MASSACHUSETTS watershed·based plans

WATERSHED-BASED PLAN

South River

(HUC-12 watershed 010802030501)

July 2026

Prepared By:

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Prepared For:

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

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Contents

Executive Summary

Introduction: The purpose of a Massachusetts Watershed-Based Plan (WBP) is to organize information about Massachusetts' watersheds and present the information in a format that will enhance the development and implementation of projects that will restore water quality and beneficial uses in the Commonwealth. The Massachusetts WBP follows the United States Environmental Protection Agency's (USEPA's) recommended format for "nine-element" watershed plans. This WBP was developed by Geosyntec Consultants, Inc. (Geosyntec) under the direction of the Massachusetts Association of Conservation Districts (MACD) with funding, input, and collaboration from the Massachusetts Department of Environmental Protection (MassDEP).

This WBP was prepared for the South River watershed (12-digit hydrologic unit code [HUC-12] 010802030501), which is in the Towns of Ashfield and Conway, Massachusetts. The total area of the South River watershed is approximately 16,831 acres (approximately 26.3 square miles). The South River mainstem is approximately 15.3 miles long and discharges into the Deerfield River. The most upstream segment of the South River (MA33-07) extends approximately 2.3 miles from its headwaters at Ashfield Pond (MA33001) (also known as Ashfield Lake) to Emmet Road in Ashfield. A dam is located at the outlet of Ashfield Pond, which is the starting point of the South River; this dam is classified as high hazard by the Massachusetts Office of Dam Safety (MAODS). The second segment of the South River (MA33-101) extends approximately 6.1 miles from Emmet Road in Ashfield to the confluence with Johnny Bean Brook in Conway. No dams are located along this segment. The South River has two tributaries along this segment: Creamery Brook (MA33-46) and Poland Brook (MA33-74). Creamery Brook (MA33-74) in Ashfield flows west to east and includes an Unnamed Tributary (MA33-137) prior to discharging to the South River. Poland Brook in Conway flows south to north into the South River and is formed by the confluence of Chapel Brook (MA33-44) and Nye Brook (MA33-71). Chapel Brook, located in Ashfield and Conway, flows west to east and includes an Unnamed Tributary (MA33-115) with headwaters west of Bird Hill Road, Ashfield. The most downstream segment of the South River (MA33-102) extends for a total of approximately 6.9 miles from the confluence with Johnny Bean Brook to the watershed discharge point into the Deerfield River. Two dams are located along this segment: the "Flagg Dam" and the "Conway Electric Dam," which are both classified as low hazard by the MAODS. The South River has four tributaries along this segment, including Johnny Bean Brook (MA33-63), Pumpkin Hollow Brook (MA33-32), an Unnamed Tributary (MA33-114), and Chadwick Brook.

Impairments, Water Quality Data, and Pollution Sources: Ashfield Pond (MA33001) is identified as a category 4A waterbody on the 2022 Massachusetts Integrated List of Waters (303(d) list) due to mercury in fish tissue from atmospheric deposition and unknown sources and water chestnut from the introduction of non-native organisms (accidental or intentional). The upstream 2.3-mile segment of the South River (MA33-07) is identified as a category 5 waterbody on the 303(d) list due to temperature from a dam or impoundment and unknown sources. The 6.1-mile segment of the South River (MA33-101), extending from Emmets Road, Ashfield to the confluence with Johnny Bean Brook, is identified as a category 5 waterbody due to Escherichia coli (*E. coli*) from unknown sources and fecal coliform from unknown sources. The downstream 6.9-mile segment of the South River (MA33-102), extending from the confluence with Johnny Bean Brook to the Deerfield River, is identified as a category 5 waterbody due to physical substrate habitat alterations from unknown sources; temperature from agriculture, dams or impoundments, and unknown sources; *E. coli* from unknown sources; and fecal coliform from unknown sources. The Unnamed Tributary to Creamery Brook (MA33-137) is identified as a Category 5 waterbody due to temperature from agriculture and unknown sources and *E. coli* from unknown sources. Additionally, subwatershed pollutant loading modeling indicated Creamery Brook subwatershed, has the largest per acre average loading of the major subwatersheds; Pumpkin Hollow Brook subwatershed and area along the South River

mainstem (not included in a major subwatershed) have the second and third largest per acre average loading, respectively.

E. coli data available from 2005, 2006, 2012, 2017-2021, 2023, and 2025 indicated elevated levels of *E. coli* (above the Massachusetts Water Quality Standards [MSWQS]) in the South River watershed. Data collected for locations along South River (MA33-07), South River (MA33-101), South River (MA33-102), Poland Brook (MA33-74), Chapel Brook (MA33-44), Creamery Brook (MA33-46), and Unnamed Tributary to Creamery Brook (MA33-137) had one or more exceedances for *E. coli*.

Total Phosphorus (TP) data for indicated levels above the Vermont standard for a medium high-gradient stream (the MSWQS does not include a TP standard) in the following segments: South River (MA33-102), South River (MA33-101), South River (MA33-102), Poland Brook (MA33-74), and the Unnamed Tributary to Creamery Brook (MA33-137).

Data collected for locations along Chapel Brook (MA 33-44), and Unnamed Tributary to Creamery Brook (MA33-137) in 2012 exceeded the MSWQS for temperature. Data collected for two locations along South River (MA-33-07) in 1995 exceeded the MSWQS for cold water fisheries.

Additional issues and pollution sources identified by stakeholders, reports and assessments include:

- erosion and channel instability
- agricultural runoff
- pet waste
- wildlife waste
- historic dams, channel modifications, removal of boulders and woody debris
- septic systems
- beaver activity
- dirt roads
- machinery repair sites
- road undermining
- weed spraying

Goals, Management Measures, and Funding: The long-term goal of this WBP is to reduce *E. coli*, TP, sediment and nitrogen loading in the South River watershed, eventually leading to delisting of impaired waterbodies in the study area from the Massachusetts Integrated List of Waters (303(d) list). It is expected that these pollutant load reductions will result in improvements to other water quality parameters throughout the watershed as well.

These goals will be accomplished through implementation of structural and non-structural Best Management Practices (BMPs) to capture runoff and reduce pollutant loading as well as implementation of watershed education and outreach to achieve additional pollutant load reductions. MACD was a recipient of Clean Water Act (CWA) Section 319 funding in Fiscal Year 2024 for its “Expanded Western Massachusetts Agricultural Nonpoint Source (NPS) Program”. Under this program, MACD is conducting outreach and engagement directed towards implementing BMPs to reduce potential agricultural nutrient runoff. The outreach focuses on restoring impaired waters and protecting unimpaired/high quality and threatened waters within Western Massachusetts watersheds including South River watershed.

It is expected that future funding for management measures will be obtained from a variety of sources including CWA Sections 604(b) and 319 Grant funding, United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) National Water Quality Initiative (NWQI) funding, Massachusetts Environmental Trust (MET) grants, Massachusetts Department of Agricultural Resources (MDAR) [such as Climate Smart Agricultural Program (CSAP)], Town capital funds, volunteer efforts, and USDA NRCS programs including the Environmental Quality Incentives Program (EQIP) and the Agricultural Management Assistance (AMA) program.

Public Education and Outreach: Goals of public education and outreach are to provide information about conservation plans and agricultural BMPs and their anticipated benefit to farm operations as well as water quality benefits; provide information about funding resources for BMP implementation; provide information to all residents within the watershed to promote watershed stewardship; and to provide information to all residents in the watershed about proposed stormwater improvements and their anticipated water quality benefits.

An initial stakeholder meeting was held on January 13, 2026, which included core stakeholders in the South River watershed. The purpose of the meeting was to introduce stakeholders to one another and gain consensus on elements of this WBP.

Implementation Schedule and Evaluation Criteria: The implementation schedule includes milestones for monitoring, farmer outreach for implementation of structural and non-structural BMPs, public education and outreach, and plan updates.

This WBP recommends continuing and possibly expanding the current water quality monitoring program that is managed by Connecticut River Conservancy (CRC) and Deerfield River Watershed Association (DRWA). The program could be expanded to include additional sampling locations and parameters. This would help deepen an understanding of water quality trends in the South River watershed including determining sources of pollution, evaluating the effectiveness of implemented BMPs, and tracking compliance with the water quality goals identified in this WBP.

This WBP is meant to be a living document, re-evaluated at least once every three years and adjusted as needed based on ongoing efforts (e.g., based on monitoring results, funding, etc.). It is recommended that a working group of watershed stakeholders be established to meet at least biannually to implement and update this WBP, and track progress. A stakeholder should also be designated for maintaining this WBP and coordinating periodic plan evaluations and updates. The Franklin Regional Council of Governments (FRCOG) is the regional planning agency for Franklin County and may be aware, through other funded projects, of work that may inform ongoing or planned projects for the South River watershed. As part of planning future nonpoint source management work within the watershed, project proponents should contact FRCOG staff for updates and opportunities to leverage funding and coordinate project activities.

Introduction

What is a Watershed-Based Plan?

Purpose & Need

The purpose of a Massachusetts Watershed-Based Plan (WBP) is to organize information about Massachusetts' watersheds and present the information in a format that will enhance the development and implementation of projects that will restore water quality and beneficial uses in the Commonwealth. The Massachusetts WBP follows the United States Environmental Protection Agency's (USEPA's) recommended format for "nine-element" watershed plans, as described below.

All states are required to develop WBPs, but not all states have taken the same approach. Most states develop WBPs only for selected watersheds. Massachusetts Department of Environmental Protection's (MassDEP's) approach has been to develop a tool to support statewide development of WBPs, so **that good projects in all areas of the state may be eligible for federal watershed implementation grant funds** under Section 319 of the Clean Water Act.

USEPA guidelines promote the use of Section 319 funding for developing and implementing WBPs. WBPs are required for all projects implemented with Section 319 funds, and are recommended for all watershed projects, whether they are designed to protect unimpaired waters, restore impaired waters, or both.

Watershed-Based Plan Outline

This WBP for the South River watershed includes nine elements (a through i) in accordance with USEPA Guidelines:

a) An **identification of the causes and sources** or groups of similar sources that will need to be controlled to achieve the load reductions estimated in this WBP (and to achieve any other watershed goals identified in the WBP), as discussed in item (b) immediately below.

b) An **estimate of the load reductions** expected for the management measures described under paragraph (c) below (recognizing the natural variability and the difficulty in precisely predicting the performance of management measures over time).

c) A **description of the nonpoint source management measures** needed to achieve the load reductions estimated under paragraph (b) above (as well as to achieve other watershed goals identified in this WBP), and an identification (using a map or a description) of the critical areas in which those measures will be needed to implement this plan.

d) An **estimate of the amounts of technical and financial assistance needed**, associated costs, and/or the sources and authorities that will be relied upon, to implement this plan. As sources of funding, States should consider the use of their Section 319 programs, State Revolving Funds, United States Department of Agriculture's (USDA's) Environmental Quality Incentives Program (EQIP) and Conservation Reserve Program, and other relevant Federal, State, local and private funds that may be available to assist in implementing this plan.

e) An **information/education component** that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented.

f) A **schedule for implementing the nonpoint source management measures** identified in this plan that is reasonably expeditious.

g) A description of **interim, measurable milestones** for determining whether nonpoint source management measures or other control actions are being implemented.

h) A set of **criteria to determine if loading reductions are being achieved** over time and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether this WBP needs to be revised or, if a nonpoint source total maximum daily load (TMDL) has been established, whether the TMDL needs to be revised.

i) A **monitoring component** to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above.

Project Partners and Stakeholder Input

This WBP was developed by Geosyntec under the direction of the Massachusetts Association of Conservation Districts (MACD) with funding, input, and collaboration from MassDEP. MACD was a recipient of Section 319 funding in Federal Fiscal Year (FFY) 2024 for its "Expanded Western Massachusetts Agricultural Nonpoint Source (NPS) Program". Under this program, MACD is conducting outreach and engagement directed towards implementing Best Management Practices (BMPs) for reducing potential agricultural nutrient runoff. The outreach focuses on restoring impaired waters and protecting unimpaired/high quality and threatened waters within Western Massachusetts watersheds including South River watershed.

The following are core project stakeholders:

- Meghan Siudzinski, MACD
- Padmini Das, MassDEP
- Judith Rondeau – MassDEP
- Meghan Selby – MassDEP
- Shervon DeLeon – MassDEP
- Michael Leff – Ecological Connections
- Melissa Langley – Connecticut River Conservancy (CRC)
- Tamsin Flanders – Franklin Regional Council of Governments (FRCOG)
- Kimberly MacPhee—FRCOG
- Maureen O'Reilly – FRCOG
- Janet Chayes – Friends of the South River
- Carolyn Shores Ness – Franklin Conservation District (FCD)
- Kyla Power – FCD
- Emily Boss – Franklin Land Trust
- Kelly Kowal – Town of Ashfield Conservation Commission
- Ricki Carroll – Town of Ashfield Park Commission
- Tony Somers – Town of Conway Conservation Commission
- Neal Anderson – Deerfield River Watershed Chapter of Trout Unlimited (DRWTU)
- Jim Krupa – DRWTU

- Eric Halloran – DRWTU
- Sheila Comstock – DRWTU, DRWA
- Michelle Cozine – United States Department of Agricultura Natural Resources Conservation Service (USDA NRCS)

This WBP was developed as part of an iterative process as outlined below:

- The Geosyntec project team first collected and reviewed existing data from MACD, FRCOG, MassDEP and other available sources.
- Subsequently, a stakeholder meeting was held on January 13, 2026, to solicit additional input and gain consensus on elements included in the plan (identifying problem areas, BMP projects, water quality goals, public outreach activities, etc.). The meeting minutes from the stakeholder meeting are included in **Appendix A**.
- Next, a WBP was drafted by Geosyntec and reviewed by MACD and FRCOG staff.
- The WBP was updated and finalized by Geosyntec based on MACD and FRCOG input and submitted by Geosyntec to MassDEP for review.

This WBP is meant to be a living document. It should be reevaluated at least once every three years and adjusted as needed based on ongoing efforts (e.g., based on monitoring results, 319 funding, etc.). It is strongly recommended that a working group of stakeholders be established to meet at least biannually to implement and update this WBP, and track progress. FRCOG is the regional planning agency for Franklin County and may be aware, through other funded projects, of work that may inform ongoing or planned projects for the South River watershed. As part of planning future nonpoint source management work within the watershed, project proponents should contact FRCOG staff, along with the Towns of Ashfield and Conway, and the Friends of the South River, for updates and opportunities to leverage funding and coordinate project activities.

Data Sources

This WBP was developed using the framework and data sources provided by MassDEP's Massachusetts Watershed-based Plans Tool (WBP Tool)[1] and supplemented by information provided in the Section 319 grant scope of services "Expanded Western Massachusetts Agricultural NPS Program" (MACD, 2025). Additional data sources were reviewed and are included in subsequent sections of this WBP.

[1] https://prj.geosyntec.com/MassDEPWBP

Element A: Identify Causes of Impairment & Pollution Sources

Element A: Identify the causes and sources or groups of similar sources that need to be controlled to achieve the necessary pollutant load reductions estimated in the watershed based plan (WBP).

General Watershed Information

This WBP was prepared for the South River watershed (12-digit hydrologic unit code [HUC-12] 010802030501), which is in the Towns of Ashfield and Conway, Massachusetts. The total area of the South River watershed is approximately 16,831 acres (approximately 26.3 square miles).

The South River watershed includes approximately 34 miles of streams, with 3.87 miles passing through agricultural land. On average, the channel slope is 3.07% (FRCOG, 2023).

The South River mainstem is approximately 15.3 miles long and discharges into the Deerfield River. The most upstream segment of the South River (MA33-07) extends approximately 2.3 miles from its headwaters at Ashfield Pond (MA33001) (also known as Ashfield Lake) to Emmet Road in Ashfield. A dam is located at the outlet of Ashfield Pond, which is the starting point of the South River; this dam is classified as high hazard by the Massachusetts Office of Dam Safety (MAODS).

The second segment of the South River (MA33-101) extends approximately 6.1 miles from Emmet Road in Ashfield to the confluence with Johnny Bean Brook (MA33-63) in Conway. No dams are located along this segment. The South River has two tributaries along this segment: Creamery Brook (MA33-46) and Poland Brook (MA33-74). Creamery Brook (MA33-74) in Ashfield flows west to east and includes an Unnamed Tributary (MA33-137) prior to discharging to the South River. Poland Brook (MA33-74) in Conway flows south to north into the South River and is formed by the confluence of Chapel Brook (MA33-44) and Nye Brook (MA33-71). Chapel Brook, located in Ashfield and Conway, flows west to east and includes an Unnamed Tributary (MA33-115) with headwaters west of Bird Hill Road, Ashfield.

The most downstream segment of the South River (MA33-102) extends for a total of approximately 6.9 miles from the confluence with Johnny Bean Brook to the watershed discharge point into the Deerfield River. Two dams are located along this segment: the “Flagg Dam” and the “Conway Electric Dam”, which are both classified as low hazard by the MAODS. The South River has four tributaries along this segment, including Johnny Bean Brook (MA33-63), Pumpkin Hollow Brook (MA33-32), an Unnamed Tributary (MA33-114), and Chadwick Brook.

Ashfield and Conway do not include any regulated municipal separate storm sewer system (MS4) and therefore no portion of the watershed requires permitting under the 2016 Massachusetts Small MS4 General Permit.

The South River watershed has 1,694 acres of Priority Habitats of Rare Species and 19 acres of Priority Natural Vegetation Communities under the Natural Heritage and Endangered Species Program. The watershed has five acres under Public Water Supply protection but no Areas of Critical Environmental Concern or Outstanding

Resource Waters. Over 2,219 acres of land protected in perpetuity exist within the South River watershed, which is part of a total of 4,006 acres of Protected and Recreational Open Space (MassDEP, 2024).

Table A-1 presents the general watershed information for the South River watershed and **Figure A-1** includes a map of the watershed boundary.

Table A-1: South River General Watershed Information

Watershed Name (Assessment Unit ID):	Ashfield Pond (MA33001) Chadwick Brook Chapel Brook (MA33-44) Creamery Brook (MA33-46) Johnny Bean Brook (MA33-63) Nye Brook (MA33-71) Poland Brook (MA33-74) Pumpkin Hollow Brook (MA33-32) South River (MA33-07) South River (MA33-101) South River (MA33-102) Unnamed Tributary (MA33-114) Unnamed Tributary (MA33-115) Unnamed Tributary (MA33-137)
Major Basin:	Deerfield River
Watershed Area (within MA):	16,831 acres (26.3 square miles)

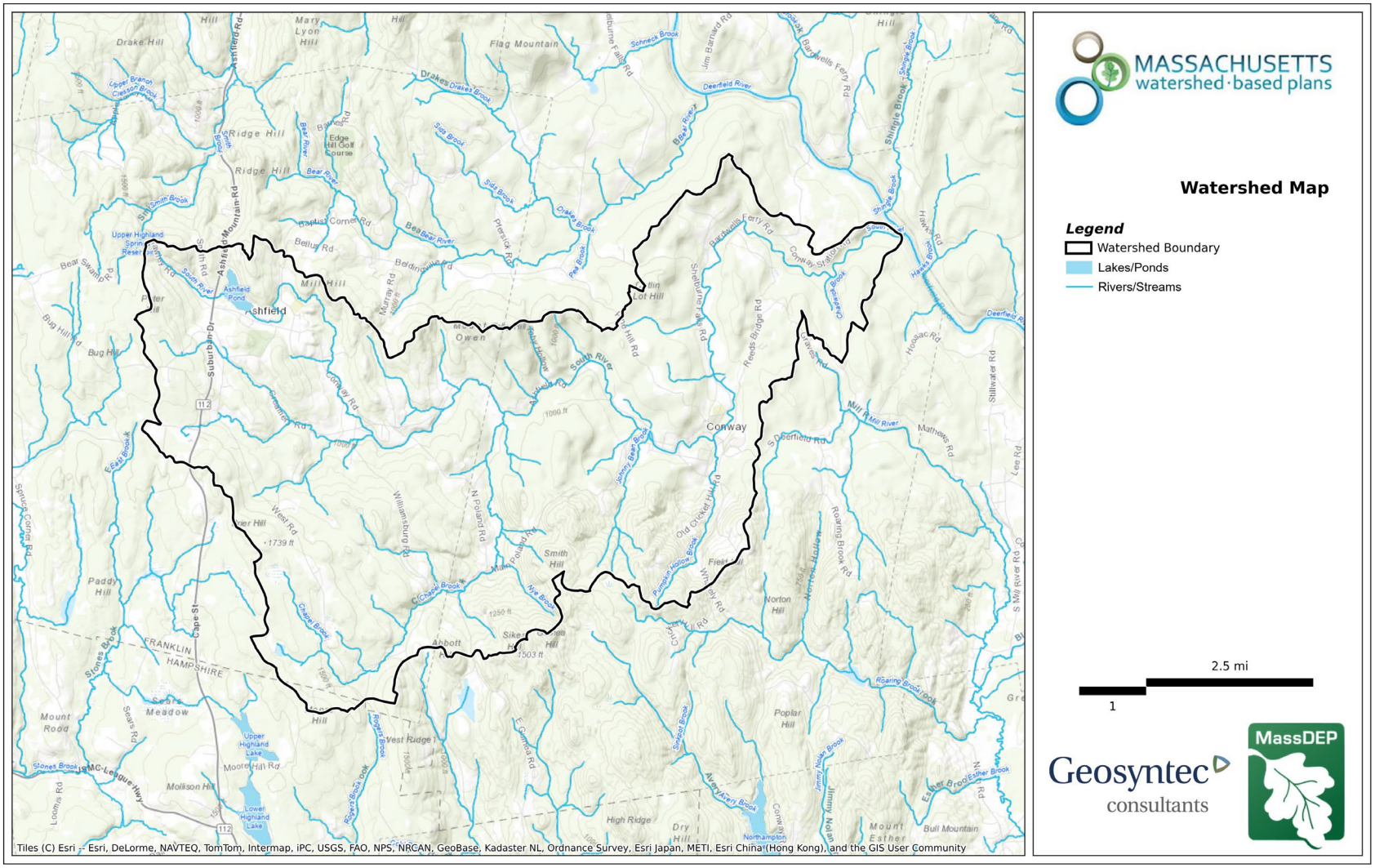

Figure A-1: South River Watershed Boundary Map

(MassGIS, 2007; MassGIS, 1999; MassGIS, 2001; USGS, 2016)

Ctrl + Click on the map to view a full-sized image in your web browser.

Water Quality Impairments and Pollution Sources

Impairment categories from the MassDEP 2022 Massachusetts Integrated List of Waters (303(d) List) (MassDEP, 2023a) are listed in **Table A-2**. Known water quality impairments, as documented in the 2022 303(d) List are illustrated in **Figure A-2** and listed in **Table A-3.** Ashfield Pond (MA33001) is identified as a category 4A waterbody due to mercury in fish tissue from atmospheric deposition and unknown sources and water chestnut from the introduction of non-native organisms (accidental or intentional). The upstream 2.3-mile segment of the South River (MA33-07) is identified as a category 5 waterbody due to temperature from a dam or impoundment and unknown sources. The 6.1-mile segment of the South River (MA33-101), extending from Emmets Road, Ashfield to the confluence with Johnny Bean Brook, is identified as a category 5 waterbody due to *Escherichia coli (E. coli)* from unknown sources and fecal coliform from unknown sources. The downstream 6.9-mile segment of the South River (MA33-102), extending from the confluence with Johnny Bean Brook to the Deerfield River, is identified as a category 5 waterbody due to physical substrate habitat alterations from unknown sources; temperature from agriculture, dams or impoundments, and unknown sources; *E. coli* from unknown sources; and fecal coliform from unknown sources. The Unnamed Tributary to Creamery Brook (MA33-137) is identified as a Category 5 waterbody due to temperature from agriculture and unknown sources and *E. coli* from unknown sources. Other waterbodies within the South River watershed are identified as category 2.

Table A-2: 2022 MA Integrated List of Waters Categories

Integrated List Category	Description
1	Unimpaired and not threatened for all designated uses.
2	Unimpaired for some uses and not assessed for others.
3	Insufficient information to make assessments for any uses.
4	Impaired or threatened for one or more uses, but not requiring calculation of a Total Maximum Daily Load (TMDL), including: 4a: TMDL is completed 4b: Impairment controlled by alternative pollution control requirements 4c: Impairment not caused by a pollutant - TMDL not required
5	Impaired or threatened for one or more uses and requiring preparation of a TMDL.

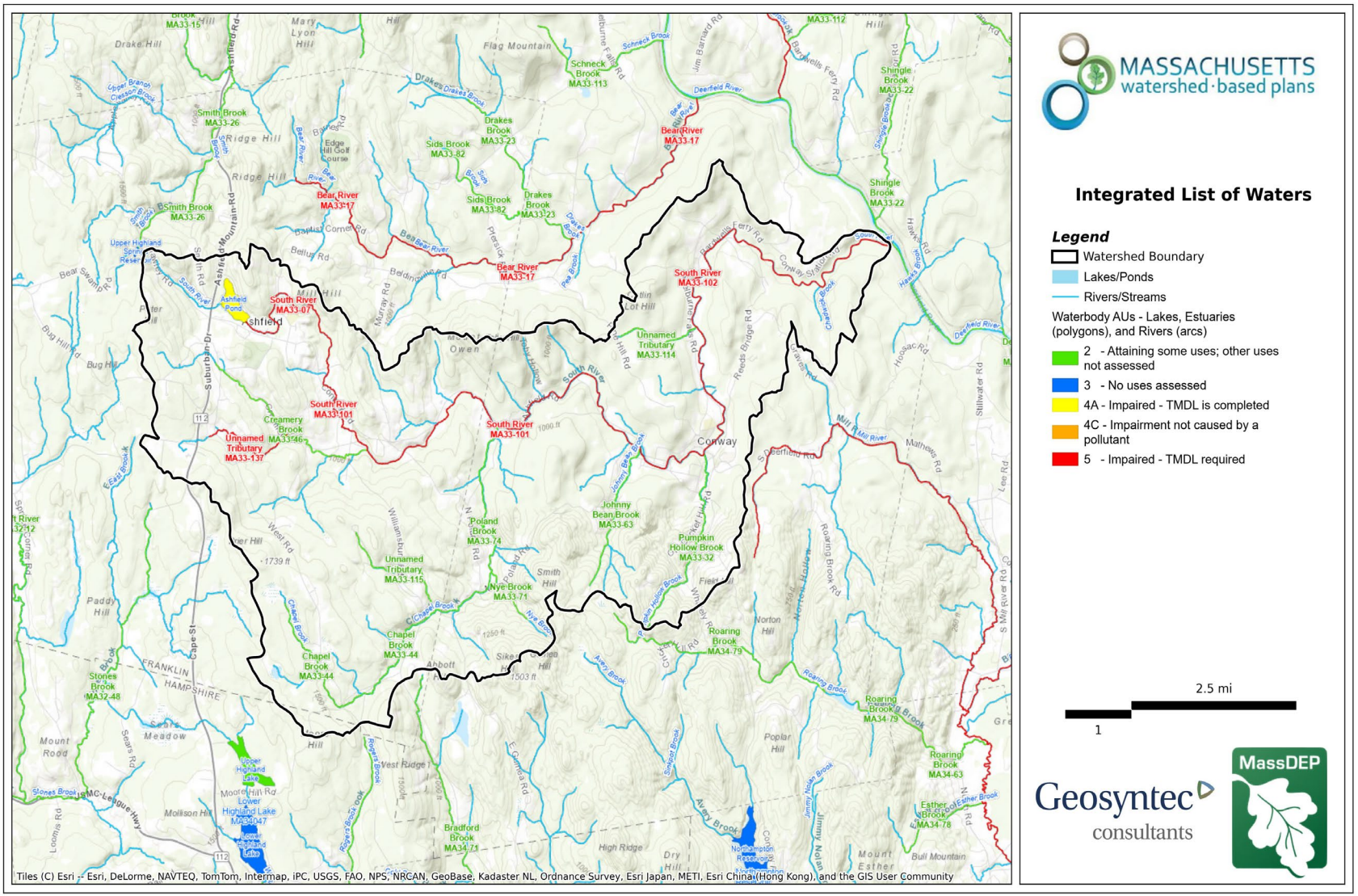

Figure A-2: South River Water Quality Impairments Map

(MassGIS, 2007; MassGIS, 1999; MassGIS, 2001; USGS, 2016; MassGIS, 2023)

Ctrl + Click on the map to view a full-sized image in your web browser.

Table A-3: Water Quality Impairments in the South River Watershed (MassDEP, 2023a)

Assessment Unit ID	Waterbody	Integrated List Category	Designated Use	Impairment Cause	Impairment Source
MA33001	**Ashfield Pond**	**4A**	Fish Consumption	MERCURY IN FISH TISSUE	ATMOSPHERIC DEPOSITION - TOXICS
MA33001	**Ashfield Pond**	**4A**	Fish Consumption	MERCURY IN FISH TISSUE	SOURCE UNKNOWN
MA33001	**Ashfield Pond**	**4A**	Fish, other Aquatic Life and Wildlife	WATER CHESTNUT	INTRODUCTION OF NON-NATIVE ORGANISMS (ACCIDENTAL OR INTENTIONAL)
MA33-07	**South River** (outlet of Ashfield Lake to Emmets Road, Ashfield)	**5**	Fish, other Aquatic Life and Wildlife	TEMPERATURE	DAM OR IMPOUNDMENT
MA33-07	**South River (outlet of Ashfield Lake to Emmets Road, Ashfield)**	**5**	Fish, other Aquatic Life and Wildlife	TEMPERATURE	SOURCE UNKNOWN
MA33-101	**South River** (Emmets Rd. to confluence with Johnny Bean Brook, Conway)	**5**	Primary Contact Recreation	ESCHERICHIA COLI (E. COLI)	SOURCE UNKNOWN
MA33-101	**South River** (Emmets Rd. to confluence with Johnny Bean Brook, Conway)	**5**	Primary Contact Recreation	FECAL COLIFORM	SOURCE UNKNOWN
MA33-102	**South River** (confluence with Johnny Bean Brook to confluence with Deerfield River, Conway	**5**	Fish, other Aquatic Life and Wildlife	PHYSICAL SUBSTRATE HABITAT ALTERATIONS	SOURCE UNKNOWN
MA33-102	**South River** (confluence with Johnny Bean Brook to confluence with Deerfield River, Conway)	**5**	Fish, other Aquatic Life and Wildlife	TEMPERATURE	AGRICULTURE
MA33-102	**South River** (confluence with Johnny Bean Brook to confluence with Deerfield River, Conway	**5**	Fish, other Aquatic Life and Wildlife	TEMPERATURE	DAM OR IMPOUNDMENT
MA33-102	**South River** (confluence with Johnny Bean Brook to confluence with Deerfield River, Conway)	**5**	Fish, other Aquatic Life and Wildlife	TEMPERATURE	SOURCE UNKNOWN
MA33-102	**South River** (confluence with Johnny Bean Brook to confluence with Deerfield River, Conway)	**5**	Primary Contact Recreation	ESCHERICHIA COLI (E. COLI)	SOURCE UNKNOWN
MA33-102	**South River** (confluence with Johnny Bean Brook to confluence with Deerfield River, Conway)	**5**	Primary Contact Recreation	FECAL COLIFORM	SOURCE UNKNOWN

Assessment Unit ID	Waterbody	Integrated List Category	Designated Use	Impairment Cause	Impairment Source
MA33-137	**Unnamed Tributary to Creamery Brook** (headwaters of perennial portion west of West Road, Ashfield to confluence with Creamery Brook, Ashfield**)**	**5**	Fish, other Aquatic Life and Wildlife	TEMPERATURE	AGRICULTURE
MA33-137	**Unnamed Tributary to Creamery Brook** (headwaters of perennial portion west of West Road, Ashfield to confluence with Creamery Brook, Ashfield**)**	**5**	Fish, other Aquatic Life and Wildlife	TEMPERATURE	SOURCE UNKNOWN
MA33-137	**Unnamed Tributary to Creamery Brook** (headwaters of perennial portion west of West Road, Ashfield to confluence with Creamery Brook, Ashfield**)**	**5**	Primary Contact Recreation	ESCHERICHIA COLI (E. COLI)	SOURCE UNKNOWN

MassDEP Water Quality Assessment Report and TMDL Review

The section below summarizes the findings of the available Water Quality Assessment Reports and/or TMDLs that relate to water quality and water quality impairments.

The following water quality assessment report and TMDL are available:

- *Deerfield River Watershed 2000 Water Quality Assessment Report* (MassDEP, 2000)
- Final MA Statewide TMDL for Pathogen Impaired Waters (MassDEP, 2024)
    - Appendix D: Deerfield River Basin | Final Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies

Select excerpts from the water quality assessment report relating to the water quality in the South River watershed are included in **Appendix B** (note: relevant information is included directly from these documents for informational purposes and has not been modified).

Additionally, the "Final Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies" (MassDEP, 2024) includes two segments within the South River watershed (MA33-101 and MA33-102). Based on data from 2005—2006, the TMDL suggests that elevated bacteria sources likely include urban stormwater, illicit sewage discharges, on-site wastewater disposal systems, agriculture, pet waste, and wildlife waste. The water quality goal of the TMDL is to meet Massachusetts Surface Water Quality Standards (MSWQS) for bacteria at the point of discharge for all of the river segments in the report (see also the "Water Quality Goals" section below).

2013 Fluvial Geomorphic Assessment of the South River Watershed (Field, 2013)

The FRCOG received a CWA Section 604(b) Water Quality Management Planning grant from MassDEP to conduct a thorough assessment of the South River mainstem, aiming to identify factors contributing to

erosion, channel instability, and habitat degradation, and identify restoration options to better manage riverine problems along the South River mainstem.

The report described how the South River watershed has experienced extensive anthropogenic influence, notably through substantial modifications to the river channel. Throughout the 18th and 19th centuries, over 30 mills operated within the watershed, each accompanied by the construction of dams to supply water for mechanical power. Additionally, extensive channel straightening and the removal of boulders and woody debris were carried out both as part of mill operations and flood mitigation measures. Although these mills are no longer functional, the historical interventions continue to affect river dynamics, aquatic habitats, and public safety in several critical ways. First, erosion of steep banks composed of silt- and clay-rich sediments—deposited behind former mill dams—now contributes to increased downstream sediment loads. Second, high-energy flood flows constrained within previously straightened channels cannot freely access adjacent floodplains due to channel incision and confining berms. Third, aquatic habitat quality remains compromised along significant portions of the river, as the absence of large boulders and woody material has reduced the presence of pools, cover, and hydraulic complexity.

The 2013 assessment found that one quarter of the riverbanks on South River are eroding. Most of this bank erosion is the result of channel incision through impoundment sediments or flow deflection around bars deposited in the channel. Where the river flows against the valley sides and encounters high banks of glacial deposits, the river is capable of initiating landslides, larger scale mass failures that rapidly introduce large amounts of sediment and wood into the channel. Forty-six mass failures were present on the South River, with most of these mass wasting events found in narrowly confined reaches of the river where the river is more likely to flow against the valley sides. Lack of vegetated buffer between the river and some adjacent farm fields likely also plays a role.

Concerns about erosion and its potential for land loss and infrastructure damage have led to the armoring of nearly 10% of the river's banks. Armoring on the South River comes in the form of concrete retaining walls found along portions of Route 116, stacked rock retaining walls, and more traditional rock riprap. A geocell retaining wall filled with soil to support plant growth was built upstream of the Main Street bridge in Conway but was washed away less than one month after completion during Tropical Storm Irene in August 2011 and replaced with boulder riprap. Bank armoring usually extends over only the bank, but in one location the riprap was also placed over much of the channel bed. While protecting property and infrastructure, bank armoring prevents natural channel adjustments that are important for creating aquatic habitat and establishing long-term channel stability. Furthermore, Route 116 parallels much of the central section of the South River, and this proximity limits natural river changes over time.

Several of the river's larger tributaries were added to the assessment in 2015. Analysis of historical aerial photographs and maps, surveying of cross sections, and mapping of erosion, bars, channel straightening, and other channel features were used to delineate and characterize 94 discreet channel segments along the river. The condition of 10 geomorphic and habitat features, including pools, wood, and riparian vegetation, were used to identify and quantify the need for restoration in each segment.

2012 South River Fish Communities and Physical Habitat Assessment (Cole, 2013)

A comprehensive assessment of river habitat and fish communities was performed as a linked study to the geomorphic assessment described above. Observed physical habitat conditions within the South River varied considerably; however, a general pattern of increasing environmental degradation was apparent in the downstream direction. Multiple environmental indicators demonstrated this trend, including bank stability, instream woody debris accumulation, riparian tree coverage, width-to-depth ratio, percentage of

glide habitat, and water temperature. The analysis determined these longitudinal patterns result from both natural processes and anthropogenic modifications, exerting a greater influence on fish community composition than local habitat variability.

In the upstream portion of the South River (generally within the Town of Ashfield), limiting factors include reduced instream complexity and cover as well as elevated levels of sediment loading. However, much of this section maintains intact habitats and summer water temperatures suitable for sustaining wild trout populations; consequently, fish assemblages are predominantly composed of wild trout and other sensitive species. In contrast, the lower portion of the South River, particularly downstream of the Conway town line, is adversely affected by channel straightening, increased sediment input, and cumulative upstream impacts. Here, fish communities are largely dominated by species that are more tolerant to these environmental conditions, with wild trout being nearly absent. Limiting factors prevalent throughout the lower river encompass diminished habitat quality and complexity, such as a lack of deep pools, adequate instream cover, and clean gravel substrates, in addition to elevated water temperatures. These degraded conditions are most pronounced in sections of the river that have been straightened or channelized, potentially facilitating juvenile Atlantic salmon to out-compete wild trout in the lower and middle reaches.

2015 Deerfield River Watershed-Based Plan (FRCOG, 2015)

Forested land use and rural land, including agricultural land use, were identified as the primary sources of pollutant loads in the South River watershed in the 2015 Deerfield River Watershed Based Plan (FRCOG, 2015). Stream channel erosion was identified as a significant source of the annual sediment load and septic systems were identified as a significant source of the annual fecal coliform load. As noted above, historically, the South River included approximately 30 dams along its length. While only 3 dams currently remain, fine-grained sediments remain in the former impoundments of many of the breached dams. These legacy sediments were cited as a potential source of suspended sediments.

Local Hazard Mitigation Plans

South River is identified in the Town of Ashfield's Hazard Mitigation Plan (Ashfield Hazard Mitigation Committee and FRCOG, 2020) and the Town of Conway's Hazard Mitigation Plan (Conway Hazard Mitigation Committee and FRCOG, 2020) as having the potential for the following hazards:

- Stream sensitivity of the South River throughout the Towns of Ashfield and Conway ranges from 'High' to 'Extreme' for its full length, except for a few small reaches of lesser sensitivity. Essential roads, as well as structures and facilities, in both towns are in the South River's 100-year floodplain and/or the mapped river corridor and vulnerable to flooding and fluvial erosion.

- A dam failure at Ashfield Lake Dam would result in catastrophic flooding in the Towns of Ashfield and Conway.

- Streambanks along the South River in the Towns of Ashfield and Conway are unstable and thus susceptible to flooding and fluvial erosion during hurricanes, tropical storms, and severe thunderstorm events.

National Water Quality Initiative (NWQI) (FRCOG, 2023)

The South River watershed was designated as a National Water Quality Initiative (NWQI) watershed by the USDA NRCS in Fiscal Year 2023. FRCOG completed the NWQI South River Watershed Assessment in July of 2023. Water quality issues identified in the assessment included bacteria, geomorphic impairment, sediment, thermal enrichment, and excess nutrients. Literature review, modeling, and fieldwork suggested

E. coli loading is likely caused by erosion, beaver activity, livestock agriculture, manure spreading, and possibly failing septic systems. Temperature problems were identified as likely stemming from the Ashfield dam impoundment, minimal riparian buffers, and wide stream channels. Changes to physical habitat were linked to streambank erosion, legacy sediment movement, and uneven human-influenced distribution of large woody debris. Elevated nutrients were identified as likely resulting from subsurface flow, agricultural and residential runoff, sediment erosion, dirt roads, and possibly failing septic systems.

January 13, 2026, Stakeholder Meeting Pollutant Sources Identification

Potential pollution sources to South River watershed discussed during the stakeholder meeting on January 13, 2026 (meeting minutes included in **Appendix** A) included:

- agricultural properties along the river
- one or two properties in the Conway portion of the watershed used for machinery repair with poor housekeeping practices
- erosion and sediment deposition along the stream banks
- undermining of Shelburne Falls Road in three locations within an approximately ½-mile section of the South River
- septic systems
- potential spraying of weeds on the banks of Ashfield Pond

It was also noted during the stakeholder meeting that recent flooding, which occurred in July of 2023, had a significant impact on the South River watershed including erosion of stream banks.

Water Quality Data

MassDEP Water Quality Monitoring Program Data

Historical and current Technical Memoranda (TM) produced by the MassDEP Watershed Planning Program (WPP) are available here: Water Quality Technical Memoranda | Mass.gov and are organized by major watersheds in Massachusetts. Most of these TMs present the water chemistry and biological sampling results of WPP monitoring surveys. The TMs pertaining primarily to biological information (e.g., benthic macroinvertebrates, periphyton, fish populations) contain biological data and metrics that are currently not reported elsewhere. The data contained in the water quality TMs are also provided on the "Data" page (Water Quality Monitoring Program Data | Mass.gov). Many of these TMs have helped inform Clean Water Act 305(b) assessment and 303(d) listing decisions.

MassDEP WPP water quality monitoring data for *E. coli* is available for the South River watershed from the years 2005, 2006, and 2012 (MassDEP, 2022a). The *E. coli* data is presented in **Table A-4** and the sampling locations are identified in **Figure A-3**. The data collected for locations along South River (MA33-07), South River (MA33-101), South River (MA33-102), Poland Brook (MA33-74), Chapel Brook (MA33-44), Creamery Brook (MA33-46), and Unnamed Tributary to Creamery Brook (MA33-137), in each of these years had one or more exceedances of the MSWQS (MassDEP, 2022b) for *E. coli*, which states that *E. coli* concentrations shall not exceed 126 colony-forming units per 100 milliliters (CFU/100mL), calculated as the geometric mean of all samples collected within any 90-day or smaller interval; and no more than 10 percent of all such samples shall exceed 410 CFU/100 mL (a statistical threshold value).

Table A-4: MassDEP Water Quality Monitoring Program *E. coli* Data for South River Watershed (MassDEP, 2022a)

Unique ID	Waterbody (Assessment Unit ID)	Sampling Location	Date	*E. coli* (CFU/100 mL or MPN/100 mL)	90-Day Geometric Mean (CFU/100 mL or MPN/100 mL)	Geometric Mean Criterion Exceeded? (126 CFU/100 mL)	STV Criterion Exceeded? (410 CFU/100 mL)	Meets MSWQS /Water Quality Goal?
W0013	South River (MA33-07)	[Emmets Road, Ashfield]	5/17/2005	17	17	No	No	**Yes**
			6/7/2005	133	48	No	No	**Yes**
			7/19/2005	649	114	No	Yes	**No**
			8/16/2005	153	122	No	Yes	**No**
			9/21/2005	77	197	Yes	Yes	**No**
W0013	South River (MA33-07)	[Emmets Road, Ashfield]	7/20/2006	167	167	Yes	No	**No**
			8/14/2006	57	98	No	No	**Yes**
W0015	South River (MA33-07)	[at emergence of underground culvert, downstream at Buckland Road, Ashfield]	7/20/2006	30	30	No	No	**Yes**
			8/14/2006	21	25	No	No	**Yes**
W0016	South River (MA33-07)	[Bronson Avenue, Ashfield]	7/20/2006	59	59	No	No	**Yes**
			8/14/2006	132	88	No	No	**Yes**
W1709	South River (MA33-07)	[approximately 370 feet upstream of Buckland Road (immediately downstream of suspect pipe behind apartments below Ashfield Lake), Ashfield]	7/20/2006	69	69	No	No	**Yes**
			8/14/2006	58	63	No	No	**Yes**
W1710	South River (MA33-07)	[approximately 500 feet upstream of Buckland Road (below outlet of Ashfield Lake), Ashfield]	7/20/2006	23	23	No	No	**Yes**
			8/14/2006	36	29	No	No	**Yes**
W1703	Pumpkin Hollow Brook (MA33-32)	[Academy Hill Road, Conway]	7/20/2006	52	52	No	No	**Yes**
			8/14/2006	29	39	No	No	**Yes**

Unique ID	Waterbody (Assessment Unit ID)	Sampling Location	Date	*E. coli* (CFU/100 mL or MPN/100 mL)	90-Day Geometric Mean (CFU/100 mL or MPN/100 mL)	Geometric Mean Criterion Exceeded? (126 CFU/100 mL)	STV Criterion Exceeded ? (410 CFU/100 mL)	Meets MSWQS /Water Quality Goal?
W1362	Chapel Brook (MA33-44)	[approximately 300 feet upstream of Main Poland Road, Conway]	5/17/2005	<1	<1 (see note 1)	No	No	**Yes**
			6/7/2005	6	2	No	No	**Yes**
			7/19/2005	1120	19	No	Yes	**No**
			8/16/2005	76	27	No	Yes	**No**
			9/21/2005	23	125	No	Yes	**No**
W1325	Creamery Brook (MA33-46)	[Williamsburg Road, Ashfield]	5/17/2005	6	6	No	No	**Yes**
			6/7/2005	22	11	No	No	**Yes**
			7/19/2005	461	39	No	Yes	**No**
			8/16/2005	155	55	No	Yes	**No**
			9/21/2005	11	92	No	Yes	**No**
W1361	Poland Brook (MA33-74)	[the most upstream North Poland Road crossing (near Bullitt Road), Conway]	5/17/2005	7	7	No	No	**Yes**
			6/7/2005	87	25	No	No	**Yes**
			7/19/2005	1410	95	No	Yes	**No**
			8/16/2005	185	112	No	Yes	**No**
			9/21/2005	18	167	Yes	Yes	**No**
W1702	Poland Brook (MA33-74)	[just upstream of confluence with South River, east of North Poland Road, Conway]	7/20/2006	24	24	No	No	**Yes**
			8/14/2006	22	23	No	No	**Yes**
W0756	South River (MA33-101)	[Bullitt Road, Ashfield]	7/20/2006	61	61	No	No	**Yes**
			8/14/2006	37	48	No	No	**Yes**
W1707	South River (MA33-101)	[approximately 800 feet upstream of the Burkeville Covered Bridge on Main Poland Road, Conway]	7/20/2006	78	78	No	No	**Yes**
			8/14/2006	64	71	No	No	**Yes**
W1708	South River (MA33-101)	[just upstream of North Poland Road (out of influence of bridge crossing), Conway]	7/20/2006	114	114	No	No	**Yes**
			8/14/2006	488	236	Yes	Yes	**No**

Unique ID	Waterbody (Assessment Unit ID)	Sampling Location	Date	*E. coli* (CFU/100 mL or MPN/100 mL)	90-Day Geometric Mean (CFU/100 mL or MPN/100 mL)	Geometric Mean Criterion Exceeded? (126 CFU/100 mL)	STV Criterion Exceeded ? (410 CFU/100 mL)	Meets MSWQS /Water Quality Goal?
W0008	South River (MA33-102)	[at USGS Gage #01169900 near Reeds Bridge Road, Conway]	5/17/2005	16	16	No	No	**Yes**
			6/7/2005	107	41	No	No	**Yes**
			7/19/2005	1300	131	Yes	Yes	**No**
			8/16/2005	435	176	Yes	Yes	**No**
			9/21/2005	127	416	Yes	Yes	**No**
W0008	South River (MA33-102)	[at USGS Gage #01169900 near Reeds Bridge Road, Conway]	7/20/2006	104	104	No	Yes	**No**
			8/14/2006	63	81	No	Yes	**No**
W1704	South River (MA33-102)	[approximately 50 feet upstream of confluence with the Deerfield River, Conway]	7/20/2006	59	59	No	No	**Yes**
			8/14/2006	30	42	No	No	**Yes**
W1705	South River (MA33-102)	[approximately 1500 feet upstream of Reeds Bridge Road, Conway]	7/20/2006	387	387	Yes	No	**No**
			8/14/2006	75	170	Yes	No	**No**
W1706	South River (MA33-102)	[downstream of Route 116, in the mixing zone from the outfall pipe on the Northwestern shore, Conway]	7/20/2006	122	122	No	No	**Yes**
			8/14/2006	72	94	No	No	**Yes**
W2260	South River (MA33-102)	[approximately 400 feet upstream of Main Street (Route 116), Conway (approximately 200 feet upstream of confluence of Pumpkin Hollow Brook)]	5/17/2012	152	152	Yes	No	**No**
			5/31/2012	162	157	Yes	No	**No**
			6/21/2012	69	119	No	No	**Yes**
			7/26/2012	42	92	No	No	**Yes**
			8/23/2012	43	67	No	No	**Yes**
			9/20/2012	186	70	No	No	**Yes**

Unique ID	Waterbody (Assessment Unit ID)	Sampling Location	Date	*E. coli* (CFU/100 mL or MPN/100 mL)	90-Day Geometric Mean (CFU/100 mL or MPN/100 mL)	Geometric Mean Criterion Exceeded? (126 CFU/100 mL)	STV Criterion Exceeded ? (410 CFU/100 mL)	Meets MSWQS /Water Quality Goal?
W2253	Unnamed Tributary to Creamery Brook (MA33-137)	[Approximately 1700 feet downstream of West Road, Ashfield]	5/17/2012	5/17/2012	108	108	No	No
			5/31/2012	5/31/2012	365	199	Yes	No
			6/21/2012	6/21/2012	205	201	Yes	No
			7/26/2012	7/26/2012	248	212	Yes	No
			8/23/2012	8/23/2012	52	176	Yes	No
			9/20/2012	9/20/2012	125	117	No	No

Source: MassDEP, 2022a

"MPN/100 mL" = most probable number per 100 milliliters

"CFU/100 mL" = colony forming units per 100 milliliters

"STV" = statistical threshold value

"MSWQS" = Massachusetts Surface Water Quality Standards (MassDEP, 2022b)

Notes:

1. The value reported for this sample was <1 CFU/ 100 mL. A value of 1 CFU/100 mL was used to calculate the geometric mean values for this location.

2. Samples collected in 2005 were reported in CFU/100 mL. Samples collected in 2006 and 2012 were reported in MPN/100 mL.

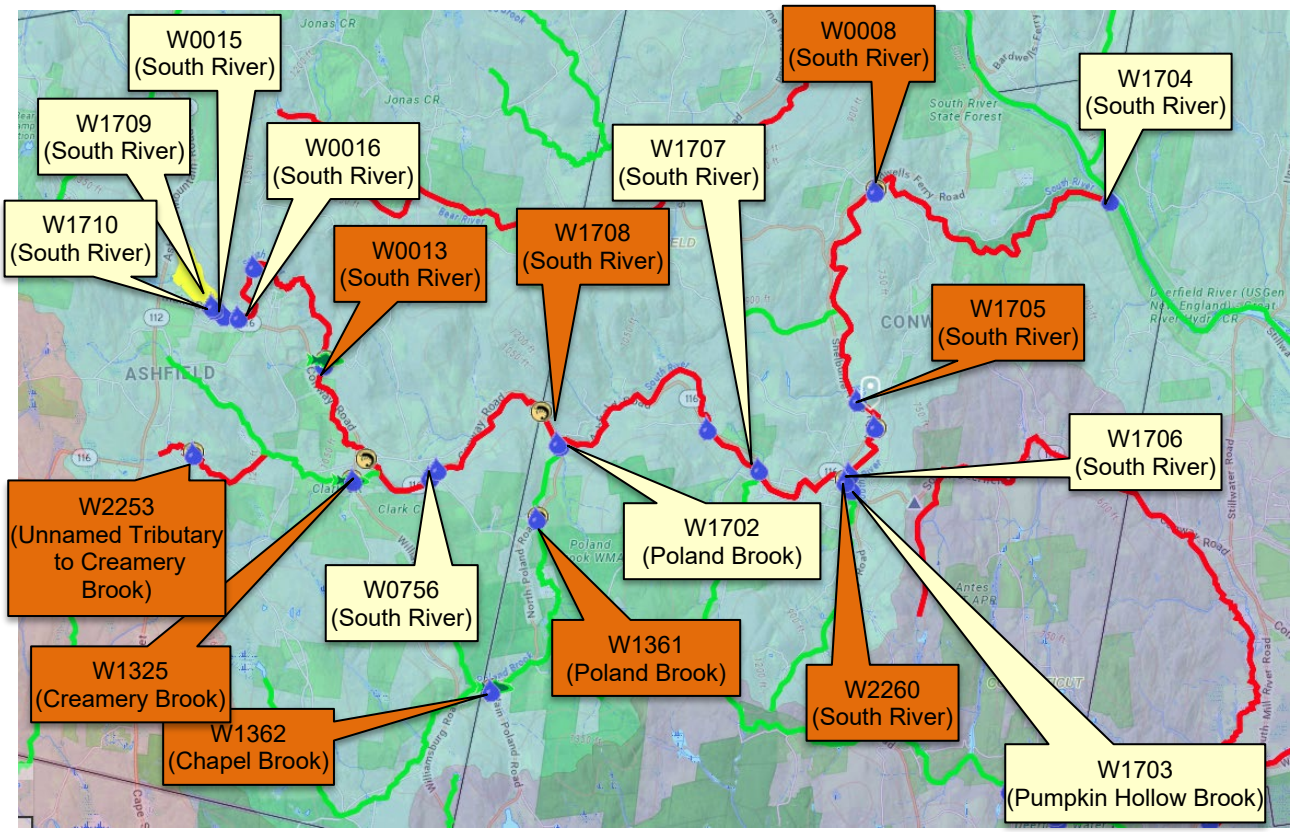

Figure A-3: MassDEP Water Quality Monitoring Program *E. coli* Data Stations for South River Watershed (MassDEP, 2025).

Note: The orange callouts identify sampling locations that had one or more exceedances of the MSWQS for *E. coli*

MassDEP WPP Water quality monitoring TP data for the South River watershed is available for the years 1995, 1996, 2000, 2005, 2012, 2013, and 2014 (MassDEP, 2022a). The TP data is presented in **Table A-5** and the sampling locations are identified in **Figure A-4**. Since Massachusetts doesn't have a water quality standard for TP, the South River NWQI cited the Vermont standard of 15 µg/L (for a medium, high-gradient stream); South River (MA33-102) had samples that exceeded this value in 1995 and 1996, South River (MA33-101 and MA33-102) had samples that exceeded this value in 2000, Poland Brook (MA33-74) had a sample that exceeded this value in 2005, and the Unnamed Tributary to Creamery Brook (MA33-137) had a sample that exceeded this value in 2012.

Table A-5: MassDEP Water Quality Monitoring Program TP Data for South River Watershed (MassDEP, 2022a)

Unique ID	Waterbody (Assessment Unit ID)	Sampling Location	Date	Total Phosphorous (µg/L)
W0008	South River (MA33-102)	[at USGS Gage #01169900 near Reeds Bridge Road, Conway]	6/7/1995	<50
			7/6/1995	20
			8/16/1995	30
			9/13/1995	10
			10/4/1995	20
			11/8/1995	20
			12/6/1995	10
W0008	South River (MA33-102)	[at USGS Gage #01169900 near Reeds Bridge Road, Conway]	2/28/1996	20
			3/20/1996	130
			4/11/1996	50
			5/15/1996	20
			6/19/1996	<10
W0009	South River (MA33-102)	[at bridge crossing of unnamed road between Shelburne Falls Road and Reeds Bridge Road, Conway]	7/25/2000	11
			8/29/2000	10
			10/17/2000	<10
W0756	South River (MA33-101)	[Bullitt Road, Ashfield]	7/25/2000	16
			8/29/2000	16
			10/17/2000	<10
W1325	Creamery Brook (MA33-46)	[Westfield Road, Ashfield]	5/17/2005	6
			6/8/2005	7
			7/20/2005	12
			8/17/2005	10
			9/20/2005	12
W1361	Poland Brook (MA33-74)	Poland Brook [the most upstream North Poland Road crossing (near Bullitt Road), Conway]	5/17/2005	9
			6/8/2005	9
			7/20/2005	21
			8/17/2005	7

Unique ID	Waterbody (Assessment Unit ID)	Sampling Location	Date	Total Phosphorous (µg/L)
W1362	Chapel Brook (MA33-44)	Chapel Brook [approximately 300 feet upstream of Main Poland Road, Conway]	5/17/2005	7
			6/8/2005	13
			7/20/2005	15
			8/17/2005	9
			9/20/2005	7
W2253	Unnamed Tributary to Creamery Brook (MA33-137)	Unnamed Tributary [Unnamed tributary to Creamery Brook, approximately 1700 feet downstream of West Road, Conway]	5/17/2012	27
			6/21/2012	15
			7/26/2012	10
			8/23/2012	8
			9/20/2012	12
W2260	South River (MA33-102)	[Approximately 1600 feet upstream of Main Street (Route 116), Conway (approximately 200 feet upstream of confluence of Pumpkin Hollow Brook]	5/17/2012	10
			6/21/2012	5
			7/26/2012	5
			8/23/2012	5
			9/20/2012	9
W1362	Chapel Brook (MA33-44)	Chapel Brook [approximately 300 feet upstream of Main Poland Road, Conway]	5/7/2013	5
			6/4/2013	8
			7/9/2013	9
			8/7/2013	7
			9/9/2013	5
W1362	Chapel Brook (MA33-44)	Chapel Brook [approximately 300 feet upstream of Main Poland Road, Conway]	5/21/2014	<5
			6/18/2014	8
			7/17/2014	9
			8/13/2014	11
W1362	Chapel Brook (MA33-44)	Chapel Brook [approximately 300 feet upstream of Main Poland Road, Conway]	5/21/2015	<5
			6/18/2015	12
			7/23/2015	<5
			8/20/2015	6

Sources: MassDEP, 2022a
"µg/L" = micrograms per Liter

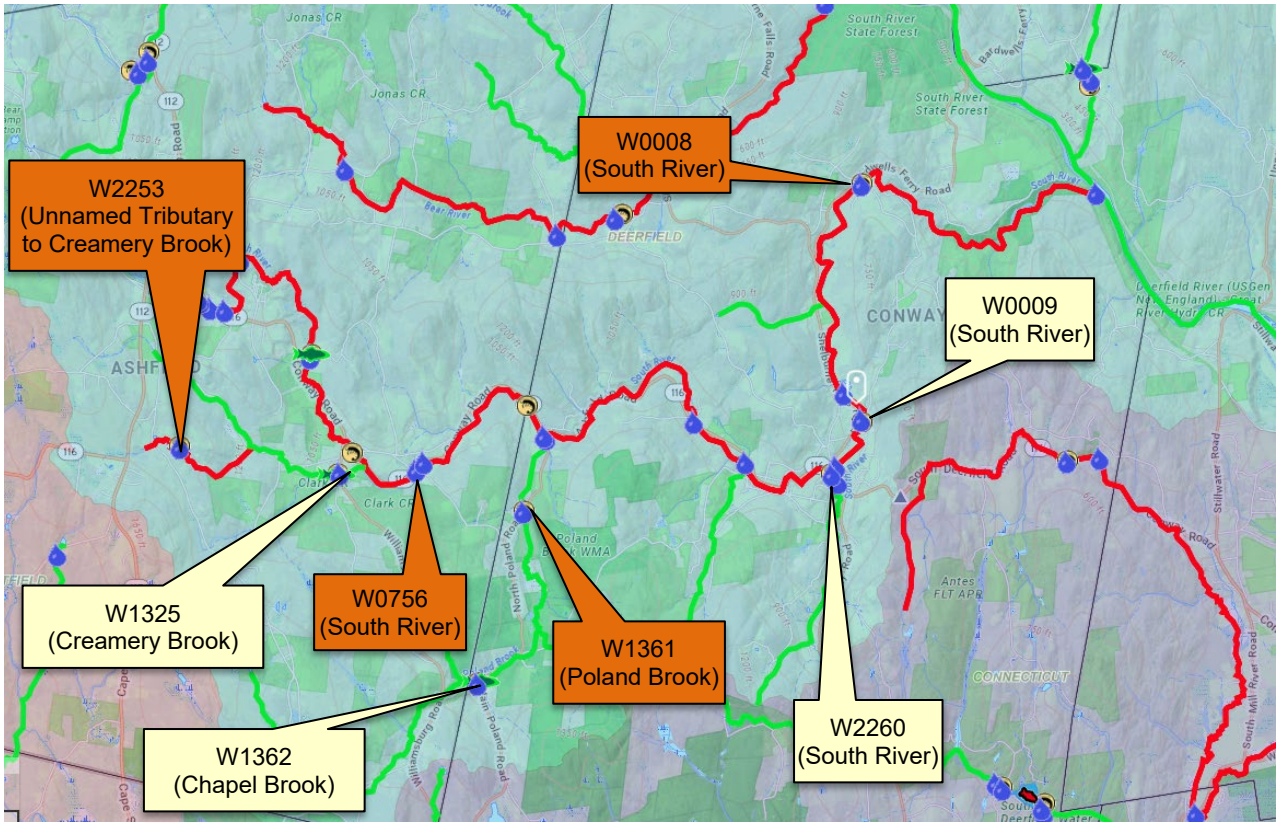

Figure A-4: MassDEP Water Quality Monitoring Program TP Data Stations for South River Watershed (MassDEP, 2025)

Note: The orange callouts identify sampling locations that had one or more exceedances of the Vermont standard for TP (15 µg/L)

MassDEP WPP water quality monitoring discrete temperature data is available from fourteen locations within the South River Watershed. All the locations also included DO data, for at least one of the years monitored. These data are presented in **Table A-6.** Additionally, MassDEP WPP Water quality monitoring continuous temperature data is available for five of the fourteen locations. These data are presented in **Table A-7**. The sampling locations are identified in **Figure A-5**. Data collected for locations along Chapel Brook (MA 33-44), and Unnamed Tributary to Creamery Brook (MA33-137) in 2012 exceeded the MSWQS for temperature, which states that, for cold water fisheries, temperature shall not exceed 68°F (20°C) based on the mean of the daily maximum temperature over a seven-day period, unless naturally occurring. None of the data indicated apparent exceedances of the MSWQS for DO in warm water fisheries, which states that DO shall not be less than 5.0 mg/L for warm water fisheries. Data collected for two locations (W0015 and W0016) along South River (MA-33-07) in 1995 exceeded the MSWQS for cold water fisheries, which states that DO shall not be less than 6.0 mg/L for cold water fisheries.

Table A-6: MassDEP Water Quality Monitoring Program Discrete Temperature and Dissolved Oxygen Data for South River Watershed (MassDEP, 2022)

Unique ID	Waterbody (Assessment Unit ID)	Sampling Location	Date	Temperature (Degrees Celsius)	Dissolved Oxygen (mg/L)
W008	South River (MA33-102)	[at USGS Gage #01169900 near Reeds Bridge Road, Conway]	6/7/1995	17.2	9.2
			7/6/1995	24.0	8.7
			7/20/1995	23.6	8.3
			8/16/1995	22.3	9.3
			9/13/1995	15.5	9.7
			10/4/1995	13.3	9.3
			11/8/1995	6.3	11.7
			12/6/1995	1.6	13.4
W0009	South River (MA33-102)	[at bridge crossing of unnamed road between Shelburne Falls Road and Reeds Bridge Road, Conway]	7/20/1995	23.3	8.9
W0010	South River (MA33-102)	[the Route 116 bridge near Elm Street, Conway]	7/20/1995	22.0	8.9
W0011	South River (MA33-101)	[the Route 116 bridge near Riley Road, Conway]	7/20/1995	21.5	8.8
W0012	South River (MA33-101)	[approximately 400 feet downstream from Bullitt Road, Ashfield]	7/20/1995	17.2	8.8
W0013	South River (MA33-07)	[Emmets Road, Ashfield]	7/20/1995	15.8	8.4
W0014	South River (MA33-07)	[Baptist Corner Road, Ashfield]	7/20/1995	17.2	8.0
W0015	South River (MA33-07)	[at emergence of underground culvert, downstream at Buckland Road, Ashfield]	7/20/1995	19.9	5.3
W0016	South River (MA33-07)	[Bronson Avenue, Ashfield]	7/20/1995	18.6	5.0
W008	South River (MA33-102)	[at USGS Gage #01169900 near Reeds Bridge Road, Conway]	2/28/1996	3.2	12.9
			3/20/1996	2.4	13.2
			4/11/1996	7.0	12
			5/15/1996	10.8	10.8
			6/19/1996	16.4	9.6
W0009	South River (MA33-102)	[at bridge crossing of unnamed road between Shelburne Falls Road and Reeds Bridge Road, Conway]	7/25/2000	17	9.4
			8/29/2000	16.9	9.3
			10/17/2000	9.0	11.3
W0756	South River (MA33-101)	[Bullitt Road, Ashfield]	7/25/2000	14.8	10
			8/29/2000	14.9	9.9
			10/17/2000	8.2	11.6

Unique ID	Waterbody (Assessment Unit ID)	Sampling Location	Date	Temperature (Degrees Celsius)	Dissolved Oxygen (mg/L)
W0013	South River (MA33-07)	[Emmets Road, Ashfield]	6/3/2005	14.3	9.7
			6/6/2005	13.4	8.3
			7/15/2005	15.9	8.6
			7/18/2005	16.0	8.3
			8/12/2005	15.6	8.2
			8/17/2005	16.2	--
			9/24/2005	13.2	--
W0014	South River (MA33-07)	[Baptist Corner Road, Ashfield]	7/18/2005	16.4	--
			8/17/2005	17.6	--
			9/24/2005	14.0	--
W1325	Creamery Brook (MA33-46)	[Williamsburg Road, Ashfield]	5/5/2005	8.1	12.4
			5/11/2005	13.3	--
			6/3/2005	13.1	10.5
			6/6/2005	13.9	10.0
			6/8/2005	16.7	9.8
			7/15/2005	17.7	9.1
			7/18/2005	18.5	8.9
			7/20/2005	18.9	9.1
			8/12/2005	18.2	9.4
			8/15/2005	18.6	8.4
			8/17/2005	17.8	9.4
			9/20/2005	15.5	10.0
W1361	Poland Brook (MA33-74)	[the most upstream North Poland Road crossing (near Bullitt Road), Conway]	5/5/2005	6.2	12.8
			5/11/2005	13.1	--
			6/3/2005	13.8	9.7
			6/6/2005	15.9	8.9
			6/8/2005	21.3	8.7
			7/15/2005	18.9	8.4
			7/18/2005	20.4	7.8
			7/20/2005	22.2	8.5
			8/12/2005	19.5	7.6
			8/15/2005	19.7	7.9
			8/17/2005	21.5	8.8
			9/20/2005	17.3	9.3

Unique ID	Waterbody (Assessment Unit ID)	Sampling Location	Date	Temperature (Degrees Celsius)	Dissolved Oxygen (mg/L)
W1362	Chapel Brook (MA33-44)	[approximately 300 feet upstream of Main Poland Road, Conway]	5/5/2005	7.2	12.6
			5/11/2005	13.5	##
			6/3/2005	14.1	9.8
			6/6/2005	15.8	9.0
			6/8/2005	18.1	9.4
			7/15/2005	18.6	8.6
			7/18/2005	19.6	8.3
			7/20/2005	20.1	9.1
			8/12/2005	18.4	8.6
			8/15/2005	19.7	8.6
W1362	Chapel Brook (MA33-44)	[approximately 300 feet upstream of Main Poland Road, Conway]	5/7/2013	12.3	--
			6/4/2013	12.8	10.5
			7/9/2013	19.0	8.9
			8/7/2013	15.3	9.8
			9/9/2013	11.4	10.5
W1362	Chapel Brook (MA33-44)	[approximately 300 feet upstream of Main Poland Road, Conway]	6/18/2014	17.4	9.2
			7/17/2014	16.7	9.4
			8/13/2014	17.1	9.2
			9/9/2014	13.5	10.0
W1362	Chapel Brook (MA33-44)	[approximately 300 feet upstream of Main Poland Road, Conway]	6/18/2015	15.0	9.6
			7/23/2015	16.9	9.2
			8/20/2015	19.8	8.8
			9/16/2015	15.5	9.7
W2253	Unnamed Tributary to Creamery Brook (MA33-137)	[approximately 1700 feet downstream of West Road, Ashfield]	5/23/2012	16.6	--
			6/26/2012	18.2	8.6
			7/31/2012	24.6	--
			8/27/2012	21.5	8.1
			9/20/2012	15.1	--
W2260	South River (MA33-102)	[approximately 400 feet upstream of Main Street (Route 116), Conway (approximately 200 feet upstream of confluence of Pumpkin Hollow Brook)]	5/23/2012	16.7	--
			6/26/2012	17.9	9.2
			7/31/2012	23.0	8.7
			8/27/2012	21.2	9.3
			9/20/2012	14.7	--

Table A-7: MassDEP Water Quality Monitoring Program Continuous Temperature Data for South River Watershed (MassDEP, 2022)

Unique ID	Waterbody (Assessment Unit ID)	Sampling Location	Start Date	End Date	Maximum Weekly Average Temperature (Degrees Celsius)
W0013	South River (MA33-07)	[Emmets Road, Ashfield]	7/18/2005	9/8/2005	17.6
W0014	South River (MA33-07)	[Baptist Corner Road, Ashfield]	7/18/2005	9/8/2005	18.4
W1362	Chapel Brook (MA33-44)	[approximately 300 feet upstream of Main Poland Road, Conway]	5/7/2013	9/9/2013	20.8 (see note 1)
			5/7/2013	9/9/2013	19.9 (see note 2)
			5/21/2014	9/9/2014	18.7
			5/21/2015	9/9/2014	19.3
W2253	Unnamed Tributary to Creamery Brook (MA33-137)	[Approximately 1700 feet downstream of West Road, Ashfield]	5/23/2012	9/20/2012	21.4
W2260	South River (MA33-102)	[approximately 400 feet upstream of Main Street (Route 116), Conway (approximately 200 feet upstream of confluence of Pumpkin Hollow Brook)]	5/23/2012	9/20/2012	22.3

Notes:

1. Two different pieces of gear were used to collect readings over this monitoring period. This value is calculated from readings collected with a temperature logger.
2. Two different pieces of gear were used to collect readings over this monitoring period. This value is calculated from readings collected with a data sonde.

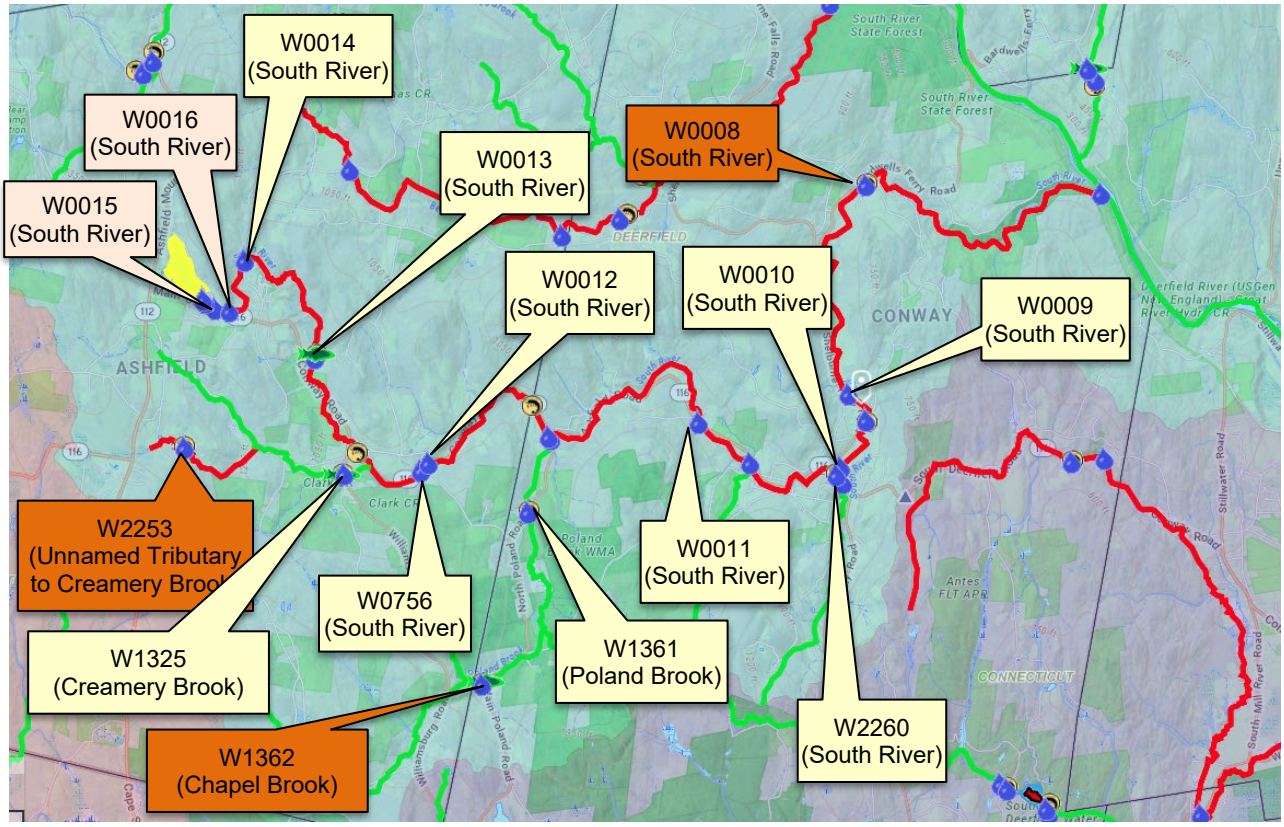

Figure A-5: MassDEP Water Quality Monitoring Program Temperature and DO Data Stations for South River Watershed (MassDEP, 2025)

Note: The orange callouts identify sampling locations that had one or more exceedances of the MSWQS for temperature for cold water fisheries. The light orange callouts identify sampling locations that had one exceedance of the MSWQS for dissolved oxygen for cold water fisheries.

Bacteria Sampling at Public Beaches

There are two public swimming areas within the South River watershed including Ashfield Park Beach, which is on Ashfield Lake, and the Conway Swimming Pool, which is a dammed portion of Pumpkin Hollow Brook.

Massachusetts Department of Public Health (MassDPH) compiles beach water quality data from local health departments and the Massachusetts Department of Conservation and Recreation (DCR) and publishes annual Public Beach Reports. All public and semi-public bathing beaches in Massachusetts are monitored for fecal indicator bacteria (for freshwater lakes, *E. coli),* and on occasion, harmful algae. Monitoring occurs during the beach season, which begins when the school year finishes in mid-June and ends during the weekend of Labor Day.

Both Ashfield Lake and the Conway swimming area have reported bacteria exceedances during the last several years. When a single sample exceeds 235 CFU/100 mL, a beach must be posted as closed until test results indicate that bacteria levels have fallen below the 235-threshold value. Ashfield Lake has also been closed occasionally for harmful algal blooms of suspected cyanobacteria. The Town of Ashfield has a notification system on the town website called "Blackboard Connect" that alerts residents to a variety of issues. Lake closures are posted there. Closure information on Blackboard Connect does not consistently

match the DPH Beach Reports. Information from both sources is summarized for the two swimming areas below. Flash flooding in Conway on July 10, 16, and 21 in 2023 caused extensive damage and the Conway Swimming Pool was closed for the remainder of the season. Erosion at the beach, parking areas, culverts, and settling ponds caused blockages and much sediment was washed into the impoundment. The "days posted" data shown in the **Table A-8** for 2023 reflects this issue, and not an issue specifically related to bacteria contamination.

Table A-8: Beach Closures in Ashfield and Conway, 2020-2023

Year	Beach Location Name	Testing Frequency	Indicator	Number of Tests	Single Sample Exceedances	Days Posted	Blackboard Connect alerts
2023	Ashfield Park Beach	weekly	*E. coli*	12	0	0	HAB alert 6/26-7/6
2022	Ashfield Park Beach	weekly	*E. coli*	17	1	0	EC closure 8/16-8/17
2021	Ashfield Park Beach	weekly	*E. coli*	15	2	14	EC closure 7/8-7/14, 7/29-8/5
2020	Ashfield Park Beach	weekly	*E. coli*	12	1	0	EC closure 8/7-8/12. HAB closure 7/2-7/18; advisory 6/26-7/6
2023	Conway Swimming Pool	weekly	*E. coli*	7		43*	NA
2022	Conway Swimming Pool	weekly	*E. coli*	15	3	12	NA
2021	Conway Swimming Pool	weekly	*E. coli*	16	4	15	NA
2020	Conway Swimming Pool	weekly	*E. coli*	16	0	0	NA

Notes: EC = E. coli bacteria, HAB = harmful algae bloom, NA (not applicable)
* Closed due to storm damage.

Connecticut River Conservancy / Deerfield River Watershed Association Monitoring Program

The CRC partnered with DRWA have been documenting the water quality in the Deerfield River and tributaries intermittently since 1990. The most recent iteration of the DRWA water quality monitoring program has been running since 2017 and includes one sampling location on the South River (identified on **Figure A-6**), which is located approximately 2.3 miles upstream of the South River watershed discharge point into the Deerfield River. Volunteers visit these sites on alternate weeks from June through September to collect samples that are tested for *E. coli*, turbidity, and conductivity. Available *E. coli* data from 2017-2021, 2023 as well as one sample from 2025 is presented in **Table A-9** (CRC, 2025). The location (MA-SOU_02.4) is located within the impaired South River segment (MA33-102). This location showed exceedances of the MSWQS for *E. coli* in every year between 2017-2021 and in 2023.

Table A-9: CRC/DRWA Water Quality Monitoring Program *E. coli* Data for South River Watershed (CRC, 2025)

Site ID	Assessment Unit ID	Sampling Location	Date	*E. coli* (CFU/100 mL or MPN/100 mL)	90-Day Geometric Mean (CFU/100 mL or MPN/100 mL)	Geometric Mean Criterion Exceeded? (126 CFU/100 mL)	STV Criterion Exceeded? (410 CFU/100 mL)	Meets MSWQS/Water Quality Goal?
MA-SOU_02.4	MA33-102	South River, Reeds Bridge Road	6/28/2017	62	62.0	No	No	Yes
			7/12/2017	275.5	130.7	Yes	No	No
			7/26/2017	185	146.7	Yes	No	No
			8/9/2017	248.1	167.3	Yes	No	No
			8/23/2017	686.7	221.9	Yes	Yes	No
			9/6/2017	122.3	200.9	Yes	Yes	No
MA-SOU_02.4	MA33-102	South River, Reeds Bridge Road	6/27/2018	127.4	127.4	Yes	No	No
			7/11/2018	201.4	160.2	Yes	No	No
			7/25/2018	547.5	241.3	Yes	Yes	No
			8/8/2018	272.3	248.7	Yes	Yes	No
			8/22/2018	2419.6	392.0	Yes	Yes	No
			9/5/2018	68.3	293.0	Yes	Yes	No
MA-SOU_02.4	MA33-102	South River, Reeds Bridge Road	6/26/2019	980.4	980.4	Yes	Yes	No
			7/10/2019	344.8	581.4	Yes	Yes	No
			7/24/2019	298.7	465.7	Yes	Yes	No
			8/7/2019	59.8	429.5	Yes	Yes	No
			8/21/2019	579.4	451.4	Yes	Yes	No
			9/4/2019	410.6	445.4	Yes	Yes	No
MA-SOU_02.4	MA33-102	South River, Reeds Bridge Road	7/8/2020	184.2	184.2	Yes	No	No
			7/22/2020	214.3	198.7	Yes	No	No
			8/19/2020	53.7	128.5	Yes	No	No
			9/2/2020	25.9	86.1	No	No	Yes
			9/16/2020	26.9	68.2	No	No	Yes
MA-SOU_02.4	MA33-102	South River, Reeds Bridge Road	6/22/2021	248.1	248.1	Yes	No	No
			7/6/2021	1986.3	702.0	Yes	Yes	No
			7/20/2021	240	490.9	Yes	No	No
			8/3/2021	101.4	330.9	Yes	No	No
			8/17/2021	248.1	312.4	Yes	No	No
			8/31/2021	187.2	286.8	Yes	No	No
MA-SOU_02.4	MA33-102	South River, Reeds Bridge Road	6/21/2023	218.7	218.7	Yes	No	No
			7/5/2023	206.4	212.5	Yes	No	No
			7/19/2023	135.4	182.8	Yes	No	No
			8/16/2023	1203.3	292.8	Yes	Yes	No
			8/30/2023	816.4	359.5	Yes	Yes	No
MA-SOU_02.4	MA33-102	South River, Reeds Bridge Road	8/27/2025	90.9	90.9	No	No	Yes

Sources: CRC, 2024

"*E. coli*" = *Escherichia coli*

"MPN/100 mL" = most probable number per 100 milliliters

"CFU/100 mL" = colony forming units per 100 milliliters

"STV" = statistical threshold value

"MSWQS" = Massachusetts Surface Water Quality Standards (MassDEP, 2022b)

Samples collected in 2017, 2018, 2019, 2020, and 2025 were reported in CFU/100 mL. Samples collected in 2023 were reported in MPN/100 mL.

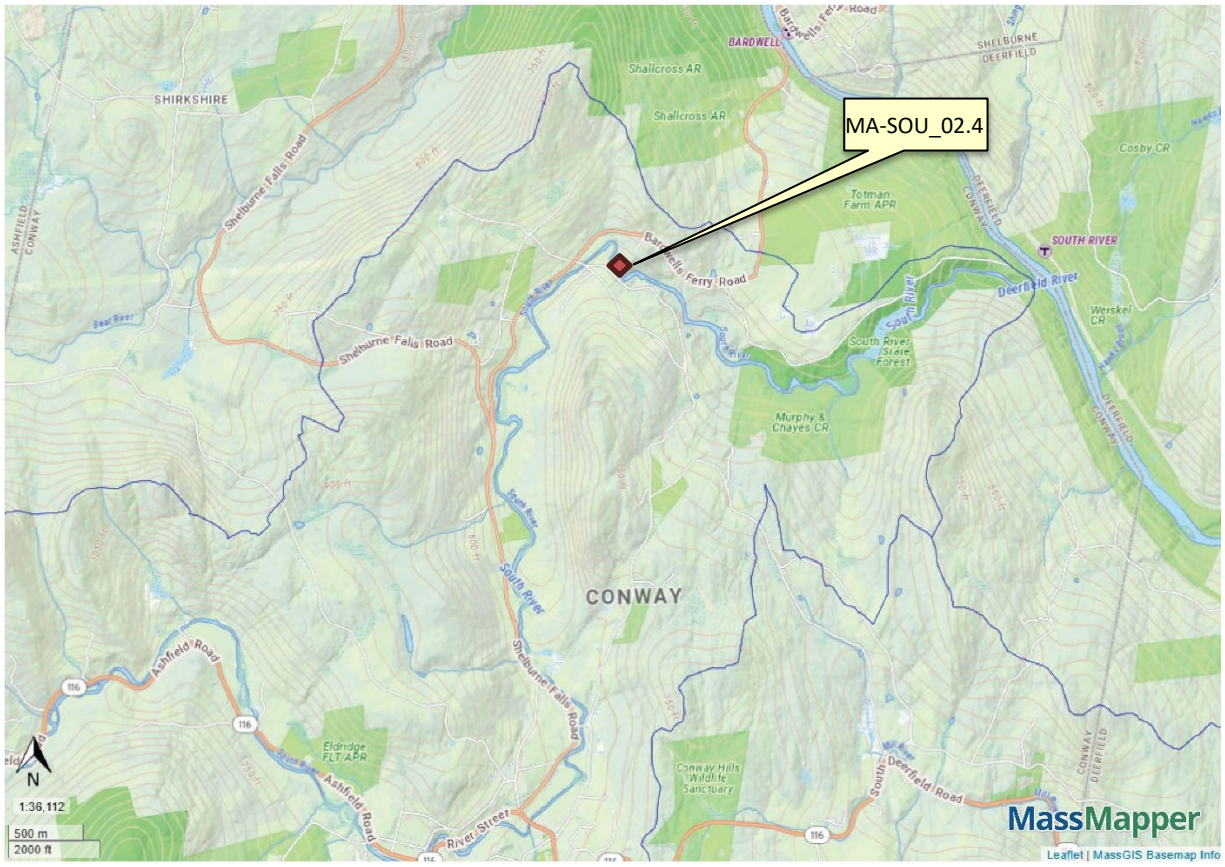

Figure A-6: CRC/DRWA Water Quality Monitoring Program Stations for South River Watershed (CRC, 2025)

Deerfield River Watershed Association (DRWA) Macroinvertebrate Assessment (Cole, 2007)

Deerfield River Watershed Association (DRWA) conducted a macroinvertebrate assessment in the South River watershed in September 2006. The objectives of the program were to augment MassDEP Division of Water Management (DWM) biomonitoring efforts to assess surface waters in the watershed with respect to their aquatic-life-use status and to familiarize citizens of the watershed with biological monitoring to increase support for and participation in watershed enhancement and protection activities. The twelve sampling sites (identified in **Figure A-7**) within the South River Watershed included eight sites along the mainstem South River from its headwaters at Ashfield Lake down to the Confluence with the Deerfield River (SORM01-SORM08), as well as the lower reaches of Poland Brook (PLBM01), Creamery Brook (CMBM01), Chapel Brook (CPBM01), and Pumpkin Hollow Brook (PHBM01). The two upstream-most sites along the South River (SORM07 and SORM08) were assessed as tributary reaches, since the reach of the South River above the confluence with Creamery Brook is smaller than Creamery Brook.

The assessment found that macroinvertebrate communities sampled from the six downstream South River sites (SORM01-SORM06) ranged from slightly impacted at five of the six reaches to non-impacted at SORM04. The Chapel Brook site (CPBM01) was found to support a diverse macroinvertebrate community with both high total taxonomic richness and high EPT[2] richness. This site was thus used as a reference site for the other tributary sites. The Creamery Brook site (CMBM01) scored within the unimpacted range

[2] EPT refers to taxa from orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies).

relative to this reference. The uppermost South River site (SORM08), the Pumpkin Hollow Brook site (PHBM01), and the Poland Brook site (PLBM01) all scored in the slightly impacted range. Macroinvertebrate conditions were moderately impacted at the upper South River site (SORM07) upstream of Creamery Brook (Cole, 2007).

Figure A-7: Macroinvertebrate assessment sites in the South River watershed sampled in September 2006 (Cole, 2007)

Aquatic invasive plants in Ashfield Lake

As mentioned previously, Ashfield Lake is considered impaired for Water Chestnut. According to the Ashfield town website, fanwort (*Cabomba caroliniana*) was identified in the lake in 2014, and between 2014 and 2020, the town commissioned surveys of the fanwort. In 2014, fanwort was surveyed and mapped. Suction harvesting was recommended to control further growth. In 2015, fanwort was surveyed and mapped following a multi-day SCUBA diver hand-pulling effort coordinated by the town. During the 2015 survey, variable milfoil (*Myriophyllum heterophyllum*) was also identified in the lake. In 2016 and 2017, a survey of fanwort and milfoil was done before a hand-pulling effort. The 2017 report notes that the lake was drawn down during the winter for the first time, to control fanwort growth. The 2018 report included a bathymetric survey and recommendations for the 2019 season, because no removal efforts were planned in 2018. By 2018, the variable milfoil patches had spread. The 2019 report noted increased prevalence of fanwort and variable milfoil. The 2020 report indicated that no removal efforts had taken place in 2019, and that fanwort and variable milfoil were still present and expanding. None of the reports mentioned

water chestnut. No further surveys or management of invasive plants at Ashfield Lake are reported on the town website after 2020.

Water Quality Goals

Bacteria, Temperature, and Total Suspended Solids (TSS)

Based on the listed impairments, the TMDL for pathogens (MassDEP, 2024) and water quality data identified above, the long-term water quality goal in the South River watershed is to reduce bacteria loading to the South River so that it meets its designated use for primary contact recreation.

A water quality goal is included for temperature in the South River (MA33-07) and the Unnamed Tributary to Creamery Brook (MA33-137) to support the fish, other aquatic life, and wildlife use, since these segments are identified as Cold Water Fisheries (see below) and listed on the 303(d) list as impaired for temperature. Since MassDEP WPP data for Chapel Brook (MA33-44) indicated exceedances of the MSWQS for temperature, a water quality goal for temperature is also included for this segment. A water quality goal is also included for temperature in South River (MA33-102) since it is listed on the 303(d) list as impaired for temperature.

Since sediment loading and erosion have been identified as sources of pollution, a water quality goal is included for Total Suspended Solids (TSS).

The water quality goals for bacteria, temperature, and TSS are based on the MSWQS (MassDEP, 2022b), which prescribe the minimum water quality criteria required to sustain a waterbody's designated uses. **Table A-10** includes the Massachusetts surface water classifications by assessment unit within the South River watershed. All the assessment units in the watershed are designated as Class 'B' waterbodies. Class B is assigned to waters designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth, and other critical functions, and for primary and secondary contact recreation. Where designated in 314 CMR 4.06 (of the MSWQS), they shall be suitable as a source of public water supply with appropriate treatment ("Treated Water Supply"). Class B waters shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value (MassDEP, 2022b). The two upstream segments of South River, Chapel Brook, Creamery Brook, Johnny Bean Brook, Nye Brook, and Poland Brook are also identified as Cold Water Fisheries, which indicates "waters in which the mean of the maximum daily temperature over a seven day period generally does not exceed 68°F (20°C) and, when other ecological factors are favorable (such as habitat), are capable of supporting a year-round population of cold water stenothermal aquatic life such as trout (Salmonidae)" (MassDEP, 2022b).

Table A-10: Surface Water Quality Classification by Assessment Unit

Assessment Unit ID	Waterbody	Class	Qualifier (If Applicable)
MA33001	Ashfield Pond	B	
MA33-07	South River	B	Cold Water Fishery
MA33-101	South River	B	Cold Water Fishery
MA33-102	South River	B	
MA33-114	Unnamed Tributary (to South River)	B	
MA33-115	Unnamed Tributary (to Chapel Brook)	B	Cold Water Fishery
MA33-137	Unnamed Tributary (to Creamery Brook)	B	Cold Water Fishery
MA33-32	Pumpkin Hollow Brook	B	
MA33-44	Chapel Brook	B	Cold Water Fishery
MA33-46	Creamery Brook	B	Cold Water Fishery
MA33-63	Johnny Bean Brook	B	Cold Water Fishery
MA33-71	Nye Brook	B	Cold Water Fishery
MA33-74	Poland Brook	B	Cold Water Fishery

Total Phosphorus (TP)

Since there is minimal TP data for the watershed, a TP goal is also included. The water quality goal for TP is based on water quality goal of 15 µg/L identified in the NWQI assessment for the South River (FRCOG, 2023) and was based on Vermont water quality standards for a medium, high-gradient stream.

Total Nitrogen (TN)

As noted above, the Deerfield River is within the Connecticut River watershed, which flows into the Long Island Sound. The Long Island Sound has a TMDL: "A Total Maximum Daily Load Analysis to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound", which has a target to attain a 58.5 percent reduction in nitrogen discharges to Long Island Sound from Connecticut and New York (and a standard of 0.34 mg/L for TN in waters entering the Long Island Sound) and a 10 percent reduction target for discharges to the Connecticut River from Massachusetts (NYSDEC, 2000). It is expected that progress made toward achieving the water quality goals will also result in reductions in nitrogen discharges to the Connecticut River stemming from the South River watershed.

Refer to **Table A-11** for a list of water quality goals for bacteria, TP, TSS, temperature, and TN. Element C of this WBP includes proposed management measures to address these water quality goals.

Table A-11: Water Quality Goals for South River Watershed

Pollutant	Waterbody Name (Assessment Unit ID)	Goal	Source
Bacteria (*E. coli*)	All Assessment Units within the watershed	**Class B Standards** • *E. coli* concentrations shall not exceed 126 CFU/100mL, calculated as the geometric mean of all samples collected within any 90-day or smaller interval; and • No more than 10 percent of all such samples shall exceed 410 CFU/100 mL (a statistical threshold value).	Massachusetts Surface Water Quality Standards (314 CMR 4.00, 2021)
Total Phosphorus (TP)	All Assessment Units within the watershed	TP should not exceed 15 µg/L	South River Watershed Assessment, NRCS NWQI (FRCOG, 2023)
Total Suspended Solids (TSS)	All Assessment Units within the watershed	Waters shall be free from floating, suspended and settleable solids in concentrations and combinations that would impair any use assigned to this Class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.	Massachusetts Surface Water Quality Standards (314 CMR 4.00, 2021)
Temperature	South River (MA33-07) Unnamed Tributary to Creamery Brook (MA33-137) Chapel Brook (MA33-44)	Temperature shall not exceed 68°F (20°C) based on the mean of the daily maximum temperature over a seven-day period, unless naturally occurring.	Massachusetts Surface Water Quality Standards (314 CMR 4.00, 2021)
	South River (MA33-102)	Temperature shall not exceed 83°F (28.3°C)	Massachusetts Surface Water Quality Standards (314 CMR 4.00, 2021)
Total Nitrogen (TN)	All Assessment Units within the watershed	10% reduction in TN	A Total Maximum Daily Load Analysis to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound (NYSDEC, 2000)

Land Use and Impervious Cover Information

Land use source data is from 2016 and was obtained from MassGIS (2019). The land use and land cover categories were matched with the associated land use category using the methodology identified in the MassDEP guidance document "2016 Massachusetts Small MS4 Permit Pollutant Loading Export Rates applied to the 2016 Massachusetts Land Use/Land Cover GIS Dataset" (MassDEP, 2023b). **Table A-12** and **Figure A-8** present the area and percent of watershed of each of these land use categories. Land use in the South River watershed is mostly forested (approximately 82 percent); approximately 7.5 percent is agricultural.

Table A-12: South River Watershed Land Uses

Land Use	Area (acres)	% of Watershed
Forest	13,783	81.9%
Agriculture	1,257	7.5%
Medium Density Residential	698	4.1%
High Density Residential	357	2.1%
Open Land	310	1.8%
Highway	232	1.4%
Water	126	0.7%
Commercial	65	0.4%
Industrial	3	0.0%

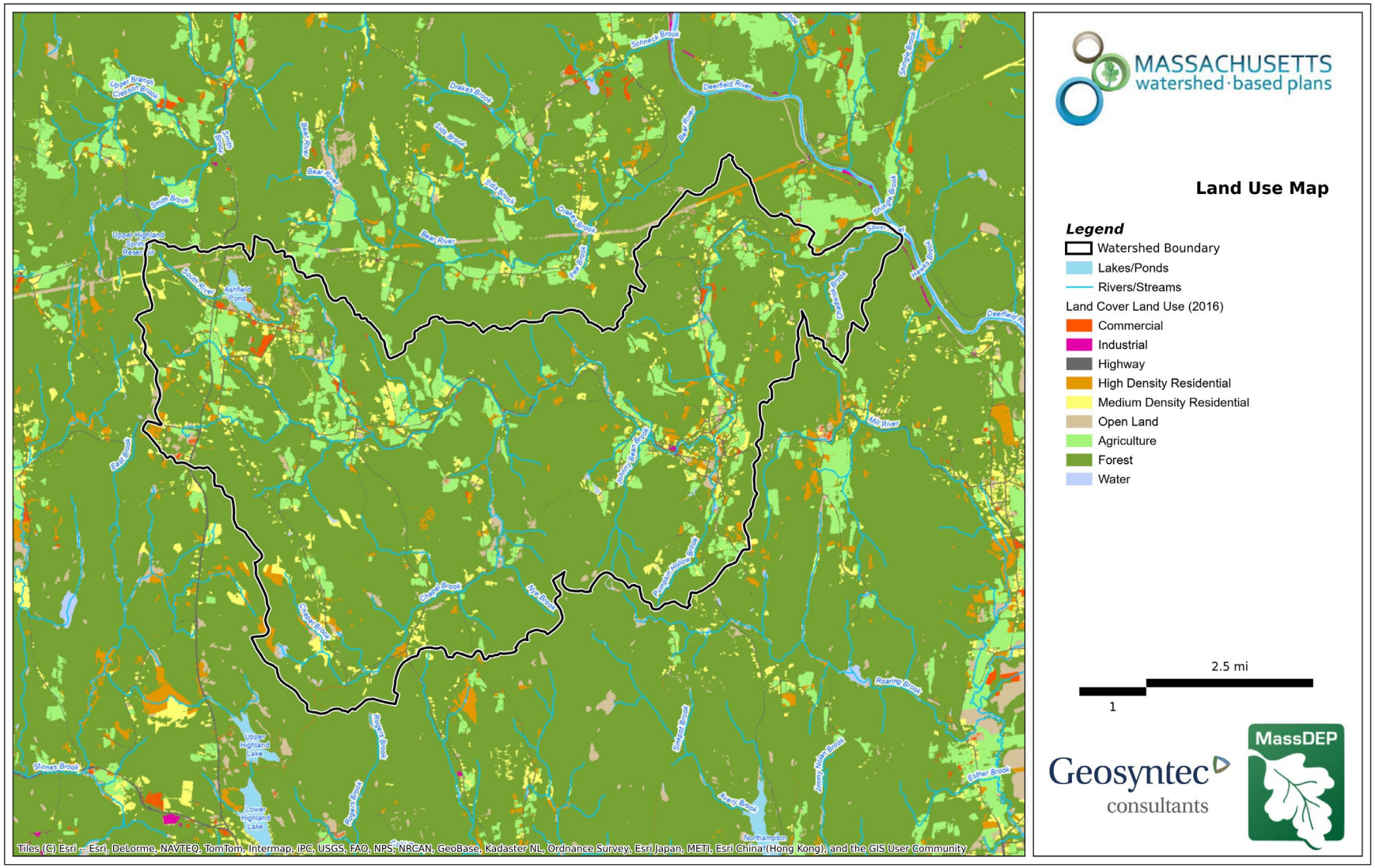

Figure A-8: South River Watershed Land Use Map

(MassGIS, 2007; MassGIS, 2019; MassGIS, 1999; MassGIS, 2001; USGS, 2016)

Ctrl + Click on the map to view a full-sized image in your web browser.

There is a strong link between impervious land cover and stream water quality. Impervious cover includes land surfaces that prevent the infiltration of water into the ground, such as paved roads and parking lots, roofs, basketball courts, etc. The total impervious area was estimated for the watershed based on the land use and impervious cover source data from 2016 (MassGIS, 2019). Approximately 2.2 percent of the South River watershed is covered by impervious area. Impervious area in the South River watershed is mainly associated with roads and the residential areas of the watershed within the centers of the Towns of Conway and Ashfield. **Figure A-9** is an impervious cover map for the South River watershed.

The relationship between total impervious area and water quality can generally be categorized as listed by **Table A-13** (Schueler et al. 2009). The impervious cover value for the watershed range is 2.2 percent; therefore, the river and surrounding tributaries would be expected to show good to excellent water quality if impervious cover were the only factor. However, as indicated above, all three segments of the South River as well as an unnamed tributary (to Creamery Brook) are impaired for *E. coli*, Fecal Coliform, and/or temperature and two tributaries (Bear River and Dragon Brook are impaired for temperature (MassDEP, 2023a), so other sources of impairment must be closely examined. Ashfield Pond, which flows into the South River is also impaired for the invasive Water Chestnut. Ashfield Lake's impervious cover value for its watershed is 4.2%, higher than the South River watershed because it is surrounded by Route 112, Buckland Road, Route 116/Main Street and many densely packed homes and outbuildings.

Table A-13: Relationship between Total Impervious Area (TIA) and water quality (Schueler et al. 2009)

% Watershed Impervious Cover	Stream Water Quality
0% to 10%	Typically high quality, and typified by stable channels, excellent habitat structure, good to excellent water quality, and diverse communities of both fish and aquatic insects.
11% to 25%	These streams show clear signs of degradation. Elevated storm flows begin to alter stream geometry, with evident erosion and channel widening. Streams banks become unstable, and physical stream habitat is degraded. Stream water quality shifts into the fair/good category during both storms and dry weather periods. Stream biodiversity declines to fair levels, with most sensitive fish and aquatic insects disappearing from the stream.
26% to 60%	These streams typically no longer support a diverse stream community. The stream channel becomes highly unstable, and many stream reaches experience severe widening, downcutting, and streambank erosion. Pool and riffle structure needed to sustain fish is diminished or eliminated and the substrate can no longer provide habitat for aquatic insects, or spawning areas for fish. Biological quality is typically poor, dominated by pollution tolerant insects and fish. Water quality is consistently rated as fair to poor, and water recreation is often no longer possible due to the presence of high bacteria levels.
>60%	These streams are typical of "urban drainage", with most ecological functions greatly impaired or absent, and the stream channel primarily functioning as a conveyance for stormwater flows.

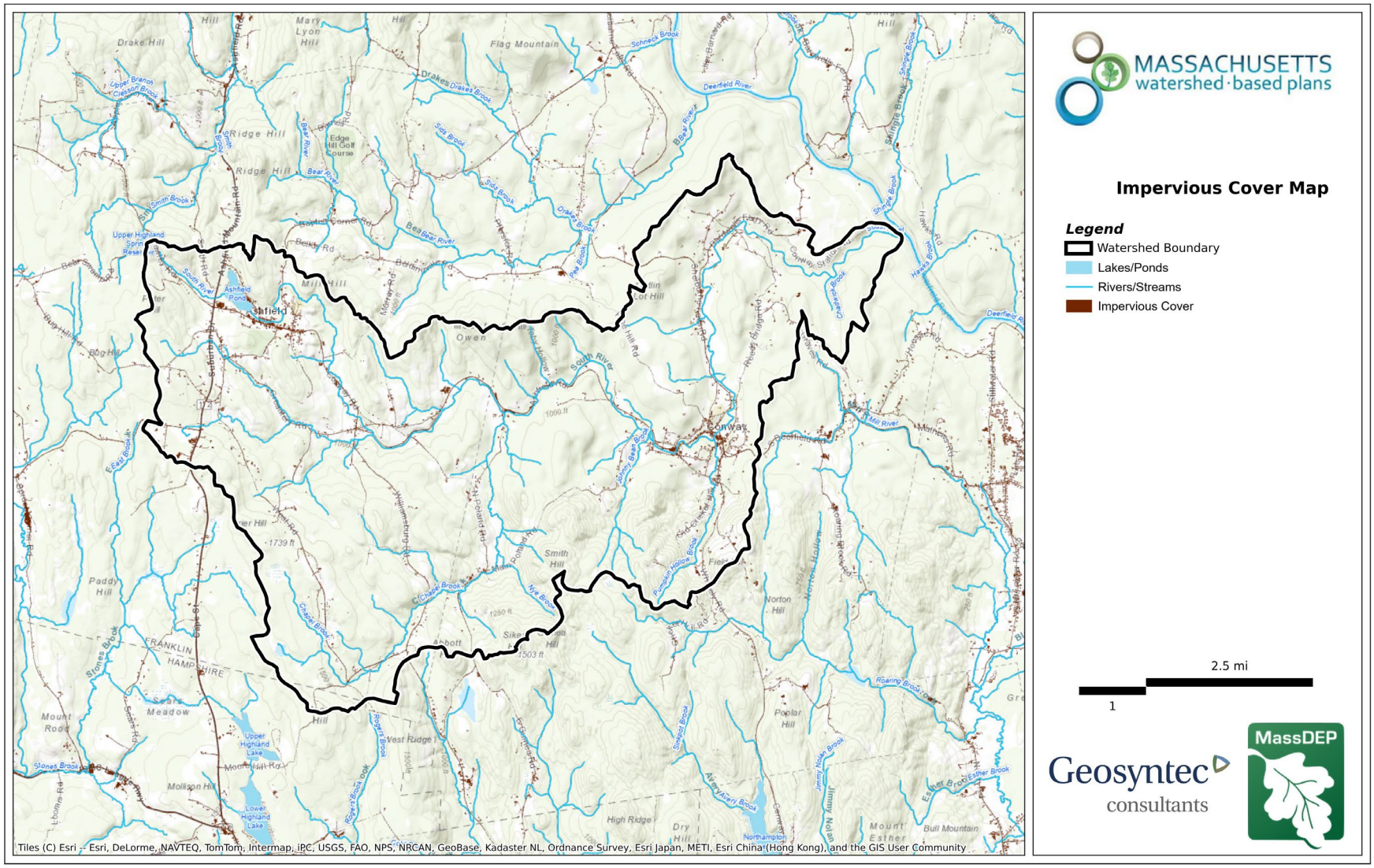

Figure A-9: South River Watershed Impervious Surface Map

(MassGIS, 2007; MassGIS, 2019; MassGIS, 1999; MassGIS, 2001; USGS, 2016)

Ctrl + Click on the map to view a full-sized image in your web browser.

Pollutant Loading

A Geographic Information System (GIS) was used for the pollutant loading analysis. The land use data (shown in **Figure A-5**) was intersected with impervious cover data (shown in **Figure A-6**) and United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soils data (USDA NRCS and MassGIS, 2012) to create a combined land use/land cover grid. The grid was used to sum the total area of each unique land use/land cover type.

Pollutant loading for key nonpoint source pollutants in the watershed was estimated by multiplying each land use/cover type area by its pollutant load export rate (PLER) as follows:

$$L_n = A_n * P_n$$

Where:

L_n = Loading of land use/cover type n (pounds per year (lb/yr));
A_n = area of land use/cover type n (acres);
P_n = pollutant load export rate of land use/cover type n (pound per acre per year (lb/acre/yr))

The PLERs are an estimate of the annual unattenuated potential total pollutant load exported via stormwater from a given unit area of a particular land cover type. The PLER values for TN, TP and TSS were obtained from MassDEP and USEPA (MassDEP, 2023b; VHB et al., 2022) (see values provided in **Appendix C**).

Table A-14 presents the estimated land-use based TN, TP and TSS pollutant loading in the South River watershed. The largest contributor of the land use-based pollutant load originates from areas designated as forested. TP and TN generated from forested areas are generally a result of natural processes such as decomposition of leaf litter and other organic material; the forested portions of the watershed therefore are unlikely to provide opportunities for nutrient load reductions through best management practices. Agricultural areas are the second largest contributors of land-use based pollutant load in the watershed. Agricultural areas provide excellent opportunities for nutrient load reductions through agricultural BMPs as described in the following sections.

Table A-15 presents the estimated land-used based TN, TP, and TSS pollutant loading by major subwatershed in the South River watershed. Approximately half of the South River watershed area is made up of five major subwatersheds (see **Figure A-10** and **Appendix D** for the subwatershed maps); the remaining area surrounds Ashfield Pond and the South River mainstem with no major tributaries to the South River. Creamery Brook and Poland Brook are the two largest subwatersheds comprising approximately 39 percent of the total South River watershed area. However, Creamery Brook, has the largest per acre average loading of all the subwatersheds. Pumpkin Hollow Brook and the remaining area along the South River mainstem have the second and third largest per acre average loading, respectively.

It is important to note pollutant loads presented in **Table A-14** and **Table A-15** do not consider loads from point sources or septic systems. Septic system sources should be separately evaluated to determine whether septic system upgrades or sanitary sewer system conversion would cost-effectively reduce bacteria and nutrient sources in the watershed.

Table A-14: Estimated Pollutant Loading in the South River Watershed for Key Nonpoint Source Pollutants

Land Use Type	Pollutant Loading[1]		
	Total Phosphorus (TP) (lb/yr)	Total Nitrogen (TN) (lb/yr)	Total Suspended Solids (TSS) (tons/yr)
Forest	1,845	7,378	202.9
Agriculture	562	3,261	18.8
Highway	381	2,724	141.9
Medium Density Residential	305	2,499	35.7
High Density Residential	135	1,042	14.6
Open Land	58	568	8.1
Commercial	52	448	5.6
Industrial	3	28	0.4
TOTAL	3,340	17,949	428.1

[1]These estimates do not consider loads from point sources or septic systems.

"lb / yr" = pounds per year

Table A-14: Estimated Pollutant Loading in the South River Watershed by Major Subwatershed for Key Nonpoint Source Pollutants

Land Use Type	Creamery Brook (2,429 acres)			Poland Brook/ Chapel Brook (4,281 acres)			Johnny Bean Brook (741 acres)			Pumpkin Hollow Brook (1,011 acres)			Unnamed Tributary (MA33-114) (273 acres)			Remaining Area in South River Watershed (8,096 acres)		
	TP (lb/ yr)	TN (lb/yr)	TSS (tons/ yr)	TP (lb/yr)	TN (lb/yr)	TSS (tons/ yr)	TP (lb/yr)	TN (lb/yr)	TSS (tons/ yr)	TP (lb/yr)	TN (lb/yr)	TSS (tons/ yr)	TP (lb/yr)	TN (lb/yr)	TSS (tons/ yr)	TP (lb/yr)	TN (lb/yr)	TSS (tons /yr)
Forest	259	1,036	28.5	505	2,020	55.6	89	355	9.8	106	422	12	32	129	3.5	854	3,416	94
Agriculture	95	549	3.1	56	324	1.9	21	119	0.7	39	226	1	8	47	0.3	343	1,996	12
Highway	75	540	27.8	52	373	19.5	5	39	2.0	29	204	11	1	9	0.5	219	1,559	82
Medium Density Residential	57	481	6.7	52	454	6.2	5	38	0.6	25	198	3	3	30	0.4	163	1,298	19
High Density Residential	26	207	2.9	26	226	3.0	1	9	0.1	12	91	1	0	0	0.0	70	509	7
Open Land	12	119	1.6	17	167	2.2	3	28	0.4	3	34	1	1	8	0.2	22	212	3
Commercial	9	79	1.0	5	41	0.5	0	0	0.0	3	29	0	0	0	0.0	35	299	4
Industrial	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0	0	0.0	3	28	0
TOTAL	534	3,010	71.5	712	3,606	88.8	123	588	13.5	217	1,204	29	46	223	4.9	1,708	9,318	221
Average lb/acre/yr	0.22	1.24	0.03	0.17	0.84	0.02	0.17	0.79	0.02	0.21	1.19	0.03	0.17	0.82	0.02	0.21	1.15	0.03

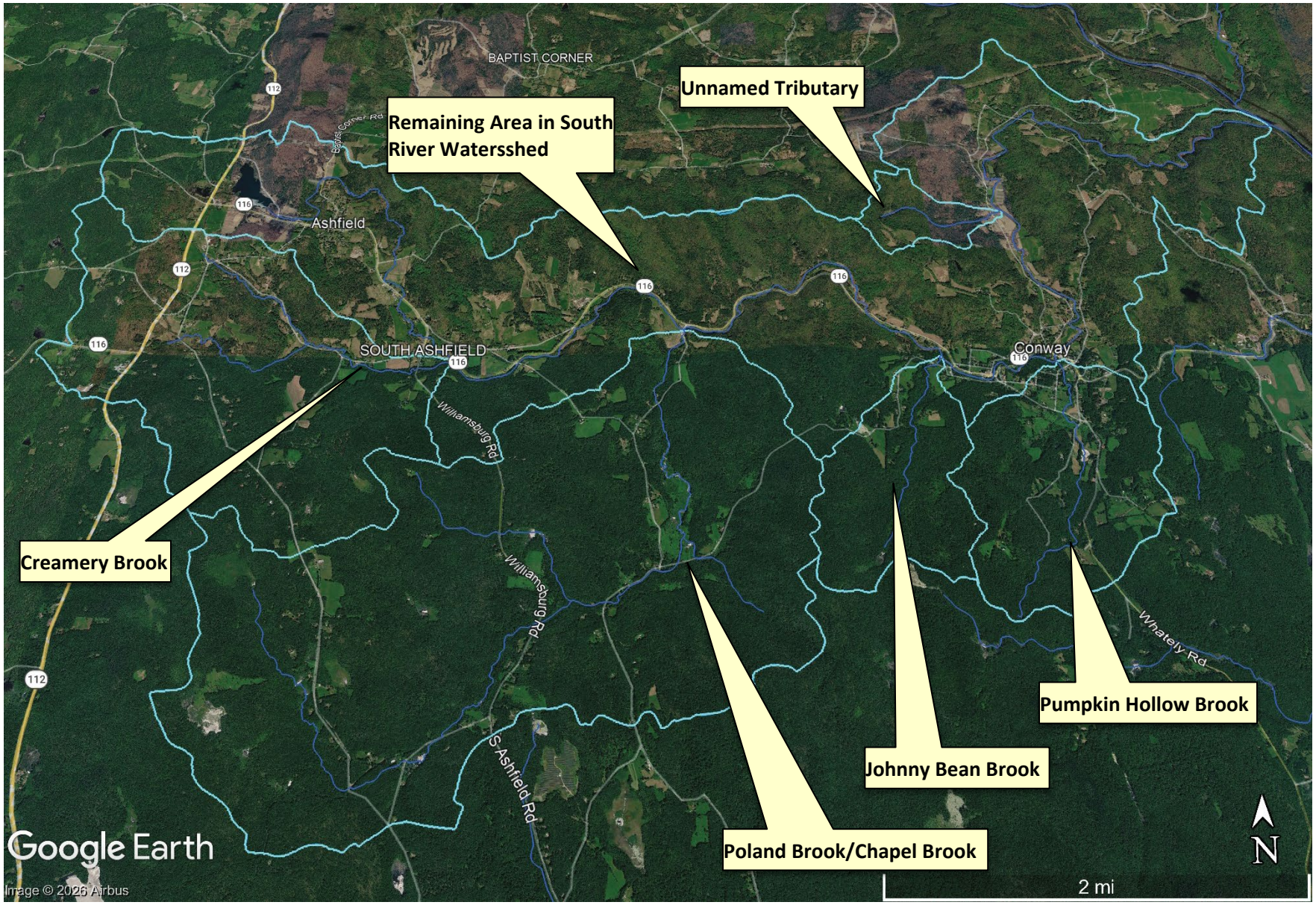

Figure A-10: Major Subwatersheds in South River Watershed

Element B: Determine Pollutant Load Reductions Needed to Achieve Water Quality Goals

Element B of your WBP should:

Determine the pollutant load reductions needed to achieve the water quality goals established in Element A. The water quality goals should incorporate Total Maximum Daily Load (TMDL) goals, when applicable. For impaired water bodies, a TMDL establishes pollutant loading limits as needed to attain water quality standards.

Estimated Pollutant Loads

Estimated land use-based pollutant loads for TP (3,340 lb/yr), TN (17,949 lb/yr), and TSS (428 tons/yr) were previously presented in **Table A-12** of this WBP. *E. coli* land use-based loading has not been estimated for this WBP, as there are not yet established PLERs available for *E. coli*; this may be updated in future revisions to this WBP.

Water Quality Goals and Required Load Reduction

There are many methodologies that can be used to set pollutant load reduction goals for a WBP. Goals can be based on water quality criteria, surface water standards, existing monitoring data, existing TMDL criteria, or other data. As discussed in Element A, water quality goals for this WBP include reducing *E. coli*, TP, TN, and TSS loading to the South River watershed.

While *E. coli* loads are not estimated, *E. coli* reductions may be determined by comparing monitored water quality concentrations to the goals for *E. coli* presented in Element A and **Table B-1**. These concentration goals are based on the Statewide Bacteria TMDL (MassDEP, 2024) and the MSWQS.

Given the iterative and adaptive nature of this WBP, the monitoring portion of this WBP (**Element I**) recommends that monitoring be performed to better understand the existing TP loading to the South River, which may help establish a specific TP related water quality goal with the next update of the WBP (expected in 2028). In the interim, a 10 percent reduction in the estimated watershed loading to 3,007 lb/yr is proposed to improve the water quality within the South River watershed. It is important to note that the South River watershed currently does not have a listed TP impairment; this TP goal is protective rather than restorative.

The TN load reduction goal is based on the 10 percent reduction goal for Massachusetts in the Long Island Sound TMDL (NYSDEC, 2000).

A 10 percent load reduction goal was also included for TSS in the South River watershed since erosion and sediment deposition were identified as a pollutant source.

The water quality goals, and corresponding required loading reductions are included in **Table B-1**. The proposed projects described in this WBP are expected to reduce *E. coli*, TP, TSS, and TN loads to the South River; however, additional load reductions may be required to meet the water quality goals.

The following adaptive sequence is recommended to sequentially track and meet these load reduction goals:

1. Continue and expand on the baseline water quality monitoring program in accordance with **Element I**. Results from the monitoring program should advise if **Element C** management measures have been effective at addressing listed water quality impairments or water quality goals for other indicator parameters established by **Table A-9** of this WBP. Results can further be used to periodically inform or adjust load reduction goals presented in **Table B-1**.

2. Based on monitoring data, establish additional long-term reduction goal(s), if needed, to lead to delisting of South River (MA33-07, MA33-101, and MA33-102), Ashfield Pond (MA33001), and the Unnamed Tributary (MA33-137) from the 303(d) list over the next 15 years.

Table B-1: Pollutant Load Reductions Needed for South River Watershed

Pollutant	Existing Estimated Total Load	Water Quality Goal	Required Load Reduction
Total Phosphorus	3,340 lb/yr	3,007 lb/yr	333 lb/yr
Bacteria (*E. coli*)	*MSWQS for bacteria are concentration standards (CFU/100 mL), which are difficult to predict based on estimated annual loading.*	• *E. coli* concentrations shall not exceed 126 colony-forming units per 100 milliliters (CFU/100mL), calculated as the geometric mean of all samples collected within any 90-day or smaller interval; and • no more than 10 percent of all such samples shall exceed 410 CFU/100 mL (a statistical threshold value).	N/A Concentration-based
Total Nitrogen	17,949 lb/yr	16,154 lb/yr	1,795 lb/yr
Total Suspended Solids	428 tons/yr	385 tons/yr	43 tons/yr

"E. coli" = Escherichia coli
"CFU/100 mL" = colony forming units per 100 milliliters
"lb/yr" = pounds per year
"MSWQS" = Massachusetts Surface Water Quality Standards (MassDEP, 2022b)
"N/A" = Not applicable

Element C: Describe management measures that will be implemented to achieve water quality goals

Element C: A description of the nonpoint source management measures needed to achieve the pollutant load reductions presented in Element B, and a description of the critical areas where those measures will be needed to implement this plan.

Management measures, also referred to as stormwater best management practices (BMPs) manage stormwater runoff by reducing peak runoff rates, managing runoff volume, and improving water quality by reducing nutrients and pollutants. There are two main types of BMPs: structural BMPs that are engineered systems such as (but not limited to) rain gardens, water quality swales, and subsurface infiltration units; and non-structural BMPs that are practices such as street sweeping,catch basin cleaning, open space/conservation planning, and regulation updates, which indirectly reduce the pollutant load to waterbodies..

Ongoing Management Measures

Expanded Western Massachusetts Agricultural Nonpoint Source Program

MACD was awarded Federal Fiscal Year 2024 CWA Section 319 grant funding for its "Expanded Western Massachusetts Agricultural Nonpoint Source Program" (MACD, 2025). Under this project, MACD is working with various agencies (e.g., NRCS, MDAR, EPA, and MassDEP) and with farmers to implement agricultural BMPS to reduce potential contaminant runoff from agricultural operations to several impaired and at-risk waterbodies in Western Massachusetts (including waterbodies within the South River watershed). Agricultural BMPs can be structural or non-structural. MACD's general strategy is to conduct outreach and education to farmers; support the development of conservation plans outlining BMPs to reduce pollutant runoff; and assist landowners in obtaining access to technical and financial resources to implement the BMPs.

Two cow farms in the South River watershed have been identified by MACD for implementation of structural agricultural BMPs. **Appendix E** includes a detailed list of these BMPs, and **Table C-1** includes an estimate of pollutant load reduction that can be achieved with implementation of these BMPs.

Table C-1: Pollutant Load Reduction Estimates for MACD Agricultural BMP Implementation Projects in the South River Watershed

Estimated Pollutant Load Reduction	Farm 1	Farm 2	Total
TN lb/yr	3,373	675	4,047
TP lb/yr	937	187	1,124
E. coli colony forming units (CFU)/year	1.35×10^{15}	2.70×10^{14}	1.62×10^{15}

The estimated pollutant load reduction (TP, TN and/or *E. coli*) that may be achieved from implementing BMPs is site-specific, can be fine-tuned once BMPs are closer to completion, and may be updated in future iterations of this WBP.

National Water Quality Initiative (NWQI)

The South River watershed was designated as a National Water Quality Initiative (NWQI) watershed by USDA NRCS in Fiscal Year 2023[3]. The NWQI is a partnership among USDA NRCS, MassDEP and the USEPA to identify and address waterbodies with agricultural-related impairments through voluntary conservation. As part of the program, NRCS will provide targeted funding for financial and technical assistance for implementation of conservation systems within the watershed. Conservation systems include practices that promote soil health, reduce erosion and lessen nutrient runoff, such as filter strips, cover crops, reduced tillage and manure management (see also examples above under the Agricultural Nonpoint Source Regional Coordinators program and below under Future Management Measures). The goal is to implement practices that not only benefit natural resources but also enhance agricultural productivity and profitability by improving soil health and optimizing the use of agricultural inputs.

The NWQI includes two phases:

- Readiness Phase: Prior to receiving targeted technical and financial assistance, the Readiness Phase provides funding for watersheds to develop a watershed assessment, expand on-farm planning and outreach, and increase support for local staff.
- Implementation Phase: In the Implementation Phase, NRCS provides technical and financial assistance for producers to implement conservation practices that address resource concerns identified in the watershed assessment, developed in the Readiness Phase.

With the South River NWQI watershed assessment complete (FRCOG, 2023), the South River Watershed is currently in the NWQI Implementation Phase. NRCS funded one project within the South River Watershed through NWQI Environmental Quality Incentives Program (EQIP) funds in 2025. Conservation practices include management of runoff and erosion from a 90-acre livestock producer property as well as nutrient management and cover crops on the cropland of this property. NRCS anticipates additional, similar work supporting livestock producers within the South River watershed in 2026.

Future Management Measures

Deerfield WBP Findings and Recommendations for the South River Watershed

Figure C-2 includes findings and recommendations for the South River watershed from the Deerfield River WBP[4]. **Table C-2** includes the status (i.e., not started, in progress, or completed) of the fifteen action items with any relevant notes.

[3] More information about the NWQI program can be found here: https://www.nrcs.usda.gov/programs-initiatives/national-water-quality-initiative

[4] Some of the management measure recommendations on the list were also included in the 2000 Water Quality Assessment Report (**Appendix B**)

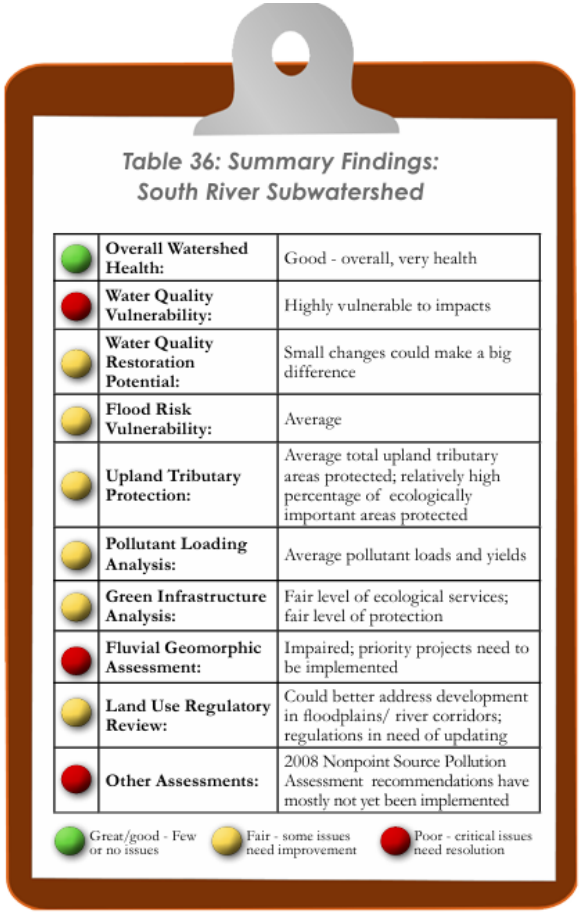

Table 36: Summary Findings: South River Subwatershed

Overall Watershed Health:	Good - overall, very health
Water Quality Vulnerability:	Highly vulnerable to impacts
Water Quality Restoration Potential:	Small changes could make a big difference
Flood Risk Vulnerability:	Average
Upland Tributary Protection:	Average total upland tributary areas protected; relatively high percentage of ecologically important areas protected
Pollutant Loading Analysis:	Average pollutant loads and yields
Green Infrastructure Analysis:	Fair level of ecological services; fair level of protection
Fluvial Geomorphic Assessment:	Impaired; priority projects need to be implemented
Land Use Regulatory Review:	Could better address development in floodplains/ river corridors; regulations in need of updating
Other Assessments:	2008 Nonpoint Source Pollution Assessment recommendations have mostly not yet been implemented

Great/good - Few or no issues Fair - some issues need improvement Poor - critical issues need resolution

Table 37: Summary Recommendations: The Deerfield River Watershed Action Plan, beginning on page 63, contains recommendations and action items applicable to the entire watershed. In addition to the Action Plan, high priority recommendations specific to the South River Subwatershed are described on the previous page and summarized here:

- **Action Item #1:** Implement the recommendations in the River Corridor Management Plan.
- **Action Item #2:** Adopt a river corridor protection bylaw that would limit development within areas of river corridors susceptible to erosion and flooding
- **Action Item #3:** Continue to secure funding for river restoration projects, identified in the River Corridor Management Plan and Fluvial Geomorphic and Habitat Plan.
- **Action Item #4:** Use MAPPR to indentify parcels for protection.
- **Action Item #5:** Conduct a Rural Roads Assessment to identify road drainage and stormwater management problems and to determine priority projects and BMPs.
- **Action Item #6:** Conduct outreach and education to riparian land owners on best management practices for protecting those areas.
- **Action Item #7:** Implement road runoff BMPs and priority projects (such as a Rural Roads Assessment project), including training for DPW staff.
- **Action Item #8:** Complete an inventory of illegal dumping areas and junkyards in each subwatershed town, and evaluate options for cleaning up these sites.
- **Action Item #9:** Conduct additional bacteria source investigations in the South River to further bracket the suspected sources of the high bacteria counts recorded in several locations in 2005 and 2006.
- **Action Item #10:** Assess the vulnerability of critical facilities to flooding and develop mitigation strategies to increase resiliency.
- **Action Item #11:** Work with local farmers to implement agricultural BMPs to protect water quality, including providing informational fact sheets on manure management to horse owners.
- **Action Item #12:** Provide incentives for forest owners - through carbon trusts or other mechanisms - to protect their land for carbon storage.
- **Action Item #13:** Work with landowners to protect upland tributary areas and the areas identified as BioMap2 Core Habitats from future development through land acquisition, conservation easements, and other mechanisms. Focus on the largely unprotected western half of the subwatershed.
- **Action Item #14:** Consider adopting OSRD/NRPZ bylaws to require greater open space protection and require a Special Permit when conventional subdivision is proposed.
- **Action Item #15:** Encourage the use of LID site planning and stormwater techniques in new development and redevelopment.

Figure C-2: Deerfield River Watershed Based Plan Summary of Findings and Recommendations for South River Watershed (copied from FRCOG, 2015)

Table C-2: Current Status of 2015 Deerfield River Watershed Based Plan Action Items

Action Item #	Action Item Description	Status	Notes
1	Implement the recommendations in the River Corridor Management Plan	In progress	The Town of Conway and FRCOG have worked to prioritize, scope, and work with landowners to identify land protection and corridor management projects along the South River since 2018. Designs for several projects have been suggested since the 2013 study (Field, 2013) and in subsequent plans. These designs range in stages of completion.
2	Adopt a river corridor protection bylaw that would limit development within areas of river corridors susceptible to erosion and flooding	In progress	The FRCOG has worked with the Town of Conway and its Planning Board to adapt the Model River Corridor Protection Overlay District Zoning Bylaw to the needs of the Town. Currently in its 10th draft, the bylaw is nearing completion. Check status in Fiscal Year 2027 after Conway's current MVP Action Grant is completed.
3	Continue to secure funding for river restoration projects, identified in the River Corridor Management Plan, Fluvial Geomorphic and Habitat Plan and with MVP grant funding	In progress	The FRCOG secured Section 319 grant funding for a sediment management project that included floodplain reconnection and bank stabilization at the South River Meadow, which was completed in 2016. Field Geology Services and GZA GeoEnvironmental have identified several resilience projects, two of which are at the conceptual design phase (https://conwayma.gov/files/5_ConwaySouth_River_ResilienceProjectsReport.pdf)
4	Use MAPPR to identify parcels for protection.	Not started	
5	Conduct a Rural Roads Assessment to identify road drainage and stormwater management problems and determine priority projects and BMPs	In progress	FRCOG completed culvert conditions assessments for all locations in Ashfield and Conway in 2020. FRCOG conducted a GIS-based vulnerable unpaved roads assessment in Ashfield in 2024 and can provide analysis maps for Ashfield or Conway. Detailed road conditions and stormwater management assessments have not been completed. FRCOG completed an Unpaved Roads Stormwater Management Toolkit in 2025, which contains design typical details for many stormwater BMPs. This Toolkit was distributed to each town in Franklin County with unpaved roads.
6	Conduct outreach and education to riparian landowners on best management practices for protecting those areas	In progress	This is part of NWQI efforts for the South River watershed as well as efforts under MACD's current Agricultural Nonpoint Source Regional Coordinators project.
7	Implement road runoff BMPs and priority projects (such as a Rural Roads Assessment project), including training for DPW staff.	In progress	FRCOG and GZA worked on this for Pine Hill in Conway.
8	Complete an inventory of illegal dumping areas and junkyards in each subwatershed town, and evaluate options for cleaning up these sites.	Not started	
9	Conduct additional bacteria source investigations in the South River to further bracket the suspected sources of the high bacteria counts recorded in several locations in 2005 and 2006.	Not started	Bracketing efforts from 2005 to 2007 were unsuccessful in finding a source; no bracketing efforts have been completed since.
10	Assess the vulnerability of critical facilities to flooding and develop mitigation strategies to increase resiliency	In progress	Documented in the Ashfield-Conway Hazard Mitigation Plan and the Ashfield-Conway Municipal Vulnerability Plan.
11	Work with local farmers to implement agricultural BMPs to protect water quality,	In progress	FRCOG completed a NWQI Watershed Assessment for the South River Watershed. Massachusetts NRCS funded one project within the South River Watershed through NWQI funds in 2025. The contract

Action Item #	Action Item Description	Status	Notes
	including providing informational fact sheets on manure management to horse owners.		cost is $101,816.00 for a livestock producer on 90 acres. Conservation practices include management of runoff and erosion within the farmstead as well as nutrient management and cover crop on the cropland. Massachusetts NRCS anticipates additional, similar work supporting livestock producers within the watershed in 2026
12	Provide incentives for forest owners - through carbon trusts or other mechanisms - to protect their land for carbon storage.	In progress	The Town of Conway has been working on setting up a carbon market program for its residents. https://recorder.com/2022/06/28/conway-gets-preliminary-carbon-market-report-46996950/
13	Work with landowners to protect upland tributary areas and the areas identified as BioMap2 Core Habitats from future development through land acquisition, conservation easements, and other mechanisms. Focus on the largely unprotected western half of the subwatershed.	Not started	
14	Consider adopting OSRD/NRPZ bylaws to require greater open space protection and require a Special Permit when conventional subdivision is proposed.	Not started	Conway does not have Subdivision Regulations
15	Encourage the use of LID site planning and stormwater techniques in new development and redevelopment.	Not started	There is discussion of LID techniques in Conway's Open Space and Recreation Plan.

Conservation of Attenuation Assets

The Deerfield River WBP (FRCOG, 2015) also recommended conservation of attenuation assets along the South River (see concept from the Deerfield River WBP in **Figure C-1**). Conservation of attenuation assets refers to land that is conserved for the purpose of allowing stream meander formation and storage of sediment. This type of land typically consists of fallow agricultural parcels that have sustained flood or erosion damage in the past and/or are parcels without the necessary frontage for development that are located along artificially straightened stream channels. The premise is that these riparian lands may be valuable to the community as flood storage attenuation assets. The proposed conservation of attenuation assets project has not advanced. A proposal that included this project and other elements was submitted by the Town of Conway for a Municipal Vulnerability Preparedness (MVP) Action Grant (project known as "The Oxbow Reconnection") but was not awarded over concerns about the complex permitting required due to wetland resource areas and Massachusetts Endangered Species Act (MESA) protected habitat. The FRCOG's 2025 River Restoration Design and Permitting Guide may be of assistance in improving the navigation of river restoration permitting hurdles for this project if pursued in the future.

Conservation of attenuation assets and encroachment removal - South River. 2014 aerial photo showing identified attenuation asset along South River in Conway, MA. Significant bank erosion observed on agricultural parcel as meanders reform along straigntened channel.

Figure C-1: Example Proposed Conservation of Attenuation Assets and Encroachment Removal along South River (FRCOG, 2015)

2012 South River Fish Communities and Physical Habitat Assessment (Cole, 2013)

This assessment (also described in Element A) concluded that conserving land and improving riparian areas upstream of the Conway/Ashfield line would benefit the South River, support wild trout and enhance habitat. A detailed riparian study could pinpoint areas needing more stream shading. It was recommended that restoration projects from the 2013 Geomorphic Assessment (see below) be implemented in the Conway portion of the South River to help restore natural river features and support fish habitats. Monitoring trout distribution during various summer conditions would also clarify population patterns and limiting factors. Overall, riparian restoration along the South River was identified as critical for long-term habitat improvement in the lower South River.

2013 Fluvial Geomorphic Assessment of the South River Watershed (Field, 2013)

As described in Element A of this WBP, the FRCOG received a Section 604(b) Water Quality Management Planning grant from MassDEP to conduct a thorough assessment of the South River mainstem, aiming to identify factors

contributing to erosion, channel instability, and habitat degradation. The assessment also included a geomorphic study that resulted in the development of conceptual restoration designs for the four highest-ranked priority sites and final designs and cost estimate for the highest ranked restoration priority site. The Town of Conway and FRCOG have worked to prioritize, scope, and work with landowners to identify land protection and corridor management projects along the South River since 2018.

Unpaved Roads BMPs

FRCOG transportation planning staff will be working with the Town of Conway to do an unpaved roads assessment in 2026. This project will follow FRCOG's Unpaved Roads Stormwater Management Toolkit and will identify priority road segments for BMP installation. If Ashfield requests these services from FRCOG, their assessment could be done in later years.

Identification of Priority Locations for Stormwater Structural BMPs

Implementing structural BMPs (e.g., low impact development practices) on new and existing development, as well as implementing agricultural BMPs as described above, and investigating and remediating potential other sources such as failing septic systems will be necessary to achieve a measurable and sustainable improvement in water quality in the South River watershed.

The following general sequence is recommended to identify and implement future structural BMPs[5]. Examples of structural BMPs include (but not limited to):

- bioretention areas and rain gardens,
- deep sump catch basins,
- dry wells,
- constructed stormwater wetlands (e.g., gravel wetland),
- porous pavement,
- sand filters,
- vegetated filter strips,
- wet ponds,
- infiltration basins and trenches,
- oil/grit separators, and water quality swales.

Pollutant load reduction estimates for the BMPs listed above (in percent) can be found on the Clean Water Toolkit website accessible here: **https://megamanual.geosyntec.com/npsmanual/bmpfactsheetmenu.aspx**

[5] For detailed information on BMP selection, siting and sizing, refer to the following document: https://prj.geosyntec.com/prjMADEPWBP_Files/Files/BMP%20Selection,%20siting%20and%20sizing%20Guidance_FINAL.pdf.
Additional references for developing BMP concepts in unpaved road areas/eroded streambanks are:

- "Massachusetts Unpaved Roads BMP Manual" (Berkshire Regional Planning Commission, 2001): https://megamanual.geosyntec.com/npsmanual/Unpaved%20Road.pdf
- FRCOG's Unpaved Roads Stormwater Toolkit (Tool 2) https://frcog.org/publications/unpaved-roads-stormwater-management-toolkit/

Note this approach applies largely to non-agricultural BMPs that might be implemented by other watershed stakeholders (such as any of the stakeholders listed in the Introduction section of this WBP), as MACD's work focuses on building relationships with the agricultural community to guide agricultural BMP implementation.

1. **Identify Potential Implementation Locations:** Perform a desktop analysis using aerial imagery and GIS data to develop a preliminary list of potentially feasible implementation locations based on land use; soil type (i.e., hydrologic soil groups A and B); available public open space (e.g., lawn area in front of a police station); potential redevelopment sites where additional public-private partnerships may be leveraged; and other factors such as proximity to receiving waters, known problem areas, or publicly owned right of ways or easements. See BMP Hotspot Map analysis below, which helps identify potential implementation locations. Creamery Brook subwatershed also has the highest modeled pollutant loading and includes an impaired segment; locations in within Creamery Brook subwatershed should be considered. Additionally, during the stakeholder meeting that was held on January 13, 2026, potential management measures that were discussed included strategies for addressing erosion along streambanks in the watershed, citing the undermining of Shelburne Falls Road in Conway by the South River in three locations as an example. Concepts have not yet been developed for these potential projects.

2. **Visit Potential Implementation Locations:** Perform field reconnaissance, preferably during a period of active runoff-producing rainfall, to evaluate potential implementation locations, gauge feasibility, and identify potential BMP ideas. During field reconnaissance, assess identified locations for space constraints, potential accessibility issues, presence of mature vegetation that may cause conflicts (e.g., roots), potential utility conflicts, site-specific drainage patterns, and other factors that may cause issues during design, construction, or long-term maintenance.

3. **Develop BMP Concepts:** Once potential BMP locations are conceptualized, use the BMP-selector tool on the watershed-based planning tool to help develop concepts. Concepts can vary widely. One method is to develop 1-page fact sheets for each concept that includes a site description, including definition of the problem, a description of the proposed BMPs, annotated site photographs with conceptual BMP design details, and a discussion of potential conflicts such as property ownership, O&M requirements, and permitting constraints. The fact sheet can also include information obtained from the BMP-selector tool including cost estimates, load reduction estimates, and sizing information (i.e., BMP footprint, drainage area, etc.).

4. **Rank BMP Concepts:** Once BMP concepts are developed, perform a priority ranking based on site-specific factors to identify the implementation order. Ranking can include many factors including cost, expected pollutant load reductions, implementation complexity, potential outreach opportunities and visibility to public, accessibility, expected operation and maintenance effort, and others. Prioritized BMP concepts should focus on reducing *E. coli* and TP loading to the South River as summarized by **Element B.**

Stormwater BMP Suitability Index

The following GIS-based analysis[6] was performed within the watershed to identify high priority parcels for BMP (also referred to as management measure) implementation:

- Each parcel within the watershed was evaluated based on ten different criteria accounting for the parcel ownership, social value, and implementation feasibility (See **Table C-2** for more detail below);

[6] GIS data used for the BMP Hotspot Map analysis included: MassGIS (2015a); MassGIS (2015b); MassGIS (2017a); MassGIS (2017b); MassGIS (2020); MA Department of Revenue Division of Local Services (2016); MassGIS (2005); ArcGIS (2020); MassGIS (2019); MassGIS (2012); and ArcGIS (2020b).

- Each criterion was then given a score from 0 to 5 to represent the priority for BMP implementation based on a metric corresponding to the criterion (e.g., a score of 0 would represent lowest priority for BMP implementation whereas a score of 5 would represent highest priority for BMP implementation);
- A multiplier was also assigned to each criterion, which reflected the weighted importance of the criterion (e.g., a criterion with a multiplier of 3 had greater weight on the overall prioritization of the parcel than a criterion with a multiplier of 1); and
- The weighted scores for all the criteria were then summed for each parcel to calculate a total BMP suitability score.

Table C-3 presents the criteria, indicator type, metrics, scores, and multipliers that were used for this analysis. Parcels with total scores above 60 are recommended for further investigation for BMP implementation suitability. **Figure C-3** presents the resulting BMP suitability index map for the South River watershed.

This analysis solely evaluated individual parcels for BMP implementation suitability and likelihood for the measures to perform effectively within the parcel's features. This analysis does not quantify the pollutant loading to these parcels from the parcel's upstream catchment. When further evaluating a parcel's BMP implementation suitability and cost-effectiveness of BMP implementation, the existing pollutant loading from the parcel's upstream catchment and potential pollutant load reduction from BMP implementation should be evaluated.

Table C-3: Matrix for Stormwater BMP Hotspot Map GIS-based Analysis

Criteria	Indicator Type	METRICS																										Multiplier	Maximum Potential Score
		Yes or No?		Hydrologic Soil Group				Land Use Type								Water Table Depth				Parcel Area			Parcel Average Slope						
		Yes	No	A or A/D	B or B/D	C or C/D	D	Low and Medium Density Residential	High Density Residential	Commercial	Industrial	Highway	Agriculture	Forest	Open Land	Water	101-200 cm	62-100 cm	31-61 cm	0-30 cm	Greater than 2 acres	Between 1-2 acres	Less than 1 acre	Less than 2%	Between 2% and 15%	Greater than 15%	Less than 50%	Between 51% and 100%		
Is the parcel a school, fire station, police station, town hall or library?	Ownership	5	0																									2	10
Is the parcel's use code in the 900 series (i.e., public property or university)?	Ownership	5	0																									2	10
Is parcel fully or partially in an Environmental Justice Area?	Social	5	0																									2	10
Most favorable Hydrologic Soil Group within Parcel	Implementation Feasibility			5	3	0	0																					2	10
Most favorable Land Use in Parcel	Implementation Feasibility							1	2	4	2	4	5	1	4	X[1]												3	15
Most favorable Water Table Depth (deepest in Parcel)	Implementation Feasibility																5	4	3	0								2	10
Parcel Area	Implementation Feasibility																				5	4	1					3	15
Parcel Average Slope	Implementation Feasibility																							3	5	1		1	5
Percent Impervious Area in Parcel	Implementation Feasibility																										5	2.5	1	5
Within 100 ft buffer of receiving water (stream or lake/pond)?	Implementation Feasibility	5	2																									2	10

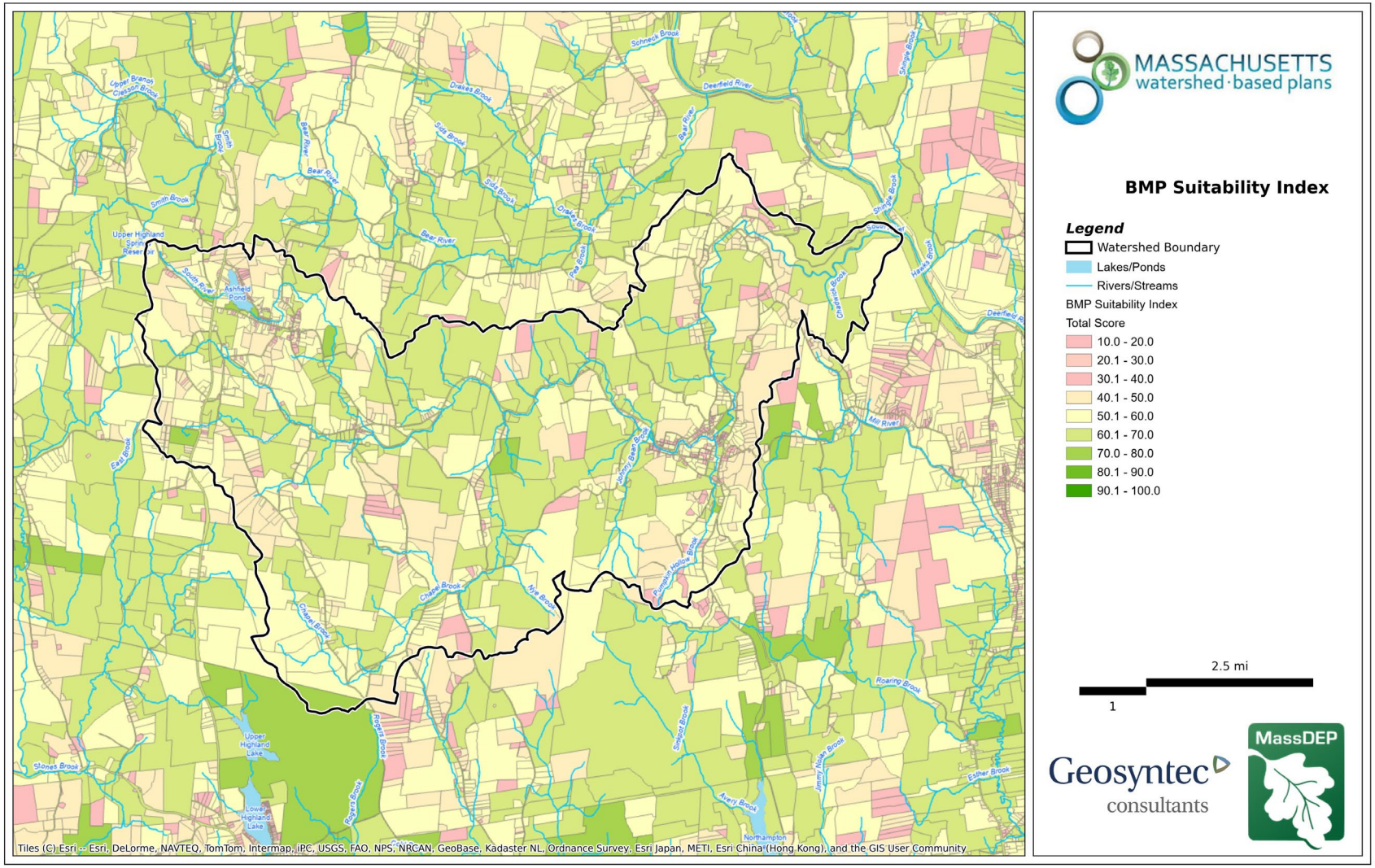

Figure C-3: South River Watershed Stormwater BMP Suitability Index Map (MassGIS (2015a), MassGIS (2015b), MassGIS (2017a), MassGIS (2017b), MassGIS (2020), MA Department of Revenue Division of Local Services (2016), MassGIS (2005), ArcGIS (2020), MassGIS (2019), MassGIS (2012), ArcGIS (2020b))

Additional Agricultural BMPs

A list of typical agricultural BMPs for future consideration for additional properties in the South River watershed is included below.

1. **Livestock Exclusion:** This practice involves the fencing of an area not intended for grazing to exclude livestock from accessing that area. Livestock exclusion may improve water quality by preventing livestock from being in the water, preventing access to steep or highly erodible banks, and by preventing animal waste deposition in surface waters. This practice prevents compaction of the soil by livestock and prevents losses of vegetation and undergrowth. This may maintain or increase evapotranspiration. Increased soil permeability may reduce erosion and decrease the transport of sediment and other pollutants to surface waters. By protecting existing vegetation, this practice also promotes shading along streams and may reduce surface water temperature.

2. **Riparian Buffers:** A riparian buffer is the area of trees, shrubs and grasses adjacent to a waterbody that can intercept pollutants from both surface and shallow groundwater before reaching a river or stream. This practice involves the protection, maintenance, and restoration of riparian forest areas. The ability of a riparian buffer to remove pollutants is dependent on the width of the buffer, the type of vegetation, the manner in which runoff traverses the vegetated areas, the slope and the soil composition within the riparian area. Riparian buffers also provide habitat for wildlife and enhance fish habitat by reducing water temperature.

3. **Alternative Livestock Water Supply:** An alternate livestock drinking water supply located away from surface waters can reduce stream bank erosion, prevent the deposition of animal waste within water bodies, protect riparian vegetation, and provide a dependable, clean source of water for livestock. In some locations, artificial shade may also be constructed to encourage use of upland sites for shading and loafing. Alternative livestock water can be provided through the following practices:

    - Pond: A water impoundment made by constructing a dam or an embankment or by excavating a pit or dugout.
    - Trough or Tank: By the installation of troughs or tanks, livestock may be better distributed over the pasture, grazing can be better controlled, and surface runoff reduced, thus reducing erosion.
    - Well: A drinking water supply well can be constructed or improved to provide water for livestock.
    - Spring Development: This practice includes improving springs and seeps by excavating, cleaning, capping, or providing collection and storage facilities. Temporary erosion and sedimentation may occur from any disturbed areas during and immediately following any related construction activities.
    - Pipeline/Pump System: A gravity pipeline or pump system can be developed in combination with the practices described above to increase to distance between a water source (e.g., well, spring) and targeted water supply areas within the pasture.

4. **Rotational Grazing Systems and Improved Pasture Management:** Rotational grazing systems and improved pasture management are recommended in conjunction with livestock exclusion and alternative livestock water supply projects. Grazing systems and improved pasture management allow farmers to better use grazing land and include:

    a. managing livestock rotation to maintain minimum grazing height recommendations and sufficient rest periods for plant recovery;

b. locating feeding and watering facilities away from sensitive areas (see alternative livestock water supply above);
c. designating a sacrifice lot/paddock (that does not drain directly into ponds, creeks, etc.) to locate livestock during the rainy season or when pastures are not growing actively to prevent overgrazing and trampling[7];
d. using compost-bedded pack barns (large, open resting area, under covered housing, usually bedded with sawdust or dry, fine wood shavings and manure composted into place and mechanically stirred on a regular basis) for dairy cows; and
e. chain harrowing pastures (at least twice a year) to break up manure piles and uniformly spread manure, after livestock are removed.

5. **Afforestation of Hay and Pastureland:** Using a small portion of hay and pastureland for tree planting. This converts pasture that is not well suited for grazing due to slope and other characteristics, optimizes the use of suitable pastureland in the watershed, and prevents runoff and soil loss from marginal pastures.

6. **Cropland Management Practices:** Cropland management practices include, among others, continuous no till, cover crops, and fertilizer management.

    a. Continuous no till is used to encourage procedures to convert fields under some degree of tillage to a system of minimal soil disturbance that will maintain a minimum a 60% rain drop intercepting residue cover.
    b. Cover crops keep cover on fields during times of year when they would otherwise be left barren in order to minimize runoff and erosion from the soil surface and also decrease leaching of nitrogen through the soil.
    c. Farmers can implement fertilizer management practices to help maintain high yields and save money on fertilizers while reducing nonpoint source pollution. A Crop Nutrient Management Plan[8]; is a tool that farmers can use to achieve these goals.

7. **Stormwater Runoff Management Practices on Agricultural Properties:** Stormwater runoff management practices on agricultural properties include structural BMPs such as gutters, downspouts, pipes, catch basins, french drains, to divert runoff and prevent it from intermingling with runoff from areas that store manure, chemicals, or other potential pollutants.

8. **Manure Management Practices:** Manure management practices include:
    a. Composting facility, which is a structure or device to contain and facilitate an aerobic microbial ecosystem for the decomposition of manure and/or other organic material into a final product sufficiently stable for storage, on farm use and application to land as a soil amendment.
    b. Waste storage facility, which is a waste storage impoundment made by constructing a pond (embankment and/or excavated pit or dugout), or by fabricating a structure.
    c. Waste transfer, which is a system using structures, pipes or conduits installed to convey wastes or waste byproduct from the agricultural production site to storage/treatment or application.

[7] See here for more information and recommended footing materials recommended for sacrifice areas: https://ag.umass.edu/sites/ag.umass.edu/files/fact-sheets/pdf/horse_footing_materials_15_05.pdf
[8] See here for ten key components to include in a crop nutrient management plan: megamanual.geosyntec.com/npsmanual/cropnutrient.aspx

d. Waste separation facility, which is a filtration or screening device, settling tank, settling basin, or settling channel used to partition solids and/or nutrients from a waste stream.
e. Roofs/covers, which are structures that collect, control, and transport precipitation from roofs
f. Anaerobic digesters, which is a facility that provides biological treatment of animal waste in the absence of oxygen.

Guidance from USDA NRCS should be considered when planning and implementing BMPs with farm owners. The Massachusetts "Field Office Technical Guide" provides detailed information on agricultural BMPs that may be implemented at farms in the watershed[9]. **Appendix F** also includes a list, provided by FRCOG, of potential agricultural BMPs that may be implemented in the watershed. An additional tool that may help for estimating pollutant load reductions of implemented agricultural BMPs is the (Pollutant Load Estimation Tool) PLET tool[10].

Additional Non-structural BMPs

It is recommended, if it has not already been done, that non-structural BMPs currently implemented in the village centers of Ashfield and Conway, including street sweeping and catch basin cleaning, be evaluated and potentially optimized for removal of TP and *E. coli*. First, it is recommended that potential pollutant load removals from ongoing activities be calculated in accordance with **Elements H and I** of this document. Next, it is recommended that ongoing activities be evaluated to see if potential improvements can be implemented to achieve higher pollutant load reductions, such as increased frequency or improved technology.

Other non-structural BMPs that are recommended to be implemented include (but not limited to):

- septic system maintenance,
- pet waste management,
- land use regulation revision (e.g., construction erosion and sediment control requirements),
- protection and conservation of open space, riparian buffers, wetlands and stream corridors,
- impervious cover reduction,
- impervious cover disconnection (e.g., disconnecting roof downspouts from impervious areas),
- municipal adoption and enforcement of construction practices that incorporate temporary erosion and sediment control BMPs.
- adoption of good housekeeping practices (e.g., yard waste management, leaf litter disposal, fertilizer application best practices), and
- public education and outreach (see Element E).

[9] The Massachusetts "Field Office Technical Guide" can be accessed at: https://efotg.sc.egov.usda.gov/#/state/MA/documents/section=4&folder=-3 ; the list of BMPs, as well as detailed information on each, is found under "Section 4 - Practice Standards and Supporting Documents" > "Conservation Practice Standards & Support Documents".

[10] The PLET tool is accessible here: https://www.epa.gov/nps/plet#Model%20Documentation.

-Element D: Identify Technical and Financial Assistance Needed to Implement Plan

Element D: Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan.

Ongoing Management Measures

Expanded Western Massachusetts Agricultural Nonpoint Source Program

As noted in Element C, MACD is performing outreach to farms in the watershed for potential implementation of agricultural BMPs. Two farms have been identified by BMP implementation. The estimated costs of these projects are currently unknown but can be updated in future iterations of this WBP.

National Water Quality Initiative (NWQI)

As noted in Element C, Massachusetts NRCS funded one implementation project within the South River Watershed through NWQI funds in 2025. Conservation practices under this project include management of runoff and erosion from a 90-acre livestock producer property as well as nutrient management and cover crops on the cropland of this property. The cost of this project is $101,816. The Massachusetts NRCS anticipates additional, similar work supporting livestock producers within the South River watershed in 2026.

Future Management Measures

Conservation of Attenuation Assets

The estimated cost for conservation of attenuation assets along the South River was presented in the Deerfield River WBP (FRCOG, 2015) and is included in **Table D-1**. Please note this cost does not account for inflation since 2015. As is noted in Element C, a proposal that included this project and other elements was submitted by the Town of Conway for a MVP Action Grant (project known as “The Oxbow Reconnection”) but was not awarded over concerns about the complex permitting required due to wetland resource areas and Massachusetts Endangered Species Act (MESA) protected habitat.

Table D-1: Conservation of Attenuation Assets Estimated Probable Cost (FRCOG, 2015)

Treatment/Item	Unit	Quantity	Unit Cost ($)	Task Cost ($)
Land acquisition / corridor easement	acre	50	$1,500	$75,000
Berm removal	unit	1	$20,000	$20,000
Bank cutting / flow diversion	unit	1	$10,000	$10,000
Machinery	day	3	$4,000	$12,000
Construction Oversight	day	3	$1,680	$5,040
Treatment Subtotal				$122,040
20% Contingency				$24,408
Construction subtotal				$146,448
Surveying, permitting and legal costs				$70,000
Project total				**$216,448**

Additional Structural and Non-structural Management Measures

Funding for future management measures to further reduce loads within the watershed may be provided by a variety of sources including Section 319 funding, NWQI funding, Climate Smart Agricultural Program (CSAP), Massachusetts Environmental Trust (MET) grants, the Agricultural Produce Safety Improvement Program (APSIP), Town and City capital funds, volunteer efforts, and NRCS grants including the EQIP and the Agricultural Management Assistance (AMA) program. MACD and FRCOG have previously been successful with and will continue to pursue securing grant funding through various sources. Guidance is available to provide additional information on potential funding sources for nonpoint source pollution reduction efforts[11].

Monitoring

As described in Element H&I, it is recommended that the current water quality monitoring program continue and be expanded. This program is run by the CRC and DRWA and the cost associated with this is determined by these entities.

[11] Guidance on funding sources to address nonpoint source pollution: http://prj.geosyntec.com/prjMADEPWBP_Files/Guide/Element%20D%20-%20Funds%20and%20Resources%20Guide.pdf

Element E: Public Information and Education

Element E: Information and Education (I/E) component of the watershed plan used to:

1. Enhance public understanding of the project; and
2. Encourage early and continued public participation in selecting, designing, and implementing the NPS management measures that will be implemented.

A component of the MACD Agricultural BMPs - Expanded Western Massachusetts Agricultural Nonpoint Source Program involves outreach to farmers. Farmer outreach through this program includes building relationships with farm owners through phone calls, farm visits, direct mailings, workshops, farm tours, newsletter/newspaper articles, and social media.

Additional components of the watershed public information and education program are described below. This includes public information and education initiatives discussed during the stakeholder meeting of January 13, 2026 (**Appendix A**). Additional outreach efforts will be determined when future management measures and activities are planned for implementation in the watershed. This section of the WBP will be updated when the plan is reevaluated in 2028 in accordance with Elements F&G of this document.

Step 1: Goals and Objectives

The goals and objectives for the watershed information and education program.

1. Provide information to farmers on funding resources for BMP implementation.
2. Provide information about farm conservation plans and agricultural BMPs and their anticipated benefit to farm operations as well as water quality benefits.
3. Provide information to promote watershed stewardship including encouraging landowners to maintain or restore vegetated buffers along streams.
4. Provide information to all residents in the watershed about proposed stormwater improvements and their anticipated water quality benefits.

Step 2: Target Audience

Target audiences that need to be reached to meet the goals and objectives identified above.

1. Farmers and agricultural landowners in the watershed.
2. Watershed organizations and other user groups, including the CRC, the DRWA, and the Friends of the South River.
3. Businesses, schools, and local governments within the watershed.
4. Indigenous community (e.g., No Loose Braids and Ohketeau Cultural Center)
5. Developers (construction) within the watershed.

6. All watershed residents.

Step 3: Outreach Products and Distribution

The outreach product(s) and distribution form(s) that will be used for each.

1. MACD representatives will conduct one-on-one meetings with farmers and support the development of farm conservation plans and assist in implementation of agricultural BMPs
2. MACD will conduct farm tours highlighting agricultural BMPs including the benefits to both farm operations as well as in improving water quality.
3. CRC and the DRWA provide water quality data about the Connecticut River watershed and Deerfield River watershed including the South River watershed on their websites (https://www.ctriver.org/; https://deerfieldriver.org/) and typically host events such as annual river clean up days. CRC recently launched an extension of their website, titled the "*Is it Clean* water quality database" (https://www.isiticlean.us) that includes predictive abilities for *E. coli* levels in waters used for swimming and boating.
4. Friends of the South River has a website with general information about the South River watershed including news and events, projects and assessments related to the South River watershed.
5. "Forests for Fish" is a collaboration between MA Woodlands Institute, Franklin Land Trust, and DRWTU, to produce materials, demonstrations, and educational events for landowners to help them manage and protect their streams (https://masswoodlands.org/initiatives/forests-for-fish/).

Step 4: Evaluate Information/Education Program

Information and education efforts and how they will be evaluated.

1. Track the number of farm tours and the attendance at each.
2. Track the number of farmers participating in outreach and education efforts, conservation plans, and implementation of BMPs.
3. Track the number of materials and information distributed to the public, such as fact sheets and emails, and the size of the lists receiving these materials.
4. Track user traffic on websites, such as CRC's *Is it Clean* database, that disseminate information and education.

Resources for Additional Outreach Products

Other public education and outreach activities and topics should also be considered, such as (but not limited to) yard waste management (leaf litter and fertilizer), pet waste management[12], and septic system maintenance and pump outs, as discussed in the Non-structural BMP section in Element C.

[12] https://www.epa.gov/system/files/documents/2023-01/bmp-pet-waste-management.pdf

The EPA's "Nonpoint Source Outreach Toolbox" (www.epa.gov/nps/toolbox) provides information, tools, and more than 700 outreach materials that can be used or adapted to develop an outreach campaign. The toolbox focuses on six nonpoint source pollution categories:

- stormwater
- household hazardous waste
- septic systems
- lawn care
- pet care
- automotive care

Outreach products in the Toolbox include print ads, public service announcements, and a variety of materials for billboards, signage, kiosks, posters, brochures, fact sheets, and giveaways that help to raise awareness and promote non-polluting behaviors. Permission-to-use information is included for outreach products, which makes it easy to tailor them to local priorities. Evaluations of several outreach campaigns also offer real-world examples of what works best in terms of messages, communication styles, and formats. Other helpful resources include:

- MassDEP's Clean Water Toolkit (https://megamanual.geosyntec.com/npsmanual/default.aspx)
- USEPA's Soak Up the Rain materials (https://www.epa.gov/soakuptherain)
- USEPA's Green Infrastructure Collaborative (https://www.epa.gov/green-infrastructure/green-infrastructure-federal-collaborative#Green%20Infrastructure%20Collaborative%20Resources)
- USGS's Northeast Stream Temperature Database (https://db.ecosheds.org)

Elements F & G: Implementation Schedule and Measurable Milestones

Element F: Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious.

Element G: A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented.

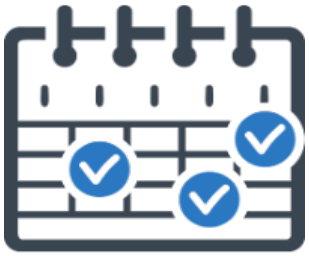

Table FG-1 provides a preliminary schedule for implementation of recommendations provided by this WBP. It is expected that the WBP will be re-evaluated and updated in 2028, or as needed, based on ongoing monitoring results and other ongoing efforts. New projects will be identified through future data analysis and stakeholder engagement and will be included in updates to the implementation schedule.

Table FG-1: Implementation Schedule and Interim Measurable Milestones[13]

Category	Measurable Milestones	Year(s)
Expanded Western Massachusetts Agricultural Nonpoint Source Program	Conduct outreach to build relationships and scope potential implementation sites for agricultural BMPs.	2025--2027
	Support the development of conservation plans outlining BMPs to reduce pollutant and nutrient runoff. Implement agricultural BMPs at two cow farms in the watershed	2026--2027
National Water Quality Initiative (NWQI)	Conservation practices including management of runoff and erosion from a 90-acre livestock producer property as well as nutrient management and cover crops on the cropland of this property.	2025--2026
	Additional implementation of conservation practices/agricultural BMPs funded through NWQI – to be determined	2026—2028
Deerfield River WBP	Implement recommendations from Deerfield River WBP	To be determined
Conservation of Attenuation Assets	Secure funding and further design and implementation	To be determined
Riparian Restoration	Identify locations, secure funding, and advance riparian restoration projects	To be determined
Unpaved Roads BMPs	Town of Conway Unpaved Roads BMPs Assessment – Identify locations	2026
Structural BMPs	Identify locations, develop and rank structural BMP concepts	To be determined
Agricultural BMPs	Identify additional locations and implement agricultural BMPs	To be determined
Non-structural BMPs	Conservation of areas along South River	To be determined
	Document potential pollutant removals from non-structural BMPs (i.e., street sweeping, catch basin cleaning). The methodology is included in the 2016 Massachusetts Small MS4 Permit and in Elements H&I of this WBP.	Annually
	Evaluate ongoing non-structural BMPs and determine if modifications can be made to optimize pollutant removals (e.g., increase frequency).	Annually
	Routinely implement optimized non-structural BMPs.	Annually
Public Information and Education	Conduct outreach and education activities including farm tours highlighting agricultural BMPs.	2026—2027
	River clean-up events	Annually
Monitoring (CRC and DRWA)	Perform water quality sampling at key locations in the South River as part of the existing water quality monitoring per Element H&I	Annually
Adaptive Management and Plan Updates	Establish a working group that includes stakeholders and other interested parties to implement recommendations and track progress. Meet at least twice per year.	2026
	Reevaluate WBP at least once every three years and adjust, as needed, based on ongoing efforts (e.g., based on monitoring results, 319 funding, etc.). – Next update, March 2029	2029
	Use monitoring results to reevaluate BMP effectiveness at reducing *E. coli* and TP and/or other indicator parameters in South River watershed and establish additional long-term reduction goal(s), if needed.	**2036**
	Delist all segments within the South River watershed from the 303(d) list.	**2041**

[13] Note that goals and milestones of this WBP are intended to be adaptable and flexible. Stakeholders will perform tasks contingent on available resources and funding.

Elements H & I: Progress Evaluation Criteria and Monitoring

Element H: A set of criteria used to determine (1) if loading reductions are being achieved over time and (2) if progress is being made toward attaining water quality goals. Element H asks "**how will you know if you are making progress towards water quality goals?**" The criteria established to track progress can be direct measurements (e.g., E. coli bacteria concentrations) or indirect indicators of load reduction (e.g., number of beach closings related to bacteria).

Element I: A monitoring component to evaluate the effectiveness of implementation efforts over time, as measured against the Element H criteria. Element I asks "**how, when, and where will you conduct monitoring?**"

The loading reduction goal is presented in Element B of this WBP. Element C of this plan describes management measures that will be implemented to help achieve this targeted load reduction. The evaluation criteria and monitoring program described below will be used to establish a baseline and measure the effectiveness of the proposed management measures (described in Element C) in improving the water quality of the South River watershed and in making progress toward achieving the water quality goals.

Direct Measurements

Connecticut River Conservancy/Deerfield River Watershed Association

The CRC and the DRWA have been documenting the water quality in the Deerfield River and tributaries intermittently since 1990. The most recent iteration of the CRC/DRWA water quality monitoring program has been running since 2017 and includes one sampling location within the South River watershed at Reeds Bridge Road along the downstream portion of the South River mainstem (MA33-102). The CRC/DRWA water quality monitoring program is a volunteer program. Before the start of each season, each volunteer is required to attend a training session with the program coordinator. Training sessions are conducted riverside so that each volunteer can practice under the supervision of the coordinator before going out into the field. The monitoring is conducted under an approved Quality Assurance Project Plan (QAPP). Volunteers visit these sites on alternate Wednesday mornings from June to September to collect samples; the sampling location along the South River is tested for *E. coli*, turbidity, and conductivity.

It is suggested that water quality monitoring in the South River watershed continue under this program and expand[14] to include additional locations upstream and downstream of suspected E. coli and/or TP sources along Creamery Brook, Unnamed Tributary to Creamery Brook, Chapel Brook, Poland Brook, and additional locations along the South River mainstem. In addition to the parameters that are currently monitored under the program,

[14] MassDEP also provides support for water quality monitoring efforts through its Water Quality Monitoring Grant Program

it is recommended that monitoring also include TP and temperature to help track progress towards the water quality goals outlined in Element A and B.

If possible, samples should be collected in locations directly downstream of implemented BMPs to determine the impact of BMPs within the watershed (samples at these locations prior to BMP implementation should also be collected to establish a baseline). Monitoring locations should ultimately be selected based on accessibility and representativeness and should be appropriate to quantify water quality improvements in the watershed. BMP performance monitoring locations should be selected after BMPs have been identified for implementation.

Indirect Indicators of Load Reduction

Non-Structural BMPs

Potential load reductions from non-structural BMPs (i.e., street sweeping and catch basin cleaning) can be estimated from indirect indicators, such as the number of miles swept, or the number of catch basins cleaned. As summarized by **Figure HI-1** and **Figure HI-2**, Appendix F of the 2016 Massachusetts Small MS4 General Permit provides specific guidance for calculating TP removal from these practices. As indicated by **Element C**, it is recommended that potential TP removal from these ongoing activities be estimated. Next, it is recommended that ongoing activities be evaluated to see if potential improvements can be implemented to achieve higher pollutant load reductions such as increased frequency or improved technology.

$$Credit_{sweeping} = IA_{swept} \times PLE_{IC\text{-}land\ use} \times PRF_{sweeping} \times AF \qquad \textbf{(Equation 2-1)}$$

Where:

$Credit_{sweeping}$	=	Amount of phosphorus load removed by enhanced sweeping program (lb/year)
IA_{swept}	=	Area of impervious surface that is swept under the enhanced sweeping program (acres)
$PLE_{IC\text{-}land\ use}$	=	Phosphorus Load Export Rate for impervious cover and specified land use (lb/acre/yr) (see Table 2-1)
$PRF_{sweeping}$	=	Phosphorus Reduction Factor for sweeping based on sweeper type and frequency (see Table 2-3).
AF	=	Annual Frequency of sweeping. For example, if sweeping does not occur in Dec/Jan/Feb, the AF would be 9 mo./12 mo. = 0.75. For year-round sweeping, AF=1.0[1]

As an alternative, the permittee may apply a credible sweeping model of the Watershed and perform continuous simulations reflecting build-up and wash-off of phosphorus using long-term local rainfall data.

Table 2-3: Phosphorus reduction efficiency factors ($PRF_{sweeping}$) for sweeping impervious areas

Frequency[1]	Sweeper Technology	$PRF_{sweeping}$
2/year (spring and fall)[2]	Mechanical Broom	0.01
2/year (spring and fall)[2]	Vacuum Assisted	0.02
2/year (spring and fall)[2]	High-Efficiency Regenerative Air-Vacuum	0.02
Monthly	Mechanical Broom	0.03
Monthly	Vacuum Assisted	0.04
Monthly	High Efficiency Regenerative Air-Vacuum	0.08
Weekly	Mechanical Broom	0.05
Weekly	Vacuum Assisted	0.08
Weekly	High Efficiency Regenerative Air-Vacuum	0.10

Figure HI-1. Street Sweeping Calculation Methodology

$$Credit_{CB} = IA_{CB} \times PLE_{IC\text{-}land\ use} \times PRF_{CB} \qquad \textbf{(Equation 2-2)}$$

Where:

$Credit_{CB}$	=	Amount of phosphorus load removed by catch basin cleaning (lb/year)
IA_{CB}	=	Impervious drainage area to catch basins (acres)
$PLE_{IC\text{-}and\ use}$	=	Phosphorus Load Export Rate for impervious cover and specified land use (lb/acre/yr) (see Table 2-1)
PRF_{CB}	=	Phosphorus Reduction Factor for catch basin cleaning (see Table 2-4)

Table 2-4: Phosphorus reduction efficiency factor (PRF_{CB}) for semi-annual catch basin cleaning

Frequency	Practice	PRF_{CB}
Semi-annual	Catch Basin Cleaning	0.02

Figure HI-2. Catch Basin Cleaning Calculation Methodology

Macroinvertebrate and Fisheries Assessments

Macroinvertebrate and fisheries assessment are another indirect indicator that could be conducted. These should at a minimum use a similar methodology and be focused on the reaches that were surveyed in August 2012 (Cole, 2013) to evaluate changes since then. These locations are included in **Table HI-1**.

Table HI-1. List of reaches from which fish and physical habitat were sampled from the South River in August 2012. (Cole, 2013)

Reach Code	River Mile	Water-body	Location Description	Impact/ Ref	Geomorph Segment	Total Needs Score	Channel Type	Lat	Long
F1	2.6	South R	above lower Reeds Bridge	I	7A	32	C, L	42.541879	-72.693838
F2	5.4	South R	300 m below Main St bridge	I	10E	31	UC, L	42.511447	-72.694315
F3	5.6	South R	100 m blw Main St Br to P. Hollow	I	10E	31	C, M	42.509613	-72.697086
F4	8.3	South R	300 m DS Rt 116 Br blw Brester Rd	R	17B	10	C, H	42.516993	-72.729413
F5	10.0	South R	Alden Gray property	I	18G	31	UC, L	42.514236	-72.754365
F6	10.4	South R	1/6 mile DS Bullitt Rd	R	19C	24	C, H	42.509616	-72.759135
F7	11.3	South R	DS side Burton Hill Road	I	20A	31	UC, M	42.509643	-72.772036
F8	11.4	South R	US side Burton Hill Road	I/R	20B	18	UC, L	42.510579	-72.773967
F9	11.9	South R	behind Double Edge Theatre	R	20D	12	UC, L	42.514473	-72.778298
F10	12.4	South R	Downstream of Emmet Road	I	20F	23	UC, L	42.520587	-72.780777
F11	12.5	South R	Upstream of Emmet Road	R	20G	7	UC, L	42.521799	-72.780588
F12	0.1	Creamery Bk	50 m above confluence with SR	I	NA	NA	C, M	42.509064	-72.772583

Channel type: Classified according to major South River channel types identified in Field 2013: C = confined, U = unconfined, L = low energy, M = moderate energy, H = high energy.

Project-Specific Indicators

Number of BMPs Installed and Pollutant Reduction Estimates:

Anticipated pollutant load reductions from future BMPs should be estimated and tracked as BMPs are installed; this information should be included in future iterations of this WBP.

Adaptive Management

As discussed in **Element B**, the baseline monitoring program will be used to evaluate if implemented **Element C** management measures have been effective at addressing listed water quality impairments or water quality goals for other indicator parameters established by **Table A-9** of this WBP. Monitoring results can further be used to periodically inform or adjust load reduction goals presented in **Table B-1**. Based on monitoring data, additional long-term reduction goal(s) may be established, if needed, to lead to delisting of South River (MA33-07, MA33-101, and MA33-102), Ashfield Pond (MA33001), and the Unnamed Tributary (MA33-137) from the 303(d) list over the next 15 years. It is recommended that this evaluation be conducted at least once every three years.

If monitoring results and indirect indicators do not show improvement to the *E. coli* and TP concentrations and other indicators measured within the watershed, the management measures and loading reduction analysis (Elements A through D) should be revisited and modified accordingly.

WBP Implementation

As stated in the introduction, this WBP is meant to be a living document. It should be reevaluated at least once every three years to track how recommendations in the WBP are being implemented and adjusted as needed based on ongoing efforts (e.g., based on monitoring results, 319 funding, etc.). It is strongly recommended that a working group of stakeholders be established to meet at least biannually to implement and update this WBP, and track progress. FRCOG is the regional planning agency for Franklin County and may be aware, through other funded projects, of work that may inform ongoing or planned projects for the South River watershed. As part of planning future nonpoint source management work within the watershed, project proponents should contact FRCOG staff, along with the Towns of Ashfield and Conway, and the Friends of the South River, for updates and opportunities to leverage funding and coordinate project activities. A stakeholder coalition could also be formed to lead implementation of this WBP.

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Appendices

Appendix A – Stakeholder Meeting Minutes

Meeting Minutes

Geosyntec consultants

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Project Name:	South River Watershed-Based Plan		
Location:	South River Watershed (Conway, Ashfield)		
Meeting Date, #:	January 13, 2026	Meeting Time:	10:00 – 11:00 AM
Prepared By:	Kevin Hogan/Julia Keay	Meeting Location:	Teams videoconference per Geosyntec invitation
Distribution:	All listed below		

Attendees:

Name	Organization	Contact Information
Kevin Hogan	Geosyntec Consultants, Inc	Kevin.Hogan@geosyntec.com
Julia Keay	Geosyntec Consultants, Inc	JKeay@Geosyntec.com
Meghan Siudzinski	Massachusetts Association of Conservation Districts (MACD)	meghansiudzinski.macd@gmail.com
Michael Leff	Ecological Connections, Inc.	mleffmacd@gmail.com
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Emily Boss	Franklin Land Trust	ecboss@franklinlandtrust.org
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Shervon DeLeon	MassDEP	Shervon.DeLeon@mass.gov
Padmini Das	MassDEP	Padmini.Das@mass.gov
Kelly Kowal	Town of Ashfield Conservation Commission	agent@hilltownconcom.org
Ricki Carroll	Town of Ashfield Park Commission	park@ashfield.org
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Jim Krupa	Trout Unlimited – Deerfield River	deerfieldrivertu@gmail.com
Eric Halloran	Trout Unlimited – Deerfield River	deerfieldrivertu@gmail.com
Sheila Comstock	Trout Unlimited – Deerfield River; Deerfield River Watershed Association (DRWA)	deerfieldrivertu@gmail.com
Michelle Cozine	United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS)	michelle.cozine@usda.gov

Meeting Minutes

Geosyntec consultants

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Minutes to be considered final unless comments are received within five (5) business days.

Agenda

- Greeting
- What is a Watershed-based Plan (WBP)?
- 319 Grant Project Spotlight
- Brief Introductions from All Participants
- Watershed & Goals Overview
- Findings/Recommendations from 2017 Subwatershed Plan
- Questions for Stakeholders/Discussion

Greeting/What is a Watershed-based Plan (WBP)?

Julia Keay: Good morning, everyone. Thanks so much for joining the meeting today. This is the meeting for the South River Watershed-based plan (WBP). It's a stakeholder meeting for this WBP. I'm Julia Keay. I work with Geosyntec Consultants, and we're working with MACD, Massachusetts Association of Conservation Districts, on this WBP for the South River. Presented the agenda.

Julia Keay: The purpose of a WBP is to organize information about a watershed that will enhance the development and implementation of projects for restoring or protecting water quality and beneficial uses. WBPs follow a nine-element format, and the elements are referred to as elements A through I. Element A identifies causes and sources of pollution in the watershed and identifies water quality goals. Element B includes an estimate of pollutant load reductions that would be required to meet water quality goals. Element C describes planned management measures to implement in the watershed that will help attain water quality goals. Element D is a description of technical and financial assistance that would be needed to implement management measures. Element E is a description of any public education and outreach in the watershed, planned or completed. Element F describes project schedule of management measures that are described in the WBP. Element G is a description of milestones that will be used to measure progress. The last two elements (H and I) relate to how water quality monitoring and how it will be measured whether implemented management measures are achieving water quality benefits.

The non-point source (NPS) Management Section in MassDEP's Watershed Planning Program review nine element WBPs that are submitted. The WBP must be accepted by MassDEP to receive Clean Water Act Section 319 grant funding for implementation projects.

319 Grant Project Spotlight

Julia Keay: This current project is a Section 319 grant-funded project. MACD is the grantee, and their project is called "Expanded Western Massachusetts Agricultural Non-Point Source Program." The project covers multiple watersheds, but they want to do implementation work in the South River watershed. That's the reason that we are creating this WBP, because currently there's no WBP for South River.

Meghan Siudzinski: I have the pleasure of working with the technical service providers who are working to implement best management practices on Western MA farms. This is an outgrowth of previous 319 grants, and my understanding, because I'm relatively new to this role, is that their observations suggested that there was a lot of opportunity in the South River watershed. And so, to make some inroads there and do some implementation in the South River, we needed to pause and get a WBP together. Activities in South River itself - that watershed – are on pause, but there's a lot of good energy and interest in engaging with the 319 program there. In the meantime, our consultants are working in nine or ten other watersheds and implementing in those while the WBP gets completed and then they'll be happy to pick up the momentum on the South River area at that time.

Julia Keay: Perfect. Thanks so much, Megan. And Michael, is there anything else you wanted to mention?

Michael Leff: OK, this will double as my introduction then. I'm Michael Leff, former director of MACD. I worked with Megan for a number of years and I have now returned to my independent consulting under the banner of Ecological Connections. I was involved in the MACD role with this type of work, going through it with Julia and Geosyntec and our consultants in the field, but also prior to that, I had been doing some work in the South River watershed, or at least we had been trying to, but ran into permitting obstacles. That's all I'll add at this point. But just what Megan said, there is a lot of opportunity in this watershed and a lot already going on there. So, we'd like to take the next steps in the process.

Brief introductions from all participants

Julia Keay: The only thing I wanted to add is I am from Western Massachusetts; I grew up in the Hilltowns (in Worthington). I am familiar with the watershed and the area.

Kevin Hogan: I work with Geosyntec, and I've been working with Julia on this South River WBP. I don't live in Western Massachusetts - I'm up on the North Shore of Boston, but I've really enjoyed working on this plan so far, and I'm looking forward to hearing the work that's being done.

Ricki Carroll: I'm the park chair in Ashfield. I'm at the beach all day, all year, practically. One question, in case I can't get back in to talk to you later, is that somebody in town (Ashfield) is planning to spray weeds on the side of the water, and I think that's pretty controversial.

Carolyn Ness: I am chair of the Franklin Conservation District, and we've been working up and down the Deerfield River watershed since Irene with a local working group called Creating Resilient Communities. We've been trying to do things within the South River as a part of the Deerfield watershed, so it is very exciting to be moving forward with this.

Kelly Kowal: I'm Kelly Kowal. I am the conservation agent for Ashfield. I have a little bit to do with the wetlands and waterways in all of Ashfield, and I help the Conservation Commission with permitting in those areas.

Michelle Cozine: My name is Michelle Cozine, and I'm a State Biologist for Massachusetts NRCS. I am from Western Massachusetts. I'm very familiar with the South River watershed and, as Michael had said earlier, we know there's several opportunities, lots of agriculture in the watershed. I'm also assisting here with our National Water Quality Initiative (NWQI) here in Massachusetts. The South River watershed, as you all know, has been identified as one of several watersheds in the State that we are prioritizing and we're excited to assist our agriculture producers in this watershed with improvements to their operations that will help our water quality. I'm also attending to help my State Resource Conservationist Catherine Magee. Catherine is on detail in Utah, and so David Zimmermann is my acting State Resource Conservationist, and he asked me to attend in his place as well, but he does hope to join future meetings.

Padmini Das: I'm Padmini Das. I am the Section Chief of the NPS Management Section at MassDEP in the Watershed Planning Program. I also have a connection with Western Massachusetts - we just moved to South Hadley and are getting to know this beautiful area and the river. So, I really appreciate this call.

Shervon DeLeon: I work with Padmini and Meghan and the rest of the MassDEP group. I'm the Section Chief for the Water Quality Monitoring Section. We do water quality monitoring throughout the State, and so we have worked in that area, and we'll be working in that area next year also, and we also provide any monitoring support that the NPS Management Section – Padmini and team - needs. Happy to be part of this conversation.

Emily Boss: I am an employee of Franklin Land Trust, out of Shelburne Falls and the Massachusetts Woodlands Institute, a subsidiary of Franklin Land Trust. We work with landowners, nonprofits and communities in the region on conservation of land. We've worked with various entities to conserve watershed land as well as some wellheads and other resources. Massachusetts Woodlands Institute has been partnering with Trout Unlimited, and we've also been working with FRCOG on restoration work for habitat, water quality, and flood resilience, as well as a variety of projects working with communities on planning.

Eric Halloran: Eric Halloran from Deerfield River Watershed chapter of Trout Unlimited. We have done a lot of work in the watershed on the South River. We did some planting years ago. We haven't been actively involved in monitoring on the South River, but we have been monitoring many of the tributaries of the Deerfield, as well as the mainstem in some locations. I believe we have some historic information about temperature logging, but we'd be checking in with Mike Cole from Cole Ecological in Greenfield for that data.

JJ Prusak: I'm a regional health inspector with the FRCOG. I'm new here, so I'm just logging on to learn about this. Don't know much about it.

Janet Chayes: I am from Conway. I'm chair of the Open Space Committee and founder of the Friends of the South River. We've been concerned about the quality, habitat, and flooding pf the South River for over a decade. We have had some restoration projects in the area and are anxious to secure more restoration.

Jim Krupa: I'm a member of the Deerfield River Watershed Trout Unlimited, and I live in Conway.

Kyla Power: I work both for the Franklin Conservation District as well as the Hampden-Hampshire Conservation District. I was also raised in the area, so there's a personal connection with the South River Watershed. Happy to be here.

Maureen O'Reilly: I am a Regional Health Inspector working at the FRCOG on behalf of the Conway and Ashfield Boards of Health. Professionally, that connection to the watershed has a lot more to do with siting and permitting for wells and septic systems. Personally, I lived in Conway for many years, within walking distance of the South River. Thanks for having us.

Meghan Siudzinski: I'm the new Executive Director of MACD. You met Michael Leff a few minutes ago, my predecessor, who I was fortunate to work with for several years. I also come out of the Franklin and Hampden-Hampshire Conservation Districts as their admin, grants administrator, and public outreach coordinator. I'm happy to be in this role. I've been involved with other MassDEP projects throughout the area with the Western MA regional coordinator's work. It's really nice to see it come into this stage of development and I'm happy to learn a lot about the South River watershed. My kids both went to Conway Grammar, and we spend a lot of time romping around up in that neck of the woods. It's nice to meet you all and see so many faces here in the new year around this piece of the project.

Melissa Langley: I'm the lab and monitoring coordinator at Connecticut River Conservancy. We do *E. coli* monitoring and conductivity, turbidity, and nutrient monitoring in the Deerfield and Connecticut River watersheds, and we have a site on the South River.

Neal Anderson: I live in Williamsburg, but I definitely have connections to Conway. My daughter lives there and is a member of Natural Roots Farm, so I've eaten lots of vegetables and greens from there right along the South River. I'm also with the Deerfield River Trout Unlimited chapter and part of the chapter's water quality monitoring team with Eric and Jim who are also on the call.

Judy Rondeau: I'm the NPS Outreach Coordinator with the NPS Management Section at MassDEP and we are funding this project through our 319 grant program.

Meghan Selby: I coordinate the 604(B) Water Quality Management Planning grant. I am in the NPS Section along with Judy and Padmini for MassDEP.

Sheila Comstock: I live along the Deerfield River. I am a board member on both the Deerfield River Watershed Association as well as the Deerfield River chapter of Trout Unlimited with some other folks that are on the line here.

Tamsin Flanders: I'm Tamsin Flanders, Natural Resources Planner at the FRCOG. My team does a lot of work in the South River related to river health and restoration. I wrote the NWQI watershed assessment for the South River watershed a couple years ago.

Tony Somers: I am the Chair of the Conway Conservation Commission. I also am the Landscape Architecture Team lead for SWCA Environmental Consultants where we are leading (Executive Office of Energy & Environmental Affairs) EEA's riparian zone replanting program. Very interested in hearing what this program is about.

Kevin Hogan: Thank you all so much for the introductions and for joining this meeting. We're happy to have you all here. I'm going to turn it back over to Julia.

Watershed & Goals Overview

Julia Keay: To orient ourselves, this is the watershed map. It just shows the outline, and it's entirely within Ashfield and Conway. There's a tiny sliver of forest, that is in Goshen, to the South.

The impairments for the South River watershed that are listed on the most recent 2022 integrated list include mainly *E. coli* in in the South River mainstem, as well as temperature in a couple of the segments and one of the unnamed tributaries to the South River. Ashfield Pond has some impairments for fish consumption for mercury due to atmospheric deposition and unknown sources, as well as some invasive water chestnut.

Also wanted to highlight the NWQI. The South River is an NWQI watershed, which is significant in that the NWQI has very similar goals to this 319 project. It's focused on agriculture in the watershed and implementing BMPS to protect water quality.

Tamsin Flanders: One thing that is unique about the NWQI relative to WBPs is that we did go out into the watershed and meet farmers and hear their interests and goals and try to match them with conservation measures. The identities of those farmers are not publicly available in the public version, but the NRCS has a version with those farmers identified.

Julia Keay: Similarly, for this WBP, we also won't specifically call out farms. We'll talk more about the NWQI, but I do think there's a lot of overlap with the NWQI.

This figure shows that the impairments. The red segments are the impaired segments in the South River. You can see it's mostly the mainstem and then one of the unnamed tributaries to Creamery Brook.

For the long-term goals in our WBP, they'll align similarly with what was presented in the NWQI. So, they'll be based on E. coli loading reduction, temperature in segments, and those will be based on the Massachusetts Surface Water Quality Standards. There'll also be goals for nutrients.

Also wanted to to highlight the land use in the watershed. As probably all of you are aware, most of the watershed is forested, but there is a high percentage of agriculture - the second highest land use in the watershed. This figure shows how a lot of it is concentrated along the stream segments in the watershed. This figure shows impervious cover, which is pretty low. It's about 2% in the watershed. It's mostly in Ashfield Center and Conway Center.

Findings/Recommendations from 2017 Subwatershed Plan

Julia Keay: This was a figure from the Deerfield plan that was done in 2017, and the overall finding was that the watershed health is overall good, but it's also highly vulnerable to impacts. They had these recommendations in the plan, which we listed out in a table and we were going try to get status on those, but I think we can go back to that as time permits. I wanted to get more into the discussion and some of the specific questions we had.

Discussion

Julia Keay: We're aware of the Connecticut River Conservancy / Deerfield River Watershed Association monitoring program and we have the *E. coli* data, but I didn't know if there was any more data besides that currently conducted by the CRC. We were also curious about any monitoring that may have been completed or is planned to be completed as part of the NWQI. Melissa Langley, I don't know if you know about the CRC monitoring question?

Melissa Langley: We only have one site on the South River and we do also have conductivity and turbidity data from that site. I'm happy to send that to you.

Julia Keay: That would be great. But you aren't monitoring for Phosphorus at that location?

Melissa Langley: No, that site doesn't have any nutrient monitoring.

Shervon DeLeon: We did recent monitoring over in that area. I'm just trying to find exactly how many sites on the South River we had and what we collected. I can probably drop that in the chat shortly. That was done in 2024.

Julia Keay: I think the most recent MassDEP data we have is 2012, so that would be helpful to get.

Shervon DeLeon (in chat): In 2024, WPP collected samples at two sites on the South River:

South River - [at bridge crossing of unnamed road between Shelburne Falls Road and Reeds Bridge Road, Conway] - 42.51463, -72.69396

South River - [approximately 1,225 feet downstream from Bullitt Road, Ashfield] - 42.50973, -72.75973

Water samples were collected from each stream site monthly from May through September 2024. Analytes include: total phosphorus, total nitrogen, nitrate-nitrogen, nitrite-nitrogen, ammonia-nitrogen, chloride, trace elements (calcium, magnesium, and sodium), dissolved hardness, and dissolved organic carbon, *E. coli*, benthic macroinvertebrates, fish population data, DO, temp, conductivity, pH (continuous and discrete data for DO and Temp was also collected).

Julia Keay: Going back to the first bullet, are there any specific pollutant sources in the watershed that people are aware of that they want to bring up and that we should include in the WBP? It doesn't have to just be agriculture. I think I forgot to mention that, but this WBP can include other sources besides agriculture.

Janet Chayes: There are at least one, maybe two, sites that have had a lot of equipment repair. There's a very old, collapsing barn that is still used for private equipment storage. Especially since they've been there for so long, there's probably some oil contaminants. I don't know what the old or current collection systems are. I don't really know the result, but it might be something to be concerned about or look at. It's just below Natural Roots, our organic farm.

Julia Keay: That's in Conway?

Janet Chayes: Yes. It will be a sensitive subject for the owner, but if there's some way you could test and everything's fine, that's cool.

Janet Chayes: Otherwise, further in town, there was a garage on Route 116, heading up to Ashfield. It had been sort of a public garage, and it changed hands recently, maybe they fixed it up, there may have been some permitting or evaluation there, but again, I don't know. It had been used for machinery repairs for a long time, so, that would be reassuring to find out the status there.

Tamsin Flanders: I heard an update the other day from a colleague on the transportation team at the FRCOG that the river is undermining Shelburne Falls Road in three locations within a half a mile or so. The town is looking at multiple strategies for working on this, but recently connected with MassDOT and they think it should be a project for the Transportation Improvement Project rather than a series of grant funding sources. So, there is long term planning on that. That area also corresponds with an oxbow that the river abandoned that has been identified under Nick Miller's work as a good oxbow reconnection project for various reasons and benefits and that has never found a funding source. They tried for Municipal Vulnerability Preparedness (MVP), but it ran into some permitting hurdles. That's, I guess, a status update maybe on some of the stuff that you're seeing as projects.

Julia Keay: That was actually one of my questions here. I think that's the project that was in the Deerfield River plan. There was one conceptual project in that plan for the South River watershed and they called it "Conservation of Attenuation Assets."

Tamsin Flanders: There have been many conceptual designs along the river, so I wouldn't necessarily know that that was the term used on that specific site.

Kevin Hogan: We have a message in the chat from Ricki Carroll. She says that she's concerned about spraying for invasives on the side of a hill running into the water by Ashfield Lake and is also wondering if there's any research in algal blooms that occur in a few weeks of hot summer weather. Ricki, if you want share a little more, feel free.

Ricki Carroll: In every summer in the last few years, we've had these little green balls in the water that are living organisms on the bottom of the lake. Then, they bloom in certain weather conditions. All I can gather from visiting sites in Vermont, Michigan, and some other places is that this is a natural thing; it's not the kind of blue-green algae that we have to be concerned about. However, I don't have anything totally definitive on it, and I'm not really sure where to get definitive information. I think that there was a study being done by the State: we had a buoy in there with some kind of contraption on the end of it the summer before this. I just want to know if anybody knew anything about some research somewhere, so that I could give beachgoers more information about it when it happens, because we don't stop people from swimming in it.

Emily Boss: I just wanted to check if sediment deposition was within the purview, or if it's specifically other sources of pollution.

Julia Keay: Yes, definitely. Sediment deposition would be a source.

Emily Boss: I don't think Hinsdale Brook is in the South River watershed? I wanted to double check, because there was a site there that was raised for us.

Julia Keay: No, it's not.

Emily Boss: OK, great. Thank you.

Tamsin Flanders: Julia, speaking of sediment deposition, I know it's not a listed impairment, but I wondered if you were thinking of making that one of the goals of the WBP. I think we've done this in the past and given anecdotal evidence, of which there is abundant amount in the South River, to support actions towards a sediment-related goal as well.

Julia Keay: I think that would be a good idea. Do you remember if in the NWQI, you used or included a sediment loading goal?

Tamsin Flanders: I don't remember. It's so challenging to have any data for that pollutant to start with.

Julia Keay: That's a good point, and that was one of the sources that was in the literature we've reviewed so far. Anything else on that that anyone wanted to bring up?

We also wanted to see if there's any public education and outreach that's been conducted in the South River watershed or that's planned. There's a whole section in our WBP regarding that. I don't know if, Trout Unlimited or Deerfield River Watershed Association, there are events that you guys do.

Janet Chayes: There's been a lot of public education. We've had numerous studies and assessments, largely based on flooding mitigation, and FRCOG has managed them all in the last few years. They have a heavy public education component. We've had lots of participation. With the last big one, after the engineers and hydrologist evaluated the top potential remediation sites, then the community got to vote on their priorities. That's all included in FRCOG's write-ups on those grants. People are quite aware of the South River and the benefits and the hazards.

Maureen O'Reilly: I'll also jump in. Working on behalf of the Board of Health for the last couple of years, there's been some requests to the Board of Health about community education about swimming or river recreation after heavy rainfall. So, I think that's one area in which the Board of Health would like to step up and learn more about some of these education sources and be able to also be another avenue for disseminating that as well.

Melissa Langley: Connecticut River Conservancy revamped our website this past field season and it now has some predictive abilities where if you put in the location that you're planning to recreate at, it will pull weather data and give you a percent estimate of the chances that it's clean for swimming or boating. That's been a really big upgrade for us. I know a lot of folks use that to get a sense of when and where they swim or boat. We, generally, as a rule, suggest that people avoid swimming for forty-eight or so hours after a heavy rain, but obviously that's personal choice. And so, if they are able to check the data for their specific site, I think it gives people some peace of mind.
We had our more basic website for years, but the more recent modeling was available starting in July or August of 2025.

Emily Boss: We're working in the general region with Trout Unlimited and also with support from other partners like Deerfield River Watershed Association to promote headwater restoration as a way to promote resilience in the watersheds. We've been working in the Deerfield River watershed, but we also would like to do advocacy in the South River area as well, both through planting on riparian areas and wood loading in these higher streams.

And a question I had, in terms of thinking about farms and agriculture: is the goal to connect people with technical assistance and funding through sources like NRCS and others that are sustainability practice oriented or is there a desire to create other incentives in the region? Vermont has worked with the river corridor easement program that they've developed, and we're also

working with FRCOG to help promote conservation language that could be used across the state that focuses on river corridors and provides language and awareness about restoration that could be done to incorporate it into the conservation and then also to do conservation of floodplains and corridors for a variety of gains.

Tamsin Flanders: I think it's not so pertinent to your question, but it feels connected to what Emily just said. MVP might be a source to look at potential projects that you're interested in of the type you're interested in, Emily. One reason being that they are now using a mapping tool that incorporates environmental justice communities, but also a variety of environmental factors like exposure to pollutants and stuff like that. They're calling these populations "burdened populations," and somehow, we don't quite understand, but somehow, Eastern Ashfield is now on that map and so that gives it a little bit higher scoring for grant applications.

Julia Keay: There was one more question regarding the NWQI. Now that the South River is in the implementation phase of the NWQI, has there been implementation already or is that still in the planning phase of actual BMPs? I don't know if anyone at NRCS can answer this right now, but if there's already implementation happening with farms in the watershed, it would be good to mention. Obviously not specifically calling out which farms.

Eric Halloran: I just wanted to chime in on Emily's comments. We've been doing a lot of work on heavy wood loading in the Deerfield watershed. That's included publicly available information, especially for landowners, about the benefits of heavy wood loading. The other resource that I'll mention is the Northeast Stream Temperature database that USGS has, which models the effects of climate change on specific areas of the whole Northeast, but you'd be able to look at the impact of climate change on the on the South River watershed.

Julia Keay. We wanted to mention, the WBP is meant to be a living document and meant to be periodically re-evaluated, once the WBP is accepted by MassDEP. If there's other projects in the watershed in the future that any of the stakeholders would like to implement, they could apply for Section 319 funding to implement those. Having this WBP in place helps with the 319 application and being eligible. We do think it's good to have someone identified as the keeper of the WBP.

Tamsin Flanders: I think Kimberly would want to think about it one more time, given how there's complex stakeholders in the watershed. Maybe the Friends of the South River would want a mention as well.

Padmini Das: We are currently working on our next request for proposals (RFP) for 604(B) and 319. As Julia mentioned, having a MassDEP-approved WBP makes the proposals most competitive, and that means that the project is basically ready to go ahead. This is a big advantage of having the WBP. We will be releasing the RFP. We don't have a timeline yet, but definitely early this year. So, if anyone has a project that you have in mind which is an implementation project, or a planning project also, please contact us. We can talk to you about your proposal and help you with your proposal as well at this point in time. So, if anyone has an idea and is planning to apply, we highly encourage you to send us an e-mail so that we can meet and have a conversation.

Julia Keay: I was just going to say, too, if there is a project currently planned, it would also be good to include that in this version of the WBP. You can let us know too to include it.

Judy Rondeau: Julia, you commented earlier, that although I think the primary focus of the particular grant funding that is funding this WBP is agricultural activities, I do want to point out that WBPs are intended to be holistic documents and to address any pollutants, any watershed concerns that the stakeholders might have. So, if you're thinking about potentially applying for a 319 grant, maybe not in this round, but maybe in future rounds, we are interested in any type of project that would protect and improve water quality. So, you don't need to be limited to agricultural projects. It could be any kind of project that is addressing a nonpoint source pollutant. Thank you.

Padmini Das: Thank you for mentioning that, Judy, I would strongly encourage you to read our five-year non-point source management plan. 2026 would be the second year of it. The plan included a lot more pollutants than before, so if you want to see what kind of pollutants are eligible for the funding, you can find it in the plan. Judy, is it possible to share the link of the plan here so that everybody can access it? And if you have any questions, we are always here. Please reach out to us.

Judy Rondeau: Yep, I'll pop it in the chat.

Judy Rondeau (in chat): MassDEP NPS Management Plan webpage: https://www.mass.gov/info-details/massachusetts-nonpoint-source-management-plan

Julia Keay: Thank you so much. I don't know if I mentioned it at the beginning, but we will e-mail out a meeting minutes document of this meeting which will include emails - if you don't want your email on there, let me know – and all the notes from this meeting. Feel free to e-mail Kevin or I if there's any additional information you want us to include in the WBP. Is there anything else anyone wanted to say before we end the meeting?

Tamsin Flanders: When I was writing the NWQI, there was a lot of interesting data, from sometime in the 2000s or right around 2010, attempting to bracket and discover the source of E. coli or fecal coliform loading around, I think, Pumpkin Hollow Brook confluence, and generally in the center of Conway. That effort at bracketing, I think, didn't result in anything concrete. I was wondering if Maureen or anyone from Conway had any kind of more contemporary, even anecdotal, information, because there's no sewer in Conway, on the state of septic systems in Conway and any patterns the Board of Health has been noticing.

Maureen O'Reilly: That's a great question. I hate to say, I don't think we fully have a grasp on the pattern on the Board of Health side of things. We only started supporting Conway in septic and well starting in July, so we've just inherited the long-term work of other folks, and there is a lot of missing or incomplete information, or maybe we just haven't seen fully yet a lot of information on a bunch of systems, particularly in some certain areas along the river. So, I think, kind of with the 5000-foot view, in terms of having data points, there are a number of locations, I want to say fewer than 8, maybe 5, that are looking to be short -term rental, and as part of policy to offer a place up for habitation, they would need to have a water test and a septic pump. So, there is possibility that there could be a couple of places that we could learn a little bit more about from those potability tests. They have to do that and fecal coliform bacteria. On one hand, there's quite a bit that we don't know and unfortunately only time will tell, but there is potentially a route to get a little bit more information.

Carolyn Ness: I'd like to just add that a lot of the work that the local working group did with the Franklin Conservation District is outdated because of the July 2023 flooding. A lot of our information prior to the 2023 flooding is going to be outdated because the flooding changed a lot: water flow, how riverbanks have been eroded, and things like that. So, I hesitate to rely too much on old information because so much has changed since the impact of the July 2023 flooding.

Julia Keay: That's a good point. Thank you everyone, so much. Sorry, we're out of time. But if there's anything else, feel free to e-mail us. We'll send the meeting minutes out in a few days. Thank you again.

Thank you for your time and for joining and participating, we really appreciate it!

Contact: Julia Keay, JKeay@geosyntec.com
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Appendix B – Select excerpts from the Deerfield River Watershed 2000 Water Quality Assessment Report (MassDEP, 2000) relating to the water quality in the South River watershed (note: relevant information is included directly from this document for informational purposes and has not been modified).

Deerfield River Watershed 2000 Water Quality Assessment Report (MA33-08 - South River)

AQUATIC LIFE

Habitat and Flow

There is a small dam on the South River near Shelburne Falls Road in Conway (downstream from the town center) and approximately 1.6 miles upstream from Reeds Bridge Road crossing in Conway.

The South River was sampled by DWM upstream from Truce Road, Conway (Station SOR01) in September 2000. At the time of the survey, the river was roughly 9 m wide with depths up to 0.3 m. The substrates were comprised primarily of cobble and boulder. The overall habitat score was 170 (Appendix B). Habitat quality was limited most by sediment deposition and velocity/depth combinations.

According to USGS (remarks from gaging station records on the South River at Reeds Bridge, Conway - 01169900) diurnal fluctuation was caused by a small powerplant on the above-described upstream dam since April 1982. Data from the USGS gage revealed that the mean annual flow for 2000 (72.3 cfs) was greater than the mean annual flow (53.2 cfs) for the period of record (37 years - 1966 to present) (Socolow, et. al. 2001). The estimated 7Q10 flow at the gage is 3.6 cfs (USGS 2003). Further downstream in Conway there is a 77 ft high dam on the South River located approximately 0.6 miles upstream from the confluence with the Deerfield River. The dam, known as Conway Electric Dam, lies within Conway State Forest and is now owned by MA DCR, Division of State Parks and Recreation (formerly MA DEM). It is no longer used and in disrepair but still creates a major barrier to fish. A large volume of sediment has accumulated behind the dam.

Biology

Compared to both the Bear River reference station (Station VP11BEA) and the Cold River reference station (Station CR01) the RBP III analyses indicated the benthic community was non-impacted in the South River upstream from Truce Road, Conway (Station SOR01) in September 2000 (Appendix B). The South River was also sampled by DWM in 1988 and 1995 upstream from Reeds Bridge Road in Conway (Appendix C). While the fish sampling efficiency at SOR01 was rated poor, fish species captured in order of abundance included; blacknose dace (Rhinichthys atratulus), Atlantic salmon (Salmo salar), longnose dace (Rhinichthys cataractae), common shiner (Luxilus cornutus), and creek chub (Semotilus atromaculatus) (Appendix B). Only the Atlantic salmon and longnose dace are considered to be intolerant of pollution. Due to the sampling inefficiencies it is unclear whether the fish community was truly dominated by tolerant species. All species present are considered to be fluvial specialists/dependants, which is indicative of a stable flow regime. In addition to these species, eastern brook trout (Salvelinus fontinalis), slimy sculpin (Cottus cognatus), and a pumpkinseed (Lepomis gibbosus), were documented in the South River by MA DFWELE in August 2000 (Richards 2003).

DWM biologists collected periphyton samples from Station SOR01, located upstream from Truce Road, Conway, at the same time as the September 2000 macroinvertebrate/habitat survey. Canopy cover was reported as 60% and percent algal cover was 90%. The dominant algal type and form were diatoms/thin film. No nuisance algal growth (green filamentous algae) was documented (Appendix D).

Chemistry-water

Water quality sampling was conducted by DWM in the South River at two locations; at the bridge at Bullitt Road in Ashfield (Station SO05) and at the bridge crossing between Shelburne Falls Road and Reeds Bridge Road in Conway (Station SO-8). These sites were sampled in July, August, and October 2000 (n = 3) (Appendix A, Tables A8 and A9). The South River was also sampled near these two locations by DWM in July 1995 (Appendix G, Tables G3 and G4). Additional locations in the South River were sampled by DWM in July 1995; near Riley Road in Conway (Station SO-6), and near Conway town center at Route 116 bridge (Station SO-7). The South River near the USGS gaging station near Reeds Bridge Road in Conway was also sampled by DWM between June 1995 and June 1996 (Station SO) on 13 sampling events (Appendix G, Tables G3 and G4).

Water quality samples were also collected from two stations on this segment of the South River on as many as six occasions between August and November 2000 by ESS (ESS 2002). Station DW8 was located downgradient from the Solar Aquatics WWTF groundwater discharge, along Route 116 before Emmet Street, Ashfield. The most downstream station sampled by ESS was Station DW7 and was located at the bridge crossing between Shelburne Falls Road and Reeds Bridge Road in Conway.

ESS also collected water quality samples in 2000 from two stations on Creamery Brook, a tributary to the South River. All of these stations were sampled six times during the study period. Station DW9 was located on Creamery Brook along Route 112, above dairy farms in Ashfield. Station DW10 was located downstream on Creamery Brook near the confluence with the South River and downstream from dairy farms in Ashfield.

The Deerfield River Watershed Association (DRWA) performed volunteer water quality monitoring in this segment of the South River at one location near Reeds Bridge Road in Conway (SOR). Samples were collected for pH, DO, alkalinity, and temperature once in April 2001 and 2002. However, due to the limited number of samples the results were not used in this assessment (DRWA 2001and DRWA 2002).

DO and % saturation

DO levels in the South River measured by DWM and ESS in 2000 were not less than 9.3 mg/L and were as high as 13.13 mg/L (Appendix A, Table A8 and ESS 2002). Percent saturation ranged from 88.4 to a high of 100.3%. It should be noted that these data represent both worst-case (pre-dawn) and daytime conditions.

Temperature

The maximum temperature in the South River measured by DWM and ESS in 2000 was 20°C (Appendix A, Table A8 and ESS 2002).

pH and Alkalinity

The pH of the South River ranged between 6.9 and 7.5 SU (Appendix A, Table A8 and ESS 2002). Alkalinity of the South River ranged from 37 to 43 mg/L (Appendix A, Table A9).

Suspended Solids

Suspended solids were below detection during the 2000 surveys (Appendix A, Table A9).

Ammonia-Nitrogen

No detectable concentrations of ammonia-nitrogen were detected in the South River during the 2000 DWM surveys (Appendix A, Table A9).

Hardness

Hardness measurements of the South River ranged from 45 to 49 mg/L (Appendix A, Table A9).

Phosphorus

Total phosphorus measurements in the South River ranged from <0.01 to 0.016 mg/L (Appendix A, Table A9).

The Aquatic Life Use for this segment of the South River is assessed as support based on the benthic macroinvertebrate community analysis and the water quality data. Of concern, however, is sediment deposition and associated substrate embeddedness, which can degrade habitat quality. The fish community may also be dominated by pollution tolerant species, although sampling efficiency was poor. Because of these issues the Aquatic Life Use is identified with an Alert Status.

PRIMARY AND SECONDARY CONTACT RECREATION

DWM collected fecal coliform bacteria samples from the South River near the USGS gaging station near Reeds Bridge Road in Conway between June 1995 and June 1996 (Station SO) (n =14) as part of the 1995/1996 Deerfield River Watershed monitoring survey (Appendix G, Table G4). DWM also collected fecal coliform bacteria from three additional stations (SO-5, SO-7, and SO-8), but these data were censored.

Fecal coliform bacteria samples were collected from the South River at two stations on six occasions representing both wet and dry weather sampling conditions between August and November 2000 by ESS (ESS 2002). Results are summarized below.

- Station DW8, located downstream from Solar Aquatics along Route 116 before Emmet Street in Ashfield - fecal coliform bacteria counts ranged from 10 to 1,800 col/100 mL. One of four counts during the Primary Contact Recreational Season exceeded 400 cfu/100 mL (the sample was representative of wet weather conditions).
- Station DW7, located at the bridge crossing between Shelburne Falls Road and Reeds Bridge Road in Conway - fecal coliform bacteria counts ranged from 40 to >2,000 col/100 mL. One of four counts during the Primary Contact Recreational Season exceeded 400 cfu/100 mL (the sample was representative of wet weather conditions).

Note: Fecal coliform samples were collected in 2000 by ESS at two stations on Creamery Brook, a tributary to the South River.

Creamery Brook was sampled along Route 112 above dairy farms in Ashfield (Station DW9) and near the confluence with South River, downstream from the farms in Ashfield (Station DW10). Both stations were sampled on six occasions representing both wet and dry weather conditions between August and November 2000 by ESS (ESS 2002). Results are summarized below.
 Station DW9 - fecal coliform bacteria counts ranged from 20 to 8,660 col/100 mL. None of the counts from four samples collected during the Primary Contact Recreational Season exceeded 400 cfu/100 mL .
 Station DW10 - fecal coliform bacteria counts ranged from 10 to >2,000 col/100 mL. Counts from one of four samples collected during the Primary Contact Recreational Season exceeded 400 cfu/100 mLs (the sample was representative of wet weather conditions).

No objectionable deposits, sheens, odors or other conditions were noted during the biological monitoring survey conducted by DWM biologists in the South River in September 2000 (Appendix B) or by field crews during any of the water quality surveys conducted in 2000. It should also be noted that turbidity measurements from the South River reported by ESS (2002) were all low with the exception of one wet weather sample during the 15 September survey (54 NTU) collected at the Reeds Bridge Road in Conway (Station DW7).

The Recreational and Aesthetics uses are assessed as support for South River based on the limited fecal coliform bacteria data and the habitat quality information. The Primary and Secondary Contact Recreational uses, however, are identified with an Alert Status because of elevated bacteria counts documented by ESS during wet weather.

The drainage area of this segment is approximately 26.37 square miles. Land-use estimates (top three) for the subwatershed (map inset, gray shaded area):
Forest 77.1%
Agriculture 12.5 %
Residential 6.1%

MA DFWELE has recommended that the South River and several tributaries - Creamery, Chapel and Poland brooks - be protected as cold water fishery habitat (MassWildlife 2001).

Report Recommendations:
• Work with Conway Electric Dam owner (currently MA DCR), other agencies, and the Town of Conway to explore options and funding sources for improving fish passage at this site, including possible removal or breaching of the dam.
• Water quality monitoring, including bacteria and physicochemical sampling should be conducted in this segment of the South River to identify sources of high bacteria counts during wet weather and document current water quality more completely during the next monitoring year (2005). In addition, macroinvertebrate biomonitoring is recommended along with fish population sampling using multiple crews or a barge-mounted electrofishing unit. Bacteria monitoring is also recommended for Creamery Brook to identify sources of high bacteria counts during wet weather.
• An evaluation of habitat quality conditions related to erosion and instream deposition/sedimentation in the South River should be conducted. Pursue 604b and/or 319 funding to evaluate and remediate problem areas.
• Continue to monitor the fish population in the South River. Long-term monitoring of the Atlantic salmon and brook trout populations at this site would be valuable.
• MA DFWELE has recommended that the river be protected as cold water fishery habitat.
• The Towns of Ashfield and Conway should participate in the Deerfield River Watershed Regional Open Space Plans, which were funded by the Massachusetts Watershed Initiative/Deerfield River Watershed Team and conducted by the Franklin Regional Council of Governments and Dodson Associates. Through these plans the towns can work cooperatively with other watershed communities to prioritize regional open space and recreational land acquisitions and protection goals, including water resources.
• In order to prevent degradation of water quality in the South River subwatershed it is recommended that land use planning techniques be applied to direct development, preserve sensitive areas, and maintain or reduce the levels of impervious cover. Ashfield and Conway should support recommendations of their recently developed individual municipal open space plans and/or Community Development Plans to protect important open space and maintain their community's rural character.
• The rural roads that cross over and/or are in close proximity to watercourses should be identified. Field reconnaissance should be performed to evaluate their potential for impacting the water and habitat quality of these adjacent watercourses. Implementation of best management practices, as described in Unpaved Roads BMP Manual (BRPC 2001), should then be encouraged as appropriate.
• The volunteer monitoring surveys to locate and map Japanese knotweed infestations conducted in 2003 by the DRWA as part of a Massachusetts Watershed Initiative/Deerfield River Watershed Team workplan project in the South River subwatershed identified and mapped large patches of this plant growing near the confluence of the South and Deerfield Rivers. Results of this

study should be consulted and local efforts to help manage current and future infestations of this invasive plant should be encouraged (Serrentino 2003).
• Work with NRCS, DAR (formerly DFA) and landowners to protect riparian buffers and encourage use of agricultural BMP's.
• Encourage local stewardship efforts by supporting the DRWA volunteer water quality monitoring program.

Deerfield River Watershed 2000 Water Quality Assessment Report (MA33-07 - South River)

AQUATIC LIFE
Biology
Although these data are too old for assessment purposes it should be noted that DWM biologists conducted benthic macroinvertebrate sampling in the South River at Emmet's Road in Ashfield in 1988 (Station SOR02 in Appendix C).

Chemistry-water
In-situ measurements (DO, %saturation, pH, temperature, conductivity, and turbidity) at four stations (SO-1, SO-2, SO-3 and SO-4) in this segment of the South River were taken on 20 July 1995 as part of the 1995/1996 Deerfield River Watershed monitoring survey (Appendix G, Table G3).

Water quality samples were collected from the South River at the second bridge crossing in Ashfield town center (Station DW11) on as many as six occasions between August and November 2000 by ESS (ESS 2002). These data are summarized below.

DO and % saturation
Although not representative of worst-case (pre-dawn) conditions the instream DOs were not less than 8.39 mg/L or 68.3% saturation.
Temperature
The maximum instream temperature was 22.5°C.

pH
The pH ranged from 6.9 to 7.2 SU at all three locations.

Turbidity
Turbidity ranged from 0.41 to 3.00 NTU.
Conductivity
Specific conductivity measurements ranged from 151.7 to 235.0 µS/cm.
The Aquatic Life Use for this segment of the South River is not assessed because of the lack of sufficient water quality and biological data. Of concern, however, is a percent saturation of less than 75% and a maximum temperature measurement greater than 20°C if this river is to be protected as a cold water fishery habitat (as proposed by MA DFWELE). This use is, therefore, identified with an Alert Status because of this concern.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS
DWM collected fecal coliform bacteria samples at four stations (SO-1, SO-2, SO-3 and SO-4) in this segment of the South River on 20 July 1995 as part of the 1995/1996 Deerfield River Watershed monitoring survey, but these data were all censored (Appendix G, Table G4).

Fecal coliform bacteria samples were collected from the South River at the second bridge crossing in Ashfield town center (Station DW11) on six occasions representing both wet and dry weather sampling between August and November 2000 by ESS (ESS 2002). The fecal coliform bacteria counts ranged from <10 to 170 cfu/100 mL.

The Recreational uses are assessed as support for this segment of the South River based on the low fecal coliform bacteria counts. No data are available to assess the Aesthetics Use.

The drainage area of this segment is approximately 2.05 square miles. Land-use estimates (top three) for the subwatershed (map inset, gray shaded area):
Forest 65.8%

Residential 10.6%
Agriculture 9.4%

It should be noted that sewering in Ashfield Center was completed in 1996. (See South River segment MA33-08 for a description of the facility).

MA DFWELE has recommended that the South River be protected as cold water fishery habitat (MassWildlife 2001).

Report Recommendations:

• Water quality monitoring including benthic macroinvertebrate sampling and physicochemical sampling should be conducted in this segment of the South River to document current water quality conditions and assess designated uses more completely during the next monitoring year cycle (2005).

• Additional information (e.g., fish population, instream water quality data including dissolved oxygen/percent saturation and temperature) should be collected from this segment of the South River. If appropriate, this segment should be protected as cold water fishery habitat as recommended by MA DFWELE.

• The Town of Ashfield should participate in the Deerfield River Watershed Regional Open Space Plans, which were funded by the Massachusetts Watershed Initiative/Deerfield River Watershed Team and conducted by the Franklin Regional Council of Governments and Dodson Associates. Through these plans the town can work cooperatively with other watershed communities to prioritize regional open space and recreational land acquisitions and protection goals, including water resources.

• In order to prevent degradation of water quality in the South River subwatershed it is recommended that land use planning techniques be applied to direct development, preserve sensitive areas, and maintain or reduce the impervious cover. The Town of Ashfield should support recommendations of their recently developed individual municipal open space plan and/or Community Development Plan to protect important open space and maintain their community's rural character.

• The rural roads that cross over and/or are in close proximity to watercourses should be identified. Field reconnaissance should be performed to evaluate their potential for impacting the water and habitat quality of these adjacent watercourses. Implementation of best management practices, as described in Unpaved Roads BMP Manual (BRPC 2001), should then be encouraged, as appropriate.

• The volunteer monitoring surveys to locate and map Japanese knotweed infestations conducted in 2003 by the DRWA as part of a Massachusetts Watershed Initiative/Deerfield River Watershed Team workplan project in the South River subwatershed identified and mapped small amounts of this plant growing in the headwater segment of the river. Results of this study should be consulted and local efforts to help manage current and future infestations of this invasive plant should be encouraged (Serrentino 2003).

Deerfield River Watershed 2000 Water Quality Assessment Report (MA33-32 - Pumpkin Hollow Brook)

AQUATIC LIFE

Habitat and Flow

Pumpkin Hollow Brook was sampled by DWM upstream from Academy Hill Road, Conway (Station PH00), in September 2000. At the time of the survey the brook was approximately 3 m wide with depths ranging from 0.25 to 0.5 m. The substrates were comprised primarily of cobble. The overall habitat score was 146 (Appendix B). Habitat quality was limited most by sediment deposition and embeddedness and by streambank instability.

Biology

Fish species captured, in order of abundance, included: creek chub (Semotilus atromaculatus), common shiner (Luxilus cornutus), blacknose dace (Rhinichthys atratulus), Atlantic salmon (Salmo salar), longnose dace (Rhinichthys cataractae), and a brook trout (Salvelinus fontinalis) (Appendix B). While two species are considered to be intolerant of pollution their numbers were extremely low and the community was dominated by tolerant and moderately tolerant species. All species collected were fluvial dependant/specialists, which are indicative of a stable flow regime.

Chemistry-water
Water quality samples were collected from Pumpkin Hollow Brook just upstream from its confluence with the South River in Conway (Station DW23) in October and November 2000 by ESS (ESS 2002). Results are summarized below.

DO and % saturation
Although not representative of worst-case (pre-dawn) conditions the instream DOs were not less than 11.82 mg/L or 88.4% saturation.

pH
The pH ranged between 7.0 and 7.1 SU.

Turbidity
Turbidity ranged between 0.31 and 21.1 NTU.

Conductivity
Specific conductivity measurements were 128.2 and 148.8 µS/cm.

The Aquatic Life Use for Pumpkin Hollow Brook is assessed as support based primarily on fish population information and best professional judgment. This use, however, is identified with an Alert Status, because of sediment deposition and associated substrate embeddedness, which can degrade habitat quality.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS
Fecal coliform bacteria samples were collected from Pumpkin Hollow Brook just upstream of its confluence with the South River in Conway (Station DW23) in October and November 2000 by ESS (ESS 2002). The fecal coliform bacteria counts were 30 and 220 cfu/100 mL (both samples were representative of wet weather conditions).

The Massachusetts Department of Public Health beach closure report (MA DPH 2001b) states that the Conway Swimming Hole on Pumpkin Hollow Brook was never closed for elevated bacteria during the 2001 season.

Too limited bacteria data are available and, so the Recreational uses are not assessed for Pumpkin Hollow Brook. No objectionable deposits or conditions were reported at Pumpkin Hollow Brook by DWM biologists in 2000 so the Aesthetics Use is assessed as support.

The drainage area of this segment is approximately 1.61 square miles. Land-use estimates (top three) for the subwatershed (map inset, gray shaded area):

Forest 65.0%
Agriculture 20.4%
Residential 10.4%

Landfills
The Deerfield River Watershed Landfill Assessment Study (Fuss and O'Neill 2003) identified two historic landfills in this segment, the Conway Landfill and the Conway Wood Waste Landfill. These landfills are both over 25 years old. It is believed that the Conway Landfill began operation around 1900. In the 1970s this dump accepted hazardous and liquid wastes and open burning was practiced. At that time a leachate plume was observed flowing from beneath the landfill, across a meadow, and into Pumpkin Hollow Brook. Sampling of surface water and groundwater were conducted on behalf of the Town of Conway by Fuss and O'Neill in July 2002. Surface water samples were collected from Pumpkin Hollow Brook upstream of the landfill and at the town swimming hole downstream of the landfill. Groundwater samples were also collected from a private well. All results were below the Massachusetts Maximum Contaminant Levels (MCLs) in the Massachusetts Drinking Water Standards according to a September 17, 2002 letter to MA DEP. This landfill is not lined but it is capped. Groundwater continues to be monitored by the town. The Conway Wood Waste Landfill received wood waste. It was closed and capped in 1991 and has been monitored since 1994. The most recent water quality results, collected in July 2002 for the town, are below MCLs of the Massachusetts Drinking Water Standards according to a September 17, 2002 letter to MA DEP. Because these sites have already been monitored, Fuss and O'Neill (2003) did not recommend these for screening level sampling under this study.

Report Recommendations:
• Water quality monitoring throughout the Pumpkin Brook subwatershed is recommended, especially nutrient and bacteria sampling to help isolate potential sources of nutrient/organic loads and to document current water quality more completely during the next monitoring year (2005). In addition, fish population sampling should be conducted along with macroinvertebrate sampling in this segment.
• An evaluation of habitat quality conditions related to erosion and instream deposition/sedimentation in Pumpkin Hollow Brook should be conducted. Pursue 604b and/or 319 funding to evaluate and remediate problem areas.
• The Town of Conway should participate in the Deerfield River Watershed Regional Open Space Plans, which were funded by the Massachusetts Watershed Initiative/Deerfield River Watershed Team and conducted by the Franklin Regional Council of Governments and Dodson Associates. Through these plans the town can work cooperatively with other watershed communities to prioritize regional open space and recreational land acquisitions and protection goals, including water resources.
• In order to prevent degradation of water quality in the Pumpkin Brook subwatershed it is recommended that land use planning techniques be applied to direct development, preserve sensitive areas, and maintain or reduce the levels of impervious cover. The Town of Conway should support recommendations of their recently developed individual municipal open space plan and/or Community Development Plan to protect important open space and maintain the communities' rural character.
• The rural roads that cross over and/or are in close proximity to watercourses should be identified. Field reconnaissance should be performed to evaluate their potential for impacting the water and habitat quality of these adjacent watercourses. Implementation of best management practices, as described in Unpaved Roads BMP Manual (BRPC 2001), should then be encouraged, as appropriate.

Deerfield River Watershed 2000 Water Quality Assessment Report (MA33-08 - South River Impoundment)

Lake assessments are based on information gathered during DWM surveys (recent and historic) as well as pertinent information from other reliable sources (e.g., abutters, herbicide applicators, diagnostic/feasibility studies, MA DPH, etc.). The 1995 DWM synoptic surveys focused on visual observations of water quality and quantity (e.g., water level, sedimentation, etc.), the presence of native and non-native aquatic plants (both distribution and areal cover) and presence/severity of algal blooms (Appendix F, Table F1). During 2000 more intensive in-lake sampling was conducted by DWM in two lakes (Pelham Lake and Plainfield Pond) in the Deerfield River Watershed as part of the TMDL program. This sampling included: in-lake measurements of dissolved oxygen, pH, temperature, Secchi disk transparency, nutrients, and chlorophyll a (Appendix F, Tables F2 and F3). Sediment samples were collected by ESS in 2000 in Sherman Reservoir (ESS 2002). The Primary Contact Recreational Use was only assessed in two MA DCR (formerly MA DEM) owned lakes with public bathing beaches (North and South Ponds) where bacteria data were reported to MA DPH as part of the public beach monitoring program. To determine the status of the Fish Consumption Use fish consumption advisory information was obtained from the MA DPH (MA DPH 2002a). Although the Drinking Water Use was not assessed in this water quality assessment report, the Class A waters were identified. Information on drinking water source protection and finish water quality is available at http://www.mass.gov/dep/brp/dws/dwshome.htm and from the Deerfield River Watershed's public water suppliers.

The use assessments and supporting information were entered into the EPA Water Body System database. Data on the presence of non-native plants were entered into the MA DEP DWM informal non-native plant tracking database.

AQUATIC LIFE
Biology
No non-native aquatic macrophytes were observed in any of the 13 lakes surveyed by DWM in 1995 and/or 2000 (Appendix F, Table F1 and Mattson 2000). Myriophyllum heterophyllum (variable water milfoil) is the only non-native aquatic species suspected in the Deerfield River Watershed (Bog Pond). The mere presence of any non-native species is considered an imbalance to the native biotic community and so this lake is identified with an Alert Status. Additionally, this species has a high potential for spreading and can easily establish itself in downstream river segments in the Deerfield River Watershed.

Over a two-year period (2000-2002) the MA DFWELE conducted fish population sampling as part of the "Lakes Survey for TMDL Development" project (MA DFWELE 2002). This study included two lakes in the Deerfield River Watershed: Pelham Lake (Rowe - MA33016) and Plainfield Pond (Plainfield – MA33017).

Pelham Lake
Pelham Lake in Rowe was sampled by MA DFWELE for the above study using electrofishing, gillnetting and seining. The fish population was dominated by yellow perch (Perca flavescens). Other collected species included: pumpkinseed (Lepomis gibbosus), golden shiner (Notemigonus crysoleucas), chain pickerel (Esox niger), white sucker (Catostomus commersoni), largemouth bass (Micropterus salmoides), brown bullhead (Ameiurus nebulosus), black crappie (Pomoxis nigromaculatus), smallmouth bass (Micropterus dolomieu), and brown trout (Salmo trutta).

Plainfield Pond
Plainfield Pond in Plainfield was sampled by MA DFWELE for the above study using electrofishing, gillnetting and seining. The fish population was dominated by yellow perch (Perca flavescens). Other collected species included: chain pickerel (Esox niger), pumpkinseed (Lepomis gibbosus), bluegill (Lepomis macrochirus), brown bullhead (Ameiurus nebulosus), largemouth bass (Micropterus salmoides), and golden shiner (Notemigonus crysoleucas).

Chemistry-water
Hypolimnetic oxygen depletion did not occur in either Pelham Lake or Plainfield Pond in September 2000 (Appendix F, Table F2). The total phosphorus concentrations were low to moderately high in Pelham Lake and were low in Plainfield Pond (Appendix F, Table F3). There are too little data (some data were censored) to assess the status of the Aquatic Life Uses for either of these ponds. Additional data/information needs to be researched to determine if these conditions are naturally occurring or anthropogenically induced.

Chemistry – sediment
Three sediment grab samples were collected and composited from behind Sherman Reservoir Dam on the Deerfield River (Station DWS-1) in July of 2000 by ESS (ESS 2002). The sediment sample was analyzed for arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, PCB (polychlorinated biphenyls), PAH (polynuclear aromatic hydrocarbons), TPH (total petroleum hydrocarbons), TOC (total organic carbon), percent volatile solids, percent water, and grain size. With the exception of arsenic and copper all analytes fell below the low effects range (L-EL) as defined by Persaud et al. (1993). The arsenic concentration was measured at 25.5 ppm, which is approximately four times greater than the L-EL and the copper concentration was measured at 32.3 ppm, which is approximately two times greater than the L-EL. The sediment was comprised primarily of silt and clay (45.5%) and fine sand (27.5%) and the total volatile solids was 14.0% by weight. No PAH, TPH, or PCB were detected.

The Aquatic Life Use was not assessed in any of the lakes in the Deerfield River Watershed because of the cursory nature of the 1995 synoptic surveys and/or the lack of dissolved oxygen data and other more recent observations. Aquatic Life Use is identified with an Alert Status in Sherman Reservoir because the concentration of arsenic and copper in the sediment sample collected behind the Sherman Dam was slightly elevated. Bog Pond is also identified with an Alert Status since there is a report of a unconfirmed non-native species present there (Myriophyllum heterophyllum) (Table 4).

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

Fish from two lakes in the Deerfield River Watershed were sampled in either 1995 or 2000 as part of the DWM watershed monitoring surveys. The lakes sampled were Sherman Reservoir (Rowe, MA / Monroe, MA / Whitingham, VT) and Bog Pond (Savoy). Fish toxics monitoring (metals, PCB, and organochlorine pesticide in edible fillets) was conducted by DWM in Sherman Reservoir in October 1995 and in Bog Pond in November 2000. These data can be found in Appendix E, Table E1 and Appendix

B, Appendix A, Table A5. Fish were also sampled in 1994 by Rose et. al. (1999) in three Deerfield Watershed lakes (Ashfield Lake, Bog Pond and Plainfield Pond) as part of a study to investigate fish mercury distribution in Massachusetts.

Sherman Reservoir, Rowe, MA / Monroe, MA / Whitingham, VT (formerly included as part of river Segment MA 33-01)
Mercury in the fish tissue from Sherman Reservoir ranged from 0.204 to 0.785 mg/kg wet weight. The mercury data triggered a site-specific advisory against the consumption of fish from Sherman Reservoir. Selenium levels ranged from 0.138 to 0.327 mg/kg wet weight. PCB arochlors and congeners, pesticides, cadmium, arsenic, and lead were not detected in the edible fillets of all samples analyzed from Sherman Reservoir.

Bog Pond, Savoy
Mercury ranged from 0.14 mg/kg in a sample of brown bullhead (Bog00-04-06) to 0.38 mg/kg in yellow perch (Bog00-01-03). Due to the fact that predator fishes tend to be highest in mercury worst case conditions have not been assessed. Predatory fish from Bog Pond likely contain mercury in concentrations at or near the MA DPH 'trigger level' of 0.5 mg/kg. Cadmium, lead, and arsenic were below MDL (minimum detection limits) in all samples analyzed and selenium concentrations were consistent with those found in waterbodies throughout the Commonwealth. Selenium does not appear to be of concern.

Plainfield Pond, Plainfield
Mercury (average concentration of 0.182 mg/kg) was detected in tissue samples of brown bullhead, largemouth bass, and yellow perch in a study of mercury distribution in fish in Massachusetts lakes performed by Rose et. al. (1999). The mercury data triggered a site-specific advisory against the consumption of fish from Plainfield Pond.

Ashfield Lake, Ashfield
The study by Rose et. al. (1999) did not detect elevated concentrations of mercury (average concentration 0.083 mg/kg) in brown bullhead, largemouth bass and yellow perch sampled from Ashfield Lake.

The most recent MA DPH Fish Consumption List recommends the following for lakes in the Deerfield River Watershed (MA DPH 2002a):
Sherman Reservoir (Rowe/Monroe) because of elevated mercury,
1. "Children younger than 12 years, pregnant women, and nursing mothers should not eat any fish from this waterbody,
2. the general public should not consume any yellow perch from this waterbody, and
3. the general public should limit consumption of non-affected fish from this waterbody to two meals per month."
Plainfield Pond (Plainfield) because of elevated mercury,
1. "Children younger than 12 years, pregnant women, and nursing mothers should not eat any Largemouth Bass from this waterbody, and
2. the general public should limit consumption of largemouth bass from this waterbody."

Sherman Reservoir (72 acres in MA out of a total of 162 acres representing both MA and VT acreage) and Plainfield Pond (60 acres) are assessed as impaired (due to mercury contamination) for the Fish Consumption Use (Table 4). The remaining 20 lakes, representing 430 acres, are not assessed for the Fish Consumption Use. [NOTE: The MA DPH fish consumption advisory list contains the status of each waterbody for which an advisory has been issued. If a waterbody is not on the list, it may be because either an advisory was not warranted or the water body has not been sampled. MA DPH's most current Fish Consumption Advisory list is available online at http://www.mass.gov/dph/beha/fishlist.htm. The source of mercury is unknown, although atmospheric deposition is suspected.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS
Bacteria samples were collected at two MA DEM (now known as MA DCR) beaches: North Pond in Florida and South Pond in Savoy in the Savoy State Forest. Elevated bacteria counts were documented infrequently in both of these ponds but neither were reported closed during the 2001 swimming season and were only closed or posted for short periods (2 days in North Pond and 1 day in South Pond) in the 2002 swimming season (Murphy 2002). Both the Primary and Secondary Contact Recreational uses are assessed as support for these two waterbodies.

There are three public beaches on lakes in the Deerfield River Watershed (Ashfield Pond in Ashfield, Pelham Lake in Rowe and Plainfield Pond in Plainfield). Although no beach closures/postings were recorded in the DPH beach closure database during the 2000/2001 seasons, too limited data are available and so, the Primary and Secondary Contact Recreational uses are not assessed.
The Primary and Secondary Contact Recreational uses are assessed as support in two lakes; North Pond and South Pond, representing a total of 48 acres. The Aesthetics Use for these waterbodies is not assessed. The Primary and Secondary Contact

Recreational and Aesthetics uses are not assessed in the remaining 20 lakes (514 acres) in the Deerfield River Watershed because of a lack of bacteria, transparency and in-lake survey data.

SUMMARY

Only two of the 22 lakes (totaling 132 acres) in the Deerfield River Watershed listed in this report are impaired for the Fish Consumption Use. The cause of impairment is mercury contamination. Two other lakes, totaling 48 acres, supported the Primary and Secondary Contact Recreational uses. A total of 18 lakes (382 out of 562 acres) are not assessed for any uses. The Aquatic Life Use for Bog Pond was identified with an Alert Status because Myriophyllum sp. (a non-native aquatic macrophyte) is suspected. The Aquatic Life Use for Sherman Reservoir was also identified with an Alert Status because of slightly elevated concentrations of arsenic and copper in the sediments.

Table 4 presents the use assessments for the individual lakes in the deerfield river watershed.

Report Recommendations:

• Confirm the presence of Myriophyllum heterophyllum, which is suspected to occur in Bog Pond (Savoy).

• Coordinate with MA DCR and/or other groups conducting lake surveys to generate quality assured lakes data. Conduct more intensive lake surveys to better determine the lake trophic and use support status. As sources of impairment are identified within lake watersheds they should be eliminated or, at least, minimized through the application of appropriate non-point source control techniques.

• Continue to review data from “Beaches Bill” required water quality testing (bacteria sampling at all formal bathing beaches) to assess the status of the recreational uses.

• Quick action is necessary to manage non-native aquatic or wetland plant species that are isolated in one or a few location(s), in order to alleviate the need for costly and potentially fruitless efforts to do so in the future. Two courses of action should be pursued concurrently. More extensive surveys need to be conducted, particularly downstream from these recorded locations to determine the extent of the infestation. And, "spot" treatments (refer to the draft Generic Environmental Impact Report for Eutrophication and Aquatic Plant Management in Massachusetts [Mattson et al. 2004] for advantages and disadvantages of each) should be undertaken to control populations at these sites. These treatments include careful hand-pulling of individual plants in small areas. In larger areas other techniques, such as selective herbicide application, may be necessary. In either case, the treatments should be undertaken prior to fruit formation and with a minimum of fragmentation of the individual plants. These actions will minimize the spreading of the populations. This draft aquatic plant report should be consulted prior to the development of any lake management plan to control non-native aquatic or wetland plant species.

• Prevent spreading of invasive plants. Once the extent of the problem is determined and control practices are exercised, vigilant monitoring needs to be practiced to guard against infestations in unaffected areas, and to ensure that managed areas stay in check. A key portion of the prevention program should be posting of boat access points with signs to educate and alert lake-users to the problem and responsibility of spreading these species.

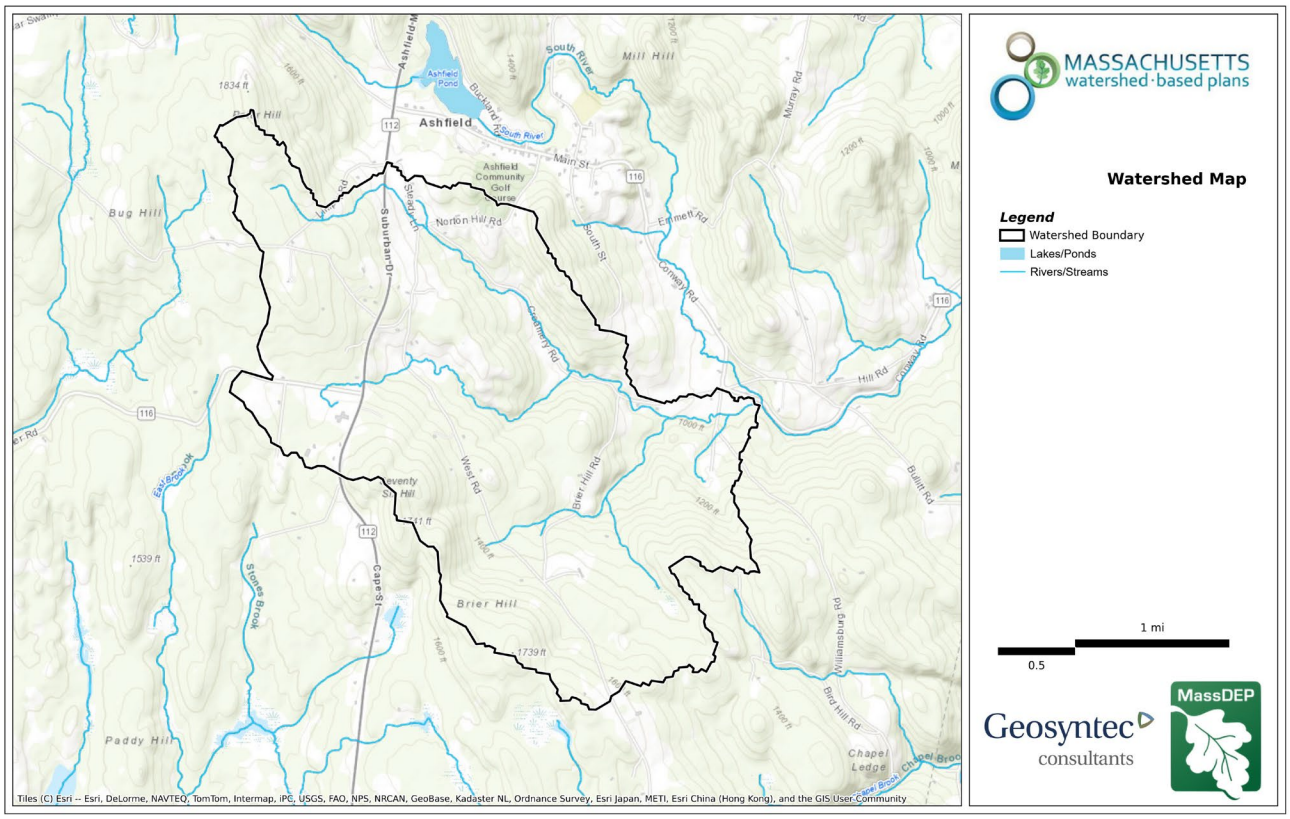
Appendix C – Pollutant Load Export Rates (PLERs)

Land Use & Cover[1]	PLERs (lb/acre/year)		
	(TP)	(TSS)	(TN)
AGRICULTURE, HSG A	0.45	7.14	2.59
AGRICULTURE, HSG B	0.45	29.4	2.59
AGRICULTURE, HSG C	0.45	59.8	2.59
AGRICULTURE, HSG D	0.45	91.0	2.59
AGRICULTURE, IMPERVIOUS	1.52	650	11.3
COMMERCIAL, HSG A	0.03	7.14	0.27
COMMERCIAL, HSG B	0.12	29.4	1.16
COMMERCIAL, HSG C	0.21	59.8	2.41
COMMERCIAL, HSG D	0.37	91.0	3.66
COMMERCIAL, IMPERVIOUS	1.78	377	15.1
FOREST, HSG A	0.12	7.14	0.54
FOREST, HSG B	0.12	29.4	0.54
FOREST, HSG C	0.12	59.8	0.54
FOREST, HSG D	0.12	91.0	0.54
FOREST, HSG IMPERVIOUS	1.52	650	11.3
HIGH DENSITY RESIDENTIAL, HSG A	0.03	7.14	0.27
HIGH DENSITY RESIDENTIAL, HSG B	0.12	29.4	1.16
HIGH DENSITY RESIDENTIAL, HSG C	0.21	59.8	2.41
HIGH DENSITY RESIDENTIAL, HSG D	0.37	91.0	3.66
HIGH DENSITY RESIDENTIAL, IMPERVIOUS	2.32	439	14.1
HIGHWAY, HSG A	0.03	7.14	0.27
HIGHWAY, HSG B	0.12	29.4	1.16
HIGHWAY, HSG C	0.21	59.8	2.41
HIGHWAY, HSG D	0.37	91.0	3.66
HIGHWAY, IMPERVIOUS	1.34	1,480	10.2
INDUSTRIAL, HSG A	0.03	7.14	0.27
INDUSTRIAL, HSG B	0.12	29.4	1.16
INDUSTRIAL, HSG C	0.21	59.8	2.41

Land Use & Cover[1]	PLERs (lb/acre/year)		
	(TP)	(TSS)	(TN)
INDUSTRIAL, HSG D	0.37	91.0	3.66
INDUSTRIAL, IMPERVIOUS	1.78	377	15.1
LOW DENSITY RESIDENTIAL, HSG A	0.03	7.14	0.27
LOW DENSITY RESIDENTIAL, HSG B	0.12	29.4	1.16
LOW DENSITY RESIDENTIAL, HSG C	0.21	59.8	2.41
LOW DENSITY RESIDENTIAL, HSG D	0.37	91.0	3.66
LOW DENSITY RESIDENTIAL, IMPERVIOUS	1.52	439	14.1
MEDIUM DENSITY RESIDENTIAL, HSG A	0.03	7.14	0.27
MEDIUM DENSITY RESIDENTIAL, HSG B	0.12	29.4	1.16
MEDIUM DENSITY RESIDENTIAL, HSG C	0.21	59.8	2.41
MEDIUM DENSITY RESIDENTIAL, HSG D	0.37	91.0	3.66
MEDIUM DENSITY RESIDENTIAL, IMPERVIOUS	1.96	439	14.1
OPEN LAND, HSG A	0.12	7.14	0.27
OPEN LAND, HSG B	0.12	29.4	1.16
OPEN LAND, HSG C	0.12	59.8	2.41
OPEN LAND, HSG D	0.12	91.0	3.66
OPEN LAND, IMPERVIOUS	1.52	650	11.3

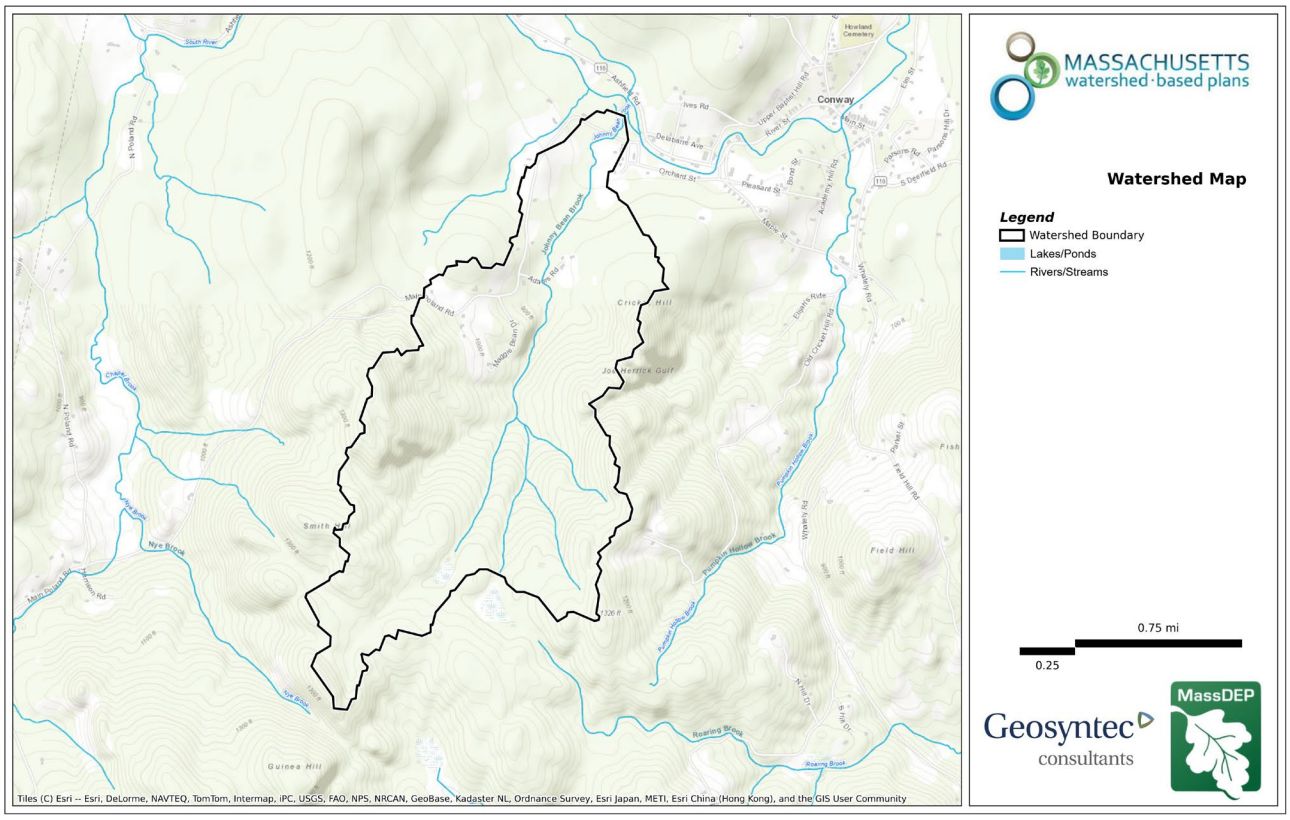
[1]HSG = Hydrologic Soil Group

Appendix D – Major Subwatershed Maps



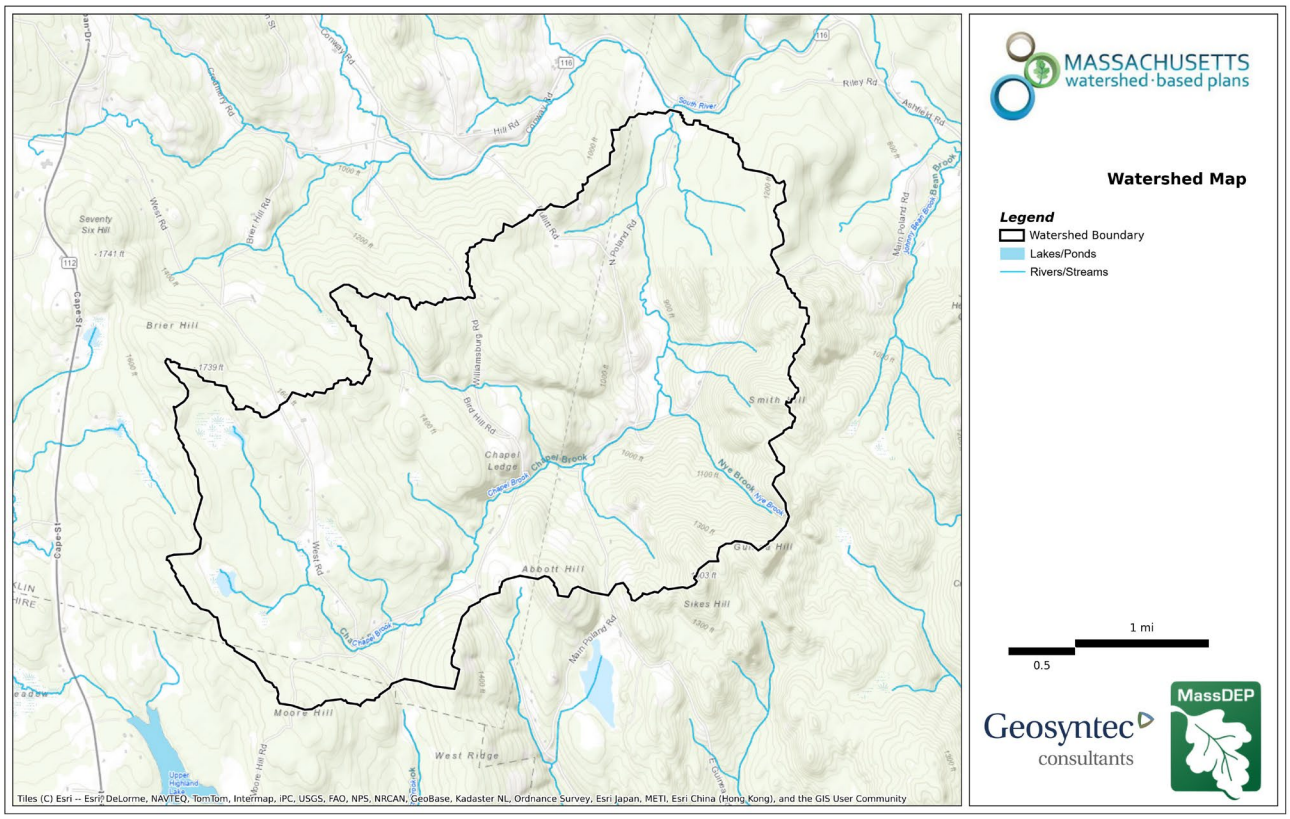
Creamery Brook Subwatershed Boundary Map (MassGIS, 2007; MassGIS, 1999; MassGIS, 2001; USGS, 2016)

Ctrl + Click on the map to view a full sized image in your web browser.



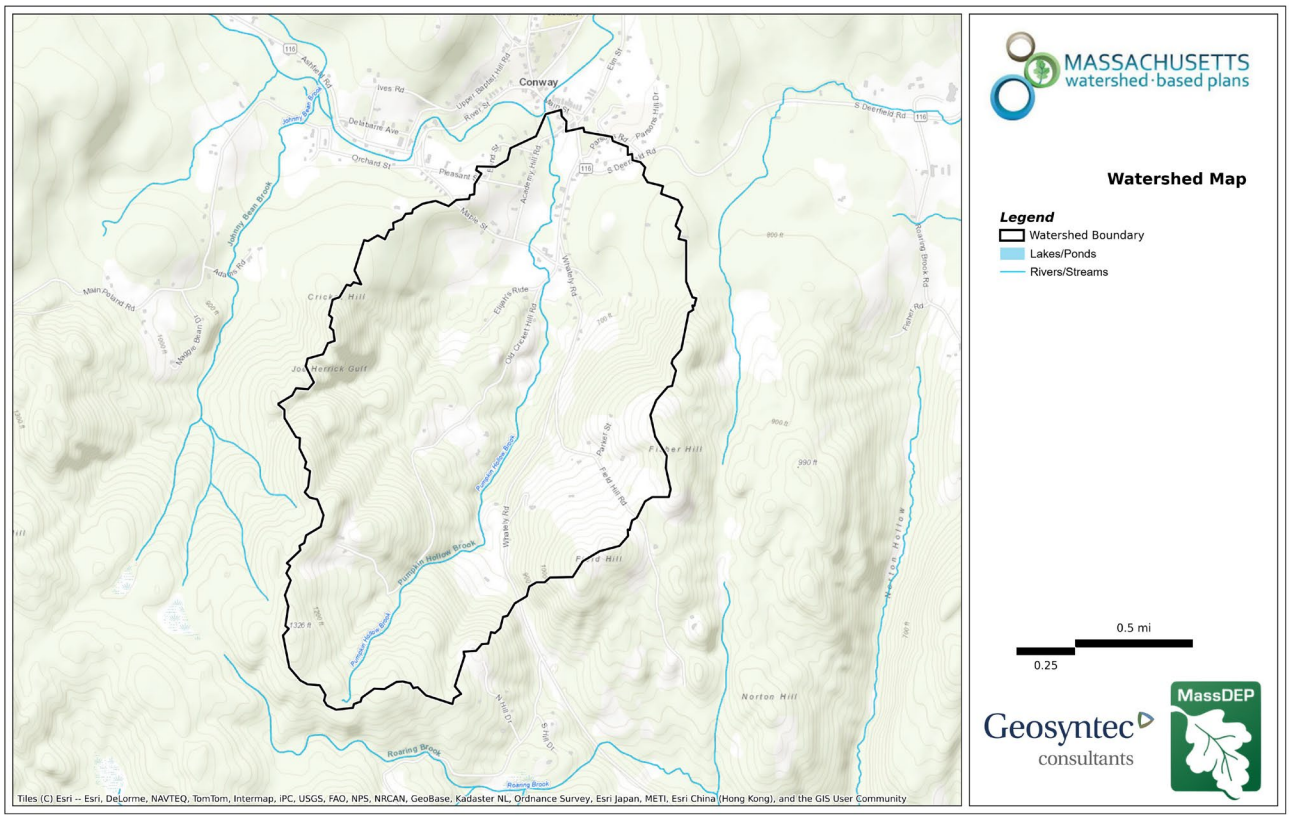
Johnny Bean Brook Subwatershed Boundary Map (MassGIS, 2007; MassGIS, 1999; MassGIS, 2001; USGS, 2016)

Ctrl + Click on the map to view a full sized image in your web browser.



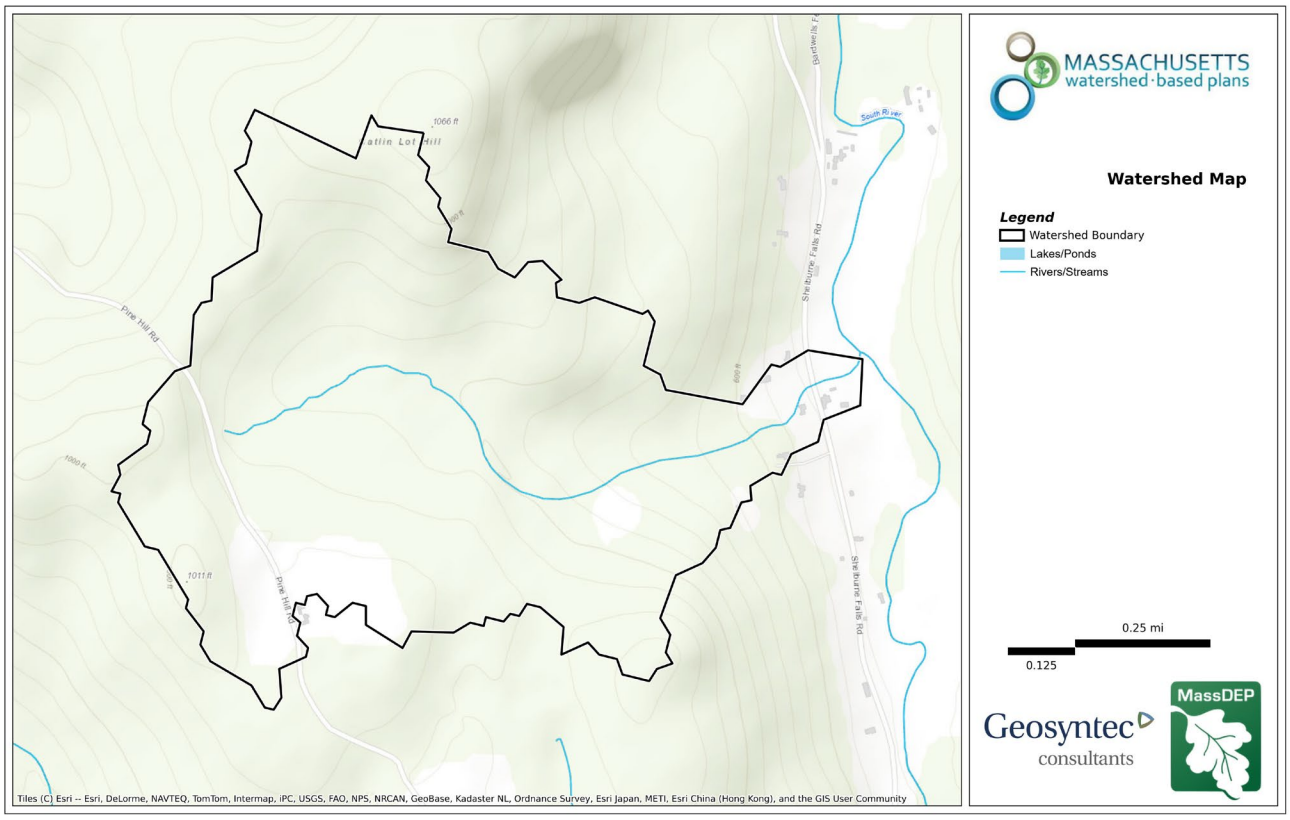
Poland Brook/Chapel Brook Subwatershed Boundary Map (MassGIS, 2007; MassGIS, 1999; MassGIS, 2001; USGS, 2016)

Ctrl + Click on the map to view a full sized image in your web browser.



Pumpkin Hollow Brook Subwatershed Boundary Map
(MassGIS, 2007; MassGIS, 1999; MassGIS, 2001; USGS, 2016)

Ctrl + Click on the map to view a full sized image in your web browser.



Unnamed Tributary (MA33-114) Subwatershed Boundary Map
(MassGIS, 2007; MassGIS, 1999; MassGIS, 2001; USGS, 2016)

Ctrl + Click on the map to view a full sized image in your web browser.

Appendix E – Summary of Agricultural BMPs included in Conceptual Projects and associated Planning-level Nitrogen Load Reductions in the South River Watershed

South River Projects Agricultural BMPs

- **Waste Storage Facility (313)**
  - Definition - A waste storage impoundment made by constructing a pond (embankment and/or excavated pit or dugout), or by fabricating a structure.
  - Purpose - To temporarily store wastes such as manure, wastewater, and contaminated runoff as a storage function component of an agricultural waste management system.

- **Composting Facility (317)**
  - Definition – A structure or device to contain and facilitate an aerobic microbial ecosystem for the decomposition of manure and/or other organic material into a final product sufficiently stable for storage, on farm use and application to land as a soil amendment.
  - Purpose – This practice is used to accomplish one or more of the following purposes–
    - To reduce the pollution potential and odors generated by organic waste solids;
    - To improve the handling characteristics of organic waste solids;
    - To reuse organic waste as animal bedding;
    - To produce a soil amendment that provides soil conditioning, slow-release plant-available nutrients, and plant disease suppression.

- **Roofs and Covers (367)**
  - Definition - A rigid, semi-rigid, or flexible manufactured membrane, composite material, or roof structure placed over a waste management facility.
  - To provide a roof or cover for:
    - water quality improvement
    - diversion of clean water from animal management areas (i.e. barnyard, feedlot or exercise area), waste storage facilities, waste treatment facilities, or agrichemical handling facilities.
    - capture of biogas for energy production
    - reducing net effect of greenhouse gas emissions
    - air quality improvement and odor reduction

      - Typically paired with a roof runoff structure, in conjunction with a composting facility, waste storage facility or heavy use area.
- **Fence (382)**
  - Definition - A constructed barrier to animals or people.
  - Purpose - This practice facilitates the accomplishment of conservation objectives by providing a means to control movement of animals and people, including vehicles.

- This practice is typically paired with heavy use areas and stream crossings.

- **Filter Strip (393)**
  - Definition - A strip or area of herbaceous vegetation that removes contaminants from overland flow.
  - Purpose - Reduce suspended solids and associated contaminants in runoff, reduce dissolved contaminant loadings in runoff, reduce suspended solids and associated contaminants in irrigation tailwater.

    - Typically paired with fencing, waste stage facilities, heavy use areas, and other field-based practices with pollutant load reductions.

- **Roof Runoff Structure (558)**
  - Definition - Structures that collect, control, and transport precipitation from roofs.
  - Purpose - To improve water quality, reduce soil erosion, increase infiltration, protect structures, and/or increase water quantity.

    - Typically paired with a roof/cover in conjunction with a composting facility, waste storage facility, or heavy use area.

- **Heavy Use Area Protection (561) & Underground Outlet (620)**
  - **Heavy Use Area Protection**
    - Definition - The stabilization of areas frequently and intensively used by people, animals or vehicles by establishing vegetative cover, by surfacing with suitable materials, and/or by installing needed structures.
    - Purpose -
    - Reduce soil erosion
    - Improve water quantity and quality
    - Improve air quality
    - Improve aesthetics
    - Improve livestock health
  - **Underground Outlet**
    - Definition - A conduit or system of conduits installed beneath the surface of the ground to convey surface water to a suitable outlet.
    - Purpose - To carry water to a suitable outlet from terraces, water and sediment control basins, diversions, waterways, surface drains or other similar practices without causing damage by erosion or flooding.

      - These two practices may be paired with a waste storage facility, sediment basin, roof runoff structure, and/or a roof/cover.

- **Water and Sediment Control Basin (638)**
  - Definition – An earthen embankment or a combination ridge and channel constructed across the slop of minor watercourses to form a sediment trap and water detention basin with a stable outlet.
  - Purpose -
    - Reduce watercourse and gully erosion
    - Trap sediment
    - Reduce and manage onsite and downstream runoff

      - This practice may be paired with waste storage facilities, heavy use areas, roofs/covers, roof runoff structures, and underground outlets (620) to manage water flow and treatment.

FARM 1 AGRICULTURAL BMPS - Estimated Pollutant Load Reduction

BMPs:
Waste Storage Facility (313)
Composting Facility (317)
Fence (382)
Roof Runoff Structure (558)
HUA Protection (561)/Underground Outlet (620)
Water and Sediment Control Basin (638)

Parameter	Value	Reference
Number of animal units (AU):	100	
Average weight of animal (lb)	1,400	
Animal Unit (AU)	1000	https://ag.umass.edu/crops-dairy-livestock-equine/fact-sheets/manure-inventory
Manure produced (lbs manure per animal/day)	60	https://ag.umass.edu/crops-dairy-livestock-equine/fact-sheets/manure-inventory
TN (lb TN/ 2000lbs manure)	11	https://ag.umass.edu/crops-dairy-livestock-equine/fact-sheets/manure-inventory
Phosphate (P205) (lbs P205/ 2000 lbs manure)	7	https://ag.umass.edu/crops-dairy-livestock-equine/fact-sheets/manure-inventory
TP (lbs TP / 2000 lbs manure	3.0555	https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/spes/spes-201/SPES-201.pdf
Fecal Coliform (fecal coliforms/gram)	4850000	https://ntrl.ntis.gov/NTRL/dashboard/searchResults/titleDetail/PB2005107536.xhtml
Fecal Coliform (fecal coliforms/2000 lb manure)	4.39985E+12	
Manure produced (lbs/day)	8400	
Manure produced (lbs/year)	3066000	
Manure produced (ton/year)	1533	
TN in manure (lbs/year)	16863	
TP in manure (lbs/year)	4684	
Fecal Coliform in manure (organisms/year)	6.74497E+15	
Percentage of manure in runoff to waterbody	20%	Estimation
Pollutant Load Reduction TN lb/year	**3373**	
Pollutant Load Reduction TP lb/year	**937**	
Pollutant Load Reduction *E. coli* colony forming units (CFU)/year	**1.35E+15**	

Method: There is currently a herd of 100 non-lactating cows at the farm with average estimated weight of 1,400 lbs. On average manure loading per cow was assumed to be 60 lbs/ day/ AU. For calculating TN, we used 11 lbs. TN/2000 lbs. of manure. For Phosphate, we used 7 lbs./2000 lbs. of manure, and then converted to TP by multiplying by .4365. This was based on data from UMass Extension. Fecal Coliform in manure was estimated to be on abased on USEPA data. It was assumed that 30 percent of the manure currently makes into the waterbodies and this loading will be removed by the proposed BMPs.

FARM 2 AGRICULTURAL BMPS - Estimated Pollutant Load Reduction

BMPs:
Roofs and Covers (367)
Roof Runoff Structure (558)
Waste Storage Facility (313)

Parameter	Value	Reference
Number of animal units (AU):	20	
Average weight of animal (lb)	1,400	
Animal Unit (AU)	1000	https://ag.umass.edu/crops-dairy-livestock-equine/fact-sheets/manure-inventory
Manure produced (lbs manure per animal/day)	60	https://ag.umass.edu/crops-dairy-livestock-equine/fact-sheets/manure-inventory
TN (lb TN/ 2000lbs manure)	11	https://ag.umass.edu/crops-dairy-livestock-equine/fact-sheets/manure-inventory
Phosphate (P205) (lbs P205/ 2000 lbs manure)	7	https://ag.umass.edu/crops-dairy-livestock-equine/fact-sheets/manure-inventory
TP (lbs TP / 2000 lbs manure	3.0555	https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/spes/spes-201/SPES-201.pdf
Fecal Coliform (fecal coliforms/gram)	4850000	https://ntrl.ntis.gov/NTRL/dashboard/searchResults/titleDetail/PB2005107536.xhtml
Fecal Coliform (fecal coliforms/2000 lb manure)	4.39985E+12	
Manure produced (lbs/day)	1680	
Manure produced (lbs/year)	613200	
Manure produced (ton/year)	306.6	
TN in manure (lbs/year)	3373	
TP in manure (lbs/year)	937	
Fecal Coliform in manure (organisms/year)	1.34899E+15	
Percentage of manure in runoff to waterbody	20%	Estimation
Pollutant Load Reduction TN lb/year	**675**	
Pollutant Load Reduction TP lb/year	**187**	
Pollutant Load Reduction *E. coli* colony forming units (CFU)/year	**2.70E+14**	

Method: There is currently a herd of 20 non-lactating cows at the farm with average estimated weight of 1,400 lbs. On average manure loading per cow was assumed to be 60 lbs/ day/ AU. For calculating TN, we used 11 lbs. TN/2000 lbs. of manure. For Phosphate, we used 7 lbs./2000 lbs. of manure, and then converted to TP by multiplying by .4365. This was based on data from UMass Extension. Fecal Coliform in manure was estimated to be on abased on USEPA data. It was assumed that 30 percent of the manure currently makes into the waterbodies and this loading will be removed by the proposed BMPs.

Appendix F – List of Potential Agricultural BMPs with USDA NRCS Code (Provided by FRCOG).

The Massachusetts "Field Office Technical Guide" can be accessed at: https://efotg.sc.egov.usda.gov/#/state/MA/documents/section=4&folder=-3 .Detailed information on each BMP can be found under "Section 4 - Practice Standards and Supporting Documents" > "Conservation Practice Standards & Support Documents"

207-Site Assessment and Soil Testing for Contaminants Activity	656-Constructed Wetland
216-Soil Health Testing	309-Agrichemical Handling Facility
217-Soil and Source Testing for Nutrient Management	311-Alley Cropping
309-Agrichemical Handling Facility	314-Brush Management
311-Alley Cropping	315-Herbaceous Weed Control
313-Waste Storage Facility	338-Prescribed Burning
316-Animal Mortality Facility	350-Sediment Basin
317-Composting Facility	351-Water Well Decommissioning
327-Conservation Cover	356-Dike
328-Conservation Crop Rotation	362-Diversion
329-Residue and Tillage Management, No Till/Strip Till/Direct Seed	367-Roofs and Covers
330-Contour Farming	378-Pond
332-Contour Buffer Strips	380-Windbreak/Shelterbelt Establishment
340-Cover Crop	381-Silvopasture Establishment
342-Critical Area Planting	382-Fence
345-Residue and Tillage Management, Reduced Till	402-Dam
355-Water Well Testing	422-Hedgerow Planting
360-Waste Facility Closure	430-Irrigation Pipeline
366-Anaerobic Digester	441-Irrigation System, Micro irrigation
386-Field Boarder	442-Sprinkler System
390-Riparian Herbaceous Cover	443-Irrigation System, Surface & Subsurface
391-Riparian Forest Buffer	462-Preision Land Forming
393-Filter Strip	464-Irrigation Land Leveling
395-Stream Habitat Improvement and Management	468-Lined Waterway or Outlet
410-Grade Stabilization Structure	484-Mulching
412-Grassed Waterway	511-Forage Harvest Management
436-Irrigation Reservoir	512-Forage and Biomass Planting
449-Irrigation Water Management	516-Livestock Pipeline
472-Access Control	558-Roof Runoff Structure
528-Prescribed Grazing	560-Access Road
561-Heavy Use Area Protection	574-Spring Development
575-Trails and Walkways	578-Stream Crossing
580-Streambank and Shoreline Protection	582-Open Channel
590-Nutrient Management	585-Stripcropping
600-Terrace	587-Structure for Water Control
601-Vegetative Barrier	595-Integrated Pest Management
612-Tree/Shrub Establishment	603-Herbaceous Wind Barriers
629-Waste Treatment	607-Surface Drain, Field Ditch
634-Waste Transfer	608-Surface Drain, Main or Lateral
635-Vegetative Treatment Area	614-Watering Facility
638-Water and Sediment Control Basin	620-Underground Outlet
632-Solid/Liquid Waste Separation Facility	650-Windbreak/Shelterbelt Renovation
642-Water Well	657-Wetland Restoration
643-Restoration and Management of Declining Habitats	658-Wetland Creation
644-Wetland Wildlife Habitat Mangement	659-Wetland Enhancement