the MEP project technical report, the flow into and out of Snows Creek is restricted by the narrow channel and culvert under Ocean Street and this salt marsh embayment has a moderately high local residence time (3.7 days) (UMass Dartmouth SMAST and MassDEP 2008c).

Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Snows Creek by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

Water Chemistry
According to the MEP project technical report the average nitrogen concentration reported for Snows Creek was 1.565 mg/L N (UMass Dartmouth SMAST and MassDEP 2008c).

Too limited data are available so the *Aquatic Life Use* for Snows Creek is not assessed.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that a portion (~10%) of this segment (encompassed by classification area SC28.9) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish classification area (comprising an estimated 10% of the Snows Creek segment area) is *Probihited* for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Snows Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Snows Creek (MA96-81)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Hyannis Inner Harbor (MA96-82)

Location:	Waters landward of an imaginary line drawn from Harbor Bluff, Barnstable to Hyannis Park, Yarmouth.
AU Size:	0.13 Square Miles
Classification:	SA
2008 303(d) List:	This is a new segment – no prior listing.

Hyannis Inner Harbor is one recipient of treated (denitrified prior to sand filter bed) wastewater effluent from the Barnstable Water Pollution Control Facility (WPCF) located in the village of Hyannis. Modelling of this groundwater discharge has shown it contributes to four waterbodies (UMass Dartmouth SMAST and MassDEP 2008c).

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)
Town of Yarmouth (MAR041176)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Hyannis Inner Harbor by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

Biology
According to the MEP project technical report the benthic community in Hyannis Inner Harbor was "typical of a moderately nitrogen enriched basin…communities were highly spatioally variable, with some species found in high numbers (Gemma)…the number of species moderately high and stress indicator species were not prevalent" (UMass Dartmouth SMAST and MassDEP 2008c).

Water Chemistry
According to the MEP project technical report the DO concentrations in Hyannis Inner Harbor were generally good (>6.0 mg/L) with periodic depletions (5.0 to 6.0 mg/L). The chlorophyll *a* concentrations were described as moderate (generally ranged from ~3 to 10 µg/L, generally >5 µg/L) (UMass Dartmouth SMAST and MassDEP 2008c). According to the MEP project technical report the average nitrogen concentration reported for three sampling stations in Hyannis Inner Harbor ranged from 0.433 to 0.599 mg/L N (UMass Dartmouth SMAST and MassDEP 2008c).

The *Aquatic Life Use* is assessed as impaired for Hyannis Inner Harbor based on the MEP analysis. It should be noted that according to the DRAFT Lewis Bay System and Halls Creek Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2010). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~16% of this segment area (SC28.0) is *Approved*, ~46% of this segment area (SC28.2) in *Conditionally Approved*, and ~38% of this segment area (SC28.1) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support for 0.02 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.11 square miles because it is either *Probihited* or *Conditionally Approved* for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Hyannis Inner Harbor. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with illicit marina/boating

pumpout releases, waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Hyannis Inner Harbor is used for water-based recreation with two public beaches. Frequent testing for Enterococci bacteria during the swimming season was conducted at Bayview Street Beach in 2002 and 2004 – 2007. There was only one reported posting at this beach in 2007 and none in any other year tested. Frequent testing for Enterococci bacteria during the swimming season was also conducted at Windmill Beach from 2003 – 2007. There were no reported postings at this beach in any year (MA DPH 2009a).

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Hyannis Inner Harbor based on the very low frequency of beach closures at Bayview Street and Windmill beaches in Yarmouth. The *Aesthetics Use* is not assessed due to the absence of data.

Hyannis Inner Harbor (MA96-82)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance,], municipal point source discharge
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.02 square miles IMPAIRED 0.11 square miles Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Mill Creek (MA96-80)

Location:	Headwaters, outlet Mill Pond, Yarmouth to confluence with Lewis Bay, Yarmouth.
AU Size:	0.07 Square Miles
Classification:	SA
2008 303(d) List:	This is a new segment – no prior listing.

NPDES Discharges (Appendix D, Table D2)
Town of Yarmouth (MAR041176)

There are also three private wastewater treatment facilities (Mayflower Place, Buck Island Village, and The Cove) that discharge via subsurface disposal systems in the Mill Creek subwatershed (UMass Dartmouth SMAST and MassDEP 2008c).

NOTE: In the upper watershed area of this segment MA DFG biologists conducted backpack electrofishing in Hawes Run (sample ID 928) up and downstream from Buck Island Road in Yarmouth in July 2003. Their sampling effort resulted in the collection of seven American eel, and three pumpkinseed (MA DFG 2008).

Town Brook is a tributary to the Mill Creek system and flows from Little Sandy Pond to Mill Pond. There is a concrete box culvert with wooden baffles functions as a fishway and enables herring to reach Little Sandy Pond. There is also a concrete and wood fishway that functions well at the Mill Pond Dam at Baxter Grist Mill (Reback *et al*. 2004).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Mill Creek is described as a salt marsh "pond" of shallow depth with large bordering tidal marshes. The system is well flushed and has negligible tidal attenuation (UMass Dartmouth SMAST and MassDEP 2008c).

Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Mill Creek by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

Biology
According to the MEP project technical report the benthic community in Mill Creek was "consistent with a salt marsh basin…moderate numbers of species and individuals, and species indicative of an organic rich environment but not contamination…it did appear to be 'patchy' potentially result of drift algae…this variability a cause for concern…moderate to high levels of drift algae, Ulva and Codium were present, some in situ and some transported in" (UMass Dartmouth SMAST and MassDEP 2008c).

Water Chemistry
According to the MEP project technical report there were periodic oxygen depletions to 4 mg/L, and very rarely to <4 mg/L in Mill Creek. The chlorophyll *a* concentrations were described as high (generally >10 µg/L and frequently >20 µg/L). According to the MEP project technical report the average nitrogen concentration reported for two sampling stations in Mill Creek were 0.562 and 0.516 mg/L N (UMass Dartmouth SMAST and MassDEP 2008c).

The *Aquatic Life Use* is assessed as impaired for Mill Creek based on the MEP analysis (the moderate impairment was noted to be based primarily on the high sustained chlorophyll levels). It should be noted that according to the DRAFT Lewis Bay System and Halls Creek Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2010). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~20% of this segment area (SC28.5) is *Conditionally Approved* and ~80% of this segment area (SC28.6) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired for Mill Creek because this segment area is either *Conditionally Approved* or *Probihited* for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Mill Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Mill Creek (MA96-80)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Lewis Bay (MA96-36)

Location:	Includes portion of Pine Island Creek and Uncle Roberts Cove to confluence with Nantucket Sound, Barnstable/Yarmouth (excluding Hyannis Inner Harbor, Barnstable/Yarmouth and Mill Creek, Yarmouth).
AU Size:	1.8 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)
Town of Yarmouth (MAR041176)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Lewis Bay by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 245 acres (~21% of the segment area) of eelgrass bed habitat present in 1951 (although it should be noted that only 52.9 acres were noted as having high confidence --in Uncle Roberts Cove and an area north of Smiths Point and seaward of Egg Island and a small area south of Dunbar Point). While only 0.7 acres (<0.1% of the segment area) of eelgrass bed habitat was found in 1995, slightly more (3.6 acres) were found in 2001. No mapping has been done for 2006.

The *Aquatic Life Use* is assessed as impaired for Lewis Bay based on the apparent significant loss of eelgrass bed habitat. According to the DRAFT Lewis Bay System and Halls Creek Total Maximum Daily Loads for Total Nitrogen, this impairment is best mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2010). The controllable local sources of total nitrogen identified in this draft TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~98.5% of this segment area (SC28.0) is *Approved* and ~1.5% of this segment area (SC28.10 and SC28.8) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support for 1.77 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.03 square miles because it is *Prohibited* for shellfish harvesting. The *Shellfish Harvesting Use* is assessed as impaired because a small area (~2%) is *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), "*A shoreline survey was conducted by DMF personnel during the spring and summer of 2003. Three streams were identified and sampled: 1) stream under Route 28 from Mill Pond; 2) two additional streams draining cranberry bogs, flowing into the northwestern part of the area under Route 28. All samples had low bacteria counts. The survey report noted that the town of Yarmouth has a strict septic system maintenance and inspection program. Therefore, no evidence of septic failures were observed on the survey. Also noted was the fact that boating activity is limited due to the shallow depth in most parts of the Bay, so boating may not be a significant potential pollution cause. However, there is a large marina located on the Hyannis side (west side), and a large ferry terminal (going to the Islands). The January 2005 Triennial Report indicates a recommendation for expansion of the seasonally managed Conditionally Approved sub- area from the previously Approved waters of Lewis Bay, due to increased boating activity in adjacent Hyannis Inner Harbor. But, improvements in water quality in the Mill Creek area have allowed a larger portion of that to be opened up to seasonal harvesting."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal

coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Lewis Bay is heavily used for water-based recreation with one semi-public and seven public beaches in Barnstable and Yarmouth. Frequent testing for Enterococci bacteria during the swimming season was conducted at these beaches from 2002 – 2007 (MA DPH 2009a). Closure data for individual Lewis Bay beaches are summarized below:
Kalmus Yacht Beach: No postings were reported in any year.
Kennedy Memorial Beach: Was posted two days in 2004 and one day in 2005 and no postings were reported in any other year (testing 2003-2007).
Veterans Beach: Was posted one day in 2004 and no postings were reported in any other year.
Baxter Avenue Beach: No postings were reported in any year (testing 2003-2007).
Colonial Acres Beach: Was posted one day in 2004 and no postings were reported in any other year.
Bay Road Beach: No postings were reported in any year.
Columbus Avenue Beach: No postings were reported in any year.
Englewood Beach: No postings were reported in any year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Lewis Bay based on the very low frequency of beach closures at Kalmus Yacht, Kennedy Memorial and Veterans beaches in Barnstable and Baxter Avenue, Colonial Acres, Bay Road, Columbus and Englewood beaches in Yarmouth. The *Aesthetics Use* in not assessed due to the absence of data.

Lewis Bay (MA96-36)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 1.77 square miles IMPAIRED 0.03 square miles Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Stewarts Creek (MA96-94)

Location:	Estuarine portion, west of Stetson Street, Barnstable to mouth at Hyannis Harbor, Barnstable.
AU Size:	0.01 Square Miles
Classification:	SA
2008 303(d) List:	This is a new segment – no prior listing.

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

Stewarts Creek is one recipient of treated (denitrified prior to sand filter bed) wastewater effluent from the Barnstable Water Pollution Control Facility (WPCF) located in the village of Hyannis. Modelling of this groundwater discharge has shown it contributes to four waterbodies (UMass Dartmouth SMAST and MassDEP 2008c).

Stewart's Creek Restoration Projec (MEPA 2006):
http://www.mass.gov/envir/mepa/pdffiles/enfs/060706em/13815.pdf: "*Stewart's Creek is connected to Hyannis Harbor through a 60' long, 3' diameter concrete culvert that passes under Ocean Avenue...This restoration project is intended to increase the rate of flushing to the estuarine/marsh ecosystem by replacing the existing culvert under Ocean Avenue with a larger culvert; restoring the pond to depths better suited for fish and wildlife; exposing suitable substrates for optimum benthic communities; and restoring salt marsh in the northern portion of lower Stewart's Creek on material dredged to restore the pond...*"

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Stewarts Creek by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

Water Chemistry
According to the MEP project technical report the average nitrogen concentration reported for Stewarts Creek was 1.245 mg/L N (UMass Dartmouth SMAST and MassDEP 2008c).

Too limited data are available so the *Aquatic Life Use* for Stewarts Creek is not assessed.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that this segment (classification area SC27.2) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish classification area is *Probihited* for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Stewarts Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Stewarts Creek (MA96-94)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Hyannis Harbor (MA96-05)

Location:	The waters from the shoreline to an imaginary line drawn from the light at the end of Hyannis breakwater, Barnstable to the point west of Dunbar Point, Barnstable.
AU Size:	0.68 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Barnstable (MAR041090)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Hyannis Harbor by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, and 2001 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 297.4 acres (~68% of the segment area) of eelgrass bed habitat (described as patchy) present in 1951 throughout the harbor. In 1995 this area was estimated to have 159.5 acres (~37%), and in 2001 there were approximately 123.7 acres (~28%) of eelgrass bed habitat available. No mapping of this area was conducted in 2006.

The *Aquatic Life Use* is assessed as support for Hyannis Harbor based on the presence of eelgrass bed habitat, an indicator of good water quality conditions. Although the percentage of eelgrass appears to be declining in the segment area, since the beds are expanding into adjacent areas where none was mapped in 1951 it is best professional judgement that the changes are not indicative of water quality problems at this time.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that almost all (99.97%) of this segment area (SC27.0) is *Approved* for shellfish harvesting (MA DFG 2009). There is an extremely small (0.03%) area (a small piece of SC27.1) that is *Prohibited*.

The *Shellfish Harvesting Use* is assessed as support for 0.6688 square miles because it is *Approved* for shellfish harvesting. This use is impaired for 0.0002 square miles because it is *Prohibited* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), "*A DMF shoreline survey was conducted in July, 2004. Many potential pollution sources identified in the late 1990's shoreline survey (mainly septic systems) were taken off the list from the July 2004 survey. This was mainly due to sewering that has occurred in portions, and septic system upgrades that have been ordered by the town of Barnstable. The town has an active septic system inspection and maintenance Title 5 program. There are two tidal wetlands (one of them in a prohibited zone) that each have a monitoring station. Two stormwater pipes with flow were tested during July, 2004: 1) Ocean St. Culvert, with a reading of 410 CFU/100 ml; 2) Sea St. Bridge Culvert, with a reading of 100 CFU/100 ml. No other stormwater sources were identified in the survey. Waterfowl were identified as a significant potential contributor, with noteworthy numbers of geese, ducks, and various shorebirds observed throughout the area. There is one marina, the Hyannis Port Yacht Club with 241 moorings and two fixed station public MSD pump-out stations. Commercial and recreational vessels frequently transit the area through a channel accessing the mooring/marina areas of the Lewis Bay/ Hyannis Inner Harbor Area."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, and stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Hyannis Harbor is heavily used for water-based recreation with four public beaches. Frequent testing for Enterococci bacteria during the swimming season was conducted at these beaches from 2002 – 2007 (MA DPH 2009a). Closure data for individual Hyannis Harbor beaches are summarized below:

East (Town) Beach: Was posted one day each in 2003, 2004, 2005, and 2006. No postings were reported other years.
Keyes Beach: Was posted three days in 2005, and two days each in 2006 and 2007. No postings were reported in any other year.
Estey Avenue Beach: No postings reported in any year.
Kalmus Ocean Beach: Was posted one day in 2004 and no postings were reported other years. (testing 2003-2007).

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Hyannis Harbor based on *Approved* status of the shellfishing area and the very low frequency of beach closures at East (Town), Keyes, Estey Avenue, and Kalmus Ocean beaches in Barnstable. The *Aesthetics Use* in not assessed due to the absence of data.

Hyannis Harbor (MA96-05)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT – 0.6688 square miles IMPAIRED – 0.0002 square miles Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

PARKERS RIVER SYSTEM

Long Pond (MA96180)

Location:	Yarmouth
AU Size:	54 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

NPDES Discharges (Appendix D, Table D2)
Town of Yarmouth (MAR041176)

DESIGNATED USE ASSESSMENT
Primary and Secondary Contact Recreational and Aesthetics Uses
There are public bathing beaches along the shoreline of Long Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Long Pond.

Long Pond (MA96180)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Parkers River (MA96-38)

Location:	Outlet Seine Pond, Yarmouth to mouth at Nantucket Sound, Yarmouth.
AU Size:	0.04 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Yarmouth (MAR041176)

In its upper watershed, the Parker River flows from Long Pond through a tidal estuary called Seine Pond and into Nantucket Sound. According to DMF biologists (Reback *et al*. 2004), while some spawning may occur in Seine Pond, the headwaters provide the majority of the habitat. The first obstruction is a concrete resting pool with a wooden notched weir-pool ladder. This structure provides water depth for herring to enter the stream on lower tidal stages. A concrete culvert forms the second obstruction and is made passable by another wooden weir-pool fishway. A third wooden weir-pool ladder allows fish to enter a culvert at Forest Road and a fourth enables herring to pass the Long Pond control structure. With proper maintenance of these ladders and stream clearing this run should continue to remain productive (Reback *et al*. 2004).

Plashes Brook is a small tributary to the lower Parkers River. A concrete control structure at Winslow Gray Road forms a small limpoundment. Wooden baffles incorporated into the structure create a fishway which allows herring to reach the impoundment. In order to reach the headwater, Plashes Pond, fish would have to negotiate a complex system of cranberry bogs with numerous impassable culverts. While access to Plashes Pond is desirable, it would be difficult to ensure passage through the bogs (Reback *et al*. 2004).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for the Parkers River by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). Although some eelgrass bed habitat (6.7 acres) was estimated in this segment of the Parkers River, the confidence was noted as being low.

Too limited data are available so the *Aquatic Life Use* is not assessed.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~10% of this segment area (SC30.5) is *Prohibited*, ~66% of this segment area (SC30.3 and 30.4) is *Conditionally Approved*, and ~24% of this segment area (SC30.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support for 0.01 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.03 square miles because it is either *Probihited* or *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"The DMF conducted a thorough shoreline survey during March 2003. All residences have individual septic systems. The town of Yarmouth has a strict septic system set of regulations. No system failures were evident at the time of this survey. There are five potential sources from stormwater inputs, mostly from roadways. Of the total fifteen stream and creeks feeding the Parker River, there are five with the highest potential contribution between Seine Pond and Route 28, particularly one near a zooquarium property, (houses exotic birds and other wildlife), on Route 28. A marina exists on the eastern shore of the Parker River just south of Route 28. Seine Pond is, itself, another potential contributor, as a large cranberry bog drains into it on the north side, plus this is the scene of large annual herring runs, plus there are houses around the pond, and boating activities occurring in the pond. Also, numerous birds were spotted throughout the pond area."* Based on the pathogen TMDL (MassDEP,

USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is one public beach, Seagull Beach in Yarmouth, along the shoreline of the Parker River. Frequent testing for Enterococci bacteria during the swimming season was conducted at this beach from 2002 – 2007 and no postings were reported for any year (MA DPH 2009a).

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for the Parker River based on the lack of any of beach closures at Seagull Beach in Yarmouth. The *Aesthetics Use* in not assessed due to the absence of data.

Parkers River (MA96-38)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.01 square miles IMPAIRED 0.03 square miles Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Miss Thachers Pond (MA96258)

Location:	Yarmouth
AU Size:	6 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

NPDES Discharges (Appendix D, Table D2)
Town of Yarmouth (MAR041176)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al*. (2004), a weir-pool fishway above Mill Pond in the Bass River system provides a small amount of additional anadromous fish habitat in Miss Thachers Pond, providing sufficient flow exists and the ladder is properly regulated. The fishway is in good condition but provides inefficient passage for Alewife and white perch.

Too limited data are available so all uses are not assessed for Miss Thatchers Pond.

Miss Thatchers Pond (MA96258)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Bass River (MA96-12)

Location:	Route 6, Dennis/Yarmouth to mouth at Nantucket Sound, Dennis/Yarmouth (excluding Grand Cove, Dennis).
AU Size:	0.69 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Dennis (MAR041103)
Town of Yarmouth (MAR041176)

Note: A stormwater treatment project is currently underway to reduce storm flows (up to the 10-year storm and the first flush from larger events) from Route 28 to the Bass River estuary. The project is designed to capture, treat (through an oil water separator to remove sediment, litter and other floatables), and recharge into the subsurface. This project was identified as Yarmouth's highest priority for improving water quality in the estuary (Norfolk Ram Group 2006).

According to Reback *et al*. (2004), Weir Creek, a tributary to Bass River, flows unobstructed from Kellys Pond to the estuary. River herring are able to access the headwater pond and the system is probably at the peak of its potential. Fresh Pond is the 31 acre headwater for an unnamed tributary to Bass River. The stream is badly overgrown and, although it supported a small run of herring in the past, none have been reported in recent years. Stream clearing could rectify this condition (Reback *et al*. 2004).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al*. (2004), Bass River is a large Cape Cod estuary which is completely tidal up to and including Mill Pond. Salinities in Mill Pond, however, are low enough to allow successful river herring and white perch spawning.

Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for the Bass River by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 290.4 acres (~66% of the segment area) of eelgrass bed habitat present in 1951 (described as continuous coverage with high confidence) thoughout the segment but little was found in the river in 1995 (14.5 acres) or 2001 (3.0 acres). No mapping has been done for 2006.

The *Aquatic Life Use* is assessed as impaired for the Bass River based on the apparent significant loss of eelgrass bed habitat.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~1% of this segment area (SC34.3) is *Prohibited* and ~99% of this segment area (SC33.1 and 34.1) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because all of the segment area is either *Probihited* or *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"Additionally sanitary surveys (data included in Table 4-11 above) were conducted in October 2003 and November 2005. DMF sampled at 12 sites (Bass River, Center Portion), once (ramps, coves, feeder streams, and pipe outfalls). Readings were <10- 40 CFU/100 ml, with elevated levels at 3 sites just following 1" of rain: High Bank Road East S.D., 1,270 CFU/100 ml; Culvert pipe at 299 Old Main, 440 CFU/100 ml; and the Stream at*

Pinefield Lane, TNTC…DMF collected fecal coliform samples …during sanitary surveys at five stations in the southern portion of this segment between December 1, 2002 and May 31, 2003. Four stations had geometric means readings ranging between 3.2 - 3.6, with the highest geometric reading of 5.5 CFU/100 ml at Portside Way. Additionally, six stations (4 stormdrains/ pipes, and 2 landing ramps) were sampled on October 15, 2003, right after a 1" rain event. Only two readings were >80 CFU/100 ml: Ferry Street stormdrain, 640 CFU/100 ml, and Wrinkle Point pipe, TNTC. Three other culvert type stations were sampled March 1, 2004. All readings were < 10 CFU/100 ml. With respect to sources of pollution with the higher counts noted above, the only noted source in the reports is the presence of a high number of boats and marinas in the area. It is suggested that further wet weather sampling of storm drain pipes with high levels above be conducted by Yarmouth and Dennis to better determine the sources." Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is one public beach, Wilbur Park Beach in Yarmouth, along the shoreline of the Bass River in Yarmouth. Frequent testing for Enterococci bacteria during the swimming season was conducted at this beach from 2002 – 2007 and no postings were reported for any year (MA DPH 2009a).

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for the Bass River based on the lack of any of beach closures at Wilbur Park Beach in Yarmouth. The *Aesthetics Use* in not assessed due to the absence of data.

Bass River (MA96-12)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Unknown
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Swan Pond River (MA96-14)

Location:	Headwaters, outlet Swan Pond, Dennis to confluence with Nantucket Sound, Dennis.
AU Size:	0.04 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Dennis (MAR041103)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Swan Pond River flows from Swan Pond to Nantucket Sound. The pond itself is tidal but some limited spawning may occur despite salinities in the high teens. There are no obstructions to anadromous fish passage (Reback *et al*. 2004).

Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Swan Pond River by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 1.7 acres (~7.5% of the segment area) of eelgrass bed habitat present in 1951 (described as continuous coverage with high confidence) in three areas near the mouth of the river but none was found in 1995 or 2001. No mapping has been done for 2006.

The *Aquatic Life Use* is assessed as impaired for the Swan Pond River based on the apparent loss of eelgrass bed habitat.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC36.0) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because all of the segment area is *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"Since 1988 the DMF has sampled this segment numerous times. In the years 1988-1996, there were numerous exceedances > 28 CFU/100 ml. In the time period 1997- 2002, there was some reduction in numbers of readings > 28 CFU/100 ml. Additionally, the DMF, through Barnstable County, collected fecal coliform samples at four to five stations, eight times, along this segment between February and August, 2002. A total of 39 samples were collected. Fecal coliform values ranged from <10 to 280, with only one reading > 200 CFU/100 ml (Hydaway Creek). Hydaway Creek had another reading of 140 CFU/100 ml; Route 28, 90 CFU/100 ml; Upper County Road, 80 and 60 CFU/100 ml; Lower County Road and Mouth having readings of 50 CFU/100 ml each. Since no sanitary type survey reports were prepared, no analysis by DMF was given as to potential pollution sources which may cause the elevated ambient levels. However, it is evident that Swan Pond is connected with drainage from cranberry bogs to the north. Also it is evident that many residences abound the area, all on septic systems."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is one public beach, South Village Beach in Dennis, at the mouth of the Swan Pond River. Frequent testing for Enterococci bacteria during the swimming season was conducted at this beach from 2002 – 2007 and only one posting was reported in 2007 and no postings were reported for any other year (MA DPH 2009a).

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for the Swan Pond River despite the extremely low frequency of beach closures at South Village Beach in Dennis. Since this beach is at the very mouth of the segment, it does not spatially represent enough of the segment area to make the assessment decision.

Swan Pond River (MA96-14)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Unknown
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

HERRING RIVER SYSTEM

Long Pond (MA96183)

Location:	Brewster/Harwich
AU Size:	715 Acres
Classification:	B
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Organic enrichment/Low DO).

WMA Withdrawal (Appendix C)
CYBUL CRISTAL FINN & FINN (registration 42204108)

NPDES Discharges (Appendix D, Table D2)
Town of Brewster (MAR041096)
Town of Harwich (MAR041120)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al.* (2004), anadromous fish have passage through the Herring River system via an efficient weir-pool fishway at West Reservoir dam and a second weir-pool ladder at Hinckleys Pond up into Long Pond providing flow is sufficient. The primary limiting factor to production in this system is the frequent low water conditions that may prevent juvenile herring from making a successful downstream migration.

Water Chemistry
A depth profile for DO was made in the deep hole of Long Pond on 8 September 2004 (Haque and Mattson 2009). The pond (maximum depth of 20.4 m) was stratified with DO depletion (i.e., $\leq$4.3 mg/L or less) at depths greater than 11.5 m. In the epilimnion DO concentrations ranged from 6.0 to 8.7 mg/L with maximum saturation of 103%. The maximum temperature was 23.5℃ and pH ranged from 6.4 to 7.2 SU. Water quality sampling at the deep hole of Long Pond was also conducted by DWM personnel (one day each in June, July, and September 2004). Chlorophyll *a* measurements were fairly low ($\leq$ 7.3 mg/m^3). Total phosphorus concentrations were low in surface samples (0.014 – 0.018mg/L) but higher in samples collected near the bottom (0.11 – 0.35 mg/L). The Secchi disk transparencies were all excellent (3.6 to 5.4 m) (Haque and Mattson 2009). There was no turbidity or any algal growths noted during any of 2004 sampling events (MassDEP 2004).

The *Aquatic Life Use* is assessed as impaired for Long Pond since there is severe oxygen depletion that is apparent below about 11 m based on the 8 September 2004 profile data (~25% of the pond surface area). It should be noted tha the Secchi disk transparencies were good, chlorophyll *a* concentrations were low and there was no evidence of any algal growths. Elevated total phosphorus concentrations in the samples taken near the bottom of the water column are a sign of release from the sediments and an internal source of nutrients to the pond. In September and October of 2007 Long Pond was treated with aluminum compounds for the inactivation of phosphorus (AECOM 2009). According to the treatment summary report (AECOM 2009) "*approximately 370 acres were treated with aluminum sulfate (70,291 gallons) and sodium aluminate (37,856 gallons) on 17 days over a 28 day period. Beginning in November 2007, phosphorus levels began to rise and water clarity declined. However, beginning in May and progressing through August 2008, water clarity increased dramatically, exceeding those reported for the last decade. There was a decrease in clarity in September 2008, consistent with historic trends, but an increase at the start of October, after which monitoring ceased. Water clarity during summer 2008 was the highest observed in over a decade.*"

Fish Consumption Use
Fish from Long Pond in Brewster/Harwich were collected and analyzed in 2001 as part of the Cape Cod Commission study (Michaud 2008). Species collected included white perch, yellow perch, and smallmouth bass. Mercury was below the MA DPH trigger level of 0.5 mg/kg in all samples analyzed. Mercury concentrations were above the MA DPH trigger level in both of the composite perch samples analyzed (0.63 and 0.93 µg/g), but was below the trigger level in the individual largemouth bass sample. There is no site-specific fish consumption advisory in place for this waterbody (MA DPH 2009c).

In September 2009 fish were collected by DWM biologists from Long Pond and edible fillets of smallmouth bass (*Micropterus dolomieu*), white sucker (*Catostomus commersoni*), and brown bullhead (*Ameiurus nebulosus*), and an individual yellow perch (*Perca flavescens*) were analyzed for mercury (Maietta *et al*. 2008 and Appendix B, Table B10). Mercury concentrations were below the MA DPH trigger level in all samples analyzed.

Since no site-specific fish consumption advisory was issued by the MA DPH, the *Fish Consumption Use* is not assessed.

Primary and Secondary Contact Recreational and Aesthetics Uses
No aesthetically objectionable conditions (e.g., odors, deposits, growths, scums, turbidity) were noted during the June, July, and September 2004 sampling events in Long Pond (MassDEP 2004). The Secchi disk transparencies were all excellent (3.6 to 5.4 m) (Haque and Mattson 2009). It should also be noted that there are several public bathing beaches along the shoreline of Long Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary Contact Recreational Use* is not assessed for Long Pond due to the lack of quality assured bacteria data. The *Secondary Contact Recreational* and *Aesthetic* uses are assessed as support based on the good Secchi disk transparencies and the lack of any aesthetically objectionable conditions.

Long Pond (MA96183)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Low dissolved oxygen Source: Unknown Suspected source: phosphorus release from anoxic sediments
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		SUPPORT
Aesthetics		SUPPORT

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

The installation of outlet retention structures and frequent dredging of deposited materials at the outlet of Long Pond to improve juvenile herring in making a successful downstream migration (Reback *et al*. 2004).

Hinckleys Pond (MA96140)

Location:	Harwich
AU Size:	164 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

WMA Withdrawal (Appendix C)
J A JENKINS & SON CRANBERRY COMPANY (registration 42202006)
RAYMOND L THACHER (registration 42212602)

NPDES Discharges (Appendix D, Table D2)
Town of Harwich (MAR041120)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al.* (2004), anadromous fish have passage through the Herring River system via an efficient weir-pool fishway at West Reservoir dam and a second weir-pool ladder into Hinckleys Pond.

Water Chemistry
A depth profile for DO was made at the deep hole in Hinckleys Pond on 8 September 2004 (Haque and Mattson 2009). The pond (maximum depth of 8.2 m) was not stratified. The DO concentrations were good (5.4 – 9.3 mg/L, and temperature ranged from 22.5 to 24.0℃. There was evidence of productivity (supersaturation (as high as 112%) and high pH (8.9 SU). Water quality sampling at the deep hole of Hinckleys Pond was also conducted by DWM personnel (one day each in June, July, and September 2004). Chlorophyll *a* measurements ranged from 6.8 to 15.4 mg/m^3. The total phosphorus concentrations were moderate (0.021 to 0.10 mg/L) with slightly higher concentrations measured near the bottom. The Secchi disk transparency measurerments were all good (2.4 to 2.8 m) (Haque and Mattson 2009). Slight turbidity and sparse algal growths in Hinckleys Pond were noted during the June, July, and September 2004 sampling events (MassDEP 2004). The Secchi disk depth transparencies measured in 2009 were all good (2.2 to 2.7 m) although a blue-green algal bloom was present during the October 2009 survey (MassDEP 2009).

The *Aquatic Life Use* is assessed as support for Hinckleys Pond based on the generally good water quality conditions. This use is identified with an alert status, however, based on the indicators of productivity (supersaturation, high pH, and slightly elevated chlorophyll a, as well as the presence of a blue-green algal bloom in 2009). Elevated total phosphorus concentrations were also measured in an unnamed tributary associated with a cranberry bog.

Fish Consumption Use
Fish from Hinckleys Pond were collected and analyzed in 2001 as part of the Cape Cod Commission study (Michaud 2008). Species analyzed included white perch, largemouth bass, and smallmouth bass. Mercury concentrations were all well below the MA DPH trigger level of 0.5 mg/kg. There is no site-specific fish consumption advisory in place for this waterbody (MA DPH 2009c).

Since no site-specific fish consumption advisory was issued by the MA DPH, the *Fish Consumption Use* is not assessed.

Primary and Secondary Contact Recreational and Aesthetics Uses
Slight turbidity and sparse algal growths in Hinckleys Pond were noted during the June, July, and September 2004 sampling events (MassDEP 2004). The possible presence of blue green algae was noted on the September field sheet. No other aesthetically objectionable conditions (odors, scums or macrophyte growth) were present. The Secchi disk transparency measurerments were all good in both 2004 and 2009 (2.2 to 2.8 m) (MassDEP 2004 and MassDEP 2009). It should be noted, however, that a blue-green algal bloom was present during the October 2009 survey (MassDEP 2009). It should also be noted that there is a public bathing beach along the shoreline of Hinkleys Pond. Currently there is uncertainty associated with the accurate reporting of

freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary Contact Recreational Use* is not assessed for Hinckleys Pond due to the lack of quality assured bacteria data. The *Secondary Contact Recreational* and *Aesthetic* uses are assessed as support based on the good Secchi disk transparencies and the general lack of any aesthetically objectionable conditions. These uses are identified with an Alert Status however because of the cyanobacteria bloom which occurred in the pond in 2009.

Hinckleys Pond (MA96140)

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED*
Secondary Contact		SUPPORT*
Aesthetics		SUPPORT*

* Alert Status issues identified, see details in use assessment.

RECOMMENDATIONS

Support improvement of freshwater Beaches Bill data quality and reporting.

Herring River (MA96-22)

Location:	Outlet of Herring River Reservoir (at North Harwich Reservoir Dam) west of Bells Neck Road, Harwich to mouth at Nantucket Sound, Harwich.
AU Size:	0.07 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

WMA Withdrawal (Appendix C)
TOWN OF HARWICH (registration 42212605)is just upstream from this segment

NPDES Discharges (Appendix D, Table D2)
Town of Harwich (MAR041120)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
The Herring River system provides anadromous fish spawning habitat in its three headwater ponds and downstream impoundments. There is an efficient weir-pool fishway that provides access at West Reservoir dam at the upper end of this segment (Reback *et al*. 2004).

Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for the Herring River by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was no estimated eelgrass bed habitat present in 1951, however there was an estimated 7.2 acres (~15% of segment area) found in 1995 and 3.1 acres (6.5% of segment area) found in 2001 in the reach of the river south of Route 28 crossing. No mapping was done in 2006.

Biology
MA DFG biologists conducted backpack electrofishing in July 2007 at the upstream end of this segment at the end of the Bog Lane (site 2352) in Harwich. Their sampling efforts, in order of dominance, resulted in the collection of 56 fish including American eel, tessellated darter, alewife, smallmouth bass, yellow perch, and an individual white sucker (MA DFG 2008). The presence of tessellated darter (n=16), a fluvial specialist species, is indicative of stable flow regime and good water quality conditions.

The *Aquatic Life Use* is assessed as support based on the fish population data and the presence of eelgrass bed habitat an indicator of good water quality conditions.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~36% of this segment area (SC38.2) is *Prohibited* and ~64% of this segment area (SC38.1) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because portions of this segment area are either *Probihited* or *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009),*"Sanitary surveys in 2000 and 2003, and a follow-up triennial report in 2006 show the overall water quality is excellent during that time of the year and that the area has "open to shellfishing status". Improved water quality has allowed the redefinition of the area north of the Route 28 bridge to open seasonal status for the fishing of oyster and quahog resources. Little monitoring or pollution analysis was provided in the continuing prohibited zone."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Testing for Enterococci bacteria during the swimming seasons was conducted at Riverside Harbor (Wixon Dock) in Harwich located along the shoreline near the mouth of the Herring River in 2002 and 2003 and once in 2004 (MA DPH 2009a). The beach was not posted and no subsequent testing has been reported.

Too limited data are available so the *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed.

Herring River (MA96-22)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
According to Reback et al. (2004), *"in the upper watershed area of the Herrring River there is an efficient weir-pool fishway provides access at West Reservoir dam and a second weir-pool ladder at Hinckleys Pond that allows fish to reach that habitat. From Hinkleys Pond fish have unimpeded access to Seymours and Long Ponds providing flow is sufficient. The primary limiting factor to production in this system is the frequent low water conditions that may prevent juvenile herring from making a successful downstream migration. The installation of outlet retention structures and frequent dredging of deposited materials from the outlets of Seymours and Long Ponds would improve this situation."*

Saquatucket Harbor (MA96-23)

Location:	South of Route 28, Harwich to confluence with Nantucket Sound, Harwich.
AU Size:	0.02 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Harwich (MAR041120)

Note: In the upper watershed area the Andrews River flows from Grass Pond to Saquatucket Harbor. While there are no obstructions to fish passage, it is noted that the stream has low flow and no defined channel below Grassy Pond so there is little potential for development (Reback *et al*. 2004).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Saquatucket Harbor by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

No data are available so the *Aquatic Life Use* is not assessed.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~40% of this segment area (SC41.2) is *Prohibited* and ~60% of this segment area (SC41.1) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because this segment area is either *Probihited* or *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"Sampling results would indicate excellent water quality, with a continued year-round required closure to shellfishing in the marina proper area. DMF reports indicate that the marina area is regarded as a potential, but not actual, pollution source. No other potential or actual pollution sources are indicated in the reports, except the 1999 report indicates possible factors from the surrounding marshes and cranberry bogs which drain upland areas."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, and/or stormwater discharges from the municipal stormwater systems.

Saquatucket Harbor (MA96-23)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

BREWSTER LAKES

Walkers Pond (MA96331)

Location:	Brewster
AU Size:	100 Acres
Classification:	B
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients, Noxious aquatic plants, Turbidity).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
There is anadromous fish passage through Stony Brook up eventually into Walkers Pond which supports one of the Commonwealth's most popular herring runs (Reback *et al*. 2004).

Biology
No non-native macrophytes were noted in Walkers Pond during the 21 September 2004 macrophyte and density mapping survey conducted by DWM biologists (Mass DEP 2004). Moderate/dense algal growths were noted during the June, July, and August 2004 sampling events (MassDEP 2004).

Water Chemistry
DO and temperature measurements were recorded at the deep hole in Walkers Pond at 15 minute intervals by an unattended multiprobe meter deployed at a depth of 1.2 meters between 1130 hours on 19 July 2004 and 1700 hours on 20 July 2004 (Haque and Mattson 2009). DO ranged from 7.0 to 8.4 mg/L and temperature from 24.5 to 26.4℃. A depth profile for DO was also made on 25 August 2004. There was no evidence of stratification in this fairly shallow waterbody (maximum depth ~2.5 m). pH was near neutral. Water quality sampling at the deep hole of Walkers Pond was also conducted by DWM personnel (one day each in June, July, and August 2004). Chlorophyll *a* measurements were fairly low 6.8 – 10.1 mg/m^3 in June and July although it should be noted that moderate turbidity and moderate/dense algal growths were noted during the June, July, and August 2004 sampling events (MassDEP 2004). Reportable total phosphorus concentrations ranged from 0.041 to 0.10 mg/L with the highest concentration measured near the bottom. The Secchi disk transparency was highest in July (1.5 m) but was only 1.0m on the August sampling date (Haque and Mattson 2009).

The *Aquatic Life Use* is assessed as impaired for Walkers Pond based on the moderate/dense algal growths and the moderate concentrations of total phosphorus.

Primary and Secondary Contact Recreational and Aesthetics Uses
Moderate turbidity and moderate/dense algal growths were noted during the June, July, and August 2004 sampling events (MassDEP 2004). No other objectionable odors, deposits, macrophyte growths, or scums were noted. The Secchi disk transparency was below the bathing beach guideline (i.e., was <1.2 m) on the August sampling date (1.0 m) but met the guideline on the other two survey dates (Haque and Mattson 2009). Similar problems (the presence of algal mats and blooms and poor Secchi disk transparencies -- as low as 0.8 m) were also documented in the pond in June and September 2009 (MassDEP 2009).

The *Primary* and *Secondary Contact Recreational* and *Aesthetic* uses are assessed as impaired based on the poor Secchi disk transparency and turbidity associated with algal blooms in Walkers Pond.

Walkers Pond (MA96331)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Excess algal growth, total phosphorus Source: Unknown Suspected sources: Internal nutrient recycling
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Poor Secchi disk transparency, excess algal growth Source: Unknown Suspected sources: Internal nutrient recycling
Secondary Contact		IMPAIRED Cause: Poor Secchi disk transparency, excess algal growth Source: Unknown Suspected sources: Internal nutrient recycling
Aesthetics		IMPAIRED Cause: Poor Secchi disk transparency, excess algal growth Source: Unknown Suspected sources: Internal nutrient recycling

Upper Mill Pond (MA96324)

Location:	Brewster
AU Size:	249 Acres
Classification:	B
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients, Organic enrichment/Low DO, Noxious aquatic plants, Turbidity).

NPDES Discharges (Appendix D, Table D2)
Town of Brewster (MAR041096)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
There is anadromous fish passage through Stony Brook up eventually into Upper Mill Pond which supports one of the Commonwealth's most popular herring runs (Reback *et al*. 2004). The connecting stream between Lower and Upper Mill Ponds, however, has a problem with sand deposits which makes fish passage difficult (Reback *et al*. 2004).

Biology
No non-native macrophytes were noted in Walkers Pond during the 20 September 2004 macrophyte and density mapping survey conducted by DWM biologists (Mass DEP 2004).

Water Chemistry
DO and temperature measurements were recorded at the deep hole in Upper Mill Pond at 15 minute intervals by an unattended multiprobe meter deployed at a depth of 1.2 meters between 1200 hours on 19 July 2004 and 1900 hours on 20 July 2004 (Mass DEP 2004). DO ranged from 8.3 to 9.0 mg/L and temperature from 23.9 to 24.9℃ (Haque and Mattson 2009). A depth profile for DO was also made on 25 August 2004. The pond (maximum depth of 8.8 m) was not stratified. The DO concentrations ranged 5.7 to 9.0 mg/L, temperature ranged from 23.0 to 23.7℃ and pH was near neutral (6.8 to 7.3 SU). Water quality sampling at the deep hole of Upper Mill Pond was also conducted by DWM personnel (one day each in June, July, and August 2004). Chlorophyll *a* measurements were low in June and somewhat higher in July (3.0 and 9.7 mg/m^3, respectively). Although the chlorophyll *a* concentration in August was extremely elevated it should be noted that the result was qualified and there were no other indicators of a problem (e.g., visual turbidity, notes of an algal bloom, Secchi disk depth transparency) so this data point is considered anomolous. Slight turbidity and sparse to moderate algal growths were noted during the June, July, and August 2004 sampling events (MassDEP 2004). The total phosphorus concentrations were fairly low (0.017 to 0.058 mg/L) with the one higher concentration measured near the bottom. The Secchi disk transparency measurerments were all good (1.6 to 3.1m) (Haque and Mattson 2009).

The *Aquatic Life Use* is assessed as support for Upper Mill Pond based on the good DO concentrations, lack of any non-native aquatic macrophytes, and the generally good water quality conditions.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beach along the shoreline of Upper Mill Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody. No objectionable turbidity, odors, deposits, macrophyte growths, or algal blooms or scums were noted in Upper Mill Pond during the June, July, and August 2004 sampling events (MassDEP 2004). All of the Secchi disk transparency measurements were good (above the bathing beach guidelines (<1.2 m) in all of the surveys conducted (MassDEP 2004 and MassDEP 2009).

The *Primary Contact Recreational Use* is not assessed for Upper Mill Pond due to the lack of bacteria data. The *Secondary Contact Recreational* and *Aesthetic* uses are assessed as support based on the good Secchi disk transparencies and the lack of any aesthetically objectionable conditions.

Upper Mill Pond (MA96324)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		SUPPORT
Aesthetics		SUPPORT

RECOMMENDATIONS

Outlet retention structures for the connecting stream between Upper and Lower Mill Ponds in Brewster should be redesigned to be more effective in preventing sediments from entering the stream (Reback *et al*. 2004).

Support improvement of freshwater Beaches Bill data quality and reporting.

Lower Mill Pond (MA96188)

Location:	Brewster
AU Size:	44 Acres
Classification:	B
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients, Noxious aquatic plants, Turbidity).

NPDES Discharges (Appendix D, Table D2)
Town of Brewster (MAR041096)

Note: A stormwater mitigation assessment, funded by the MA CZM CPR grant program and the Town of Brewster, was completed in June 2007 and provided an assessment of stormwater pollution entering the Stony Brook Watershed (Stearns & Wheler 2007). The Town of Brewster submitted a proposal to implement stormwater best management practices at the Stony Brook Road Mill Site (Bersin 2008). This contract is currently under development.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
There is anadromous fish passage through Stony Brook up into Upper Mill Pond which supports one of the Commonwealth's most popular herring runs (Reback *et al*. 2004). A series of connected weir-pool fishways and stone baffles allow the fish to surmount a natural elevation change and Lower Mill Pond dam, enabling them to reach the headwater ponds.

Water Chemistry
A depth profile for DO was made at the deep hole in Lower Mill Pond on 7 September 2004 (Haque and Mattson 2009). The pond (maximum depth of 4.0 m) was not stratified. The DO concentrations were good (7.6 to 8.6 mg/L, temperature ranged from 23.1 to 23.4℃ while pH ranged from 7.7 to 8.5 SU. Water quality sampling at the deep hole of Lower Mill Pond was also conducted by DWM personnel (one day each in June, July, and September 2004). Chlorophyll *a* measurements were lowest in June (7.8 mg/m^3) but were elevated (as high as 44.0 mg/m^3) in July and September. The total phosphorus concentrations were fairly low (0.028 to 0.047 mg/L) with slightly higher concentrations measured near the bottom. The Secchi disk transparency measurerments were good in June and September (2.2 and 2.0 m, respectively) but was only 0.9 m in July (below the beach guideline of 1.2 m). Moderate turbidity and dense/very dense algal growths were also noted as being present during the June, July, and September 2004 sampling events (MassDEP 2004). The Secchi disk depth transparencies measured in 2009 were all good (2.2 to 2.4 m) (MassDEP 2009).

The *Aquatic Life Use* is assessed as impaired for Lower Mill Pond based on the indications of enrichment including moderate/dense algal growths and elevated chlorophyll *a* concentrations.

Primary and Secondary Contact Recreational and Aesthetics Uses
Moderate turbidity and dense/very dense algal growths were noted during the June, July, and August 2004 sampling events (MassDEP 2004). No other objectionable odors, deposits, macrophyte growths, or scums were noted. The Secchi disk transparency measurerments were good in June and September (2.2 and 2.0 m, respectively) but transparency was only 0.9 m in July (below the beach guideline of 1.2 m) (Haque and Mattson 2009). Secchi disk transparencies in the pond in 2009 were all good (MassDEP 2009).

The *Primary* and *Secondary Contact Recreational* and *Aesthetic* uses for Lower Mill Pond are assessed as impaired based on dense/very dense algal growths and the poor Secchi disk transparency.

Lower Mill Pond (MA96188)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Excess algal growth, elevated chlorophyll a Source: Unknown
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Excess algal growth, poor Secchi disk transparency Source: Unknown
Secondary Contact		IMPAIRED Cause: Excess algal growth, poor Secchi disk transparency Source: Unknown
Aesthetics		IMPAIRED Cause: Excess algal growth, poor Secchi disk transparency Source: Unknown

RECOMMENDATIONS

Outlet retention structures for the connecting stream between Upper and Lower Mill Ponds in Brewster should be redesigned to be more effective in preventing sediments from entering the stream (Reback *et al*. 2004).

Sheep Pond (MA96289)

Location:	Brewster
AU Size:	138 Acres
Classification:	B
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Metals [12/20/2007NEHgTMDL], Organic enrichment/Low DO).

NPDES Discharges (Appendix D, Table D2)
Town of Brewster (MAR041096)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Water Chemistry
A depth profile for DO was made in the deep hole of Sheep Pond on 9 September 2004 (Haque and Mattson 2009). The pond (maximum depth of 18.3 m) was stratified with DO depletion (i.e., <2.3 mg/L or less) at depths greater than ~14.0 m. In the epilimnion DO concentrations ranged from 5.5 to 8.4 mg/L with maximum saturation of 100% and temperatures between 16.3 and 23.9 ℃. The pH ranged from 6.1 to 7.2 SU. Water quality sampling at the deep hole of Sheep Pond was also conducted by DWM personnel (one day each in June, July, and September 2004). Chlorophyll *a* measurements were extremely low ($\leq$ 2.2 mg/m^3). Total phosphorus concentrations were also extremely low with the highest concentrations measured near the bottom (0.023 mg/L). The Secchi disk transparencies were all excellent (8.5 to 11.8 m) (Haque and Mattson 2009). There was no turbidity or any algal growths noted during any of 2004 sampling events (MassDEP 2004).

The *Aquatic Life Use* is assessed as support for Sheep Pond based on the generally excellent water quality conditions. Although severe oxygen depletion was apparent below about 14 m (~20% of the pond surface area), it is best professional judgement that these conditions are naturally occurring given the lack of any other indicators of enriched conditions. The Secchi disk transparencies were excellent, chlorophyll *a* concentrations were extremely low and there was no evidence of any algal growths.

Fish Consumption Use
Fish were collected from Sheep Pond by the Cape Cod Commission in 2001 (DeCesare and Connors 2002 and Michaud 2008). Species collected included smallmouth bass and white perch. Due to the presence of elevated mercury, MA DPH issued the following advisory (MA DPH 2009c): *"Children under 12 years of age, pregnant women, nursing mothers, and women of childbearing age who may become pregnant should refrain from consuming any fish from Sheep Pond" and "The general public should limit consumption of all fish from Sheep Pond to two meals per month".*

Because of the site-specific fish consumption advisory for Sheep Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Primary and Secondary Contact Recreational and Aesthetics Uses
No aesthetically objectionable conditions (e.g., odors, deposits, growths, scums, turbidity) were noted during the June, July, and September 2004 sampling events in Sheep Pond (MassDEP 2004). It should also be noted that there are several public bathing beaches along the shoreline of Sheep Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no *Primary Contact Recreational Use* assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary Contact Recreational Use* is not assessed for Sheep Pond due to the lack of quality assured bacteria data. The *Secondary Contact Recreational* and *Aesthetic* uses are assessed as support based on the good Secchi disk transparencies and the lack of any aesthetically objectionable conditions.

Sheep Pond (MA96289)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		SUPPORT
Aesthetics		SUPPORT

RECOMMENDATIONS

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Support improvement of freshwater Beaches Bill data quality and reporting.

Taylors Pond (MA96-42)

Location:	Chatham.
AU Size:	0.02 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients [6/21/2006, CN206.0], Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Chatam (MAR041101)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Taylors Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

Biology
According to the MEP project technical report the benthic community in Taylors Pond was “impoverished” (few species and low number of individuals in grab samples) (UMass Dartmouth SMAST and MassDEP 2003 and 2007).

Water Chemistry
According to the MEP project technical report water column nitrogen concentrations in Taylors Pond were enriched over incoming tidal waters, DO depletion to ~4 mg/L was common, and chlorophyll a concentrations were generally between 10 – 15 µg/L (UMass Dartmouth SMAST and MassDEP 2003 and 2007).

The *Aquatic Life Use* is assessed as impaired for Taylors Pond based on the MEP analysis. According to the Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek, Taylors Pond/Mill Creek Total Maximum Daily Load Re-Evalutations for Total Nitrogen (MassDEP 2008b), there is impairment of this waterbody which can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2008b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC45.0) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because all of the segment area is *Conditionally Approved* for shellfish harvesting. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Taylors Pond (MA96-42)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Mill Creek (MA96-41)

Location:	Outlet of Taylors Pond, Chatham to confluence with Cockle Cove, Chatham.
AU Size:	0.03 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients <6/21/2006, CN206.0>, Pathogens). According to the Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek, Taylors Pond/Mill Creek Total Maximum Daily Load Re-Evalutations for Total Nitrogen (MassDEP 2008b), there is impairment in Taylors Pond in this subwatershed which can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2008b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers. The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

DESIGNATED USE ASSESSMENT

Aquatic Life Use

Eelgrass Bed Habitat

Eelgrass surveys and analysis of historical data was conducted for Mill Creek by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

According to the MEP project technical report, "Mill Creek is very shallow with parts becoming emergent at low tide. In addition, Mill Creek functions primarily as a salt marsh a high proportion of the tidal reach being vegetated by *Spartina* grasses" and this system has a low sensitivity to nitrogen inputs (UMass Dartmouth SMAST and MassDEP 2007).

The *Aquatic Life Use* is assessed as support for the Mill Creek tidal salt marsh based on the MEP analysis. Mill Creek has a pollution prevention TMDL.

Shellfish Harvesting Use

The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC44.0) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because all of the segment area is *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"In a DMF shoreline survey, no septic system failures were observed. Six stormwater runoff sites were identified, and stations were set up for future monitoring during rain events (but none of the sites appeared to be dry weather flow problems, or pollution threats). Several stream and creeks were identified, but did not appear to be threats. There are no marinas, and little boating activity in the area. Large numbers of geese and ducks were occasionally observed, particularly in the fall. This area has high water quality, and will continue to be conditionally approved for shellfishing."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, and/or unspecified ruban stormwater.

Primary and Secondary Contact Recreational and Aesthetics Uses

There is a small portion of one public beach, Forest Street Beach in Chatham, at the mouth of Mill Creek. Frequent testing for Enterococci bacteria during the swimming season was conducted at this beach from 2002 – 2007. There was one reported posting in 2003 and one in 2006 and no postings were reported for any other year (MA DPH 2009a).

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for the Mill Creek despite the very low frequency of beach closures at Forest Street Beach in Chatham. Since this beach is at the

very mouth of the segment, it does not spatially represent enough of the segment area to make the assessment decision.

Mill Creek (MA96-41)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, unspecified urban stormwater
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

BUCKS CREEK SYSTEM

Harding Beach Pond (MA96-43)

Location:	Locally known as Sulfur Springs (northeast of Bucks Creek), Chatham.
AU Size:	0.07 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients [6/21/2006, CN206.0], Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Chatam (MAR041101)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Harding Beach Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

Water Chemistry
According to the MEP project technical report Harding Beach Pond (Sulphur Springs) is a shallow basin containing significant macroalgal accumulation, phytoplankton blooms, and high chlorophyll a concentrations (>20 µg/L). Water column nitrogen concentrations were described as high with DO depletion to <3 mg/L (UMass Dartmouth SMAST and MassDEP 2003 and 2007). The report also noted that there are “signs Sulphur Springs is currently transitioning to salt marsh”.

The *Aquatic Life Use* is assessed as impaired for Harding Beach Pond based on the MEP analysis. According to the Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek, Taylors Pond/Mill Creek Total Maximum Daily Load Re-Evalutations for Total Nitrogen (MassDEP 2008b), there is impairment of this waterbody which can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2008b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC46.0) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because all of the segment area is *Conditionally Approved* for shellfish harvesting. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Harding Beach Pond (MA96-43)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Cockle Cove Creek (MA96-79)

Location:	Northeast of the bend in Cockle Drive, Chatham to confluence with Bucks Creek, Chatham (2005 orthophotos used to delineate segment).
AU Size:	0.007 Square Miles
Classification:	SA
2008 303(d) List:	This is a new segment – no prior listing.

It should be noted that segment area is in the Sulphur Springs/Bucks Creek subwatershed. Cockle Cove Creek is the primary recipient of treated wastewater effluent from the Town of Chatham's WWTF, which discharges to the aquifer near the freshwater stream which forms the headwaters of the central salt marsh creek (Howes *et al*. 2006). According to the Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek, Taylors Pond/Mill Creek Total Maximum Daily Load Re-Evalutations for Total Nitrogen (MassDEP 2008b), impairment of both Sulphur Springs and Bucks Creek in this subwatershed system can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2008b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, groundwater discharge (Chatham WWTF), stormwater runoff, and fertilizers. Cockle Cove Creek was determined not to be impaired but has a pollution prevention TMDL.

DESIGNATED USE ASSESSMENT

Aquatic Life Use

Eelgrass Bed Habitat

Eelgrass surveys and analysis of historical data was conducted for Cockle Cove Creek by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

Biology

In August 2005 a special study was conducted by SMAST and MCZM staff in Cockle Cove Creek. The results of the study were summarized as follows (Howes *et al*. 2006):

"The emergent vegetated marsh is healthy and productive

The creek bank vegetation and macroinvertebrates are indicative of a healthy productive New England salt marsh

Macroalgae indicative of nitrogen enrichment (Ulva, filamentous greens) were sparse along the creek banks,

The creek bottom infaunal community was diverse and productive and indicative of a healthy salt marsh creek,

Macroalgae indicative of nitrogen enrichment…were sparse within the creek bottoms, and the drift algae in the lower marsh reach was sparse and appeared to be entering on the flood tide."

According to the MEP project technical report, "Cockle Cove Creek and its associated marsh area are functioning well as a salt march ecosystem" (UMass Dartmouth SMAST and MassDEP 2007).

The *Aquatic Life Use* is assessed as support for the Cockle Cove Creek tidal salt marsh based on the MEP analysis.

Shellfish Harvesting Use

The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that where designated in this segment area (a portion of which is encompassed in SC46.0) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because all of the segment area is *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), "*There was a town of Chatham sponsored project, "Town of Chatham Massachusetts, Bacteria Sources Assessment for a Wetland Dominated Watershed: Guidance Document and Case Study Report", published in 2005. This study concentrated on enterococcus sampling in the Cockle Cove and estuary areas. The study sampled seven sites, four times, along an approximately 1.5 mile length of Cockle Cove Creek in 2005. Enterococci levels ranged from 15 - 7,933 CFU/100 ml, with at least twelve readings exceeding 1,000 CFU/100 ml, concentrated in the upper reaches of the creek in late August 2005 following a 1" rain event. Two other wet weather events showed*

relatively higher readings (range 40- 3,065 CFU/100 ml) than several other dry weather events (range 1- 1,748 CFU/100 ml). Additionally, the Town of Chatham Board of Health monitored two sites (upper reach area) for enterococcus several times each year in Cockle Cove 2001-2004. Readings ranged between 3- 13,950 CFU/100 ml, with at least 3 readings above 7,650 CFU/100 ml. Additionally, the town of Chatham, during 2004, monitored some 20 beaches sites within the Chatham area. The data indicate particularly high levels at two sites in the lower end of Cockle Cove Creek: 1) station B4b, at the Cockle Cove Creek Parking Lot, where levels during June - August 2005 (12 samples) ranged between <2- 1,710, with a geometric mean of 248 CFU/100 ml, and June - August 2006 (21 samples) ranged between <3- 4,067, with a geometric mean of 620 CFU/100 ml; 2) station B4c, Cockle Cove Creek at Ridgevale Bridge, where levels during June- August 2005 (12 samples) ranged between <2- 232, with a geometric mean of 11 CFU/100 ml, and June- August 2006 (26 samples) where levels ranged between <2- 2,240, with a geometric mean of 126 CFU/100 ml. As to prime pollution sources, the study really could not conclude that any principal human factors were the cause(s). Septic systems are strictly controlled by the town of Chatham, and stormwater runoff from roadways, etc., do not seem to be significant factors. It should be noted that there is a wastewater treatment facility (Chatham) in the northern most part of the Cockle Cove drainage area, whose discharge may affect that portion. Natural sources, including wildlife, and accumulation of vegetation and other material along shorelines, are thought to be major contributors. Considerable evidence of wildlife presence was observed in the marshes, including foxes, foxholes, birds, feces and remnants of meals. Animal by-products getting into the marsh areas may be very significant contributors to high bacteria counts according to the study. Of course, the study recommends that the town seriously re-check all currently operating septic systems to insure their proper operation, and check out possible stormwater runoff contributor factors from roadways, to see if these, too, might be bacteria contributors. It should be pointed out that Cockle Cove Creek is adjacent to, and within a couple miles of, the two listed segments above, Mill Creek Segment MA 96-41, and Bucks Creek Segment MA 96-44. Although there is no available data actually within these two segments, the data in Cockle Cove indicates there could be bacteria contamination from there affecting Mill Creek and Bucks Creek, particularly at their lower ends, and in any public beach areas in between these two segments." Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or unspecified urban stormwater.

Primary and Secondary Contact Recreational and Aesthetics Uses

There is one public beach, Cockle Cove Creek Beach, which runs along the southern shoreline of Cockle Cove Creek and a small portion of another public beach, Bucks Creek Beach at the mouth of Cockle Cove Creek. Frequent testing for Enterococci bacteria during the swimming season was conducted at Cockle Cove Creek Beach from 2002 – 2007 (MA DPH 2009a). Cockle Cove Creek Beach was preemptively closed for almost all seasons by the Chatham Board of Health because of consistently elevated indicator levels and the sampling history of the beach. Bucks Creek Beach, samples taken between 2003 and 2007, was reportedly posted for two days in 2004 and 2007 but was posted for the majority (73%) of the 2006 swimming season. No postings were reported for Bucks Creek Beach in 2003 or 2005 swimming seasons.

The *Primary Contact Recreational* use is assessed as impaired for Cockle Cove Creek based primarily on the frequency of beach closures at Cockle Cove Creek Beach in Chatham. The *Secondary Contact Recreational* and *Aesthetics Uses* in Cockle Cove Creek are not assessed due to the absence of data.

Cockle Cove Creek (MA96-79)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, unspecified urban stormwater
Primary Contact		IMPAIRED Cause: Elevated Enterococcus bacteria Source: Unknown
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

(UMass Dartmouth SMAST and MassDEP 2007) "*there are two dynamics we'd recommend watching for: (1) the spread of the large Phragmites stand in the eastern "finger" and (2) the rate and extent of short-form Spartina alterniflora and unvegetated marsh pannes. We would recommend long-term monitoring (surveying) of the plant communities at a frequency of every 2-3 years."*

Bucks Creek (MA96-44)

Location:	Outlet from Harding Beach Pond (locally known as Sulfur Springs), Chatham to confluence with Cockle Cove, Nantucket Sound, Chatham.
AU Size:	0.02 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients [6/21/2006, CN206.0], Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Bucks Creek by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

Water Chemistry
According to the MEP project technical report there was a moderate amout of macroalgae observed in Bucks creek (UMass Dartmouth SMAST and MassDEP 2003 and 2007).

The *Aquatic Life Use* is assessed as impaired for Bucks Creek based on the MEP analysis. According to the Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek, Taylors Pond/Mill Creek Total Maximum Daily Load Re-Evalutations for Total Nitrogen (MassDEP 2008b), there is impairment of this waterbody which can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2008b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC46.0) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because all of the segment area is *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"… Evidence suggests that pollution from the Cockle Creek area is not getting into the Bucks Creek Segment. No other potential sources of pollution are notable with the exception of birds throughout the area. Six additional stations, including the outlet of Cockle Cove, are listed in the report for future DMF follow-up sampling to determine whether or not these cause any pollution effects to the Bucks Creek water body."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is one public beach, Bucks Creek Beach that runs along the shoreline of Bucks Creek. Frequent testing for Enterococci bacteria during the swimming season was conducted at Bucks Creek Beach from 2003 – 2007 (MA DPH 2009a). Bucks Creek Beach was reportedly posted for two days in 2004 and 2007 but was posted for the majority (73%) of the 2006 swimming season. No postings were reported for Bucks Creek Beach in 2003 or 2005 swimming seasons.

The *Primary Contact Recreational* use is assessed as impaired for Bucks Creek based primarily on the frequency of beach closures at Bucks Creek Beach in Chatham. Elevated Enterococci bacteria levels are also problematic in Cockle Cove Creek, a tributary to Bucks Creek. The *Secondary Contact Recreational* and *Aesthetics Uses* in Bucks Creek are not assessed due to the absence of data.

Bucks Creek (MA96-44)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		IMPAIRED Cause: Elevated Enterococcus bacteria Source: Unknown, upstream source
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

STAGE HARBOR SYSTEM

Oyster Pond (MA96-45)

Location:	Including Stetson Cove, Chatham.
AU Size:	0.21 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients [6/21/2006, CN206.0], Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Chatam (MAR041101)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Oyster Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 88 acres (~65% of the segment area) of eelgrass bed habitat present in 1951 throughout the segment but only 14.9 acres (11% of the segment area was found in the pond in 1995. None was found in either 2001 or 2006.

The *Aquatic Life Use* is assessed as impaired for Oyster Pond based on the apparent significant loss of eelgrass bed habitat. According to the Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek, Taylors Pond/Mill Creek Total Maximum Daily Load Re-Evalutations for Total Nitrogen (MassDEP 2008b), there is impairment of this waterbody which can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2008b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that there are two small areas (SC50.3 and SC50.4) encompassed in the segment area (~0.5%) that are *Prohibited*, the majority (~85%) of this segment area (SC50.1) is *Conditionally Approved*, and ~15% of this segment area (SC50.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support for 0.03 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.18 square miles because it is either *Probihited* or *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"DMF conducted a special ambient survey for fecal coliform in the Oyster Pond area on January 29, 2002. Nine stations were sampled once, (including 3 pipe discharges), and the range of the readings were between <10- 690 CFU/100 ml. The highest reading was taken on Blaisdell Creek at the outlet. DMF conducted another survey involving four stations in the same area on January 31, 2002. The range of readings were between <10- 70 CFU/100 ml. Additionally, the DMF conducted a shoreline survey on January 29, 2002. The last shoreline survey conducted was in 1999, where there were a number of possible sources from septic systems. All of those have been fixed. Remaining potential pollution sources are believed to be several large stormwater discharges going into the east end of the pond. These drain from Route 28, and Main St. Mass Highway has plans to fix the problems coming off Route 28, and the town of Chatham supposedly has already undergone engineering projects to eliminate/treat the stormwater components coming off Main St. Additionally, there is widespread runoff occurring at the Oyster Pond Furlong town landing area, going into the "prohibited area" part of the pond. There is also a large culvert draining a freshwater wetlands behind Route 28 that may be a contributing problem. Another problem is a ditch system that originates in a small pond wetland system behind Cross St., which drains into Oyster pond during rain periods. Engineering projects by Chatham are underway to remediate these problems. Wildlife have not been typically observed in very large numbers. There are a number (201 mooring permits) of*

small recreational boats on the pond, many of which have holding tanks for wastes. Boats could be a potential pollution source, although Oyster pond is part of the Stage Harbor Complex "No Discharge Area" which prevents the discharge of untreated or treated boat waste." Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is one public beach, Oyster Pond Beach in Chatham, on the eastern shore of Oyster Pond. Frequent testing for Enterococci bacteria during the swimming season was conducted at this beach from 2003 – 2007. There were no reported postings at this beach for any year (MA DPH 2009a).

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for the Oyster Pond based on the lack of beach closures at Oyster Pond Beach in Chatham. The *Aesthetics Use* in not assessed due to the absence of data.

Oyster Pond (MA96-45)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment), total nitrogen Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, golf courses].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.03 square miles IMPAIRED 0.18 square miles Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Oyster Pond River (MA96-46)

Location:	Outlet of Oyster Pond, Chatham to confluence with Stage Harbor, Chatham.
AU Size:	0.14 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients [6/21/2006, CN206.0], Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

DESIGNATED USE ASSESSMENT

Aquatic Life Use

Eelgrass Bed Habitat

Eelgrass surveys and analysis of historical data was conducted for Oyster Pond River by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 47 acres (~52% of the segment area) of eelgrass bed habitat present in 1951 and an estimated 54.6 acres in 1995 (~61% of the segment area). In 2001 there were an estimated 24.7 acres (~28% of area with the beds primarily in the lower reach of the river) and in 2006 there was an estimated 26.1 acres (~29% of the segment area).

The *Aquatic Life Use* is assessed as impaired for Oyster Pond River based on the apparent loss of eelgrass bed habitat. According to the Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek, Taylors Pond/Mill Creek Total Maximum Daily Load Re-Evalutations for Total Nitrogen (MassDEP 2008b), there is impairment of this waterbody which can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2008b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, and fertilizers.

Shellfish Harvesting Use

The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that there are two small areas (SC49.1 and SC49.2) encompassed in the segment area (both adjacent to marinas) that are *Conditionally Approved*, but the majority (~98%) of this segment area (SC49.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support for 0.137 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.003 square miles because it is *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"Since the counts were for the most part quite low, no pollution sources were mentioned in the DMF data reports."* Since the *Conditionally Approved* areas are adjacent to the marinas it is BPJ these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases.

Primary and Secondary Contact Recreational and Aesthetics Uses

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Oyster Pond River based on the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

Oyster Pond River (MA96-46)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment), total nitrogen Source: Subsurface wastewater disposal (septic) systems, and fertilizers [yard maintenance]
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.137 square miles IMPAIRED 0.003 square miles Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Mill Pond (MA96-52)

Location:	including Little Mill Pond (PALIS # 96174), Chatham.
AU Size:	0.06 Square Miles
Classification:	SA
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [6/21/2006, CN206.0]).

NPDES Discharges (Appendix D, Table D2)
Town of Chatam (MAR041101)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Mill Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 32.8 acres (~81% of the segment area) of eelgrass bed habitat present in 1951 (described as patchy). In 1995 there was an estimate of only 4.5 acres (~11% of the segment area) and in 2001 there was an estimated 0.5 acres (~1% of area). No beds were found in 2006.

The *Aquatic Life Use* is assessed as impaired for Mill Pond based on the apparent loss of eelgrass bed habitat. According to the Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek, Taylors Pond/Mill Creek Total Maximum Daily Load Re-Evalutations for Total Nitrogen (MassDEP 2008b), there is impairment of this waterbody which can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2008b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC51.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support since all of the area is *Approved* for shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Mill Pond based on the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

Mill Pond (MA96-52)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment), total nitrogen Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, golf courses].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Stage Harbor (MA96-11)

Location:	From the outlet of Mill Pond, Chatham (including Mitchell River) to the confluence with Nantucket Sound at a line from the southernmost point of Harding Beach southeast to the Harding Beach Point , Chatham.
AU Size:	0.56 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients [6/21/2006, CN206.0], Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

DESIGNATED USE ASSESSMENT

Aquatic Life Use

Eelgrass Bed Habitat

Eelgrass surveys and analysis of historical data was conducted for Stage Harbor by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 151.5 acres (~42% of the segment area) of eelgrass bed habitat present in 1951 and an estimated 185.7 acres in 1995 (~52% of the segment area). In 2001 there were an estimated 136.4 acres (~38% of the segment area) and in 2006 there was an estimated 129.7 acres (~36% of the segment area). It is noted that the beds were least stable in the Mitchell River area of this segment.

The *Aquatic Life Use* is assessed as support for Stage Harbor based on the fairly stable presence of eelgrass bed habitat throughout the majority of the segment area, an indicator of good water quality conditions. It should be noted that according to the Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek, Taylors Pond/Mill Creek Total Maximum Daily Load Re-Evalutations for Total Nitrogen (MassDEP 2008b), this waterbody can best be protected by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2008b). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, and fertilizers.

Shellfish Harvesting Use

The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that nearly all of this segment area (SC51.0, SC48.0) is *Approved* for shellfish harvesting (MA DFG 2009). There is one small area (SC48.4) that is *Conditionally Approved* (~0.6% of the segment area) adjacent to Stage Harbor Marine.

The *Shellfish Harvesting Use* is assessed as support for 0.557 square miles because it is *Approved* for shellfish harvesting. This use is assessed for a very small area (0.003 square miles representing ~0.6% of the segment area) because it is *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009),*"The DMF collected fecal coliform samples during a sanitary survey (data included in Table 4-10 above) at four to five stations (including 3 discharge pipes), twice, along this segment between August and September 2001. A total of 9 samples were collected. Fecal coliform values ranged from 5 to 1550 CFU/100 ml. Champlain Creek had elevated readings of 265 and 1,550 CFU/100mL. Johnson Creek at the bridge had one reading of 270 CFU/100 ml, and Little Mill Pond Creek had one reading of 265 CFU/100 mL. Elevated readings were just following rainfall of approximately 0.33". Despite a few elevated readings in scattered locations, the analysis of overall results show that this area has continuing excellent water quality. Champlain Creek could be further investigated by the town to see if the high levels continue, and if so, what the cause(s) might be (MDPH 2006)."* Since the *Conditionally Approved* area is adjacent to a marina area it is BPJ this restriction is likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases.

Primary and Secondary Contact Recreational and Aesthetics Uses

Frequent testing for Enterococci bacteria during the swimming seasons was conducted at Hardings Beach in Chatham (a small section of this beach is located along the shoreline at mouth of Stage Harbor) from 2002 – 2007 (MA DPH 2009a). The beach was not reported as posted in any year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Stage Harbor based on the lack of any beach closures at Hardings Beach and the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

Stage Harbor (MA96-11)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.557 square miles IMPAIRED 0.003 square miles Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

CHATHAM HARBOR SYSTEM (PLEASANT BAY / LITTLE PLEASANT BAY)
PLEASANT BAY SYSTEM

Quanset Pond (MA96-74)

Location:	Orleans.
AU Size:	0.02 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [10/24/2007, CN244.0]).

NPDES Discharges (Appendix D, Table D2)
Town of Orleans (MAR041146)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Quanset Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

Biology
According to the MEP project technical report the benthic community in Quanset Pond supported significantly depleted benthic animal populations (few species and low number of individuals in grab samples) (UMass Dartmouth SMAST and MassDEP 2006a).

Water Chemistry
According to the MEP project technical report Quanset Pond exhibited frequent hypoxia (DO depletion) and the average chlorophyll *a* concentration was 8.88 µg/L (UMass Dartmouth SMAST and MassDEP 2006a).

The *Aquatic Life Use* is assessed as impaired for Quanset Pond based on the MEP analysis. According to the Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC60.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support since all of the segment area is *Approved* for shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
Frequent testing for Enterococci bacteria during the swimming seasons was conducted at the Quanset Harbor Club Association Beach in Orleans located along the shoreline of this segment from 2002 – 2007 (MA DPH 2009a). The beach was reported as posted once in 2006 and no other postings were reported in any other year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Quanset Pond based on the general lack of beach closures at Quanset Harbor Club Association Beach and the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

Quanset Pond (MA96-74)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Round Cove (MA96-75)

Location:	Harwich.
AU Size:	0.02 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [10/24/2007, CN244.0]).

NPDES Discharges (Appendix D, Table D2)
Town of Harwich (MAR041120)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Round Cove by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). No eelgrass bed habitat occurs in this segment area.

Biology
According to the MEP project technical report the benthic community in Round Cove, summarized as being significantly impaired, was found to be dominated by intermediate stress indicator species (UMass Dartmouth SMAST and MassDEP 2006a).

Water Chemistry
According to the MEP project technical report Round Cove DO concentrations were generally >5.0 mg/L and the average chlorophyll *a* concentration was 10.31 µg/L (UMass Dartmouth SMAST and MassDEP 2006a).

The *Aquatic Life Use* is assessed as impaired for Round Cove based on the MEP analysis. According to the Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC59.0) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired since all of the segment area is *Conditionally Approved* for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Round Cove. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Frequent testing for Enterococci bacteria during the swimming seasons was conducted at the Round Cove Beach in Harwich located along the shoreline of this segment only in 2002 - 2003 (MA DPH 2009a). The beach was not reported as posted in either year, however more recent testing has not been conducted.

The *Primary* and *Secondary Contact Recreational* and *Aesthetic* uses are not assessed as for Round Cove based on the general lack of recent data.

Round Cove (MA96-75)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Goose Pond (MA96106)

Location:	Chatham
AU Size:	35 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

WMA Withdrawal (Appendix C)
RAYMOND D MURPHY (registration 42205502)

NPDES Discharges (Appendix D, Table D2)
Town of Chatham (MAR041101)

DESIGNATED USE ASSESSMENT
Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beach along the shoreline of Goose Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Goose Pond.

Goose Pond (MA96106)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Muddy Creek (MA96-51)

Location:	Source south of Countryside Drive and north-northeast of Old Queen Anne Road, Chatham to mouth at Pleasant Bay, Harwich/Chatham, including Upper and Lower reaches.
AU Size:	0.05 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [10/24/2007, CN244.0], Pathogens [4/28/2005, CN207.0]).

NPDES Discharges (Appendix D, Table D2)
Town of Chatham (MAR041101)
Town of Harwich (MAR041120)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
This creek formerly flowed through a tide gate which has been removed so there are no longer any obstructions to anadromous fish passage (Reback *et al*. 2004).

Biology
According to the MEP project technical report the benthic community in upper Muddy Creek was described as having a significantly depleted benthic animal population, and in lower Muddy Creek was significantly impaired (UMass Dartmouth SMAST and MassDEP 2006a).

Water Chemistry
According to the MEP project technical report Muddy Creek the DO concentrations in Muddy Creek were frequently <4.0 mg/L and upper Muddy Creek exhibited frequent anoxia. The average chlorophyll *a* concentration reported was 15.23 µg/L (UMass Dartmouth SMAST and MassDEP 2006a).

The *Aquatic Life Use* is assessed as impaired for Muddy Creek based on the MEP analysis. According to the Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that there is a small area (SC58.1) at the mouth of this segment that is *Conditionally Approved* (~3%), but the the majority (~97%) of this segment area (SC58.2) is *Prohibited* for shellfish harvesting (MA DFG 2009). A TMDL for pathogens was completed and approved for Muddy Creek (Samimy *et al*. 2005).

The *Shellfish Harvesting Use* is assessed as impaired because the segment area is either *Probihited* or *Conditionally Approved* for shellfish harvesting. According to the TMDL (Samimy *et al*. 2005), "*further focused investigations be undertaken in the most contaminated sections of Muddy Creek. Runoff from Route 28, a storm drain off Sugar Hill Road as well as other local roads, diffuse runoff from the Chatham Town Landing, and inputs from the wetlands at the head of the Creek are areas that should be investigated further. Waterfowl could be a significant source of bacterial contamination here in the summer, particularly cormorants roosting in the upper basin. Bacterial contamination attributable to wildlife is considered a natural condition that cannot be managed unless some form of human inducement such as feeding or improper trash disposal is causing the congregation*." Based on the pathogen TMDL (Samimy *et al*. 2005) these restrictions are likely due to elevated fecal coliform bacteria counts associated waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Muddy Creek (MA96-51)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Schoolhouse Pond (MA96281)

Location:	Chatham
AU Size:	20 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

DESIGNATED USE ASSESSMENT
Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beach along the shoreline of Schoolhouse Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Schoolhouse Pond.

Schoolhouse Pond (MA96281)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Lovers Lake (MA96186)

Location:	Chatham.
AU Size:	37 Acres
Classification:	B\WWF
2008 303(d) List:	This is a new segment – no prior listing.

NPDES Discharges (Appendix D, Table D2)
Town of Chatham (MAR041101)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
There is anadromous fish passage into Lovers Lake by means of a 60 foot length notched weir-pool fishway that allows fish to enter the culvert below the lake and a wooden vertical slot fishway that enables fish to overcome the outlet control structure (Reback *et al*. 2004).

Water Chemistry
Although not enough quality assurance information is available to make a use impairment decision it should be noted that low dissolved oxygen levels are reported to occur in the hypolimnion of Lovers Lake representing ~35 % of the lake area (Mitchell 2008 and McVoy 2009a). According to Mitchell (2008): *"The current trophic state of Lovers Lake is eutrophic, based on the high levels of nutrients, early and pervasive anoxia in the hypolimnion, low summer SDT transparency, and evidence of internal recycling. The average phosphorus levels at the surface stations in summer 2007 (32-38 ug/L) are above the CCC criterion for impacted lakes, as well as most generally acceptable trophic classification of eutrophic (i.e., >25 ug/L) (Wetzel, 2001; CCC; 2003). These levels are consistent with the historic phosphorus data (Table 2-4). Although chlorophyll was not monitored in 2007, historic chlorophyll levels were elevated (>25 ug/L). In addition, based on photographs taken in 2005, a dense blue-green algal bloom occurred in Lovers Lake. The historic SDT record shows that transparency is limited to a less than a meter in summer observations, as is consistent with 2007 data…The persistence of low SDT values into the fall, accompanied by observations of brownish-green or tea-colored water…suggests that phytoplankton blooms (possibly dinoflagellates or chrysophytes) are still occurring. These observations, taken together with the large sediment oxygen demand and seasonal hypoxia and elevated phosphorus in deep waters, clearly indicate that Lovers Lake is eutrophic."*

The *Aquatic Life Use* is not assessed for Lovers Lake since not enough quality assured data are available. This use is identified with an Alert Status however because of low dissolved oxygen concentrations in the hypolimnion.

Primary and Secondary Contact Recreational and Aesthetics Uses
Secchi disk transparency measurements were taken in Lovers Lake between May and November 2007. Transparency was poor (i.e., <1.2 m) throughout August and early September and again in early October; (four of 12 measurements during primary contact recreational season) (Mitchell 2008). "*The seasonal pattern shows that SDT depth is between 4 and 6 m during late spring and early summer with a seasonal maximum of nearly 7 m on 5/23/07. During July and August, the SDT declines markedly with a minimum value of 0.5 m in early August. This is the same period when the DO pattern suggests the influence of high levels of phytoplankton. The SDT depth still stays relatively shallow during the fall which suggests that concentration of suspended material (algae or senescing organic material) in the water is still high. The SDT results from the 2007 surveys were compared to those seen during the PALS monitoring (2001- 2006) displayed in Figure 2-6. The maximum values in 2007 were deeper than those previously observed, but there is still a progressive decreased in SDT value with season and the lowest values (<0.5 m) are similar. It is interesting to note that the SDT at the northern basin of Lovers Lake averages 5.0 m before mid-July (when flashboards are reinstalled) and 1.6 m from mid-July to November turnover."*

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are assessed as impaired for Lovers Lake based on poor Secchi disk transparency.

Lovers Lake (MA96186)

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Poor Secchi disk transparency Source: Unknown
Secondary Contact		IMPAIRED Cause: Poor Secchi disk transparency Source: Unknown
Aesthetics		IMPAIRED Cause: Poor Secchi disk transparency Source: Unknown

* Alert Status issues identified, see details in use assessment

Stillwater Pond (MA96309)

Location:	Chatham
AU Size:	18 Acres
Classification:	B\WWF
2008 303(d) List:	This is a new segment – no prior listing.

NPDES Discharges (Appendix D, Table D2)
Town of Chatham (MAR041101)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
There is anadromous fish passage into Stillwater Pond by means of a wooden vertical slot fishway that allows herring to enter the unnamed tributary over a wide range of tidal conditions and a second fishway overcomes an elevation change and control structure at Stillwater Pond. The 147 feet of two foot diameter corrugated plastic pipe has been fitted internally with wooden notched baffles and appears to function adequately for passage over low gradient elevation changes (Reback *et al*. 2004).

Water Chemistry
Although not enough quality assurance information is available to make a use impairment decision it should be noted that low dissolved oxygen levels are reported to occur in the hypolimnion of Stillwater Pond representing ~ 52% of the lake area (Mitchell 2008 and McVoy 2009a). According to Mitchell (2008): *"The current trophic state of Stillwater Pond is eutrophic, based on the high levels of nutrients, early and pervasive anoxia in the hypolimnion, low summer SDT transparency, and evidence of internal recycling. The average phosphorus levels at the surface stations in summer 2007 (40-43 ug/L) are above the CCC criterion for impacted lakes, as well as most generally acceptable trophic classification of eutrophic (i.e., >25 ug/L) (Wetzel, 2001; CCC, 2003). These levels show with some increase from the historic phosphorus data (Table 2-5; Appendix A). It is possible that the rerouting of water from Lovers Lake that used to outlet to Frost Fish Creek has increased the amount of phosphorus being delivered to the pond. Although chlorophyll was not monitored in 2007, historic chlorophyll levels were elevated (>25 ug/L). SDT transparency is limited to a less than a meter in late summer observations similar to previous monitoring years (Table 3-3; Appendix A). These observations, taken together with the large sediment oxygen demand and seasonal hypoxia and elevated phosphorus in deep waters, clearly indicate that Stillwater Pond is eutrophic."*

The *Aquatic Life Use* is not assessed for Stillwater Pond since not enough quality assured data are available. This use is identified with an Alert Status however because of low dissolved oxygen concentrations in the hypolimnion.

Primary and Secondary Contact Recreational and Aesthetics Uses
Secchi disk transparency measurements were taken in Stillwater Pond between May and November 2007. Transparency was poor (i.e., <1.2 m) throughout August and mid September through early October; (four of 12 measurements during primary contact recreational season) (Mitchell 2008). "*The seasonal pattern shows that SDT depth is generally much shallower than for Lovers Lake and that it did not exceed 3 m at any time during the sampling period. The average value through early July was 2.5 m. From that period on until late turnover in December it averaged 1.3 m and generally did not meet the MA visibility criterion."*

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are assessed as impaired for Stillwater Pond based on poor Secchi disk transparency.

Stillwater Pond (MA96309)

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Poor Secchi disk transparency Source: Unknown
Secondary Contact		IMPAIRED Cause: Poor Secchi disk transparency Source: Unknown
Aesthetics		IMPAIRED Cause: Poor Secchi disk transparency Source: Unknown

* Alert Status issues identified, see details in use assessment

Frost Fish Creek (MA96-49)

Location:	Outlet from cranberry bog northwest of Stony Hill Road, Chatham to confluence with Ryder Cove, Chatham.
AU Size:	0.01 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [10/24/2007, CN244.0], Pathogens [4/28/2005, CN207.0]).

NPDES Discharges (Appendix D, Table D2)
Town of Chatham (MAR041101)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al*. (2004), there are no longer any obstructions to anadromous fish passage along Frost Fish Creek.

Biology
According to the MEP project technical report the benthic community in Frost Fish Creek was significantly impaired (few species and low numbers) (UMass Dartmouth SMAST and MassDEP 2006a).

The *Aquatic Life Use* is assessed as impaired for Muddy Creek based on the MEP analysis. According to the Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates all of this segment area (SC57.0) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because all of the segment area is Probihited for shellfish harvesting. According to the bacteria TMDL (MassDEP 2005), "*it is likely that sources of bacterial contamination to Frost Fish Creek include adjacent wetlands and runoff from the Route 28 culvert. Wildlife could make a substantial contribution to the contamination. Most of the land surrounding the inner basin of upper Frost Fish Creek is conservation or public land and wetlands. It is unlikely that contaminant levels in the inner basin result from anthropogenic activities. In addition bacteria levels remain high (although lower than summer levels) during the winter suggesting that wildlife are using the basin year round. Bacterial testing relative to targeting waterfowl as a potential source of contamination should consider analytical test to differentiate anthropogenic versus non-anthropogenic sources of bacterial contamination for definitive proof that waterfowl are the source. The information provided from this type of sampling will be useful in identifying appropriate measures to remediate the bacterial contamination…Additionally an investigation should be undertaken to determine if septic systems are a problem in residential areas and if there are any contributing bacteria sources around the Chatham Middle and High Schools*. Based on the pathogen TMDL (MassDEP 2005) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Frost Fish Creek (MA96-49)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, discharges from municipal separate storm sewer systems
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

According to the pathogen TMDL for Frost Fish Creek (MassDEP 2005) "*further focused sampling will help to better define the nature and magnitude of the sources. In order to determine the impact from wildlife, bacterial testing to differentiate between anthropogenic and non-anthropogenic sources should be considered. The information provided from this type of sampling will be useful in identifying what measures, if any, would be appropriate to remediate the bacterial contamination. Additionally an investigation should be undertaken to determine if septic systems are a problem in residential areas and if there are any contributing bacteria sources around the Chatham Middle and High Schools.*"

Ryder Cove (MA96-50)

Location:	Chatham.
AU Size:	0.19 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients [10/24/2007, CN244.0], Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Chatham (MAR041101)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Ryder Cove by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 76.3 acres (~64% of the segment area) of eelgrass bed habitat present in 1951 and an estimated 58.6 acres in 1995 (~49% of the segment area). In 2001 there were an estimated 34.4 acres (~29% of the segment area) and in 2006 there was an estimated 28.9 acres (~24% of the segment area).

The *Aquatic Life Use* is assessed as impaired for Ryder Cove based on the apparent loss of eelgrass bed habitat in the segment area. It should be noted that according to the Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that the majority (~92%) of this segment area (SC56.0) is *Approved* for shellfish harvesting. There is a small area (SC56.2) near the Ryders Cove boatyard that is *Conditionally Approved* (<2%), and two other areas (portion of SC57.0 “Frostfish Cove” and all of SC56.3) that are *Prohibited*for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support for 0.17 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.02 square miles because it is either *Prohibited* or *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009*),”From sanitary surveys, most potential pollution sources are small in scope and do not have any adverse impact on the resource area. The biggest impact could be the Ryder’s Cove town landing and adjacent marina, however, that area is automatically seasonally closed for shellfishing because of marina usage. It should be pointed out that quite a few of the seasonally closed areas to shellfishing on the Cape involve marina areas, which DMF automatically designates as seasonally closed to insure protection of the public health. According to DMF, Ryder’s Cove has excellent water quality conditions overall.”* Since the *Conditionally Approved* area is adjacent the marina area and the *Prohibited* area is in the cove downstream from Frost Fish Creek it is BPJ these restriction are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases and upstream source(s) in Frost Fish Creek.

Ryder Cove (MA96-50)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment), total nitrogen Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.17 square miles IMPAIRED 0.02 square miles Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, upstream source(s)
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Crows Pond (MA96-47)

Location:	To Bassing Harbor, Chatham.
AU Size:	0.19 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [10/24/2007, CN244.0]).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Crows Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 101.2 acres (~82% of the segment area) of eelgrass bed habitat present in 1951 and an estimated 27.9 acres in 1995 (~23% of the segment area). In 2001 there were an estimated 25.3 acres (~21% of the segment area) and in 2006 there was an estimated 98.7 acres (~80% of the segment area).

The *Aquatic Life Use* is assessed as support for Crows Pond based on the presence of eelgrass bed habitat in the segment area, an indicator of good water quality conditions. It should be noted that according to the Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen, this waterbody can best be protected by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that almost all of this segment area (SC55.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because all of the segment area is *Approved* for shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
Although there is one public beach, Fox Hill Beach, and one semi-public beach, Harbor Cove Beach, no reporting of testing for bacteria during the swimming seasons at either location has been reported (MA DPH 2009a).

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Crows Pond based on *Approved* status of the shellfishing area. The *Aesthetics Use* in not assessed due to the absence of data.

Crows Pond (MA96-47)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Bassing Harbor (MA96-48)

Location:	Excluding Crows Pond and Ryder Cove, Chatham.
AU Size:	0.13 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 2

This segment is on the 2008 Integrated List of Waters in Category 2 - Attaining Some Uses (Shellfishing, Primary Contact, Secondary Contact); Others Not Assessed.

NPDES Discharges (Appendix D, Table D2)
Town of Chatham (MAR041101)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Bassing Harbor by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 67.4 acres (~79% of the segment area) of eelgrass bed habitat present in 1951 and an estimated 64.4 acres in 1995 (~75% of the segment area). In 2001 there were an estimated 53.3 acres (~62% of the segment area) and in 2006 there was an estimated 60.9 acres (~71% of the segment area).

The *Aquatic Life Use* is assessed as support for Bassing Harbor based on the fairly stable presence of eelgrass bed habitat in the segment area, an indicator of good water quality conditions. It should be noted that According to the Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC54.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because all of the segment area is *Approved* for shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Bassing Harbor based on *Approved* status of the shellfishing area. The *Aesthetics Use* in not assessed due to the absence of data.

Bassing Harbor (MA96-48)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Pleasant Bay (MA96-77)

Location:	The waters between the mouth of Muddy Creek, Harwich and imaginary lines drawn from the northeastern edge of Orleans (near The Horseshoe), southeasterly to the northeastern tip of Sipson Island, then continuing to and around the northeastern border of Sipson Meadow, Orleans then south to the northern tip of Strong Island, Chatham and from the southeastern tip of Strong Island to Allen Point, Chatham (excluding the delineated segments; Bassing Harbor, Round Cove and Quanset Pond).
AU Size:	2.88 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [10/24/2007, CN244.0]).

NPDES Discharges (Appendix D, Table D2)
Town of Brewster (MAR041096)
Town of Chatham (MAR041101)
Town of Harwich (MAR041120)
Town of Orleans (MAR041146)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Pleasant Bay by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 543.7 acres (~30% of the segment area) of eelgrass bed habitat present in 1951 and an estimated 403 acres in 1995 (~22% of the segment area). In 2001 there were an estimated 392.4 acres (~21% of the segment area) and in 2006 there was an estimated 291.7 acres (~16% of the segment area).

Biology
According to the MEP project technical report the benthic community in Pleasant Bay was "indicative of moderate levels of stress from organic matter loading and oxygen depletion…the pattern was for a decrease in habitat quality moving from the marginal to depths…pattern is typical of a system near, but beyond its nitrogen loading limit…" (UMass Dartmouth SMAST and MassDEP 2006a).

Water Chemistry
According to the MEP project technical report the DO concentrations in Pleasant Bay were generally good although there were infrequent low oxygen events. The average chlorophyll *a* concentration reported for Pleasant Bay was 5.84 µg/L (UMass Dartmouth SMAST and MassDEP 2006a).

The *Aquatic Life Use* is assessed as impaired for Pleasant Bay based on the MEP analysis. It should be noted that according to the Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC53.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because all of the segment area is *Approved* for shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
Pleasant Bay is heavily used for water-based recreation with six public/semi-public beaches. Frequent testing for Enterococci bacteria during the swimming season was conducted at these beaches from 2002 – 2007 (MA DPH 2009a). Closure data for individual Pleasant Bay beaches are summarized below:
Pleasant Bay Beach in Orleans: Was posted for two days in 2003 and one day in 2004 and no postings were reported in any other year.
Little Inn at Pleasant Bay Beach in Orleans: No postings were reported in any year.
Wequasett Inn Resort Beach in Harwich: Was posted one day in 2007 and no postings were reported in any other year.
Pleasant Bay Beach in Harwich: Was posted one day in 2003 and no postings were reported in any other year.
Jacknife Harbor Beach in Chatham: No postings were reported in any year.
Scatteree Beach in Chatham: No postings were reported in any year (2003-2007).

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Pleasant Bay based on the very low frequency of beach closures at Pleasant Bay, Little Inn at Pleasant Bay, Wequasett Inn Resort, Pleasant Bay, Jacknife Harbor and Scatteree beaches in Orleans, Harwich, and Chatham and the *Approved* status of the shellfish areas. The *Aesthetics Use* in not assessed due to the absence of data.

Pleasant Bay (MA96-77)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture, golf courses].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

LITTLE PLEASANT BAY SYSTEM

Cliff Pond (MA96039)

Location:	Brewster
AU Size:	191 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

DESIGNATED USE ASSESSMENT

Fish Consumption Use

Fish from Cliff Pond were collected and analyzed in 2001 as part of the Cape Cod Commission study (Michaud 2008). Species collected included largemouth bass, smallmouth bass, and yellow perch. Although mercury was highly elevated in the individual largemouth bass sample, MA DPH does not typically issue advisories based on individual fish samples. Fish from Cliff Pond were also collected by MassDEP biologists in May 2009 (Maietta *et al.* 2010). Mercury concentrations in composite samples of smallmouth bass, brown bullhead, yellow perch, and white sucker were all below the MA DPH trigger level of 0.5 mg/kg (Appendix B, Table B10).

Since no site-specific fish consumption advisory was issued by the MA DPH, the *Fish Consumption Use* is not assessed for Cliff Pond.

Primary and Secondary Contact Recreational and Aesthetics Uses

There are several public bathing beaches along the shoreline of Cliff Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody. It should be noted, however, that there was a cyanobacteria bloom that occurred in Cliff Pond in 2009 which is of concern.

Too limited data are available so the *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed. These uses are identified with an Alert Status however because of the cyanobacteria bloom which occurred in the pond in 2009.

Cliff Pond (MA96039)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED*
Secondary Contact		NOT ASSESSED*
Aesthetics		NOT ASSESSED*

* Alert Status issues identified, see details in use assessment.

RECOMMENDATIONS

Support improvement of freshwater Beaches Bill data quality and reporting.

Continue to obtain information regarding any cyanobacteria bloom(s) (extent, frequency, duration) in Cliff Pond to better evaluate the status of the *Recreational* and *Aesthetics* uses.

Baker Pond (MA96008)

Location:	Orleans/Brewster
AU Size:	26 Acres
Classification:	B
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

NPDES Discharges (Appendix D, Table D2)
Town of Orleans (MAR041146)

The immediate shoreline of this kettle pond is largely undeveloped although there are scattered residences within its watershed. Aside from the low-density residential areas, land use is predominantly forested. There is a small access area with limited parking which can accommodate small trailerable boats, canoes and/or kayaks located on the easternmost corner of the pond. The area is managed by the Massachusetts Department of Fish and Game (MDFG) Office of Fishing and Boating Access (OFBA).

DESIGNATED USE ASSESSMENT
Fish Consumption Use
In June 2007 fish were collected from Baker Pond and edible fillets of largemouth bass (*Micropterus salmoides*), pumpkinseed (*Lepomis gibbosus*), yellow perch (*Perca flavescens*), and brown bullhead (*Ameiurus nebulosus*) were analyzed for mercury (Maietta *et al*. 2008 and Appendix B, Table B3). Due to the presence of elevated mercury, MA DPH issued the following advisory (MA DPH 2009c): "*Children younger than 12 years of age, pregnant women, women of childbearing age who may become pregnant and nursing mothers should not eat any yellow perch from Baker Pond. The advisory also recommends that: the general public should limit consumption of yellow perch from Baker Pond to two meals per month."*

Because of the site-specific fish consumption advisory for Baker Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Primary and Secondary Contact Recreational and Aesthetics Uses
None of the Secchi disk transparency measurements taken in Baker Pond between 2001 and 2005 (n=25) were <1.2 m (Eichner *et al*., 2007).

Too limited data are available so the *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed.

Baker Pond (MA96008)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Crystal Lake (MA96050)

Location:	Orleans
AU Size:	33 Acres
Classification:	B\WWF
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Organic enrichment/Low DO).

NPDES Discharges (Appendix D, Table D2)
Town of Orleans (MAR041146)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Water Chemistry
A depth profile for DO was made at the deep hole in Crytal Lake on 7 September 2004. There was evidence of stratification with DO depletion (i.e., <0.7 mg/L or less) at depth greater than 5.0 m. The maximum temperature was 23.2℃ and pH was low ranging from 5.7 (measure d in the 6 to 7 m depth) – 6.5 SU. Water quality sampling at the deep hole of Crystal Lake was also conducted by DWM personnel (one day each in June, July, and September 2004). Chlorophyll *a* measurements were lowranging from 1.4 – 3.6 mg/m^3 on the three sampling dates. Reportable total phosphorus concentrations ranged from 0.006 to 0.17 mg/L with the highest concentrations in the near bottom samples. The Secchi disk transparency was excellent ranging from 5.0 to 7.2 m.

The *Aquatic Life Use* is assessed as impaired for Crystal Lake based on the severe oxygen depletion that occured below about 5.0 m representing approximately half of the lake's surface area. Higher total phosphorus values in the samples taken near the bottom of the water column are a sign of release from the sediments and an internal source of nutrients to the lake.

Fish Consumption Use
In June 2007 fish were collected from Crystal Lake as part of the MassDEP ORS Mercury Research Project and edible fillets of 15 individual largemouth bass (*Micropterus salmoides*) were analyzed for mercury. A summary of the fish toxics monitoring data for Crystal Lake can be found in Appendix B (Table B7) (MassDEP 2008e).

There is no site-specific fish consumption advisory for Crystal Lake so the *Fish Consumption Use* is not assessed.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beach along the shoreline of Crystal Lake. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no *Primary Contact Recreational Use* assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody. There were no objectionable odors, deposits, growths (algae or macrophytes), or any conditions observed by DWM personnel in the lake during the three sampline events (one day each in June, July, and September 2004) (Mass DEP 2004). Secchi disk transparency measurements were all excellent (ranging from from 5.0 to 7.2 m. None of the Secchi disk transparency measurements taken in Crystal Lake between 2001 and 2005 (n=25) were <1.2 m (Eichner *et al*., 2007).

The *Secondary Contact Recreational* and *Aesthetic Uses* are assessed as support for Crystal Lake based on the excellent Secchi disk transparency and the lack of any objectionable conditions. The *Primary Contact Recreational Use* is not assessed due to the lack of any quality assured bacteria data.

Crystal Lake (MA96050)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause(s): Low dissolved oxygen Source(s): Internal nutrient recycling
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		SUPPORT
Aesthetics		SUPPORT

RECOMMENDATIONS

Support improvement of freshwater Beaches Bill data quality and reporting.

Pilgrim Lake (MA96246)

Location:	Orleans
AU Size:	38 Acres
Classification:	B\WWF
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

NPDES Discharges (Appendix D, Table D2)
Town of Orleans (MAR041146)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al*. (2004), there are two fishways that provide passage to Pilgrim Lake. The first, which overcomes an elevation change, is a concrete notched weir-pool structure which was functional but in a state of deterioration. The second, a concrete and wood weir-pool design was described as passable with proper flow regulation.

Too limited data are available so the *Aquatic Life Use* is not assessed. This use is identified with an Alert Status however because of the deteriorating fish passage structure.

Fish Consumption Use
In June 2007 fish were collected from Pilgrim Lake and edible fillets of largemouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), white perch (*Morone Americana)*, and pumpkinseed (*Lepomis gibbosus)* were analyzed for mercury (Maietta *et al*. 2008 and Appendix B, Table B3) (MassDEP 2008e). Mercury concentrations were below the MA DPH trigger level in all four fish samples analyzed.

No site-specific fish consumption advisory was issued for Pilgrim Lake, so the *Fish Consumption Use* is not assessed.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beach along the southern shoreline of Pilgrim Lake. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

None of the Secchi disk transparency measurements taken in Pilgrim Lake between 2001 and 2005 (n=17) were <1.2 m (Eichner *et al*., 2007).

Too limited data are available so the *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed.

Pilgrim Lake (MA96246)

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Replacement of the deteriorating concrete notched weir-pool structure (Reback *et al*. 2004).

Support improvement of freshwater Beaches Bill data quality and reporting.

Areys Pond (MA96-70)

Location:	Orleans.
AU Size:	0.02 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [10/24/2007, CN244.0]).

NPDES Discharges (Appendix D, Table D2)
Town of Orleans (MAR041146)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Areys Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 0.5 acres (~4.3% of the segment area) of eelgrass bed habitat present in 1951 however the confidence in the data were described as low. No eelgrass bed habitat has since been identified in this segment.

Biology
According to the MEP project technical report the benthic community in Areys Pond was significantly depleted (UMass Dartmouth SMAST and MassDEP 2006a).

Water Chemistry
According to the MEP project technical report Areys Pond exhibited frequent anoxia. The average chlorophyll *a* concentration reported was 12.49 µg/L (UMass Dartmouth SMAST and MassDEP 2006a).

The *Aquatic Life Use* is assessed as impaired for Areys Pond based on the MEP analysis. According to the Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (encompassed in area SC63.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because all of the segment area is *Approved* for shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Areys Pond based on *Approved* status of the shellfishing area. The *Aesthetics Use* in not assessed due to the absence of data.

Areys Pond (MA96-70)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Namequoit River (MA96-71)

Location:	Headwaters, outlet Areys Pond, Orleans to confluence with The River, Orleans.
AU Size:	0.06 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [10/24/2007, CN244.0]).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Namequoit River by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 3.1 acres (~8% of the segment area) of eelgrass bed habitat present in 1951 however only 0.3 acres were described as having high confidence and this area was associated with the bed at the mouth of this segment. In 1995 there was an estimated 1.0 acres of eelgrass bed habitat (~2.7% of segment) but none was found in 2001 or 2006.

The *Aquatic Life Use* is assessed as impaired for the Namequoit River based on the apparent loss of eelgrass bed habitat. According to the Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (encompassed in area SC63.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because all of the segment area is *Approved* for shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Namequoit River based on *Approved* status of the shellfishing area. The *Aesthetics Use* in not assessed due to the absence of data.

Namequoit River (MA96-71)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment), total nitrogen Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater], and fertilizers [yard maintenance, agriculture].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

The River (MA96-76)

Location:	The water landward of an imaginary line drawn between Old Field Point and Namequoit Point including Meetinghouse Pond, and Kescayo Gansett Pond locally known as "Lonnies Pond", Orleans (excluding the delineated segments; Namequoit River and Areys Pond).
AU Size:	0.42 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [10/24/2007, CN244.0]).

NPDES Discharges (Appendix D, Table D2)
Town of Orleans (MAR041146)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for The River by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 65.4 acres (~25% of the segment area) of eelgrass bed habitat present in 1951 (51.6 acres were described as having high confidence). In 1995 this area was estimated to have 35.5 acres (~13%), and in 2001 there were approximately 21.6 acres (~8%) of eelgrass bed habitat available. In 2006 there were 10.7 acres (~4.0% of segment area) of eelgrass beds.

The *Aquatic Life Use* is assessed as impaired for The River based on the apparent significant loss of eelgrass bed habitat. According to the Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that almost all of this segment area (99.7% of segment area is encompassed in shellfish area SC63.0) is *Approved* for shellfish harvesting (MA DFG 2009). There is a very small area (SC63.4) which is *Conditionally Approved* for shellfish harvesting (~0.3% of segment area) in the vicinity of the Nauset Marine docks.

The *Shellfish Harvesting Use* is assessed as support for 0.418 square miles of the segment area which is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.002 square miles because it is *Conditionally Approved* for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for The River. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with with illicit marina/boating pumpout releases waterfowl, pet waste, on-site (septic) systems and stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Frequent testing for Enterococci bacteria during the swimming seasons was conducted at two public beaches, Kents Beach and Meeting House Pond Beach, in Orleans along shoreline of this segment from 2002 – 2007 (MA DPH 2009a). Kent's Beach was reported as posted for three days in 2002 and one day in 2003. No other postings were reported in any other year. Meeting House Pond Beach had no reported postings in any year. There is also one semi-public beach, Jack Knife Point Beach, that was sampled only in 2005 and no postings were reported in that year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for The River based on the general lack of beach closures at Kents, Meeting House Pond, and Jack Knife Point beaches and the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

The River (MA96-76)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment), total nitrogen Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance, agriculture].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.418 square miles IMPAIRED 0.002 square miles Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Paw Wah Pond (MA96-72)

Location:	Orleans.
AU Size:	0.008 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [10/24/2007, CN244.0]).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Paw Wah Pond by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 2.0 acres (~38% of the segment area) of eelgrass bed habitat present in 1951 and 2.9 acres (~50% of segment area) in 1995. None were found in 2001 or 2006.

The *Aquatic Life Use* is assessed as impaired for Paw Wah Pond based on the apparent significant loss of eelgrass bed habitat. According to the Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that this segment area (SC64.0) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the segment area is Probihited for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Paw Wah Pond. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, and/or unspecified urban stormwater.

Paw Wah Pond (MA96-72)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment), total nitrogen Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater], and fertilizers [yard maintenance].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, unspecified urban stormwater
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Pochet Neck (MA96-73)

Location:	to confluence with Little Pleasant Bay, Orleans.
AU Size:	0.24 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [10/24/2007, CN244.0]).

NPDES Discharges (Appendix D, Table D2)
Town of Orleans (MAR041146)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Pochet Neck by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 48.4 acres (~32% of the segment area) of eelgrass bed habitat present in 1951 and 19.6 acres (~13% of the segment area) in 1995. In 2001 there were only 2.1 acres of eelgrass bed habitat (1.4%) and in 2006 only 1.9 acres (1.3% of segment area).

The *Aquatic Life Use* is assessed as impaired for Pochet Neck based on the apparent significant loss of eelgrass bed habitat. According to the Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that almost all of this segment area (99% of segment area is encompassed in shellfish area SC62.2) is *Approved* for shellfish harvesting (MA DFG 2009). There is a very small area (SC62.1) which is *Prohibited* for shellfish harvesting (~1% of segment area) in the vicinity of Pochet Creek.

The *Shellfish Harvesting Use* is assessed as support for 0.238 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.002 square miles because it is *Prohibited* for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Pochet Neck. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, and/or unspecified urban stormwater.

Primary and Secondary Contact Recreational and Aesthetics Uses
No testing for either of the two semi-public beaches along the shoreline of Pochet Neck (Gilmin Inn and Barley Neck beaches) has been reported to MA DPH.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Pochet Neck based on the the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

Pochet Neck (MA96-73)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.238 square miles IMPAIRED 0.002 square miles Cause: Elevated fecal coliform bacteria Sources: Waterfowl, wildlife other than waterfowl, unspecified urban stormwater
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Little Pleasant Bay (MA96-78)

Location:	Waters north and east of imaginary lines drawn from the northeasterly edge of Orleans (near The Horseshoe), southeasterly to the northeastern tip of Sipson Island, then continuing to and around the northeastern border of Sipson Meadow, Orleans then south to the northern tip of Strong Island, Chatham then east to a point on the inner Cape Cod National Seashore (excluding the delineated segments; The River, Pochet Neck, and Paw Wah Pond).
AU Size:	3.3 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Nutrients [10/24/2007, CN244.0]).

DESIGNATED USE ASSESSMENT

Aquatic Life Use

Eelgrass Bed Habitat

Eelgrass surveys and analysis of historical data was conducted for Little Pleasant Bay by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 1083.1 acres (~52% of the segment area) of eelgrass bed habitat present in 1951 and 905.6 acres (~43% of the segment area) in 1995. In 2001 there were 849.0 acres of eelgrass bed habitat (~41%) and in 2006 there were 830.7 acres (~40% of segment area).

Biology

According to the MEP project technical report the benthic community in Little Pleasant Bay was "indicative of moderate levels of stress from organic matter loading and oxygen depletion…the pattern was for a decrease in habitat quality moving from the marginal to depths…pattern is typical of a system near, but beyond its nitrogen loading limit…" (UMass Dartmouth SMAST and MassDEP 2006a).

Water Chemistry

According to the MEP project technical report the DO concentrations in Little Pleasant Bay were generally good although there were infrequent low oxygen events in the upper Pleasant Bay at Namequoit Point. The average chlorophyll *a* concentration reported for Namequoit Point was 1.97 µg/L and near Strong Island was 4.77 µg/L (UMass Dartmouth SMAST and MassDEP 2006a).

The *Aquatic Life Use* is assessed as impaired for Little Pleasant Bay based on the MEP analysis. It should be noted that according to the Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen, impairment of this waterbody can best be mitigated by reducing excess nutrient loading, in particular total nitrogen (MassDEP 2007c). The controllable local sources of total nitrogen identified in this TMDL include on-site subsurface wastewater disposal (septic) systems, stormwater runoff, and fertilizers.

Shellfish Harvesting Use

The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates almost all of this segment area (SC61.0) is *Approved* for shellfish harvesting (MA DFG 2009). There is an extremely small area (SC61.1), which comprises 0.02% of the segment area, 100' out from the mouth of Paw Wah Pond that is *Prohibited*.

The *Shellfish Harvesting Use* is assessed as support for 3.299 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.001 square miles because it is *Prohibited* for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Little Pleasant Bay. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl and upstream source(s) in Paw Wah Pond.

Primary and Secondary Contact Recreational and Aesthetics Uses
The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Little Pleasant Bay based on the the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

Little Pleasant Bay (MA96-78)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Total nitrogen Sources: Subsurface wastewater disposal (septic) systems, stormwater runoff [unspecified urban stormwater and discharges from municipal separate storm sewer systems], and fertilizers [yard maintenance].
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 3.299 square miles IMPAIRED 0.001 square miles Cause: Elevated fecal coliform bacteria Sources: Waterfowl, upstream source(s)
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Chatham Harbor (MA96-10)

Location:	Harbor bounded on the east by the Cape Cod National Seashore, with the northern extent as an imaginary line drawn northeast from northern tip of Strong Island to a point on the inner Cape Cod National Seashore and the western extent as an imaginary line drawn from the southern tip of Strong Island south to Allen Point including the waters south to an imaginary line drawn along the northern edge of the South Beach Bar extending from Chatham Lighthouse to the inlet created by the 1987 storm, Chatham. (area associated with Cape Cod National Seashore designated as ORW).
AU Size:	2.85 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 2

This segment is on the 2008 Integrated List of Waters in Category 2 - Attaining Some Uses (Shellfishing, Primary Contact, Secondary Contact); Others Not Assessed.

NPDES Discharges (Appendix D, Tables D1 and D2)
Chatham Pier Fish Market, Inc. (MA0040215)
Town of Chatham (MAR041101)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Chatham Harbor by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 384.5 acres (~21% of the segment area) of eelgrass bed habitat present in 1951 and approximately 202.5 acres (11.1%) in 1995. In 2001 there were 95.4 acres (5.2%) and in 2006 there were an estimated 127.3 acres (~7%).

The *Aquatic Life Use* is assessed as support for Chatham Harbor based on the presence of eelgrass bed habitat, an indicator of good water quality conditions. Although the percentage of eelgrass appears to be declining in the segment area, since this area has experienced major changes in circulation (e.g., new outlet caused by erosion of barrier beach), it is best professional judgement that changes in eelgrass bed habitat areas are not indicative of water quality problems at this time.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates this segment area (SC52.0N and a portion of OC1.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support since the entire segment area is *Approved* for shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
Frequent testing for Enterococci bacteria during the swimming seasons was conducted at the following public/semi-public beaches, Chatham Bars Inn Beach, Hawthorne Beach, and Lighthouse Beach, in Chatham along shoreline of this segment from 2002 – 2007 (MA DPH 2009a). Neither Chatham Bars Inn Beach nor Lighthouse Beach were reported as posted in any year. Hawthorne Beach had no reported postings in any year (2003 – 2007) either.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Chatham Harbor based on the lack of any beach closures at Chatham Bars Inn, Hawthorne, and Lighthouse beaches and the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

Chatham Harbor (MA96-10)

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

NAUSET HARBOR SYSTEM

Town Cove (MA96-68)

Location:	Entire cove to Nauset Harbor, including Rachael Cove and Woods Cove, Orleans/Eastham (area associated with Cape Cod National Seashore designated as ORW).
AU Size:	0.79 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

NPDES Discharges (Appendix D, Table D2)
Town of Eastham (MAR041110)
Town of Orleans (MAR041146)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Town Cove by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 66.2 acres (~13% of the segment area) of eelgrass bed habitat present in 1951 and only 0.7 acres (0.1% of the segment area) were found 2001. No mapping was done in 2006.

The *Aquatic Life Use* is assessed as impaired for Town Cove based on the apparent significant loss of eelgrass bed habitat.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates this almost all of this segment area (OC4.0 and a portion of OC2.0) is *Approved* for shellfish harvesting (MA DFG 2009). There is an extremely small area (OC4.1), which comprises ~0.4% of the segment area, described as the waters and flats of Abelino Creek that is *Prohibited* for shellfish harvesting.

The *Shellfish Harvesting Use* is assessed as support for 0.787 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.003 square miles because it is *Prohibited* for shellfish harvesting. Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Town Cove is used for water-based recreation with two public beaches. Frequent testing for Enterococci bacteria during the swimming season was conducted at these beaches from 2002 – 2007 (MA DPH 2009a). Closure data for individual Town Cove beaches are summarized below:
Town Cove Beach in Orleans: Was posted one day each in 2003, 2004, 2005, and 2006, and four days in 2007 (4.8% of swimming season in that year).
Town Cove Beach in Eastham: Was posted one day in 2006, and no postings were reported in any other year. There are three semi-public beaches, Collins Landing, Asa Landing and Shore Cottage beaches, however MA DPH has no reports of testing/postings.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Town Cove based on the low frequency of beach closures at Town Cove beaches in Orleans and Eastham and the *Approved* status of the shellfish areas. The *Aesthetics Use* in not assessed due to the absence of data.

Town Cove (MA96-68)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Unknown
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.787 square miles IMPAIRED 0.003 square miles Cause: Elevated fecal coliform bacteria Sources: Waterfowl, discharges from municipal separate storm sewer systems
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

Nauset Harbor (MA96-28)

Location:	The waters south of an imaginary line drawn east from Woods Cove, Orleans around the southern point of Stony Island, around the southern end of the unnamed island in the harbor, to the Cape Cod National Seashore point, excluding Mill Pond, Orleans (area associated with Cape Cod National Seashore designated as ORW).
AU Size:	0.41 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 2

This segment is on the 2008 Integrated List of Waters in Category 2 - Attaining Some Uses (Shellfishing, Primary Contact, Secondary Contact); Others Not Assessed.

NPDES Discharges (Appendix D, Table D2)
Town of Eastham (MAR041110)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Nauset Harbor by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 5.7 acres (~2% of the segment area) of eelgrass bed habitat present in 1951 in one area along the shoreline south of Woods Cove (described as patchy but of high confidence). Only 1.1 acres (0.4% of the segment area) were found 2001. No mapping has been done for 2006.

The *Aquatic Life Use* is not assessed for Nauset Harbor (eelgrass bed habitat data are inconclusive). This use is identified with an Alert Status however since the beds were smaller in 2001 than in 1951.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates this segment area (OC2.0 and portion of OC5.0 and OC3.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support because all of the segment area is *Approved* for shellfish harvesting.

Primary and Secondary Contact Recreational and Aesthetics Uses
Frequent testing for Enterococci bacteria during the swimming seasons was conducted at two public beaches, Priscilla's Landing Beach and Nauset Beach, in Orleans along the shoreline of this segment from 2002 – 2007 (MA DPH 2009a). Priscilla's Landing Beach was reported as being posted for one day in 2004 with no other postings reported in any other year. No postings were reported for Nauset Beach in any year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Nauset Harbor based on the general lack of any beach closures at Priscilla's Landing and Nauset beaches in Orleans and the *Approved* status of the shellfish area. The *Aesthetics Use* in not assessed due to the absence of data.

Nauset Harbor (MA96-28)

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment.

EASTHAM PONDS

Herring Pond (MA96133)

Location:	Eastham
AU Size:	42 Acres
Classification:	B\WWF
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

NPDES Discharges (Appendix D, Table D2)
Town of Eastham (MAR041110)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Anadromous fish (herring) have access to Herring Pond via a combination of stream baffles and a weir-pool fishway. The fishway should be maintained and sand removed from the pond's outlet to maintain this run (Reback *et al*. 2004).

No other data are available so the *Aquatic Life Use* is not assessed for Herring Pond.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beach along the shoreline of Herring Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Herring Pond.

Herring Pond (MA96133)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Depot Pond (MA96061)

Location:	Eastham
AU Size:	26 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

NPDES Discharges (Appendix D, Table D2)
Town of Eastham (MAR041110)

DESIGNATED USE ASSESSMENT
Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beaches along the shoreline of Depot Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Depot Pond.

Depot Pond (MA96061)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Great Pond (MA96115)

Location:	Eastham
AU Size:	109 Acres
Classification:	B
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Nutrients, Organic enrichment/Low DO).

NPDES Discharges (Appendix D, Table D2)
Town of Eastham (MAR041110)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Herring Brook is a short stream that drains acres of river herring habitat in Bridge and Great Ponds. The outlet control structure at Herring Brook Road, which also functions as a weir-pool fishway, is regulated by the Town of Eastham personnel, to allow herring to enter the headwater ponds. A frequent problem on this system is the deposition of sand at the mouth of the stream which often requires removal prior to the spring run (Reback *et al*. 2004).

Biology
No non-native macrophytes were noted in Great Pond during the 26 July 2004 macrophyte and density mapping survey conducted by DWM biologists (Mass DEP 2004). Blue-green algae clumps were, however, were noted to be present.

Water Chemistry
A depth profile for DO was made at the deep hole in Great Pond on 23 August 2004 (Haque and Mattson 2009). There was evidence of stratification with DO depletion (i.e., <1.5 mg/L or less) at depth greater than 6.0 m. The maximum temperature was 25.1℃. Supersaturation (up to 111%) and somewhat high pH (up to 9.0SU) was present in the epilimnion (to depths of ~4.0 m), indicative of productivity. Water quality sampling at the deep hole of Great Pond was also conducted by DWM personnel (one day each in June, July, and September 2004). Water quality sampling at the deep hole of Great Pond was also conducted by DWM personnel (one day each in June, July, and August 2004). Chlorophyll *a* measurements were elevated ranging from 9.7 – 31.6 mg/m^3 on the three sampling dates. Reportable total phosphorus concentrations ranged from 0.012 to 0.055 mg/L, with slightly higher concentrations in samples collected near the bottom of the water column. The Secchi disk transparency was good ranging from 2.5 to 4.4 m (Haque and Mattson 2009).

The *Aquatic Life Use* is assessed as impaired for Great Pond based on the severe oxygen depletion that occured below about 5.5 m representing approximately 25% of the lake's surface area. Chlorophyll *a* readings on two of the three dates sampled were high (> 20 mg/m^3) indicating some phytoplankton productivity. Slightly elevated total phosphorus values in the samples taken near the bottom of the water column are a sign of release from the sediments and an internal source of nutrients to the pond.

Fish Consumption Use
No site specific fish consumption advisory was issued by MA DPH for Great Pond in Eastham although fish toxics monitoring was conducted in this waterbody in October 1994 (data reported in DeCesare and Connors 2002).

The *Fish Consumption Use* is not assessed for Great Pond since there is no site specific advisory in place for this waterbody.

Primary and Secondary Contact Recreational and Aesthetics Uses
Secchi disk transparency readings were above the bathing beach guidelines (>1.2 m) on all three dates of the Mass DEP sampling in 2004 (Haque and Mattson 2009). Slight turbidity and sparse to moderate algal growths resulting in a green tint to the water column were noted during the June, July, and August 2004 sampling events (MassDEP 2004). There were, however, no unpleasant odors or scums reported. There are public beaches along the shoreline of Great Pond in Eastham. Currently there is uncertainty associated with the accurate

reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no *Primary Contact Recreational Use* assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary Contact Recreational Use* is not assessed for Great Pond since no quality assured bacteria data are available. The *Secondary Contact Recreational* and *Aesthetics Uses* are assessed as support since the Secchi disk transparency measurements were all indicative of good conditions and there were no objectionable odors, oils, deposits, or other conditions noted by DWM field sampling staff.

Great Pond (MA96115)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Low dissolved oxygen, elevated chlorophyll-a Source: Unknown Suspected source: Internal nutrient recycling
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		SUPPORT
Aesthetics		SUPPORT

RECOMMENDATIONS

Support improvement of freshwater Beaches Bill data quality and reporting.

WELLFLEET KETTLE PONDS

Gull Pond (MA96123)

Location:	Wellfleet
AU Size:	103 Acres
Classification:	B\ORW
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

DESIGNATED USE ASSESSMENT
Fish Consumption Use
In May 2006 fish were collected from Gull Pond and edible fillets of seven individual white perch (*Morone american*) were analyzed for mercury (Appendix B, Table B2). No DPH site-specific advisory has been issued for Gull Pond.

Since no site-specific fish consumption advisory was issued by the MA DPH, the *Fish Consumption Use* is not assessed.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beach along the shoreline of Gull Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no Primary Contact Recreational Use assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Gull Pond.

Gull Pond (MA96123)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Support improvement of freshwater Beaches Bill data quality and reporting.

Kinnacum Pond (MA96163)

Location:	Wellfleet
AU Size:	2 Acres
Classification:	B\ORW
2008 303(d) List:	This is a new segment – no prior listing.

DESIGNATED USE ASSESSMENT

Fish Consumption Use

In May 2008 fish were collected by DWM biologists from Kinnacum Pond and edible fillets of yellow perch (*Perca flavescens*) were analyzed for mercury (Maietta *et al*. 2008 and Appendix B, Table B4). Mercury concentrations ranged from 0.21 to 0.63 µg/g and were above the MA DPH trigger level in one of the three composite fish samples analyzed. The highest mercury concentration was in a two-fish composite sample and it should be noted that these perch were extremely large (~15" perch). The overall average mercury concentration in the yellow perch was below the MA DPH trigger level.

The *Fish Consumption Use* is not assessed for Kinnacum Pond since there is no site-specific advisory for this waterbody.

Kinnacum Pond (MA96163)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Spectacle Pond (MA96306)

Location:	Wellfleet
AU Size:	2 Acres
Classification:	B\ORW
2008 303(d) List:	This is a new segment – no prior listing.

DESIGNATED USE ASSESSMENT

Fish Consumption Use

In May 2008 fish were collected by DWM biologists from Spectacle Pond and edible fillets of yellow perch (*Perca flavescens*) and an individual largemouth bass (*Micropterus salmoides*) were analyzed for mercury (Maietta *et al*. 2008 and Appendix B, Table B4). Mercury concentrations were above the MA DPH trigger level in both of the composite perch samples analyzed (0.63 and 0.93 µg/g), but was below the trigger level in the individual largemouth bass sample.

The *Fish Consumption Use* is not assessed for Spectacle Pond since there is currently no MA DPH site-specific advisory for this waterbody. However it is DWM staff's best professional judgement that this use be identified with an Alert Status since the overall average mercury concentration in the composite perch samples exceed the MA DPH trigger level.

Primary and Secondary Contact Recreational and Aesthetics Uses

There is a public bathing beach along the shoreline of Spectacle Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no *Primary Contact Recreational Use* assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Spectacle Pond.

Spectacle Pond (MA96306)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED*
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Support improvement of freshwater Beaches Bill data quality and reporting.

Update the *Fish Consumption Use* if warranted after MA DPH review.

Long Pond (MA96179)

Location:	Wellfleet
AU Size:	35 Acres
Classification:	B\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

DESIGNATED USE ASSESSMENT
Fish Consumption Use
In May 2007 yellow perch (*Perca flavescens*) were collected by DWM biologists from Long Pond and one composite sample of edible fillets was analyzed for mercury (Maietta *et al*. 2008 and Appendix B, Table B3). Due to the presence of elevated mercury, MA DPH issued the following advisory (MA DPH 2009c): *"No one should consume any fish from this water body."*

Because of the site-specific fish consumption advisory for Long Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Primary and Secondary Contact Recreational and Aesthetics Uses
There is a public bathing beach along the shoreline of Long Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no *Primary Contact Recreational Use* assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Long Pond.

Long Pond (MA96179)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Support improvement of freshwater Beaches Bill data quality and reporting.

Great Pond (MA96117)

Location:	Wellfleet
AU Size:	41 Acres
Classification:	B\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

DESIGNATED USE ASSESSMENT

Fish Consumption Use

In May 2006 fish were collected by DWM biologists from Great Pond and edible fillets of seven individual yellow perch (*Perca flavescens*) were analyzed for mercury (Appendix B, Table B2). Due to the presence of elevated mercury, MA DPH issued the following advisory (MA DPH 2009c) recommending: *"The general public should not consume any fish from this water body".*

Because of the site-specific fish consumption advisory for Great Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Primary and Secondary Contact Recreational and Aesthetics Uses

There is a public bathing beach along the shoreline of Great Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no *Primary Contact Recreational Use* assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Great Pond.

Great Pond (MA96117)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Support improvement of freshwater Beaches Bill data quality and reporting.

Duck Pond (MA96068)

Location:	Wellfleet
AU Size:	11 Acres
Classification:	B\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

DESIGNATED USE ASSESSMENT

Fish Consumption Use

In May 2006 fish were collected by DWM biologists from Duck Pond and edible fillets of seven individual yellow perch (*Perca flavescens*) were analyzed for mercury (Appendix B, Table B2). Due to the presence of elevated mercury, MA DPH issued the following advisory (MA DPH 2009c) recommending: *"The general public should not consume any fish from this water body".*

Because of the site-specific fish consumption advisory for Duck Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired.

Primary and Secondary Contact Recreational and Aesthetics Uses

There is a public bathing beach along the shoreline of Duck Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no *Primary Contact Recreational Use* assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Duck Pond.

Duck Pond (MA96068)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Support improvement of freshwater Beaches Bill data quality and reporting.

Dyer Pond (MA96070)

Location:	Wellfleet
AU Size:	10 Acres
Classification:	B\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

DESIGNATED USE ASSESSMENT

Fish Consumption Use

In June 2007 fish were collected from Dyer Pond as part of the MassDEP ORS Mercury Research Project and edible fillets of 30 individual yellow perch (*Perca flavescens*) were analyzed for mercury. A summary of the fish toxics monitoring data for Dyer Pond can be found in Appendix B, Table B5. Due to the presence of elevated mercury, MA DPH issued the following advisory (MA DPH 2009c) recommending: *"The general public should not consume any fish from this water body".*

Because of the site-specific fish consumption advisory for Dyer Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Primary and Secondary Contact Recreational and Aesthetics Uses

There is a public bathing beach along the shoreline of Dyer Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore no *Primary Contact Recreational Use* assessment (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics Uses* are not assessed for Dyer Pond.

Dyer Pond (MA96070)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Support improvement of freshwater Beaches Bill data quality and reporting.

WELLFLEET HARBOR SYSTEM

Duck Creek (MA96-32)

Location:	Source west of Route 6, Wellfleet to Wellfleet Harbor (at a line from Shirttail Point to Taylor Road), Wellfleet.
AU Size:	0.15 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

DESIGNATED USE ASSESSMENT
Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that a portion of this segment area (CCB13.1) is *Prohibited* (~7% of the segment area), a portion (CCB13.2) is *Conditionally Approved* (~53%), and a portion (CCB 13.0) is *Approved* (~40% of the segment area) for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support for 0.06 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.09 square miles because it is either *Conditionally Approved* or *Probihited* for shellfish harvesting *Prohibited* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"Most of the readings above were quite low (<2- 4 CFU/100 ml), but there were a few exceptions. At station #3, adjacent to the athletic field (in Wellfleet), 2 readings (10/01/01, and 9/26/01) were > 27 CFU/100 ml. According to historical data, rainfall adversely impacts the area of Station #3 due in large part to a culvert pipe with a clapper valve that allows fresh water drainage of Mill Creek located across the street into Duck Creek (Wellfleet). Station #7, at the railroad bridge, also had two readings (9/26/01, and 9/17/01) >27 CFU/100 ml. On those same dates, station #8 at Richmond Road had readings of 22 CFU/100 ml. In 2003, station #10, in the Cove, where the geometric means were 3.8 CFU/100 ml, and station #8, at the bottom of the Creek/top of the Cove where the geometric means was 3.6 CFU/100 ml."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems, and/or unspecified urban stormwater.

Duck Creek (MA96-32)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 0.06 square miles IMPAIRED 0.09 square miles Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, on-site (septic) systems, unspecified urban stormwater
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Herring Pond (MA96134)

Location:	Wellfleet
AU Size:	18 acres
Classification:	B/ORW
2008 303(d) List:	This is a new segment – no prior listing.

DESIGNATED USE ASSESSMENT

Fish Consumption Use

In May 2006 fish were collected from Herring Pond and edible fillets of seven individual white perch (*Morone americana*) were analyzed for mercury (Appendix B, Table B2). No DPH site-specific advisory has been issued for Herring Pond.

Since no site-specific fish consumption advisory was issued by the MA DPH, the *Fish Consumption Use* is not assessed for Herring Pond.

Herring Pond (MA96134)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Herring River (MA96-67)

Location:	From outlet of Herring Pond, Wellfleet to south of High Toss Road, Wellfleet.
AU Size:	3.6 Miles
Classification:	B\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Metals, pH).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
According to Reback *et al* (2004),
'Herring River has its source in four kettle hole ponds within the Cape Cod National Seashore which provide a total of acres of habitat for herring. The first of these, Herring Pond, is connected to the remaining three by artificial ditches. The only obstruction to passage on the system is the Herring River dike and tide gate. This structure is impacting the river herring population in a number of ways. Most obvious is that passage through the tide gate is only possible during a limited portion of the tidal cycle. While the effect this has on population size is unknown, it is certainly an important limiting factor. Another impact is the frequent loss of juvenile herring to low oxygen levels caused by the lack of flushing action in the stream. Due to the poor access to the sections of stream where this occurs, little is known about the actual extent of these losses. In addition to the effects of the dike, the issue of low water levels at the pond outlets, so common on Cape Cod, impacts the river resource in this system as well. The connecting ditches often become dry and require dredging to insure movement of the juveniles out of the system. With the exception of removal of the dike, little can be done to improve this population" (Reback et al. 2004).

The dike on the Herring River at Chequesset Neck has resulted in flow alterations (changes in tidal amplitude and flushing) in this segment of the Herring River (HRTC 2007). The historical diking and ditching practices were originally aimed at controlling mosquito infestations. Consequently, tidal influence no longer exists in this segment of the Herring River and the former saltmarsh system is functioning as a disturbed freshwater wetland and in some areas as dry deciduous woodlands (HRTC 2007 and Portnoy 2003). The mosquito infestations remain problematic.

Biology
Fish kills have been associated with water quality problems in the Herring River (HRTC 2007 and Portnoy 2003).

Water Chemistry
As a result of the diking and altered hydrology, the following water quality conditions currently exist in this segment of the Herring River (HRTC 2007 and Portnoy 2003): no measurable salinity, low pH conditions and associated metals toxicity (aluminum), and oxygen depletion.

The *Aquatic Life Use* is assessed as impaired for the Herring River based on the flow alterations (changes in tidal amplitude and flushing), no measurable salinity, low pH conditions and associated metals toxicity (aluminum), and oxygen depletion. The tide gate also impedes/restricts fish passage.

Herring River (MA96-67)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Low pH , aluminum, fish kills, other flow regime alterations, fish passage barrier Source: Changes in tidal circulation and flushing, hydrostructure impacts on fish passage
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Herring River Environmental Impact Statement - The Herring River Restoration Committee is preparing joint Environmental Impact Statement/Report (EIS/EIR) for the Herring River Restoration Project in Wellfleet and Truro. This restoration project is being developed in partnership with the towns of Wellfleet and Truro in cooperation with CZM's Wetlands Restoration Program, U.S. Fish and Wildlife Service, NOAA, and Natural Resources Conservation Service. In addition to satisfying federal and state requirements, this EIS will also be developed in compliance with the Cape Cod Commission's Regional Policy Plan as a Development of Regional Impact. The development of project alternatives and mitigation strategies will be described and analyzed in the Detailed Restoration Plan and Draft Environmental Impact Statement/Report (EIS/EIR), tentatively expected for public review in the spring of 2011.

There are currently no designated shellfishing areas in this segment of the Herring River. Although no *E. coli* or *Enterococci* sampling has been conducted, Cape Cod National Park Service staff and others have conducted some fecal coliform bacteria sampling during the summer of 2005 in the Herring River. Results of this investigation suggest the following (Portnoy and Allen 2006): "*Modeling of Herring River under tide-restored conditions showed that a predicted 13-fold increase in river intertidal volume, over existing tide-Restricted conditions, would dilute measured FC to concentrations that are acceptable for shellfish-growing waters. Restored tidal flow would also reduce coliform survival time by increasing salinity, dissolved oxygen and pH, all presently depressed throughout the system because of the biogeochemical disturbance of diking and drainage. Results from Herring River, plus a preliminary survey of other diked Cape Cod estuaries, suggest a direct relationship between the degree of tidal restriction and surface-water FC, which should be studied further*."

Herring River (MA96-33)

Location:	South of High Toss Road, Wellfleet to Wellfleet Harbor (at an imaginary line drawn due north from the eastern tip of Great Island to the opposite shore), Wellfleet.
AU Size:	0.4 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

DESIGNATED USE ASSESSMENT

Aquatic Life Use

Habitat and Flow

According to Reback *et al* (2004), the only obstruction to passage for Alewife, blueback, white perch on the system is the steel and concrete Herring River dike and tide gate at Chequesett Road in Wellfleet. This structure is impacting the river herring population in a number of ways. Most obvious is that passage through the tide gate is only possible during a limited portion of the tidal cycle. While the effect this has on population size is unknown, it is certainly an important limiting factor. Another impact is the frequent loss of juvenile herring to low oxygen levels caused by the lack of flushing action in the stream. Due to the poor access to the sections of stream where this occurs, little is known about the actual extent of these losses. In addition to the effects of the dike, the issue of low water levels at the pond outlets, so common on Cape Cod, impacts the river resource in this system as well. The connecting ditches often become dry and require dredging to insure movement of the juveniles out of the system. With the exception of removal of the dike, little can be done to improve this population (Reback *et al*. 2004).

The dike on the Herring River at Chequesset Neck has resulted in flow alterations (changes in tidal amplitude and flushing) upstream of the dike in this segment of the Herring River (HRTC 2007). The dike is comprised of three six by six foot culverts; two culverts are fitted with clapper valves to allow drainage but block the inflow of seawater and the third culvert has a partially open sluice gate that allows some seawater to flow upstream from the dike (HRTC 2007).

Eelgrass Bed Habitat

Eelgrass surveys and analysis of historical data was conducted for the Herring River by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 31.1 acres (~12% of the segment area) of eelgrass bed habitat present in 1951 primarily along the shoreline and near the area referred to as the Gut. Only 2.7 acres (1.1% of the segment area) were found in 1995 and 0.7 acres (0.3% of the segment area) was found in 2001. No mapping has been done for 2006.

Biology

Fish kills have been associated with water quality problems in the Herring River (HRTC 2007 and Portnoy 2003).

Water Chemistry

As a result of the diking and altered hydrology, the following water quality conditions currently exist in this segment of the Herring River upstream from the dike at Chequesset Neck (HRTC 2007 and Portnoy 2003): brackish waters extend to High Toss Road at high tide but at low tide salinity is near zero throughout most of the river above the dike, acid sulfate soils upstream from the dike contribute to low pH conditions and associated metals toxicity (aluminum). These issues are not problematic seaward from the dike.

The *Aquatic Life Use* is assessed as impaired upstream from the dike at Chequesset Neck (the upper 0.071 mi^2 area) because of flow alterations (changes in tidal amplitude and flushing), no measurable salinity, low pH conditions and associated metals toxicity (aluminum), and oxygen depletion. The *Aquatic Life Use* is assessed as impaired for the lower 0.324 mi^2 portion of the river based on the apparent significant loss of eelgrass bed habitat.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that a portion of this segment area (CCB12.4) is *Prohibited* (~27% of the segment area), and a portion (CCB12.1) is *Conditionally Approved* (~73% of the segment area) for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because a portion of the segment area is either *Conditionally Approved* or *Probihited* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"During the 2002-2003 sampling events, at the Boat Ramp, 47% of the readings >27 CFU/100 ml; at Chequesset Neck Bridge, 22% of the readings >27 CFU/100 ml; at Botleneck, 47% of the readings >27 CFU/100 ml; at Split of Land, 20% of the readings >27 CFU/100 ml; and at Ross Residence, and Tip of Great Island 10% of the readings >27 CFU/100 ml. Chequesset Neck Bridge, and the Boat ramp each had 3 readings >50 CFU/100 ml. The Gut had 2 readings > 50 CFU/100 ml. Site #8, Keller Residence, Ross Residence, and the Spit of Land each had one reading >50 CFU/100 ml. Conditions show slightly worse conditions following wet conditions than dry conditions. Water quality issues were identified in this segment, with quite a few areas prohibited for shellfishing. Stormwater runoff as well as boating activities appear to have a significant pollutant effect in this area. The town of Wellfleet and/or MassDEP, need to conduct some follow-up source tracking activities. There is a chance that drainage from Herring River into the northwest corner of Wellfleet Harbor might, in the future, pose some bacteria related problems in at least that portion of the Harbor."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and/or unspecified urban stormwater.

Herring River (MA96-33)

Designated Uses		Status
Aquatic Life		IMPAIRED upper 0.071 mi^2 area Cause: Low pH, aluminum, other flow regime alterations, fish passage barrier Source: Changes in tidal circulation and flushing, hydrostructure impacts on fish passage IMPAIRED lower 0.324 mi^2 area Cause: Loss of eelgrass bed habitat (estuarine bioassessment) Source: Unknown
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, unspecified urban stormwater
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Wellfleet Harbor (MA96-34)

Location:	The waters north of an imaginary line drawn east from the southern tip of Jeremy Point, Wellfleet to Sunken Meadow, Eastham excluding the estuaries of Herring River, Duck Creek, Blackfish Creek, and Fresh Brook, Wellfleet (area associated with Cape Cod National Seashore designated as ORW).
AU Size:	8.4 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

DESIGNATED USE ASSESSMENT

Aquatic Life Use

Eelgrass Bed Habitat

Eelgrass surveys and analysis of historical data was conducted for Wellfleet Harbor by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was no eelgrass found in Wellfleet Harbor in 1951. In 1995 there were some small beds (3.0 acres representing 0.1% of the segment area) at the mouth of the harbor in the vicinity of Jeremy Point. No mapping of this area was done in 2006.

Too limited data are available so the *Aquatic Life Use* is not assessed for Wellfleet Harbor.

Shellfish Harvesting Use

The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of the areas that comprise this segment area (CCB11.0, CCB13.0, CCB14.0, and CCB9.0) are *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support since all of the areas that comprise this segment are *Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), "*Despite the fact that there is a lot of pleasure and commercial boating activities in this harbor area, the segment enjoys excellent water quality. The Herring River, which flows into the harbor at its western end, was identified by DMF as a potential pollution source (but the above data do not document an actual pollution effect, see the Herring River Segment, MA 96-33 report above). Also, the DMF has identified Duck Creek, MA 96-32, which flows into the northeastern end of Wellfleet Harbor as a potential pollution source."*

Primary and Secondary Contact Recreational and Aesthetics Uses

Welllfleet Harbor is heavily used for water-based recreation with seven public/semi-public beaches. Frequent testing for Enterococci bacteria during the swimming season was conducted at these beaches from 2003 – 2007 (MA DPH 2009a). Closure data for individual Wellfleet Harbor beaches are summarized below:
Chequesset Yacht and Country Club Beach: No postings were reported in any year.
Powers Landing Beach: No postings were reported in any year.
Mayo Beach: Was posted one day each in 2003 and 2004 and no postings were reported in any other year.
Indian Neck Beach: No postings were reported in any year.
Burton Baker Beach: No postings were reported in any year.
Omaha Road Beach: No postings were reported in any year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Wellfleet Harbor based on the very low frequency of beach closures at the public/semi-public beaches in Wellfleet and the *Approved* status of the shellfish areas. The *Aesthetics Use* in not assessed due to the absence of data.

Wellfleet Harbor (MA96-34)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

TRURO KETTLE PONDS

Great Pond (MA96114)

Location:	Truro
AU Size:	17 Acres
Classification:	B\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

DESIGNATED USE ASSESSMENT
Fish Consumption Use
In May 2007 fish were collected by DWM biologists from Great Pond and composite samples of edible fillets ofsmallmouth bass (*Micropterus dolomieu*), yellow perch (*Perca flavescens*), and brown bullhead (*Ameiurus nebulosus*) were analyzed for mercury (Maietta *et al*. 2008 and Appendix B, Table B3). Due to the presence of elevated mercury, MA DPH issued the following advisory (MA DPH 2009c): *"Children younger than 12 years of age, pregnant women, women of childbearing age who may become pregnant, and nursing mothers should not eat any fish from Great Pond. The advisory also recommends that: the general public should limit consumption of all fish from Great Pond to two meals per month."*

Because of the site-specific fish consumption advisory for Great Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Great Pond (MA96114)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Round Pond (West) (MA96261)

Location:	Truro
AU Size:	2 Acres
Classification:	B\ORW
2008 303(d) List:	This is a new segment – no prior listing.

DESIGNATED USE ASSESSMENT

Fish Consumption Use

In May 2008 fish were collected by DWM biologists from Round Pond (West) and edible fillets of yellow perch (*Perca flavescens*) were analyzed for mercury (Maietta *et al*. 2008 and Appendix B, Table B4). Mercury concentrations were above the MA DPH trigger level in two of the three composite perch samples analyzed (0.53 and 1.5 µg/g), but was below the trigger level in the third sample.

The *Fish Consumption Use* is not assessed for Round Pond (West) since there is currently no MA DPH site-specific advisory for this waterbody. However it is DWM staff's best professional judgement that this use be identified with an Alert Status since the overall average mercury concentration in the composite perch samples exceed the MA DPH trigger level.

Round Pond (West) (MA96261)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED*
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Update the *Fish Consumption Use* if warranted after MA DPH review.

Ryder Pond (MA96268)

Location:	Truro
AU Size:	18 Acres
Classification:	B\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Metals [12/20/2007NEHgTMDL], Nutrients, Organic enrichment/Low DO).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Water Chemistry
A depth profile for DO was made at the deep hole of Ryder Pond on 23 August 2004 (Haque and Mattson 2009). There was evidence of stratification with oxygen depletion occurring at depths below 7m. The maximum temperature was 24.6℃. It should also be noted th at pH was fairly low (6.1 – 6.2SU between the surface and depth of 5m but through the thermocline was very low 5.4 SU). Water quality sampling at the deep hole of Ryder Pond was also conducted by DWM personnel (one day each in June, July, and August 2004). Chlorophyll *a* concentrations were fairly low ranging from 4.9 – 12.8 mg/m^3 on the three sampling dates. Total phosphorus concentrations were also fairly ranging from 0.007 to 0.039 mg/L with the highest concentrations measured in samples collected near the bottom. The Secchi disk transparencies were all excellent (6.5 – 7.8 m) (Haque and Mattson 2009).

The *Aquatic Life Use* is assessed as impaired for Ryder Pond based on the severe oxygen depletion that was measured below about 7.5 m based on the 23 August 2004 profile data (~15 to 20% of the pond's surface area). Although all low, slightly higher total phosphorus concentrations were measured in the samples collected near the bottom indicating some release of phosphorus from anoxic sediments and internal loading of phosphorus.

Fish Consumption Use
In May 2006 fish were collected by DWM biologists from Ryder Pond and edible fillets of seven individual yellow perch (*Perca flavescens*) were analyzed for mercury (Appendix B, Table B2). Due to the presence of elevated mercury, MA DPH issued the following advisory (MA DPH 2009c) recommending: *"The general public should not consume any fish from this water body".*

Because of the site-specific fish consum ption advisory for Ryder Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Primary and Secondary Contact Recreational and Aesthetics Uses
Secchi disk transparency readings were all well above the bathing beach guidelines on all three sampling dates ranging from 6.5 to 7.8 m (Haque and Mattson 2009). No aesthetically objectionable conditions (e.g., odors, deposits, growths, scums, or turbidity) were noted during the June, July, and August 2004 sampling events (MassDEP 2004).

The *Primary Contact Recreational Use* is not assessed for Ryder Pond since no quality assured bacteria data are available. The *Secondary Contact Recreational* and *Aesthetics* uses are assessed as support based on the good Secchi disk depths and the lack of any objectionable conditions.

Ryder Pond (MA96268)

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Low dissolved oxygen Source: Unknown Suspected source: Internal nutrient recycling
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		SUPPORT
Aesthetics		SUPPORT

RECOMMENDATIONS

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Snow Pond (MA96303)

Location:	Truro
AU Size:	7 Acres
Classification:	B\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

DESIGNATED USE ASSESSMENT
Fish Consumption Use
In May 2007 largemouth bass (*Micropterus salmoides*) were collected from Snow Pond and two composite samples of edible fillets were analyzed for mercury (Maietta *et al*. 2008 and Appendix B, Table B3). Due to the presence of elevated mercury, MA DPH issued the following advisory (MA DPH 2009c): *"Children younger than 12 years of age, pregnant women, women of childbearing age who may become pregnant and nursing mothers should not eat any largemouth bass from Snow Pond and that the general public should limit consumption of largemouth bass from Snow Pond to two meals per month."*

Because of the site-specific fish consumption advisory for Snow Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Snow Pond (MA96303)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Round Pond (East) (MA96260)

Location:	Truro
AU Size:	6 Acres
Classification:	B\ORW
2008 303(d) List:	This is a new segment – no prior listing.

DESIGNATED USE ASSESSMENT

Fish Consumption Use

In July 2008 fish were collected from Round Pond (East) as part of the MassDEP ORS Mercury Research Project and edible fillets of 15 individual largemouth bass (*Micropterus salmoides*) and 30 individual yellow perch (*Perca flavescens*) were analyzed for mercury. A summary of the fish toxics monitoring data for Round Pond (East) can be found in Appendix B (Table B8). The average mercury concentration for both species was above the MA DPH trigger level.

The *Fish Consumption Use* is not assessed for Round Pond (East) since there is currently no site-specific fish consumption advisory. However it is DWM staff's best professional judgement that this use be identified with an Alert Status since the overall average mercury concentration in both the largemouth bass and yellow perch samples exceed the MA DPH trigger level.

Round Pond (East) (MA96260)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED*
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Update the *Fish Consumption Use* if warranted after MA DPH review.

Slough Pond (MA96298)

Location:	Truro
AU Size:	29 Acres
Classification:	B\ORW
2008 303(d) List:	Category 4a

This segment is on the 2008 Integrated List of Waters in Category 4a-TMDL is Completed (Metals [12/20/2007NEHgTMDL]).

DESIGNATED USE ASSESSMENT

Fish Consumption Use

In June 2007 fish were collected from Slough Pond as part of the MassDEP ORS Mercury Research Project and edible fillets of 30 individual yellow perch (*Perca flavescens*) and 12 individual largemouth bass (*Micropterus salmoides*) were analyzed for mercury. A summary of the fish toxics monitoring data for Slough Pond can be found in Appendix B (Table B6). Due to the presence of elevated mercury, MA DPH issued the following advisory (MA DPH 2009c): *"Children younger than 12 years or age, pregnant women, women of childbearing age who may become pregnant, and nursing mothers should not eat any fish from this water body, and the general public should limit consumption of all fish from this water body to two meals per month."*

Because of the site-specific fish consumption advisory for Slough Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

Slough Pond (MA96298)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Horseleach Pond (MA96144)

Location:	Truro
AU Size:	23 Acres
Classification:	B\ORW
2008 303(d) List:	This is a new segment – no prior listing.

DESIGNATED USE ASSESSMENT

Fish Consumption Use

In July 2008 fish were collected from Horseleach Pond as part of the MassDEP ORS Mercury Research Project and edible fillets of 15 individual largemouth bass (*Micropterus salmoides*) and 30 individual yellow perch (*Perca flavescens*) were analyzed for mercury. A summary of the fish toxics monitoring data for Horseleach Pond can be found in Appendix B (Table B9). The average mercury concentration for largemouth bass was above the MA DPH trigger level.

The *Fish Consumption Use* is not assessed for Horseleach Pond since there is currently no site-specific fish consumption advisory. However it is DWM staff's best professional judgement that this use be identified with an Alert Status since the overall average mercury concentration in the largemouth bass samples exceed the MA DPH trigger level.

Horseleach Pond (MA96144)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED*
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Update the *Fish Consumption Use* if warranted after MA DPH review.

OUTER CAPE AREA

Pamet River (MA96-31)

Location:	Tidegate at Route 6A, Truro to mouth at Cape Cod Bay (including Pamet Harbor), Truro.
AU Size:	0.14 Square Miles
Classification:	SA
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
This tidal stream nearly bisects the upper arm of Cape Cod. The salinity in its upper reaches is reduced by a steel tide gate. The fish passage problems for alewife, blueback, trout are caused by the tide gate (Reback *et al*. 2004).

Too limited data are available so the *Aquatic Life Use* is not assessed. This use is identified with an Alert Status however since DMF biologists noted that there are fish passage issues of concern.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that a portion (~25%) of this segment area (CCB7.3) is *Prohibited* and a portion (~75%) of this segment area (SC7.1) is *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as impaired because the segment area is either Probihited or *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"A DMF shoreline survey (as part of the sanitary survey) was conducted during the Fall of 2006. Potential sources of bacteria pollution in the Pamet River area include: tidegates, storm drains, retention catch basins, culverts, and migratory waterfowl. Various sized concentrations of migratory waterfowl (Canada geese, cormorants, duck, and gull species) were observed at sampling stations throughout the survey area, and could be a significant factor to adverse water quality. Rain events seem to have an upward effect on pollutants. A special sanitary survey was conducted at 5 stations once on January 1, 2007. Fecal coliform levels ranged between 11-311 CFU/100 ml, with the 311 reading coming from a stormdrain near Meetinghouse Road."* Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, and/or unspecified urban stormwater.

Primary and Secondary Contact Recreational and Aesthetics Uses
Frequent testing for Enterococci bacteria during the swimming seasons was conducted at Pamet Harbor Beach in Truro located along the shoreline of this segment from 2003 – 2007 (MA DPH 2009a). The beach was reportedly posted once in 2004 and twice in 2007 but no postings were reported in any other year.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for the Pamet River based on the general lack of beach closures at Pamet Harbor Beach. The *Aesthetics Use* in not assessed due to the absence of data.

Pamet River (MA96-31)

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, waste from pets, unspecified urban stormwater
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

Village Pond (MA96329)

Location:	Truro
AU Size:	2 Acres
Classification:	B
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

DESIGNATED USE ASSESSMENT
No recent quality assured data are available so all uses are not assessed.

Village Pond (MA96329)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

East Harbor (Pilgrim Lake) (MA96-83)

Location:	Truro
AU Size:	0.50 square miles
Classification:	SA
2008 303(d) List:	This is a new segment – no prior listing.

DESIGNATED USE ASSESSMENT

Aquatic Life Use

Habitat and Flow

The National Seashore and the Town of Truro joined efforts to replace and open the culvert connecting Pilgrim Lake with Cape Cod Bay (Moles 2007). According to Portnoy *et al*. (2007), "*the clapper valves in the 4-ft diameter by 700-ft-long culvert connecting the system to Cape Cod Bay have been held open since November 2002 to try to improve water quality in the East Harbor lagoon. Ten-foot tides in Cape Cod Bay are reduced by passage through the culvert to 1.5 ft in Moon Pond; in East Harbor lagoon ("Pilgrim Lake") tides are barely detectable, at most 0.1 ft*."

Biology

Molluscan bivalves, both hard clam (quahog) and soft shelled clams (steamers) have been discovered in Pilgrim Lake (Moles 2007). Portnoy *et al*. (2007) report the following conditions:

"As in 2005 and 2006, dense beds of macroalgae (Cladophora spp. and Ulva intestinalis) and filamentous cyanobacteria began to accumulate in June and July, but died back in August.

Widgeon grass, which had proliferated throughout the lagoon since 2004, was much less abundant in 2007, perhaps explaining the 2007 decrease in macroalgae, which are often light-limited and benefit from attachment to submerged seagrasses.

Soft-shell clams were abundant throughout most of the estuary, with hard clams Restricted to the creeks of Moon Pond. Unlike in 2006, clam survival was apparently high during the 2007 summer, probably due to decreased organic loading from macroalgae and consequently higher dissolved oxygen.

Many species of estuarine finfish, shellfish and other benthic animals continue to reestablish throughout the East Harbor lagoon and Moon Pond. In East Harbor lagoon and Moon Meadow former fresh/brackish finfish have been replaced by an assemblage of species typical of lower Cape salt marshes. These animals are using the system for spawning, as a nursery habitat and for feeding.

For the first time in at least several decades, hundreds of bay and sea ducks began to feed, probably on submerged plants, fish and benthic animals, in the lagoon in winter 2006-7."

Water Chemistry

National Park Service (NPS) environmental monitoring of the East Harbor back-barrier estuary began with observations of an oxygen depletion and fish kill in 2001 and has continued to the present (Portnoy *et al.* 2007). Salinity in the lake has been reported to increase from 4 to 20 ppt (Moles 2007). Portnoy *et al*. (2007) report the following conditions:

> Salinity, which was about 4 parts per thousand (ppt) prior to clapper-valve opening, is now quite stable at about 20 ppt in winter and 25-27 ppt in summer in most of the lagoon; however, the surrounding wetlands, with the exception of Moon Pond, receive little seawater.
>
> *Monthly observations of lagoon water quality showed consistently low dissolved inorganic nitrogen, phytoplankton densities and chlorophyll, and high water clarity except during periods of ice cover. A one-day flux study at the High Head Road culvert showed four times the nitrogen exported during ebb tide, than imported from Cape Cod Bay during flood tide, suggesting that Cape Cod Bay water is not an important source of nitrogen to the lagoon. Observed low nutrient concentrations in inflowing Cape Cod Bay water also indicate that increased tidal exchange (i.e. flushing) will reduce the concentration of nitrogen that is apparently stimulating macroalgal blooms.*
>
> *A preliminary nutrient bioassay, plus observed water-column nutrient ratios, indicated that macroalgal growth in East Harbor lagoon is strongly nitrogen limited. Potential nitrogen sources include: 1) "recycled" nitrogen released from the decomposition of organic matter from the lagoon's sediments and extensive wetlands; 2) nitrogen fixation by cyanobacteria; 3) wastewater from adjacent development; 4) atmospheric deposition; and 5) tidal water from Cape Cod Bay. The relative importance of these sources is as yet unknown.*

The *Aquatic Life Use* is not assessed for East Harbor (Pilgrim Lake) since this system is currently in the process of transition back to a tidal estuary.

Shellfish Harvesting Use
The DMF shellfishing area CCB:4.5 is Prohibited (Moles 2007). Portnoy et al. (2007) report "*Fecal coliform, the water-quality standard for shellfish-waters, was consistently high in the northwest cove and in freshwater discharging from Salt Meadow, but very low throughout the lagoon except after heavy rain, suggesting runoff pollution from Route 6." Waterfowl are also utilizing this area"* (Portnoy et al. 2007).

The *Shellfish Harvesting Use* is assessed as impaired because the segment area is *Probihited* for shellfish harvesting. These restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl and unspecified urban stormwater.

East Harbor (Pilgrim Lake (MA96-83)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated fecal coliform bacteria Sources: Waterfowl, unspecified urban stormwater
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Continue to evaluate the studies being conducted by the NPS to assess the designated uses. These include the following (Portnoy *et al*. 2007):
Further analysis of hydrodynamic modeling, completed in 2005, shows that:
- *the replacement of the 4-ft diameter culvert with an opening at least 16 ft wide would increase flushing about ten fold, likely improving lagoon water quality, but tidal range would be only about 0.4 ft, yielding little increase in intertidal area.*
- *increasing the opening to the full 150-ft width of undeveloped land at Noons Landing would increase flushing 78 fold, increase tidal range to nearly four feet, and yield a restored intertidal area of 325 acres including both unvegetated flats and wetlands.*

In an effort to assess potential sources of nutrients fueling macroalgae blooms, NPS and Cape Cod Commission are studying the groundwater system of Beach Point to determine flow direction and the potential for nutrients from wastewater to reach the East Harbor lagoon.
Otherwise, the above environmental monitoring of East Harbor lagoon will continue in 2008, with additional wetland-vegetation transects, macroalgae nutrient bioassays and intensified surface water-quality monitoring.
The US Army Corps of Engineers plans to continue its Comprehensive Feasibility Study of more complete tidal restoration in East Harbor once new funding is obtained.

Clapps Pond (MA96035)

Location:	Provincetown (area associated with Cape Cod National Seashore designated as ORW)
AU Size:	40 Acres
Classification:	B\ORW
2008 303(d) List:	Category 3

This segment is on the 2008 Integrated List of Waters in Category 3 - No Uses Assessed

DESIGNATED USE ASSESSMENT
No recent quality assured data are available so all uses are not assessed.

Clapps Pond (MA96035)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

Provincetown Harbor (MA96-29)

Location:	The waters northwest of an imaginary line drawn northeasterly from the tip of Long Point, Provincetown to Beach Point Beach, Truro (area associated with Cape Cod National Seashore designated as ORW).
AU Size:	4.33 Square Miles
Classification:	SA\ORW
2008 303(d) List:	Category 5

This segment is on the 2008 Integrated List of Waters in Category 5 - Waters Requiring a TMDL (Pathogens). The TMDL for pathogens was recently completed and approved (MassDEP, USEPA Region 1, and ENSR 2009).

Note: According to the Town of Provincetown (Turner 2008), in FY03, the Massachusetts Office of Coastal Zone Management (CZM) provided funding to perform a stormwater assessment and develop a comprehensive stormwater management plan for Provincetown Harbor. Structural BMPs were implemented at discharges (P-7, Atlantic Avenue and P-1 – Provincetown Inn) in FY05 and FY06, respectively, with assistance from MA CZM Coastal Remediation Program. Final designs for BMP implementation at 252 Bradford Street which discharges to P-20 (Kendall Lane) were also developed. The Town of Provincetown was recently selected to receive funding under the 319 Nonpoint Source Pollution Grant Program to construct three additional stormwater collection and infiltration facilities for P-3 (West End Parking Lot), P-8 (Court Street) and P-20 (Bradford Street).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Eelgrass Bed Habitat
Eelgrass surveys and analysis of historical data was conducted for Provincetown Harbor by the MassDEP Wetlands Conservancy Program (WCP) as part of the Eelgrass Mapping Project. Surveys were conducted in 1995, 2001, and most recently in 2006 as part of this program (MassGIS 2008 and Costello 2008). Additional analysis of available aerial photos from 1951 was used to reconstruct the eelgrass distribution prior to any substantial development of the watershed. The 1951 data were only anecdotally validated, while the 1995, 2001, and 2006 maps were field validated (MassGIS 2008 and Costello 2008). There was an estimated 1042.5 acres (~38% of the segment area) of eelgrass bed habitat present in 1951. In 1995 there was an estimated 711.9 acres (~26% of the segment area) and in 2001 there was an estimated 671.2 acres (~24%). No mapping of eelgrass bed habitat has been done for 2006.

The *Aquatic Life Use* is assessed as support for Provincetown Harbor based on the fairly stable presence of eelgrass bed habitat, an indicator of good water quality conditions.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~10% of this segment area (CCB5.1 CCB4.1, CCB4.3) is *Prohibited*, and estimated 13% of this segment area (CCB5.0 and a portion of CCB4.4) is *Conditionally Approved*, and ~77% of this segment area (portion of CCB4.0) is *Approved* for shellfish harvesting (MA DFG 2009).

The *Shellfish Harvesting Use* is assessed as support for 3.33 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 1.0 square miles (~23% of the segment area) because it is either *Prohibited* or *Conditionally Approved* for shellfish harvesting. According to the TMDL (MassDEP, USEPA Region 1, and ENSR 2009), *"In 2003 there were a number of (Ryder Street Beach) exceedances >104 CFU/100 ml. The exceedances were linked to storm events, and the sources were believed to be septic system failures, marine sanitary wastes, and pet waste. The DMF wrote a particularly detailed "Sanitary Survey of Ryder Street Beach Report" in June 2004. Ryder Beach was selected by the EPA as a "flagship" beach as part of their New England Clean Beach Initiative. Since this selection, the town has creatively pursued the installation of a municipal sewer to tie-in suspected septic contributors in the immediate beach area as well as those in low- lying areas near stormwater collection systems where infiltration of contaminated groundwater is problematic. Additionally, the town installed particle separators in the beach area, and has completed an overall stormwater management study and is seeking funds to implement the control recommendations in that study. With boat wastes, the town provides a boat pumping service (holding tank). Studies have indicated that dog wastes play a key pollution role, so stricter pet access to the beach has been enforced, plus installation of mutt mitts and pooper scoopers have occurred to make removal of wastes more expedient. A follow-up monitoring survey is recommended, to determine if all these efforts have actually reduced bacteria pollution levels at the beach, and in*

surrounding water areas." Based on the pathogen TMDL (MassDEP, USEPA Region 1, and ENSR 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and/or unspecified urban stormwater.

Primary and Secondary Contact Recreational and Aesthetics Uses
Provincetown Harbor is heavily used for water-based recreation with 17 public/semi-public beaches (Herring Cove, Provincetown Inn Rotary, 29 Commercial Street, West End Lot, Town Landing West of Coast Guard, Altantic Avenue, Court Street, Ryder Street, 333 Commmercial Street, Johnson Street, 451 Commercial Street, Atkins Lane, Kendal Lane, 593 Commercial Street, 637 Commercial Street, Town Landing Snail Road, and Town Landing Breakwater beaches). Frequent testing for Enterococci bacteria during the swimming season was conducted at these beaches from 2002 – 2007 (MA DPH 2009a). With the exception of four beaches which experienced closures during one of the sampling years (Ryder Street was posted for 32% of the 2003 season, 333 Commercial Street was posted for 12% of the 2003 season, Atkins Lane was posted for 13% of the 2004 season, and Kendal Lane was posted for 13% of the 2006 season), none of the beaches were posted with any notable frequency during any of the seasons.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support based on the low frequency of beach closures at the 17 beaches along the shoreline of Provincetown Harbor. The *Aesthetics Use* in not assessed due to the absence of data.

Provincetown Harbor (MA96-29)

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		SUPPORT 3.33 square miles IMPAIRED 1.0 square miles Cause: Elevated fecal coliform bacteria Sources: Marina/boating pumpout releases, waterfowl, waste from pets, on-site (septic) systems, unspecified urban stormwater
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

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