In 1992-93 monitoring, the Blackstone River headwaters were found to have some of the highest concentrations of fecal coliforms along the entire river under wet weather conditions[77]. Fecal coliform concentrations were reduced downstream by high residual chlorine discharged at UBWPAD during most time periods. During dry weather high bacteria counts were found at several locations during dry weather but many areas met standards. 1998 monitoring also found high levels in a many locations[78]. Many illicit connections were found and repaired however more such connections may be, as yet, undiscovered. Poor aesthetic quality in some reaches also impairs contact recreational use.

→ complete CSO projects;
continue efforts to detect and correct illicit discharges;
implement stormwater management measures;
continue monitoring and analysis to identify other sources;
complete, in cooperation with groups such as the Blackstone Rive Coalition, water quality restoration plans or TMDLs for bacteria in the river and evaluate progress.

C. Woonasquatucket River

There are few data in headwater streams of the Woonasquatucket River. The lower Woonasquatucket (from Stillwater Reservoir to the mouth of the river at Waterplace Park) has fecal coliform counts exceeding criteria in many locations even in dry weather. During wet weather lower river conditions fail to meet fecal coliform criteria both upstream and downstream of CSOs[79]. The Woonasquatucket River is not a shellfishing area.

Phase 2 of the NBC CSO project, to be completed by 2014, should eliminate (?) overflows to the Woonasquatucket River. Smithfield operates the only WWTF discharging to the river, is studying a municipal onsite wastewater management plan, and has extensive sewering included on the CWFA PPL. A TMDL for pathogens in the segment between Georgiaville Pond and the most upstream CSO outfall is a priority for RI DEM but has not been completed yet. Although the TMDL has not been completed, based on fieldwork completed in the watershed, RI DEM has identified the likely need for stormwater BMPs for 30 areas in the watershed. These are included on the TMDL implementation list (18 town and 12 state).

→ complete TMDL analysis, particularly for dry weather discharges;
complete phase 2 of NBC CSO project;
design and implement stormwater management measures.

D. Wood-Pawcatuck River

The Wood-Pawcatuck River generally meets fishable/swimmable standards with respect to bacteria except in the tidal portions. The tidal Pawcatuck and Little Narragansett Bay are listed as impaired by pathogens. All of Little Narragansett Bay has been closed to shellfishing due to high coliform bacteria concentrations since 1948 (1947 in RI waters). CT allows commercial harvest of shellfish in the estuary provided they are depurated in state-certified waters. The RI-CT boundary splits the tidal Pawcatuck and Little Narragansett Bay.

Preliminary work to develop TMDLs for the tidal Pawcatuck and Little Narragansett Bay was initiated by RI DEM but suspended due to staff reductions. CT recognizes the need for a TMDL but assigns it a low priority[80]. A bi-state special area management plan (SAMP) was developed in 1993 for the Pawcatuck estuary and Little Narragansett Bay[81].

Bacteria sources include the Westerly and Pawcatuck WWTFs, stormwater, septic systems, boats, industry, and waterfowl[82]. An upgrade to the Westerly WWTF was completed in October, 2003.

The concentration of bacteria in effluents from the two WWTFs discharging to the tidal river and bay is sufficiently low to ensure little impact on use attainment. A community ISDS repair program for Westerly is included on the CWFA PPL. Although the TMDL is not complete, RI DEM identified the likely need for stormwater management measures for 10 areas in the watershed on its TMDL implementation list (5 state and 5 local). 1992 counts showed slips and mooring spaces for nearly 2,000 boats in the bay as well as ramps for trailered boats. The RI portion of Little Narragansett Bay has been designated as a "no discharge" area for boaters since 1998, and, in 2003, the CT portion of the bay was designated "no discharge" as well.

→ complete a bi-state water quality restoration plan or TMDL for the tidal portions of the Pawcatuck and Little Narragansett Bay;
implement stormwater management measures;
ensure pumpout access and compliance with "no discharge" from boats.

5. By 2020, restore the Seekonk, Moshassuck, Providence, and Pawtuxet Rivers, Upper Bay, and Mount Hope Bay to fishable and swimmable condition.

A. Seekonk River

The Seekonk River is listed as impaired by pathogens. The river is not designated for shellfishing use and does not meet fecal coliform standards for swimming.

RI DEM considers the CSO facilities plan to be an action equivalent to a TMDL. CSO inputs are the largest source of bacteria to the river. The river also receives bacteria input from the Bucklin Point WWTF, from the Blackstone and Ten Mile Rivers, and in runoff from its immediate, small, and almost entirely sewered watershed.

NBC's Bucklin Point WWTF will be completing a major upgrade in 2006 to provide wet weather capacity of 116 MGD during storms and 46 MGD over sustained period of time. Phase 2 of NBC's CSO project, to be completed in 2014, will address overflows on the Providence side of the Seekonk. Overflows along the Blackstone are included in phase 3 of the project, to be completed in 2022. Stormwater BMPs for three areas in the combined Providence/Seekonk watershed are included in DEM's TMDL implementation list (all state responsibility). Redevelopment of the East Providence waterfront should afford opportunities to improve stormwater management. As noted above, data indicate that conditions in the Seekonk River fail to meet swimming water standards even in dry weather. Reducing bacteria loads to the point of achieving swimming and shellfishing standards in the Seekonk is likely to require additional effort.

→ complete Bucklin Point WWTF upgrade and phase 2 of NBC's CSO project;
implement stormwater management measures in conjunction with road work and redevelopment;
conduct a comprehensive investigation to identify needs after most of the CSO inputs are eliminated in 2014.

B. Moshassuck River

The Moshassuck River is listed as impaired by pathogens. It is not a shellfishing area.

RI DEM considers the NBC CSO facilities plan to be an action equivalent to a TMDL except for the reach of the West River above the most-upstream CSO outfall where TMDL work is to start in 2008. No provisions for corrective action are included on DEM's TMDL implementation list

because TMDL analysis has not yet started. Without analysis, it is difficult to identify steps to achieve swimmability by 2020.

Likely sources of pollution are CSOs, nonpoint pollution, and possibly illicit connections. No WWTFs discharge to the Moshassuck. CSOs are to be dealt with through a combination of separating sewers and connections to the storage tunnel as part of phase 2 of NBC's project to be completed by 2014. Lincoln, now approximately half sewered, has development of a wastewater facilities plan on the CWFA PPL.

→ complete phase 2 of NBC's CSO project
develop a water quality restoration plan or TMDL for bacteria in the Moshassuck

C. Providence River

The Providence River is listed as impaired by pathogens. The river does not meet fecal coliform standards for swimming. Shellfishing is not a designated use although quahogs are plentiful and reopening the area or parts of the area, as mentioned above, may be possible in the future.

RI DEM considers the CSO facilities plan to be an action equivalent to a TMDL. CSO inputs are the largest source of bacteria to the river. The river also receives bacteria input from the Fields Point and East Providence WWTFs, from the Seekonk, Woonasquatucket, Moshassuck, and Pawtuxet Rivers, and in runoff from its immediate watershed. Achieving swimmable conditions will depend on success in reducing bacteria loads in all those tributaries as well as identifying and eliminating nearby sources.

→ complete NBC CSO project;
implement stormwater management measures in conjunction with road work and redevelopment;
evaluate progress and identify additional needs after completion of phase 1 of the CSO project in 2007 and plan on an additional evaluation after most CSO inputs are eliminated in 2014.

D. Pawtuxet River

The mainstem of the Pawtuxet River is not listed as impaired by pathogens either in the headwaters or downstream. Several ponds and streams in the watershed are listed as impaired by bacteria but sources are expected to be localized.

→ preserve status as unimpaired by pathogens.

E. Upper Narragansett Bay

Upper Narragansett Bay is listed as impaired by pathogens. It is a shellfishing area although it is conditionally closed because of bacteria pollution.

RI DEM considers the CSO facilities plan to be an action equivalent to a TMDL for this area. It receives bacteria input from the Providence and Warren Rivers and its immediate watershed. NBC's CSO project and Warwick sewering should improve conditions. Bacteria reductions in the Palmer and Runnins Rivers may also have effects although the connecting Warren River is not listed as impaired.

→ complete NBC CSO project;
complete Warwick sewers and require tie-ins where available;

evaluate progress and identify additional needs after completion of phase 1 of the CSO project in 2007

F. Mount Hope Bay

Mount Hope Bay is a shellfishing area but it is closed except for an area along the western shore off Bristol and the Kickamuit River that is conditionally open. An area in MA waters is restricted to harvest with depuration subject to state regulations. Almost all of Mount Hope Bay plus the tidal Kickamuit, Lee, Cole, and Taunton Rivers are listed as impaired by pathogens. Shellfishing remains a designated use except for the area in MA waters that is restricted and an area in RI waters in the center of the bay. The latter area meets the swimming water quality criterion and is not listed as impaired by pathogens.

Bacteria contamination may be reduced significantly with completion of the Fall River CSO project. The project is expected to reduce fecal loading to Mount Hope Bay by 75%. Phase I, increasing the capacity of the WWTF from 50 to 106 MGD, is complete. Phase IIA, a main storage tunnel and screening and disinfection facility for the north system, should be completed by December, 2004. Phase IIB, to be completed by September 2005, will evaluate the project's effectiveness and examine costs and benefits of additional measures. Interstate cooperation during this phase may enable a comprehensive assessment of water quality and shellfishing management in the area.

RI completed its 12-year cycle shoreline survey for shellfishing impacts in 2002. RI DEM has pathogen TMDLs under development for the Kickamuit Reservoir and Upper Kickamuit River. Septic systems, storm drains, and other possible sources have been identified. Farm BMPs as well as storm water BMPs are likely to be needed. Warren, the major RI community in the Kickamuit watershed, is about 70% sewered and has additional sewering on the CWFA project priority list. Concerted effort by RI DEM to complete TMDL analyses underway and planned for the area can benefit from and complement the Fall River CSO evaluation effort and other MA pollution control activities.

→ complete Fall River CSO project phase II;
assess progress in 2005 through coordinated bi-state efforts and identify additional steps that may be needed.

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GOAL	CAUSE OF PROBLEM	SOLUTION
UPPER BAY -- Upper Narragansett Bay (north of line from Warwick Pt. to tip of Prudence Island to Poppasquash Pt.) and all tributaries thereto		
Goal 1: By 2010, reopen 25% of areas now closed to swimming; Reduce number and frequency of beach closures by 50%; Reduce number of days shellfish areas are closed by 50% and reopen 2000 acres	Bacteria due to CSO's, Stormwater Runoff, Sanitary Connections to storm drains	1. Complete Phase 1 of CSO Project by 2007. Should result in 40 % re in bacterial loading; acre-days of shellfish closure should be reduced in northern half of UNB (Area A) and 77% in southern half of UNB(Ar total reduction of 56%. No additional shellfish areas will be permaner No beaches to be reopened. Decrease in beach closure days undete 2. Eliminate sanitary connections to storm drains at Warren Town Beac (78 closure days in 03) 3. Eliminate bacteria or disinfect storm runoff at Bristol Beach (26 closu
Goal 2: By 2015, restore the Blackstone and Woonasquatucket Rivers to fishable/ swimmable condition.	Swimmable - due to bacteria (Woonasquatucket and Blackstone)	1. Complete Phase 2 of NBC CSO Project by 2014. This will reduce ba Woonasquatucket R. Violations may remain due to storm water runo Blackstone R. CSO's will not be addressed until 2022. 2. Phase out high risk cesspools in RI
	Fishable - due to low dissolved oxygen (D.O.) (Woonasquatucket and Blackstone)	3. Planned upgrades to WWTFs on Blackstone R should enable DO sta be met. Provide Best Practicable Treatment (BPT) for nutrient remova Woonasquatucket. Complete planned upgrades to MA WWTFs on Blackstone and conduct analyses on need for additional reductions.
Goal 3: By 2020, restore Seekonk, Moshassuck, Providence, and Pawtuxet Rivers and Upper Bay to fishable/swimmable conditions	Swimmable - due to bacteria (all locations)	1. Complete Phase 3 of CSO Project by 2022. Should result in 95% red in bacterial loading to the Upper Bay for an 80% reduction in acre-da shellfishing closure. No beaches reopened. Beach closure days redu > 50%. 2. Conduct bacterial monitoring of Pawtuxet R. to determine source and extent of bacterial violations; phase out high risk cesspools in RI
	Fishable - due to low dissolved oxygen (Seekonk, Providence, and Pawtuxet Rivers and Upper Bay); - and bacteria for shellfishing (Upper Bay, Providence, and Seekonk Rivers)	3. Provide BPT for nitrogen at all RI WWTF's discharging to Upper Bay; Complete upgrades at MA WWTFs and analyze need for additional re
MID AND LOWER BAY -- Narragansett Bay, including Greenwich Bay and Mt. Hope Bay, from Upper Bay south to southern tip of Jamestown and Newport		
Goal 1: By 2010, reduce number and frequency of beach closures by 50%; Reduce the number of days that shellfish areas are closed by 50% and reopen 2000 acres	Bacteria due to stormwater runoff; ISDS discharges; inflow from the Providence River; poor tidal flushing	1. Sewer area of Warwick tributary to Greenwich Bay and require tie-ins bacteria and nutrients from ISDS systems. 2. Implement stormwater management measures affecting 18 priority o 3. Ensure compliance with "no discharge" from boats 4. Effect of CSO Project on bacteria uncertain. Monitor to determine im
Goal 2: By 2015, restore Greenwich Bay to fishable and swimmable condition	Swimmable - due to bacteria Fishable - due to low dissolved oxygen from nutrient inputs ; - and bacteria (shellfishing)	1. actions above 2. Provide BPT for nitrogen at EG WWTF. BPT at all WWTF's discharg Upper Bay should result in DO attainment in West Passage 3. Effect of Upper Bay WWTFs on nutrients uncertain. Monitor to deter
Goal 3: By 2020, restore Mt. Hope Bay to fishable and swimmable condition	Swimmable - due to bacteria Fishable - due to low dissolved oxygen from nutrient inputs; - and bacteria (shellfishing)	1. Complete Fall River CSO project by 2005. Should result in 75% redu in bacterial loading to Mt. Hope Bay 2. Implement stormwater best management practices (BMPs) in Kickam
SOUTH SHORE -- South coast of Washington County, Jamestown, Newport and Little Compton		
Goal 1: By 2010, reduce number and frequency of beach closures by 50%	Bacterial due to CSO's; sanitary connection to storm drain; runoff	1. Determine source of high bacteria in storm drains at Scarborough St and eliminate 2. Eliminate CSO (Newport) and other sources at King's Park 3. Eliminate sources of runoff pollution to stream at Third Beach
Goal 2: By 2015, restore Wood/Pawcatuck R to fishable and swimmable condition	Swimmable - due to bacteria in tidal segments	1. Establish community ISDS repair program for Westerly; phase out ce 2. Implement stormwater BMPs
	Fishable - due to low dissolved oxygen from nutrient inputs; - and bacteria (shellfishing) in tidal segments	3. Upgrade Westerly WWTF including BPT for nitrogen

Note: yellow or shaded background indicates nutrient-related causes and solutions
Note: BPT (Best Practicable Treatment) means treatment that will reduce nitrogen discharge to the Bay from RI WWTFs by 40-50%