Final Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies

Appendix B: Housatonic River Basin

Commonwealth of Massachusetts
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Massachusetts Department of Environmental Protection

The mission of the Massachusetts Department of Environmental Protection (MassDEP) is to protect and enhance the Commonwealth's natural resources – air, water, and land – to provide for the health, safety, and welfare of all people, and to ensure a clean and safe environment for future generations. In carrying out this mission MassDEP commits to address and advance environmental justice and equity for all people of the Commonwealth; provide meaningful, inclusive opportunities for people to participate in agency decisions that affect their lives; and ensure a diverse workforce that reflects the communities we serve.

Watershed Planning Program

The mission of the Watershed Planning Program (WPP) in the Massachusetts Department of Environmental Protection is to protect, enhance, and restore the quality and value of the waters of the Commonwealth. Guided by the federal Clean Water Act, WPP implements this mission statewide through five Sections that each have a different technical focus: (1) Surface Water Quality Standards; (2) Surface Water Quality Monitoring; (3) Data Management and Water Quality Assessment; (4) Total Maximum Daily Load; and (5) Nonpoint Source Management. Together with other MassDEP programs and state environmental agencies, WPP shares in the duty and responsibility to secure the environmental, recreational, and public health benefits of clean water for all people of the Commonwealth.

Acknowledgements

FB Environmental Associates, under contractual agreements with MassDEP, previously prepared two separate documents for the Watershed Planning Program: (1) *Massachusetts TMDL for Pathogen-Impaired Inland Fresh Water Rivers* and (2) *Massachusetts Statewide TMDL for Pathogen-Impaired Coastal Waterbodies*. MassDEP combined these two documents into a single statewide approach encompassing both inland fresh water and coastal impairments to prepare the *Final Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies*.

Disclaimer

References to trade names, commercial products, manufacturers, or distributors in this report constituted neither endorsement nor recommendations by the Massachusetts Department of Environmental Protection.

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1. Introduction

This appendix to the Massachusetts Statewide Total Maximum Daily Load (TMDL) for Pathogen-Impaired Waterbodies provides additional information to support the determination of the Total Maximum Daily Load (TMDL) for four pathogen-impaired river segments in the Housatonic River watershed (Figure 1-1). The core document and appendix together complete the TMDL for each of these pathogen-impaired river segments.

This appendix includes a description of the watershed and maps to identify the segments for the TMDLs; the Massachusetts Surface Water Quality Standards (SWQS, 314 CMR 4.00) water classification, impaired designated uses, qualifiers and the applicable water quality standards; the data supporting the pathogen impairment determination; and a description of the sources of pathogen loading with supporting maps. For water quality data, the Method Detection Limit (MDL) is reported and used for values below the MDL when calculating geometric means.

This appendix includes a summary of the allocation of the current indicator bacteria load into two categories: point sources (waste load allocation, WLA) and nonpoint sources (load allocation, LA), based on an analysis of watershed percent impervious cover. This appendix also identifies the percent reduction in indicator bacteria pollutant load from current conditions required to meet the TMDL, based on the highest levels of indicator bacteria recorded in the monitoring data. Refer to Table 1-1.

Finally, for each impaired segment, this appendix presents existing local management efforts to reduce pathogen pollutant loading. General recommended next steps for implementation of this TMDL are provided in the Housatonic River Watershed Overview section.

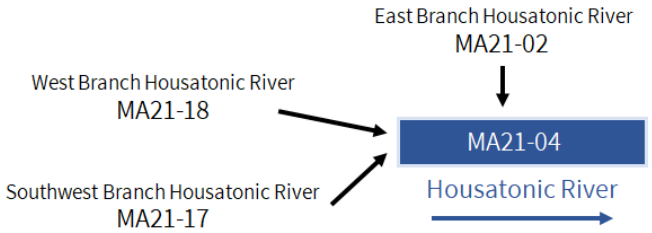


Figure 1-1. Conceptual diagram of water flow routing through the Housatonic River watershed for the 4 pathogen-impaired river segments. The mainstem Housatonic River is highlighted in blue. Tributary segments to the major rivers are shown with arrows to the blue mainstem. Not to scale.

Table 1-1. ***E. coli*** Total Maximum Daily Loads (TMDLs), the percent reductions needed to meet the TMDL target (126 CFU/100ml) based on the Massachusetts Surface Water Quality Standards (SWQS), and the flow-based TMDL allocations for pathogen-impaired **freshwater** assessment units in the Housatonic River Basin

Waterbody & Assessment Unit	Class (Qualifier)	TMDL Type	SWQS-Based TMDL target (CFU/100ml)	Maximum Geomean (CFU/100ml)	Geomean Percent Reduction	TMDL Allocation	*Flow (cfs)* 1	10	100	1,000	10,000	100,000
							Flow-Based Target TMDL (CFU/day*10^9)					
East Branch Housatonic River		R	126	328	62%	WLA (7%)	0.2	2.1	20.6	205.8	2,058.5	20,584.8
MA21-02	B (WW)			(90 day)		LA (93%)	2.9	28.8	287.7	2,876.8	28,768.3	287,683.2
Housatonic River		R	126	536	76%	WLA (6%)	0.2	1.8	17.6	176.2	1,762.3	17,623.4
MA21-04	B (WW)			(30 day)		LA (94%)	2.9	29.1	290.6	2,906.4	29,064.5	290,644.6
Southwest Branch Housatonic River		R	126	1,586	92%	WLA (5%)	0.2	1.5	15.5	154.6	1,545.6	15,456.1
MA21-17	B (CW, HQW)			(90 day)		LA (95%)	2.9	29.3	292.8	2,928.1	29,281.2	292,811.9
West Branch Housatonic River		R	126	314	60%	WLA (6%)	0.2	2.0	19.7	196.9	1,968.7	19,687.3
MA21-18	B (CW, HQW)			(90 day)		LA (94%)	2.9	28.9	288.6	2,885.8	28,858.1	288,580.7

Table 1-2. **Enterococci** Total Maximum Daily Loads, the percent reductions needed to meet the TMDL target (35 CFU/100ml) based on the Massachusetts Surface Water Quality Standards (SWQS), and the flow-based TMDL allocations for pathogen-impaired **freshwater** assessment units in the Housatonic River Basin

Waterbody & Assessment Unit	Class (Qualifier)	TMDL Type	SWQS-Based TMDL target (CFU/100ml)	Maximum Geomean (CFU/100ml)	Geomean Percent Reduction	TMDL Allocation	*Flow (cfs)* 1	10	100	1,000	10,000	100,000
							Flow-Based Target TMDL (CFU/day*10^9)					
East Branch Housatonic River		P	35	NA	-	WLA (7%)	0.1	0.6	5.7	57.2	571.8	5,718.0
MA21-02	B (WW)					LA (93%)	0.8	8.0	79.9	799.1	7,991.2	79,912.0
Housatonic River		P	35	NA	-	WLA (6%)	-	0.5	4.9	49.0	489.5	4,895.4
MA21-04	B (WW)					LA (94%)	0.8	8.1	80.7	807.3	8,073.5	80,734.6
Southwest Branch Housatonic River		P	35	NA	-	WLA (5%)	-	0.4	4.3	42.9	429.3	4,293.4
MA21-17	B (CW, HQW)					LA (95%)	0.8	8.1	81.3	813.4	8,133.7	81,336.6
West Branch Housatonic River		P	35	NA	-	WLA (6%)	0.1	0.5	5.5	54.7	546.9	5,468.7
MA21-18	B (CW, HQW)					LA (94%)	0.8	8.0	80.2	801.6	8,016.1	80,161.3

Class *defined in the Massachusetts Surface Water Quality Standards (SWQS) at 314 CMR 4.02.*
Qualifiers *that identify segments with special characteristics are defined at 314 CMR 4.06(1)(d).*
- ***CW*** *= Cold Water; waters that meet the cold water fisheries (CWF) definition at 314 CMR 4.02 and are subject to CWF dissolved oxygen and temperature criteria*
- ***HQW*** *= High Quality Water; waters designated for protection under 314 CMR 4.04(2)*
- ***WW*** *= Warm Water; waters that meet the warm water fisheries (WWF) definition at 314 CMR 4.02 and are subject to WWF dissolved oxygen and temperature criteria*

Pathogen bacteria units are presented in colony-forming units or CFU.
TMDL Type *identifies the restorative or protective action approach:*
- ***R*** *= Restorative TMDL addressing a pathogen impairment identified in the 2018/2020 Integrated List of Waters*
- ***R**** *= Restorative TMDL addressing a historic impairment of former indicator bacteria for which no current applicable criteria are available. See Section 2.3 of the core document for summary of water quality criteria and designated uses.*
- ***P*** *= Protective TMDL addressing all applicable uses, regardless of impairment status, for the associated pathogen (refer to the Massachusetts SWQS: 314 CMR 4.00)*

Target TMDL or Total Maximum Daily Load is presented as both SWQS-Based and Flow-Based.
- ***SWQS-Based TMDL Target*** *is the target concentration applicable to the TMDL pollutant indicator bacteria based on the Surface Water Quality Standards (314 CMR 4.00).* ***Flow-Based Target TMDL*** *is the target concentration (CFU/100mL) multiplied by the standard flow volume (cubic feet per second or cfs). See Section 4.2.2 in core document for full equation and conversion factors.*

Maximum Geomean *is the highest calculated 30- or 90- day rolling geometric mean for TMDL pollutant indicator bacteria associated with the segment.*
Geomean Percent Reduction *is the percent reduction from the highest calculated 30- or 90- day rolling geomean needed to achieve the target concentration. Percent reductions are for planning purposes only.*

2. Housatonic River Watershed Overview

The entire Housatonic River watershed covers an area of approximately 545 square miles in southwestern Massachusetts (Figure 2-1). The Housatonic River begins at the confluence of the West and Southwest branches in Clapp Park, Pittsfield, MA. Another major tributary, the East Branch Housatonic River, joins the Housatonic River at Fred Garner Park in Pittsfield (MassDEP, 2007). Large portions of these three tributaries and the mainstem of the Housatonic River are pathogen-impaired. Within the pathogen-impaired watersheds, there are 50 named rivers, approximately 161 named river miles; many smaller unnamed rivers; and 34 named lakes, ponds, and impoundments (USGS, 2019).

The Southwest Branch Housatonic River begins along the border of Richmond and Pittsfield at the outlet of Richmond Pond and flows generally northeast. The Southwest Branch watershed drains 24 square miles, flowing about six miles before meeting the Housatonic River in Pittsfield. There is one pathogen-impaired river segment in the Southwest Branch Housatonic River watershed.

The West Branch Housatonic River begins in Lanesborough at the outlet of Pontoosuc Lake and flows generally south. The West Branch watershed drains 37 square miles, flowing about 4 miles before meeting the Housatonic River in Pittsfield. There is one pathogen-impaired river segment in the West Branch Housatonic River watershed.

The East Branch Housatonic River begins on the border of Washington and Hinsdale at the outlet of Muddy Pond and flows generally southwest. The East Branch watershed drains 71 square miles, flowing about 8 miles before meeting the Housatonic River in Pittsfield. The East Branch Housatonic River has historically been used for waterpower and contains many impoundments and hydroelectric dams. Power was still generated in 2002 by the Pittsfield Development Authority (formerly known as the General Electric Company) (MassDEP, 2007). There is one pathogen-impaired river segment in the East Branch Housatonic River watershed.

The Housatonic River flows approximately 150 miles to the south from Pittsburg through Massachusetts and Connecticut before discharging into the Long Island Sound near Bridgeport, CT. Of the total 150 miles, the Housatonic River flows approximately 54 miles within Massachusetts. The Housatonic River watershed has been characterized by its many dams and consequent flow alterations in addition to many withdrawals and inputs (MassDEP, 2007). Within the pathogen-impaired segment watersheds (described in detail in the following sections), there are three active NPDES major and/or minor permits for wastewater discharge to surface waters along the Housatonic River (2) and East Branch Housatonic River (1). A portion of the Housatonic River in Connecticut is being considered by the National Park Service for designation under the Wild and Scenic Rivers Act (NWSRS, 2020).

The pathogen-impaired portion of the Housatonic River watershed overlaps at least partially with 13 municipalities. Of these, 10 were identified as being direct sources of pathogen loading to the impaired river segments in this TMDL. The efforts of these municipalities contributing to pollutant loading are described in the segment-specific sections below. For each segment, the cities and towns that contain or border the impaired segment were identified. Towns comprising more than 10% of the impaired stream segment's sub-basin (that portion of its watershed not shared with upstream segments) were also included. In addition, towns which may not meet the above characteristics, but which have land area in the sub-basin near the impaired segment (e.g., Town of Lenox for the Housatonic River segment MA21-04), were included on a case-by-case basis. See Figure 2-1 for a map showing pathogen-impaired segments and municipalities.

Many municipalities operate and maintain municipal separate storm sewer systems (MS4s) in urban areas. These networks of drains and pipes convey polluted runoff from streets and developed areas to streams. In addition, these networks are sometimes subject to direct wastewater inflows through illegal cross-connections, leaks from sewer pipes or septic systems, dumping, or other unauthorized wastewater sources, and together these sources are termed illicit discharges.

EPA and MassDEP jointly issued the General Permits for Stormwater Discharges from MS4s, which became effective July 1, 2018. Communities that discharge to pathogen-impaired waterbodies with approved TMDLs are required to implement enhanced best management practices (BMPs) for public education and designate the

catchments as Problem Catchments or High Priority under the Illicit Discharge Detection and Elimination (IDDE) Program, in addition to the requirement to reduce pollutants to the Maximum Extent Practicable (USEPA, 2020; Appendix F).

In addition to municipalities, there is one Regional Planning Agency (RPA) in the Housatonic River watershed, the Berkshire Regional Planning Commission. These are public organizations advising municipalities, private business groups, and state and federal governments on a range of matters. Their research, coordination, and technical assistance is especially valuable on watershed issues such as pathogen pollutants and stormwater that cross town boundaries.

- Berkshire Regional Planning Commission (BRPC), http://www.berkshireplanning.org/ (BRPC, 2020)

The following RPA initiatives and tools are especially noteworthy:

- There are regional stormwater coalitions within some RPAs, and these are noted in the segment-specific sections below.

Beyond these activities, the Massachusetts Statewide Municipal Stormwater Coalition (MSMSC), composed of about 10 stormwater groups around the state, further coordinates with and assists municipalities on pathogen pollutant concerns in the “Think Blue” campaign. (Think Blue Massachusetts, 2019).

Additional watershed scale initiatives are carried out by several organizations including:

The **Housatonic Valley Association (HVA)** developed a Housatonic River Paddle Guide, https://hvatoday.org/ (HVA, 2020).

The **Riverways Instream Flow Stewards (RIFLS),** https://eeaonline.eea.state.ma.us/DFG/RIFLS/#/home (MassDER, 2016)

Great Barrington Housatonic River Walk from the Great Barrington Land Conservancy, https://gbriverwalk.org/ (GBLC, 2020)

Massachusetts Watershed Coalition, http://www.commonwaters.org/ (MWC, 2020)

Upper Housatonic Valley Natural Heritage Area, https://housatonicheritage.org/ (HH, 2020)

The following actions will help reduce pathogen loads to the streams. The list is a starting point and is not comprehensive. For a more detailed discussion of pollutant reduction actions, see Section 5 “Implementation” of the core TMDL document.

- Collect additional water quality data for all segments for which existing data are all older than five years.
- **Municipalities:** Continue to implement requirements of the MS4 permit, which includes specific requirements for waterbodies with an approved Bacteria/Pathogen TMDL, such as prioritization and reporting, enhanced BMPs, IDDE work, and education (USEPA, 2020).
- **Regional Planning Agencies (RPAs) and municipalities:** Continue and expand collaboration on MS4 and stormwater issues. Cooperatively developing tools and sharing knowledge has many advantages, including reduced costs, increased innovation, and more consistent and effective stream restoration efforts at the watershed scale.
    - Two tools developed by Metropolitan Area Planning Council (MAPC) are potentially valuable in all MS4 communities in the state. Municipalities and other RPAs (with permission from MAPC) should consider adapting and/or expanding on these tools in their area:
        - Stormwater Utility/Funding Starting Kit (MAPC, 2014).
        - MAPC and the Neponset River Watershed Association created a GIS toolkit to calculate MS4 outfall catchments, which is a requirement under the MS4 General Permit (MAPC, 2018).
- **USDA NRCS and landowners:** Develop comprehensive nutrient management plans for agriculture, using local connections to farmers for outreach.
- **Parks departments, schools, private landowners, and others** who maintain large, mowed fields with direct access to water should consider maintaining a vegetative buffer along the water’s edge. Buffers

slow and filter stormwater runoff, provide a visual screen that can reduce large aggregations of waterfowl, and have many other water quality benefits at low cost.

MassDEP Technical and Planning Support for the Implementation of Pathogen and Total Nitrogen Pollution Reduction in the Housatonic River Watershed

In April 2022, MassDEP supported a planning project that prioritized and ranked stormwater catchments for pathogen and nutrient removal within the Housatonic River Watershed. The project characterized the watershed through geographic data analysis and explored potential pollutant removal scenarios with the EPA OptiTool. Based on the results of the analysis, communication with municipal staff, and site investigations, the project team identified a list of potential sites for the development stormwater control mechanism (SCM) retrofit opportunities. Concept designs were then developed for 10 sites across the municipalities of Dalton, Lanesborough, and Pittsfield. The preliminary designs were presented to the municipalities and the Berkshire Environmental Action Team (BEAT), Berkshire Regional Planning Commission (BRPC), and Housatonic Valley Association (HVA).

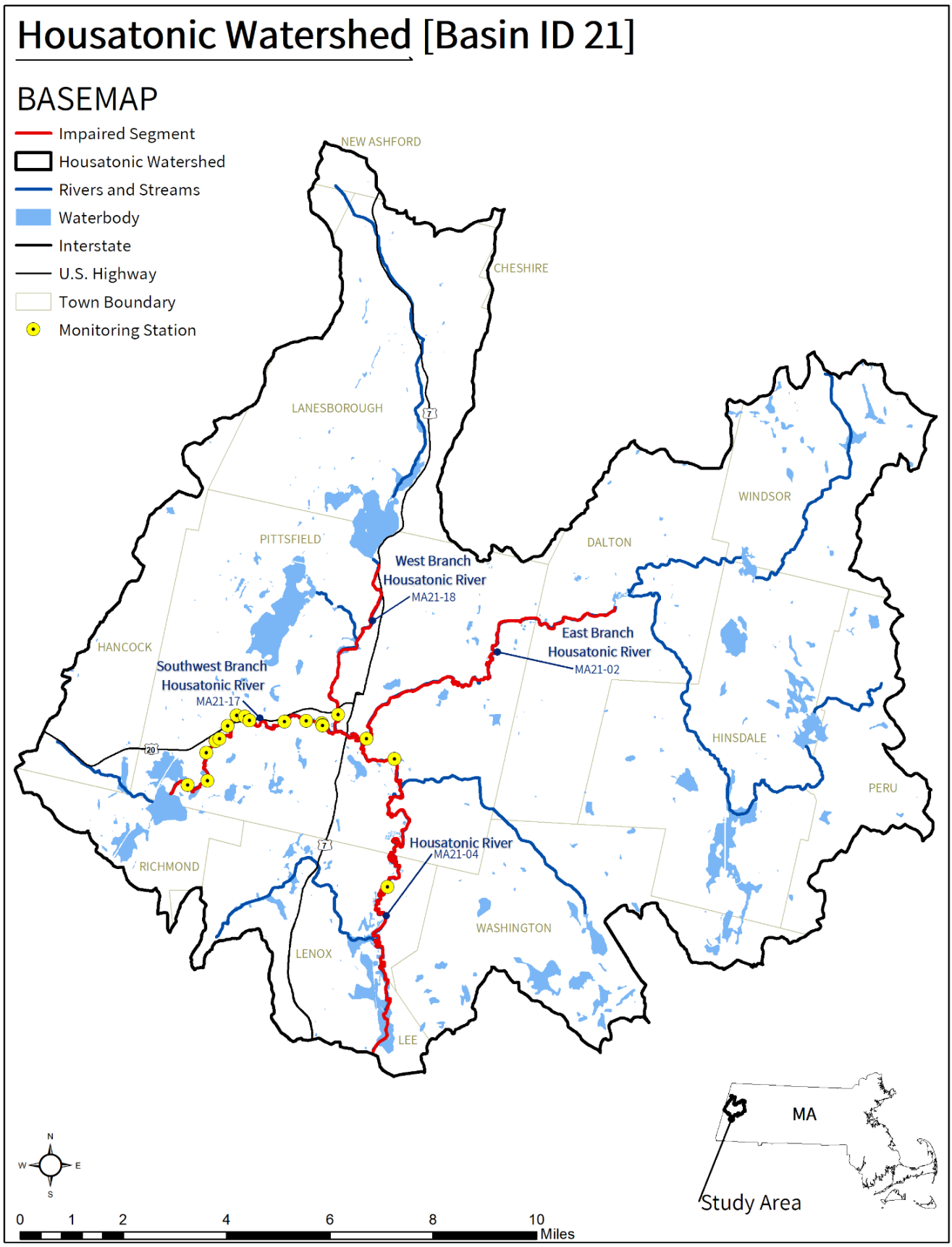


Figure 2-1: Map of all pathogen-impaired river segments, water quality monitoring stations, municipal borders, waterbodies, and roads in the Housatonic River watershed.

3. MA21-02 East Branch Housatonic River

3.1. Waterbody Overview

The East Branch Housatonic River segment MA21-02 is 8 miles long and begins at the outlet of Center Pond in Dalton, MA. The segment flows southwest to end at its confluence with the Housatonic River in Pittsfield, MA.

Tributaries to the East Branch Housatonic River segment MA21-02 includes an unimpaired section of the East Branch Housatonic River, Walker Brook, Barton Brook, Unkamet Brook, Brattle Brook, and other unnamed streams. Named lakes and ponds within the watershed include Ashmere Lake, the Cleveland Brook Reservoir, Plunkett Reservoir, Muddy Pond, Belmont Reservoir, Fernwood Reservoir, Windsor Reservoir, and others.

Key landmarks in the watershed include the town centers of Hinsdale, Dalton, and Pittsfield, along with the Wahconah Country Club and golf course, the Allendale Shopping Center, and residential neighborhoods of Pittsfield between Elm Street and Pomeroy Avenue. The segment is crossed by West Housatonic Street and South Street in Dalton; and Hubbard Avenue, East Street, Newell Street, Lyman Street, Elm Street, Pomeroy Avenue, and Dawes Avenue in Pittsfield.

The East Branch Housatonic River (MA21-02) drains an area of 71 square miles, of which 5 mi^2 (7%) is impervious and 3 mi^2 (4%) is directly connected impervious area (DCIA). The watershed is partially[1] served by public sewer and 18% is subject to stormwater regulations under the NPDES General MS4 Stormwater Permit (USEPA, 2020). There is one NPDES permit on file governing point source discharges of pollutants to surface waters within the direct drainage area to the watershed (Table 3-1) but no MassDEP discharge to groundwater permit for on-site wastewater discharge within the watershed. There are five NPDES industrial stormwater discharge permits in the segment watershed (Table 3-2). There are also no combined sewer overflows, five landfills, and no unpermitted land disposal dumping grounds within the segment watershed. See Figure 3-1.

Reduction from Highest Calculated Geomean: 62%

Watershed Area (Acres): 45,344

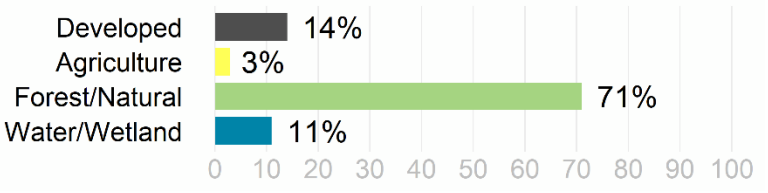
Segment Length (Miles): 8.0

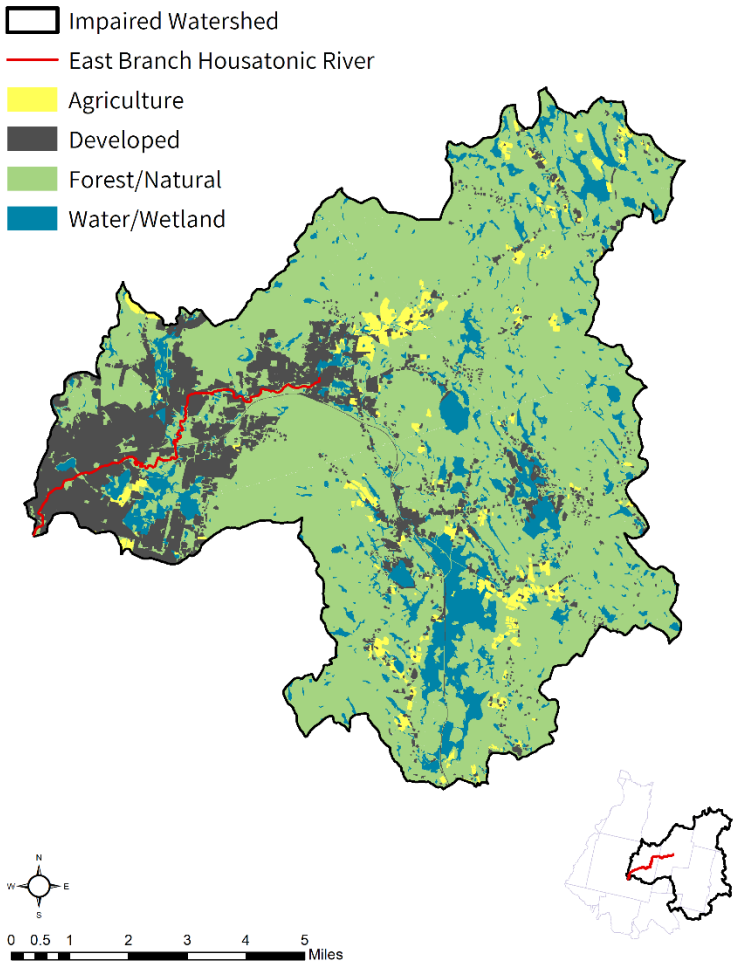
Impairment(s): *E. coli*, fecal coliform (Primary Contact Recreation)

Class (Qualifiers): B (Warm Water)

Impervious Area (Acres, %): 3,028 (7%)

DCIA Area (Acres, %): 1,744 (4%)





[1] Estimated percentage of developed areas with wastewater infrastructure in the watershed was based on available information: MWRA service areas, MassDEP's Water Utility Infrastructure Mapping Project https://www.mass.gov/guides/water-utility-resilience-program (MassDEP, 2020), MS4 reports, and local knowledge.

Table 3-1. National Pollutant Discharge Elimination System (NPDES) permits for Wastewater Treatment Facilities (WWTF) in the segment watershed. Only permits unique to this segment watershed are shown. WWTF are identified as either municipal (MUN) or other (OTH), if applicable.

NPDES ID	NAME	TOWN	WWTF
MA0000671	CRANE & CO INC WWTP	PITTSFIELD	OTH

Table 3-2. National Pollutant Discharge Elimination System (NPDES) permits for Industrial Stormwater in the segment watershed. Only permits within this watershed are listed.

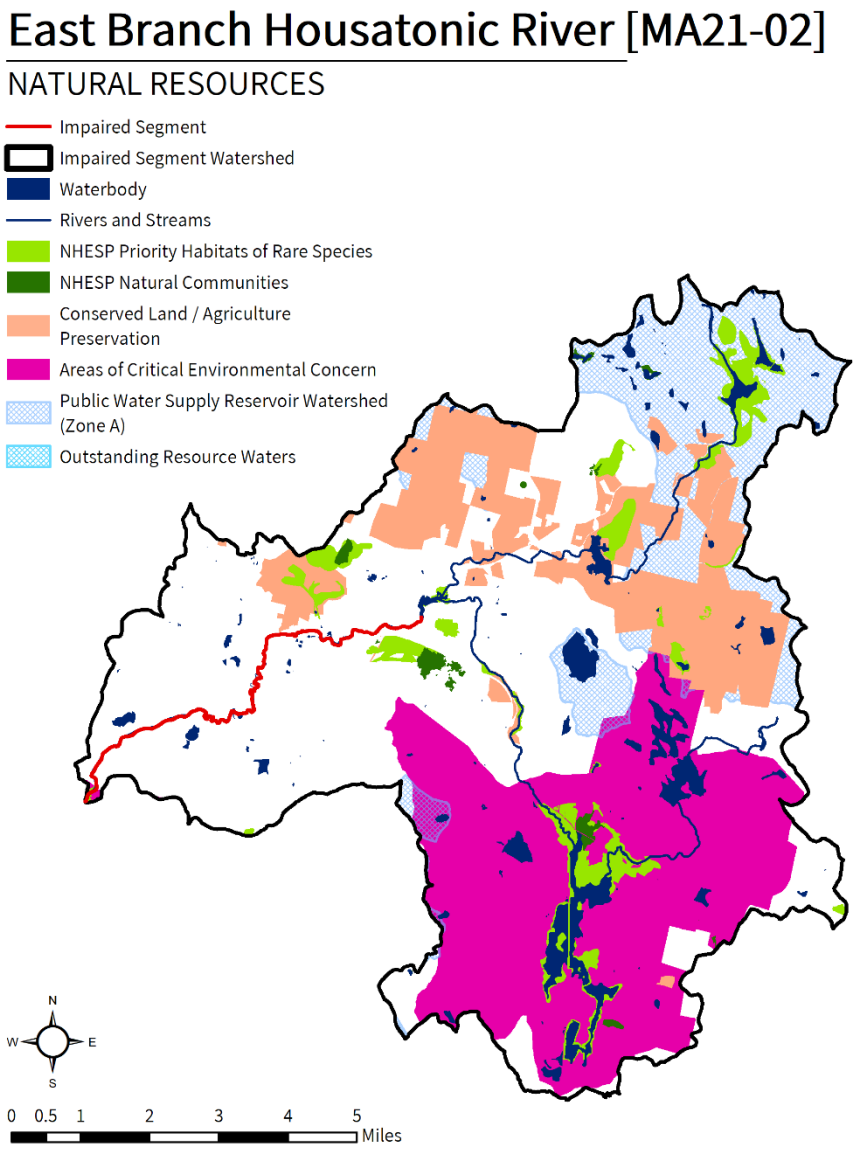
NPDES ID	NAME	TOWN
MA0000671	CRANE & CO INC WWTP	PITTSFIELD
MA0003891	GENERAL ELECTRIC PITTSFIELD	PITTSFIELD
MA0040312	PITTSFIELD SAND & GRAVEL	PITTSFIELD
MA0000671	CRANE & CO INC WWTP	PITTSFIELD
MA0003891	GENERAL ELECTRIC PITTSFIELD	PITTSFIELD

The East Branch Housatonic River (MA21-02) watershed is predominantly forested (71% of land use); however, the developed areas (14%) are concentrated around the segment itself. Portions of Cleveland Brook and the East Branch Housatonic River upstream of Center Pond (where the segment begins) flows through a golf course which has little to no wooded buffer around the stream. The segment flows through medium density mixed residential and commercial areas in downtown Dalton, then a commercial district with expansive parking lots near the MA-9/MA-8 intersection in Pittsfield, MA. The downstream portions of the segment flow through areas of dense residential development, open recreational fields, and additional commercial districts in Pittsfield.

In the East Branch Housatonic River (MA21-02) watershed, under the Natural Heritage and Endangered Species Program, there are 2,686 acres (6%) of Priority Habitats of Rare Species and 279 acres (1%) of Priority Natural Vegetation Communities. There are 10,436 acres (23%) under Public Water Supply protection and 14,057 acres (31%) of Areas of Critical Environmental Concern in the watershed. Over 6,927 acres (15%) of land protected in perpetuity[2] exist within the segment watershed, which is part of a total of 17,248 acres (38%) of Protected and Recreational Open Space[3]. See Figure 3-1.

[2] Land protected in perpetuity include several interests such as conservation restriction, agricultural preservation, private deed restrictions, wetland restrictions, aquifer protection, historic preservation, etc. Refer to Mass GIS metadata for the Protected and Recreational Open Space data layer.

[3] Only land protected in perpetuity is shown on the natural resources map. Protected and Recreational Open Space estimates reflect areas in the State of Massachusetts only (and thus reflect only a portion of the total open space for watersheds that extend outside the State of Massachusetts).



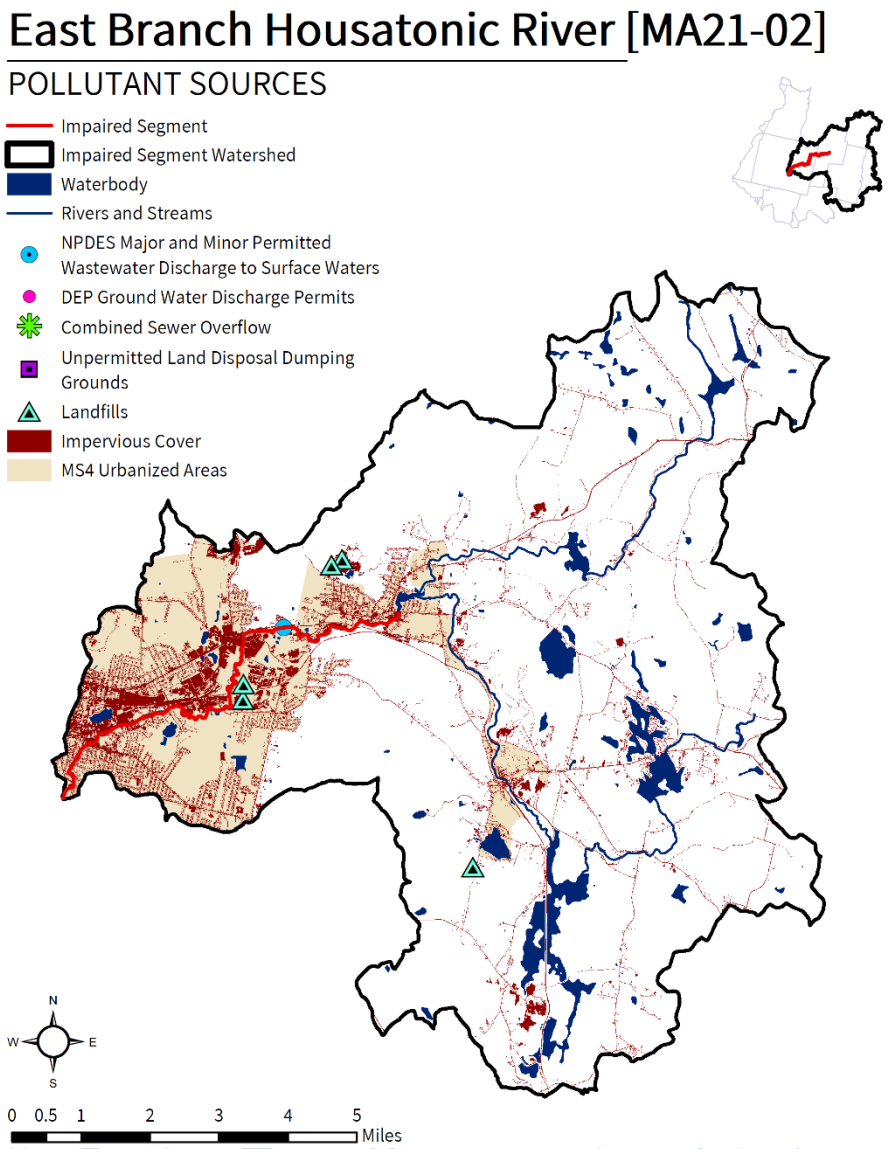


Figure 3-1. Natural resources and potential pollution sources draining to the East Branch Housatonic River segment MA21-02. The map on the left shows critical habitat, water features, and conserved land. The map on the right indicates potential and known pollution sources, including impervious cover, MS4 areas, and permitted facilities.

3.2. Waterbody Impairment Characterization

The East Branch Housatonic River (MA21-02) is a Class B, Warm Water (MassDEP, 2021).

The Primary Contact Recreation use was assessed for attainment of SWQS using the indicator bacteria *E. coli* at the station listed below (refer to Tables 3-3, 3-4; Figure 3-2). Data were evaluated against the SWQS geomean criterion of 126 CFU/100 mL for *E. coli* indicator bacteria and the Statistical Threshold Value (STV) criterion of 410 CFU/100 mL for *E. coli*. The geomean and STV criteria for the impaired segment apply to data on a year-round, 90-day rolling basis.

- In 2007, five samples were collected at W1107, resulting in two days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of five samples, one exceeded the STV criterion during dry weather.

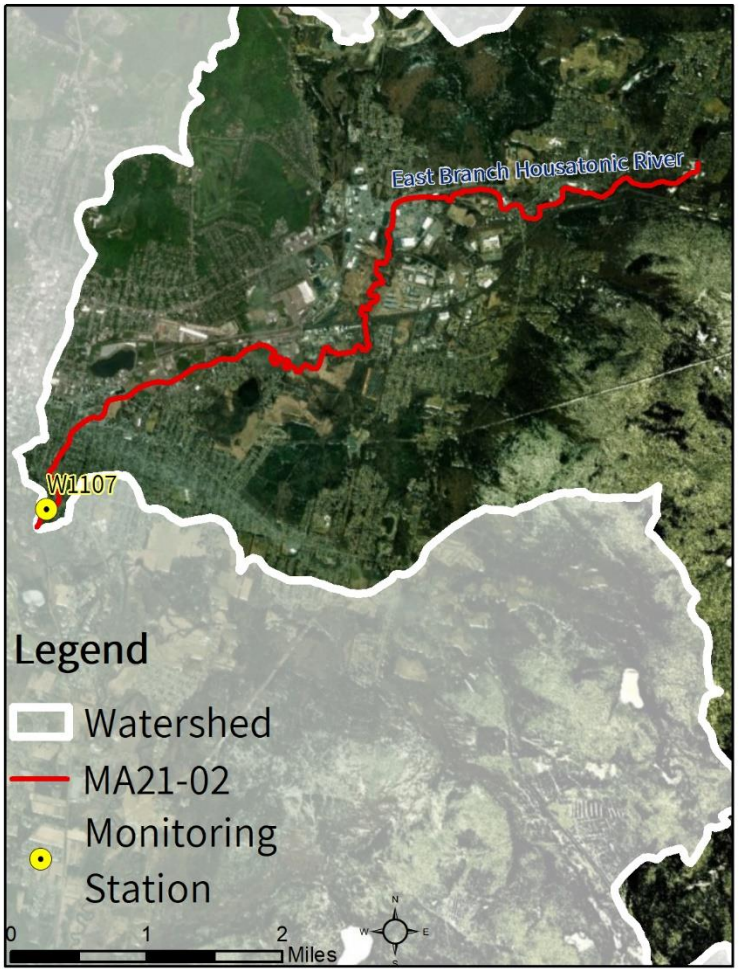


Figure 3-2. Location of monitoring station(s) along the impaired river segment.

Table 3-3. Summary of indicator bacteria sampling results by station for the East Branch Housatonic River (MA21-02). The maximum 90-day rolling geometric mean (geomean), the number of days exceeding the geomean criterion of 126 CFU/100 mL for *E. coli* indicator bacteria, and the number of single samples exceeding the Statistical Threshold Value (STV) criterion of 410 CFU/100 mL for *E. coli* indicator bacteria are shown. The STV criterion is applied to the single sample results if less than 10 samples were collected within a calendar year at a site. The highest maximum 90-day rolling geomean of the sites is used to calculate the percent load reduction required to meet SWQS.

Unique Station ID	First Sample	Last Sample	Count	Maximum 90-Day Rolling Geomean (CFU/100mL)	Number Geomean Exceedances	Number STV Exceedances
W1107	5/8/2007	9/25/2007	5	328	2	1

Table 3-4. Indicator bacteria data by station, indicator, and date for the East Branch Housatonic River (MA21-02). Each sample date was designated wet or dry weather with wet weather defined as more than 0.5 inches of precipitation in the previous 72 hours. Red text highlights criteria exceedances of 410 CFU/100 mL (applied to single-sample "Result" since there were no more than 10 samples in a year to calculate the Statistical Threshold Value or STV) and 126 CFU/100 mL (applied to rolling 90-day geomean) for *E. coli* indicator bacteria.

Unique Station ID	Indicator	Date	Wet/Dry	Result (CFU/100mL)	90-Day Rolling Geomean (CFU/100mL)	90-Day Rolling STV (CFU/100mL)
W1107	*E. coli*	5/8/2007	DRY	22	22	
W1107	*E. coli*	6/12/2007	WET	368	90	
W1107	*E. coli*	7/17/2007	DRY	200	117	
W1107	*E. coli*	8/21/2007	DRY	480	328	
W1107	*E. coli*	9/25/2007	DRY	160	249	

3.3. Potential Pathogen Sources

Comparing data collected during wet weather versus dry weather conditions provides an indication of the types of sources present and information that can be used to focus pollutant reduction activities. Pathogen levels (as estimated by indicator bacteria) are usually higher in wet weather conditions as storm sewer systems overflow and/or stormwater runoff carries fecal matter that has accumulated on the landscape to the river via overland flow and stormwater conduits. Wet weather sources include wildlife and domesticated animal waste (including pets), urban stormwater runoff (including MS4 areas), CSOs, and SSOs. In other cases, dry weather pathogen and associated indicator bacteria concentrations can be high when there is a constant flow of pollutants during dry weather, which then becomes diluted during periods of precipitation. Dry weather sources include leaking sewer pipes, illicit connections of sanitary sewers to storm drains, failing septic systems, recreational use (such as swimmers), and direct wildlife and domesticated animal waste (including pets).

The indicator bacteria data for the East Branch Housatonic River (MA21-02) were elevated during dry weather. Given the relatively small sample set, additional sampling under both wet and dry conditions, ideally at more than one location, would likely help to identify pollutant sources. Elevated indicator bacteria during dry weather suggest that baseflow sources, such as leaking pipes, illegal cross connections, other illicit discharges, and failing septic systems, are likely to be major sources of pathogens.

Each potential pathogen source is described in further detail below.

Urban Stormwater: Portions of the watershed are heavily developed and include the town centers of Dalton and Pittsfield. The watershed has 18% of land area in MS4 and 4% as DCIA. The developed areas within the watershed include many areas of high density mixed residential, commercial, and industrial development. Stormwater runoff from urban areas is likely a major source of pathogens.

Illicit Sewage Discharges: Most of the downstream portion of the watershed is served by public sewer. Sewer related risks include leaking infrastructure (pipes, pump stations, etc.) and sanitary sewer overflows, which may be caused by undersized infrastructure, blockages, or excessive infiltration of groundwater or rainwater into pipes, exceeding system capacity. Illicit connections of wastewater to stormwater drains are also a risk.

On-Site Wastewater Disposal Systems: Nearly all development in the upstream portions of the watershed relies on septic systems for wastewater treatment. It is likely that a portion of septic systems are not being properly maintained and are discharging untreated effluent to groundwater.

Agriculture: Agricultural activities account for 3% of the total land use area within the watershed. Those visible on recent aerial photos include open fields, hayfields, row crops, and pastureland. Agricultural activities related to manure storage and spreading, if not well managed, are a possible source of pathogens to waterbodies.

Pet Waste: There are many conservation and recreational lands, parks, ballfields, and dense residential neighborhoods near or along the segment which may be popular for dog-walking. These areas, especially where paths are adjacent to rivers, ponds, or wetlands, represent a possible source of pathogens from pet waste.

Wildlife Waste: There are large open recreational fields along the river between Newell and Elm streets in Pittsfield, and many high-density residential neighborhoods further downstream. Just upstream of the segment, the river flows through a golf course which in places has no wooded buffer around the river channel. Large open mowed areas such as conservation and recreational lands, fields, golf courses, and wetlands with a clear sightline to a waterbody may attract excessive waterfowl and elevate indicator bacteria counts in the water.

3.4. Existing Local Management

This section identifies the municipalities immediately surrounding the impaired segment and its sub-basin. For a complete view of upstream municipalities and waterbodies, see the map in Figure 2-1.

City of Pittsfield

Most of Pittsfield is subject to stormwater regulations under the NPDES General MS4 Stormwater Permit. Pittsfield (Permit ID #MAR041018) has an EPA approved Notice of Intent (NOI). The town does not have a Stormwater Management Plan. The town has mapped all of its stormwater outfall system, available online at https://arcg.is/1OSTCa. (City of Pittsfield, 2019). The town adopted illicit discharge detection and elimination (IDDE), erosion and sediment control (ESC), and post-construction stormwater regulations in 2008. According to the NOI, there are 67 stormwater outfalls into the pathogen-impaired East Branch Housatonic (MA21-02); 84 stormwater outfalls into the pathogen-impaired West Branch Housatonic (MA21-18); 42 stormwater outfalls into the pathogen-impaired Housatonic River (MA21-04); and 42 stormwater outfalls into the pathogen-impaired Southwest Branch Housatonic River (MA21-17).

Pittsfield has the following ordinances and bylaws:

- Stormwater Ordinance: https://ecode360.com/30744151 (City of Pittsfield, n.d., a)
- Pittsfield does not have any supplementary regulations beyond the MassDEP regulations for wetland protection.
- Title 5 Supplementary Regulations: None found.
- Stormwater Utility: None found.
- Pet Waste: https://ecode360.com/15966545 (City of Pittsfield, n.d., b)

The Pittsfield Master Plan has a Water Resources section in Chapter 6 – Open Space and Recreation and Natural Resource Protection – which includes information on surface waters, wetlands, groundwater, and floodplains (City of Pittsfield, 2009). One of the three goals of the Master Plan -- to promote sustainable practices in all development projects -- incorporates reducing stormwater runoff. The plan also mentions the Housatonic River throughout the Natural Resources chapter. In the Public Facilities chapter, the plan explains that the urbanized areas of Pittsfield comply with stormwater management regulations under Phase II of the NPDES program. Approximately 95% of Pittsfield residents have access to the sanitary sewer service.

Town website: https://www.cityofpittsfield.org/ (City of Pittsfield, 2020)

Master Plan:
https://www.cityofpittsfield.org/city_hall/community_development/planning_and_development/master_plan.php
(City of Pittsfield, 2009)

Stormwater page: https://ecode360.com/30744151 (City of Pittsfield, n.d., a.)

Open Space and Recreation Plan:
https://www.cityofpittsfield.org/city_hall/community_development/open_space_program/docs/Final%20OSRP.pdf (City of Pittsfield and BRPC, 2009)

Town of Dalton

Approximately 10% of Dalton is subject to stormwater regulations under the NPDES General MS4 Stormwater Permit. Dalton (Permit ID #MAR041004) has an EPA approved Notice of Intent (NOI). Dalton has a webpage (link below) dedicated to stormwater management and has mapped all of its MS4 stormwater systems. Dalton adopted illicit discharge detection and elimination (IDDE) in 2007, as well as erosion and sediment control (ESC)

and post-construction stormwater regulations in 2006. There are 48 stormwater outfalls to the East Branch Housatonic River (MA21-01) (formerly impaired due to fecal coliform, now in attainment), 56 stormwater outfalls to the pathogen-impaired East Branch Housatonic River (MA21-02), and 8 stormwater outfalls to Waconah Falls Brook.

Dalton stormwater management program: https://dalton-ma.gov/wp-content/uploads/2020/09/Dalton-Final-2019-SWMP.pdf (Town of Dalton, 2019)

Dalton has the following relevant ordinance and bylaw:

- Stormwater Management and Erosion Control: Chapter 280 https://ecode360.com/9537082
- Title V Supplemental Regulations: None found.
- Stormwater Utility: None found.
- Pet Waste Ordinance: None found.

The Town of Dalton has a Master Plan that mentions stormwater and has a section dedicated to water under the Environmental Inventory as well as a section dedicated to Open Space and Recreation.

- Town website: https://dalton-ma.gov/
- Master Plan: https://dalton-ma.gov/wp-content/uploads/2019/07/Final_Dalton_Master_Plan_160720_Compressed.pdf (Town of Dalton and BRPC, 2016)

Town of Hinsdale

A small portion of Hinsdale falls within the MS4 study area, and the town was granted a MS4 General Permit waiver by the EPA.

Hinsdale has the following relevant ordinances and bylaws:

- Hinsdale does not have any supplementary regulations beyond the MassDEP regulations for stormwater management or wetland protection.
- Title V Supplemental Regulations: None found.
- Stormwater Utility: None found.
- Pet Waste Ordinance: None found.

The Town of Hinsdale Master Plan provides information on town water resources in the Natural Resources chapter, starting on page 9-2 (Town of Hinsdale and BRPC, 2017). Stormwater is specifically mentioned as a threat to the quality of the town water supply. The plan provides information on the town sewer in the Infrastructure chapter. The Hazard Mitigation plan notes the town's plans to develop a stormwater mitigation plan, though no stormwater management ordinance has been adopted.

Town website: https://www.hinsdalemass.com/ (Town of Hinsdale, 2020)

Master Plan (draft): https://docs.wixstatic.com/ugd/f35351_1f630cf701794133ba015362702c367d.pdf (Town of Hinsdale and BRPC, 2017)

Hazard Mitigation Plan: https://docs.wixstatic.com/ugd/b84944_2cd3f9862ae94ea7becaca63471744a0.pdf (Town of Hinsdale, 2019)
Open Space and Recreation Plan:
https://docs.wixstatic.com/ugd/c1f318_ee15a042a066459eb692c5ae6151b326.pdf (Town of Hinsdale and BRPC, 2018)

Town of Peru

Peru is not within the MS4 area.

Peru has the following relevant ordinances and bylaws:

- Wetlands bylaw: https://www.townofperuma.com/sites/g/files/vyhlif3671/f/pages/town_of_peru_general_by_laws-_as_amended_through_september_14._2018_pdf.pdf (Town of Peru, 2018)
- Article 19 Animal Control bylaw, Section II part C https://www.townofperuma.com/sites/g/files/vyhlif3671/f/pages/town_of_peru_general_by_laws-_as_amended_through_september_14._2018_pdf.pdf (Town of Peru, 2018)

Peru does not have a Master Plan available.
Peru does not have an Open Space and Recreation Plan available.

Town of Windsor

Windsor is not within the MS4 area. Windsor has no relevant ordinances and bylaws. Windsor has no Master Plan and no Open Space and Recreation Plan available.

4. MA21-04 Housatonic River

4.1. Waterbody Overview

The Housatonic River segment MA21-04 is 12.3 miles long and begins at the confluence of the Southwest Branch Housatonic River and the West Branch Housatonic River in Pittsfield, MA. The segment flows south into Lenox, MA to end at the Woods Pond dam (NATID: MA00731) (pond was formerly segment MA21120) on the border of Lenox and Lee, MA.

Tributaries to the Housatonic River segment MA21-04 includes the pathogen-impaired segments of Southwest Branch Housatonic River (MA21-17), West Branch Housatonic River (MA21-18), and East Branch Housatonic River (MA21-02). Additional tributaries, proceeding downstream, are Wampenum Brook, Sackett Brook, Sykes Brook, Roaring Brook, Yoku Brook, Sawmill Brook, and Felton Lake Brook. Named lakes and ponds within the watershed include Pontoosuc Lake, Onota Lake, Richmond Pond, Sandwash Reservoir, Ashley Lake, Ashmore Lake, Cleveland Brook Reservoir, and others.

Key landmarks in the watershed near the segment include the Country Club of Pittsfield and golf course, the Mass Audubon Canoe Meadows Wildlife Sanctuary, Sandwash Reservoir, Ashley Lake, Farnham Reservoir, Mill Brook Reservoir, Ashley Reservoir, and Upper Sackett Reservoir. The segment is crossed by Housatonic Street and New Lenox Road in Lenox; and Holmes Road, Pomeroy Avenue, and South Street/US-7/MA-20 in Pittsfield.

The Housatonic River (MA21-04) drains an area of 170 square miles, of which 10 mi^2 (6%) is impervious and 5 mi^2 (3%) is directly connected impervious area (DCIA). The watershed is partially[4] served by public sewer and 17% is subject to stormwater regulations under the NPDES General MS4 Stormwater Permit (USEPA, 2020). There are two NPDES permits on file governing point source discharges of pollutants to surface waters within the immediate drainage area and one additional NPDES permit within the entire watershed (Table 4-1). There are no MassDEP discharge to groundwater

Reduction from Highest Calculated Geomean: 76%

Watershed Area (Acres): 109,022

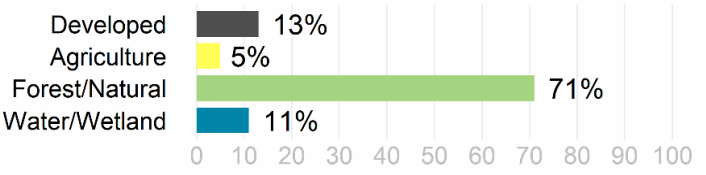
Segment Length (Miles): 12.3

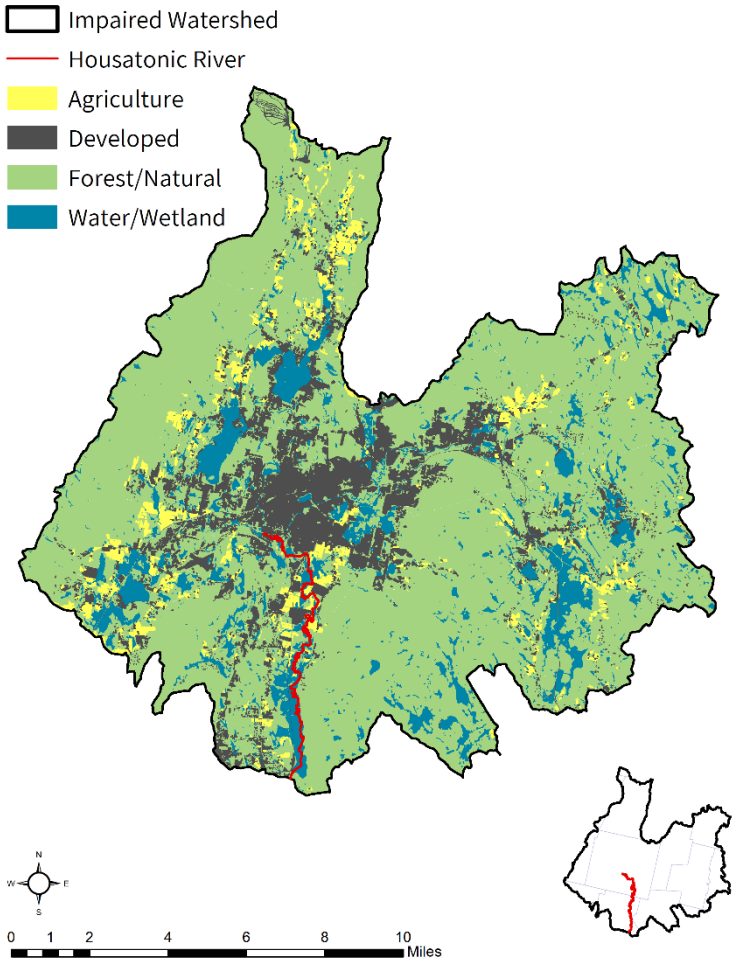
Impairment(s): *E. coli,* fecal coliform (Primary Contact Recreation)

Class (Qualifier): B (Warm Water)

Impervious Area (Acres, %): 6,233 (6%)

DCIA Area (Acres, %): 3,254 (3%)





[4] Estimated percentage of developed areas with wastewater infrastructure in the watershed was based on available information: MWRA service areas, MassDEP's Water Utility Infrastructure Mapping Project https://www.mass.gov/guides/water-utility-resilience-program (MassDEP, 2020), MS4 reports, and local knowledge.

permits for on-site wastewater discharge within the watershed. There are also no combined sewer overflows, nine landfills, and no unpermitted land disposal dumping grounds within the segment watershed. See Figure 4-1.

Table 4-1. National Pollutant Discharge Elimination System (NPDES) permits for Wastewater Treatment Facilities (WWTF) in the segment watershed. Only permits unique to this segment watershed are shown. WWTF are identified as either municipal (MUN) or other (OTH), if applicable.

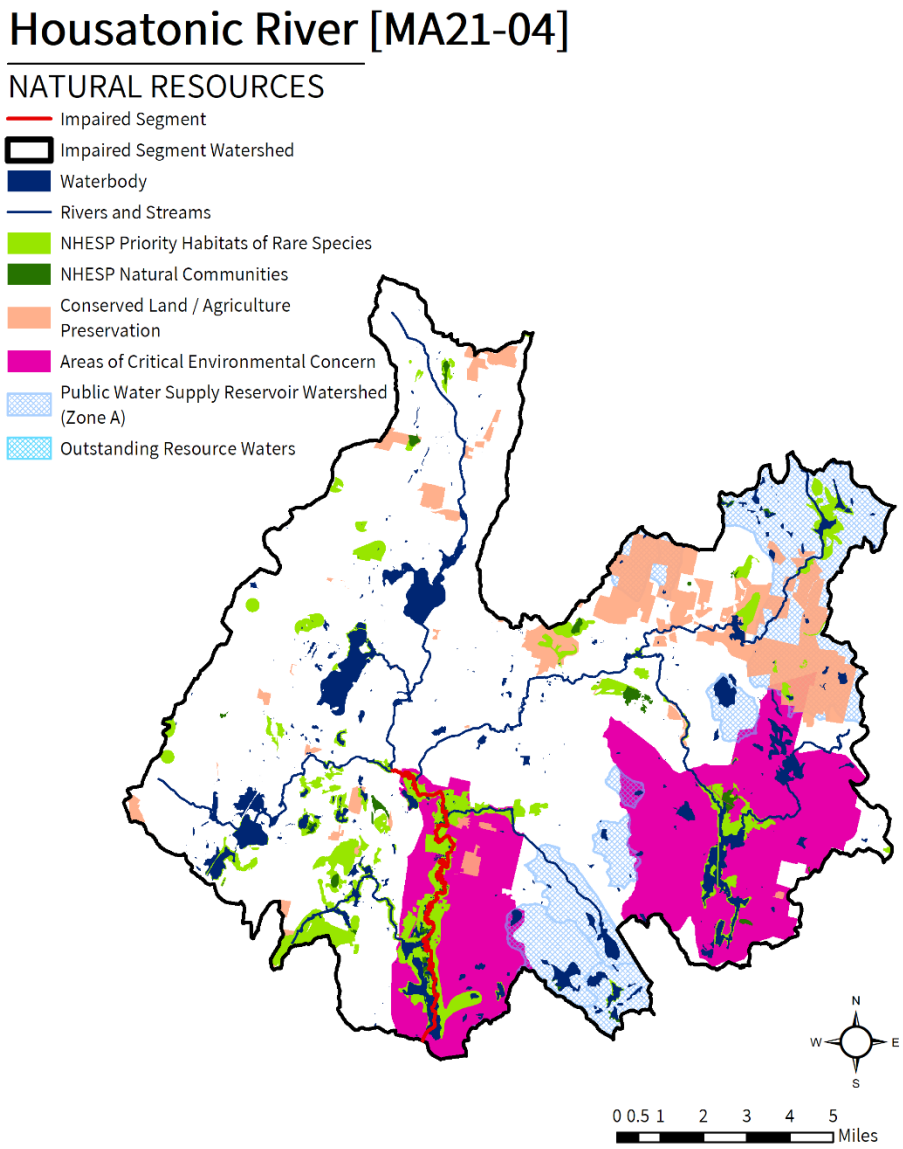
NPDES ID	NAME	TOWN	WWTF
MA0101681	PITTSFIELD WWTP	PITTSFIELD	MUN
MA0100935	LENOX CENTER WWTP	LENOX	MUN

The segment watershed is mostly forested (71%); however, the developed areas (13%) are concentrated along the tributaries immediately upstream of the segment in urbanized Pittsfield. Development consists of medium to high density mixed residential, commercial, and industrial development, with several expansive parking lots in proximity to the upstream tributaries. The segment itself flows primarily through low density development and wooded areas south of Pittsfield. Agricultural land uses along the segment appear to be used for row crops and hay.

In the Housatonic River (MA21-04) watershed, under the Natural Heritage and Endangered Species Program, there are 9,164 acres (8%) of Priority Habitats of Rare Species and 704 acres (1%) of Priority Natural Vegetation Communities. There are 15,900 acres (15%) under Public Water Supply protection and 23,739 acres (22%) of Areas of Critical Environmental Concern in the watershed. Over 8,728 acres (8%) of land protected in perpetuity[5] exist within the segment watershed, which is part of a total of 46,400 acres (43%) of Protected and Recreational Open Space[6]. See Figure 4-1.

[5] Land protected in perpetuity include several interests such as conservation restriction, agricultural preservation, private deed restrictions, wetland restrictions, aquifer protection, historic preservation, etc. Refer to Mass GIS metadata for the Protected and Recreational Open Space data layer.

[6] Only land protected in perpetuity is shown on the natural resources map. Protected and Recreational Open Space estimates reflect areas in the State of Massachusetts only (and thus reflect only a portion of the total open space for watersheds that extend outside the State of Massachusetts).



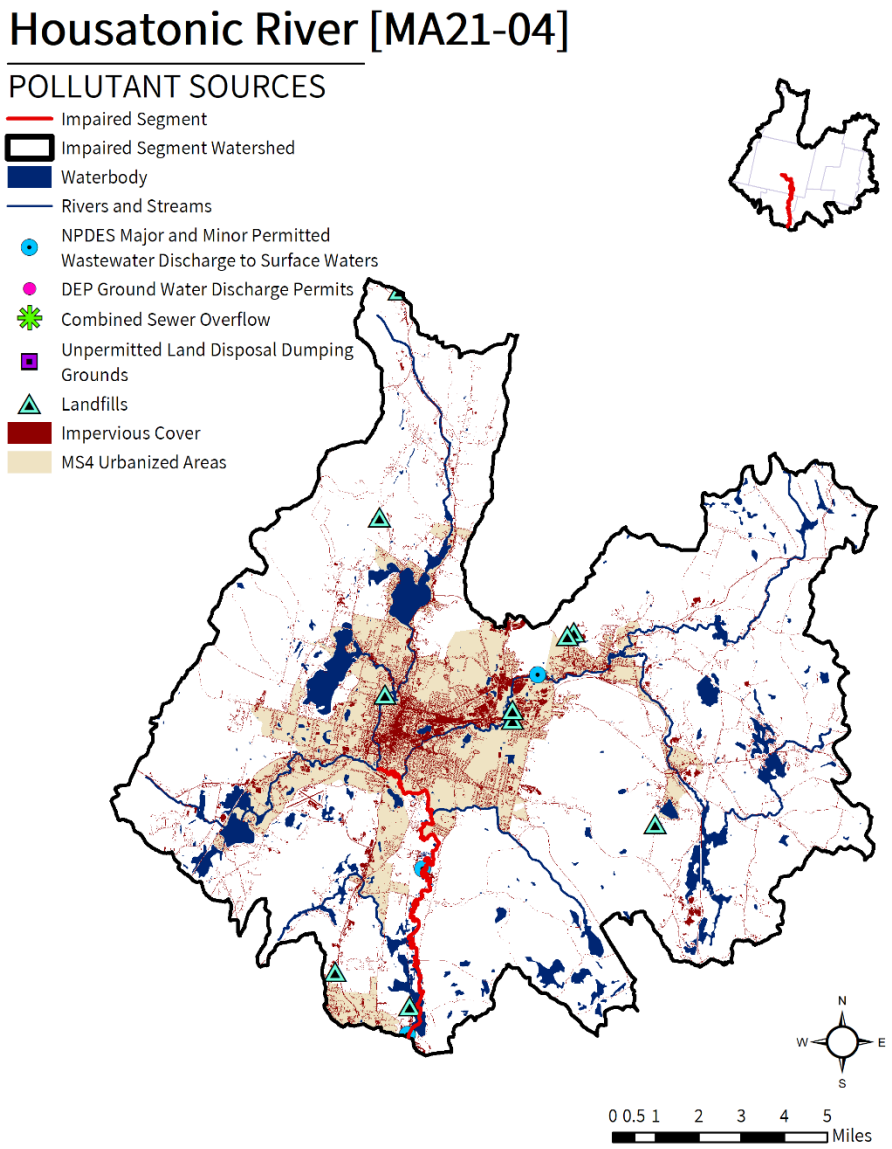


Figure 4-1. Natural resources and potential pollution sources draining to the Housatonic River segment MA21-04. The map on the left shows critical habitat, water features, and conserved land. The map on the right indicates potential and known pollution sources, including impervious cover, MS4 areas, and permitted facilities.

4.2. Waterbody Impairment Characterization

The Housatonic River (MA21-04) is a Class B, Warm Water (MassDEP, 2021).

The Primary Contact Recreation use was assessed for attainment of SWQS using the indicator bacteria *E. coli* at the station listed below (refer to Tables 4-2, 4-3; Figure 4-2). Data were evaluated against the SWQS geomean criterion of 126 CFU/100 mL for *E. coli* indicator bacteria and the Statistical Threshold Value (STV) criterion of 410 CFU/100 mL for *E. coli.* The geomean and STV criteria for the impaired segment apply to data on a year-round, 30-day rolling basis.

- In 2007, five samples were collected at W1104, resulting in three days when the 30-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of five samples, one exceeded the STV criterion during wet weather.
- In 2007, five samples were collected at W1105, resulting in 4 days when the 30-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of five samples, one exceeded the STV criterion during wet weather.

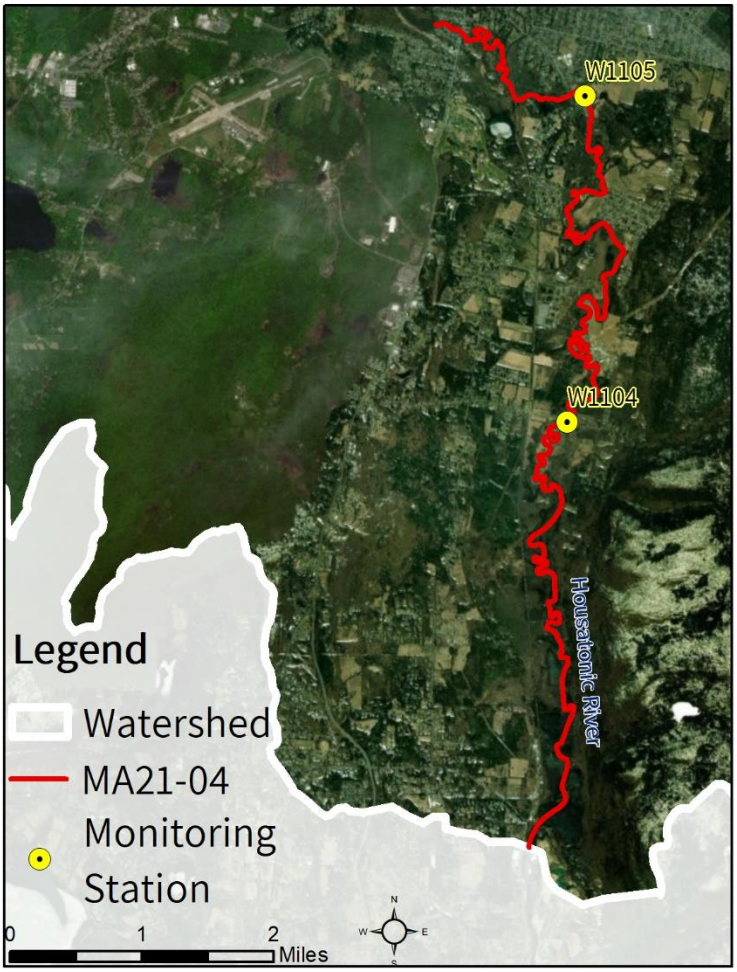


Figure 4-2. Location of monitoring station(s) along the impaired river segment.

Table 4-2. Summary of indicator bacteria sampling results by station for the Housatonic River (MA21-04). The maximum 30-day rolling geometric mean (geomean), the number of days exceeding the geomean criterion of 126 CFU/100 mL for *E. coli* indicator bacteria, and the number of single samples exceeding the Statistical Threshold Value (STV) criterion of 410 CFU/100 mL for *E. coli* indicator bacteria are shown. The STV criterion is applied to the single sample results if less than 10 samples were collected within a calendar year at a site. The highest maximum 30-day rolling geomean of the sites is used to calculate the percent load reduction required to meet SWQS.

Unique Station ID	First Sample	Last Sample	Count	Maximum 30-Day Rolling Geomean (CFU/100mL)	Number Geomean Exceedances	Number STV Exceedances
W1104	5/8/2007	9/25/2007	5	536	3	1
W1105	5/8/2007	9/25/2007	5	416	4	1

Table 4-3. Indicator bacteria data by station, indicator, and date for the Housatonic River (MA21-04). Each sample date was designated wet or dry weather with wet weather defined as more than 0.5 inches of precipitation in the previous 72 hours. Red text highlights criteria exceedances of 410 CFU/100 mL (applied to single-sample "Result" since there were no more than 10 samples in a year to calculate the Statistical Threshold Value or STV) and 126 CFU/100 mL (applied to rolling 30-day geomean) for *E. coli* indicator bacteria.

Unique Station ID	Indicator	Date	Wet/Dry	Result (CFU/100mL)	30-Day Rolling Geomean (CFU/100mL)	30-Day Rolling STV (CFU/100mL)
W1104	*E. coli*	5/8/2007	DRY	30	30	
W1104	*E. coli*	6/12/2007	WET	536	536	
W1104	*E. coli*	7/17/2007	DRY	256	256	
W1104	*E. coli*	8/21/2007	DRY	100	100	
W1104	*E. coli*	9/25/2007	DRY	200	200	
W1105	*E. coli*	5/8/2007	DRY	16	16	
W1105	*E. coli*	6/12/2007	WET	416	416	
W1105	*E. coli*	7/17/2007	DRY	200	200	
W1105	*E. coli*	8/21/2007	DRY	140	140	
W1105	*E. coli*	9/25/2007	DRY	220	220	

4.3. Potential Pathogen Sources

Comparing data collected during wet weather versus dry weather conditions provides an indication of the types of sources present and information that can be used to focus pollutant reduction activities. Pathogen levels (as estimated by indicator bacteria) are usually higher in wet weather conditions as storm sewer systems overflow and/or stormwater runoff carries fecal matter that has accumulated on the landscape to the river via overland flow and stormwater conduits. Wet weather sources include wildlife and domesticated animal waste (including pets), urban stormwater runoff (including MS4 areas), CSOs, and SSOs. In other cases, dry weather pathogen and associated indicator bacteria concentrations can be high when there is a constant flow of pollutants during dry weather, which then becomes diluted during periods of precipitation. Dry weather sources include leaking sewer pipes, illicit connections of sanitary sewers to storm drains, failing septic systems, recreational use (such as swimmers), and direct wildlife and domesticated animal waste (including pets).

The indicator bacteria data for the Housatonic River (MA21-04) were elevated during wet weather. Elevated indicator bacteria during wet weather is consistent with urban stormwater, pet waste, and wildlife pathogen sources. Certain types of septic system malfunctions, such as rainwater infiltration or saturated disposal fields which overflow during precipitation, may also result in elevated wet weather indicator bacteria levels. Due to the small sample size (and limited wet weather conditions), more data are needed to accurately target the sources of pathogens to the segment.

Each potential pathogen source is described in further detail below.

Urban Stormwater: Although most of the segment flows through low to medium density developed land uses, portions of the watershed are heavily developed especially around the upstream end of the segment in Pittsfield. The watershed has 17% of land area in MS4 and 3% as DCIA. Stormwater runoff from urban areas is likely a significant source of pathogens.

Illicit Sewage Discharges: The downstream areas of the watershed, especially surrounding the segment, are mostly served by public sewer. Sewer related risks include leaking infrastructure (pipes, pump stations, etc.) and sanitary sewer overflows, which may be caused by undersized infrastructure, blockages, or excessive infiltration of groundwater or rainwater into pipes, exceeding system capacity. Illicit connections of wastewater to stormwater drains are also a risk.

On-Site Wastewater Disposal Systems: Nearly all development in the upstream portions of the watershed relies on septic systems for wastewater treatment. It is likely that a portion of septic systems are not being properly maintained and are discharging untreated effluent to groundwater.

Agriculture: Agricultural activities account for 5% of the total land use area within the watershed. Those agricultural activities visible on recent aerial photos within the immediate drainage area include open fields, hayfields, row crops, and pastureland. Agricultural activities related to manure storage and spreading, if not well managed, are a possible source of pathogens to waterbodies.

Pet Waste: Conservation and recreational lands, parks, ballfields, and residential neighborhoods near or along the segment which may be popular for dog-walking, especially where paths are adjacent to rivers, ponds, or wetlands, represent a possible source of pathogens.

Wildlife Waste: Large open mowed areas such as conservation and recreational lands, fields, golf courses, and wetlands with a clear sightline to a waterbody may attract excessive waterfowl and elevate indicator bacteria counts in the water.

4.4. Existing Local Management

This section identifies the municipalities immediately surrounding the impaired segment and its sub-basin (excludes upstream impaired segment watersheds). For a complete view of upstream municipalities and waterbodies, see the map in Figure 2-1.

City of Pittsfield. See Section 3.4

Town of Dalton. See Section 3.4

Town of Hinsdale. See Section 3.4

Town of Lanesborough

A small portion of Lanesborough is subject to stormwater regulations under the NPDES General MS4 Stormwater Permit. Lanesborough (Permit ID #MAR041012) has an EPA approved Notice of Intent (NOI). The town does not have a Stormwater Management Plan. The town has mapped all of its stormwater outfall system which is available at http://berkshire.maps.arcgis.com/apps/webappviewer/index.html?id=ded45f5daaee412db24afc34500cd0c6 (Town of Lanesborough, n.d., a). The town adopted illicit discharge detection and elimination (IDDE), erosion and sediment control (ESC), and post-construction stormwater regulations in 2008. According to the NOI, there are seven stormwater outfalls into the pathogen-impaired Hoosic River (MA11-03).

Lanesborough has the following relevant ordinances and bylaws:

- Lanesborough does not have any supplementary regulations beyond the MassDEP regulations for stormwater management or wetland protection.
- Title V Supplemental Regulations: None found.
- Pet Waste Bylaw: None found.
- Stormwater Utility: None found.

The Town of Lanesborough does not have a Master Plan. The Economic Development Plan provides a brief description of the geography of the Town of Lanesborough, noting Pontoosuc Lake, the Cheshire reservoir, and the headwaters of the Hoosic River (Town of Lanesborough and BRPC, 2017). The plan also notes the goal of eliminating septic systems through expanding the sewer system for water quality protection.

Town Website: https://www.lanesborough-ma.gov/ (Town of Lanesborough, 2020)

Economic Development Plan: https://www.lanesborough-ma.gov/sites/g/files/vyhlif761/f/uploads/economic_development_plan_2017.pdf (Town of Lanesborough and BRPC, 2017)

Stormwater Management Plan:
https://www.lanesborough-ma.gov/town-manager/pages/storm-water-management-program (Town of Lanesborough, n.d., b)
Lanesborough does not have an Open Space and Recreation Plan available.

Town of Lee

Lee is not within the MS4 area.

Lee has the following relevant ordinances and bylaws:

- Stormwater Ordinance and/or Bylaws: Nothing beyond state regulations.
- Stormwater Utility: None found.
- Title 5 Supplementary Regulation: Nothing beyond State of Massachusetts Title V Regulations.
- Wetland Protection Bylaw: https://www.lee.ma.us/conservation-commission/pages/wetlands-protection-act (Town of Lee, n.d.)
- Pet Waste Ordinance: None found.
- Contact Recreation Ordinance: None found.

The Lee Master Plan chapter on Natural Resources, Open Space, and Outdoor Recreation includes a section on Water, Wetlands and Floodplains (Town of Lee and BRPC, 2000). This section notes that one waterbody within the town, Laurel Lake, has dealt with eutrophication due to septic system water contamination. Beyond this, the plan does not mention waterway impairment, bacteria, or pathogens. The plan includes information on stormwater drains, though does not provide information on Lee's Storm Drain System. The plan has a wastewater section in the municipal utilities chapter, and notes that over 85% of Lee's households are on public sewer. Septic system maintenance is aggressively enforced by the town's Board of Health.

Lee Town Website: https://www.lee.ma.us/ (Town of Lee, 2020)

Master Plan: https://semspub.epa.gov/work/01/211805.pdf (Town of Lee and BRPC, 2000)

Open Space and Recreation Plan:
https://www.lee.ma.us/sites/g/files/vyhlif771/f/uploads/lee_osrp_january_2016_published.pdf (Town of Lee and BRPC, 2016)

Town of Lenox

Lenox received a MS4 General Permit waiver on October 31, 2017:
https://www3.epa.gov/region1/npdes/stormwater/ma/waivers/lenox-epa-waiver-response.pdf (Hamjian, 2017)

Lenox has the following relevant ordinances and bylaws:

- Regulation of Sewer Use: Chapter VII, pg. 13
  https://www.townoflenox.com/sites/lenoxma/files/uploads/town_of_lenox_bylaws_2018_edition_0.pdf (Town of Lenox, 2014)
- Pet waste bylaw: Chapter XVII Dogs, Section 9 Removal of Dog Litter pg. 29
  https://www.townoflenox.com/sites/lenoxma/files/uploads/town_of_lenox_bylaws_2018_edition_0.pdf (Town of Lenox, 2014)

Lenox's Master Plan has a section on Wastewater (page 80): https://semspub.epa.gov/work/01/211777.pdf (Town of Lenox and BRPC, 1999)

Lenox has an Open Space and Recreation Plan:
https://www.townoflenox.com/sites/g/files/vyhlif3341/f/uploads/lenox_open_space_recreation_plan.pdf (Town of Lenox, 2015)

5. MA21-17 Southwest Branch Housatonic River

5.1. Waterbody Overview

The Southwest Branch Housatonic River segment MA21-17 is 5.8 miles long and begins at the outlet of Richmond Pond in Pittsfield, MA. The segment generally flows to the northeast to US-20 before flowing east, ending at its confluence with the West Branch Housatonic River (forming the headwaters for the Housatonic River) in Pittsfield, MA.

Tributaries to segment MA21-17 include an unimpaired portion of the Southwest Branch Housatonic River, Jacoby Brook, Smith Brook, Maloy Brook, and several unnamed streams. Named lakes and rivers within the watershed include Richmond Pond and Mud Pond.

Key landmarks in the watershed include Smith, Doll, Holy, and Shaker mountains to the west. The watershed also includes Berkshire Community College and the Pittsfield Municipal Airport. The segment is crossed by Lakeside Drive (twice), Cloverdale Street, Melbourne Road, Lebanon Avenue, Hungerford Street (twice), Barker Road, West Housatonic Street/US-20 (twice), and Cadwell Road in Pittsfield.

The Southwest Branch Housatonic River (MA21-17) drains an area of 24 square miles, of which 1.2 mi^2 (5%) is impervious and 0.5 mi^2 (2%) is directly connected impervious area (DCIA). The watershed is partially[7] served by public sewer and 19% is subject to stormwater regulations under the NPDES General MS4 Stormwater Permit (USEPA, 2020). There are no NPDES permits on file governing point source discharges of pollutants to surface waters and no MassDEP discharge to groundwater permits for on-site wastewater discharge within the watershed. There are also no combined sewer overflows, no landfills, and no unpermitted land disposal dumping grounds within the segment watershed. See Figure 5-1.

The segment watershed is mostly forested (68%), though the developed areas (13%) are concentrated around the segment. The segment itself flows through large, wooded tracts, several large wooded and meadow wetlands, and low and

Reduction from Highest Calculated Geomean: 92%

Watershed Area (Acres): 15,069

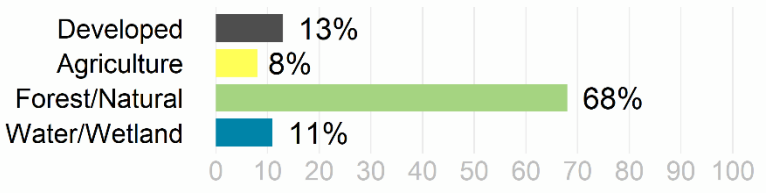
Segment Length (Miles): 5.8

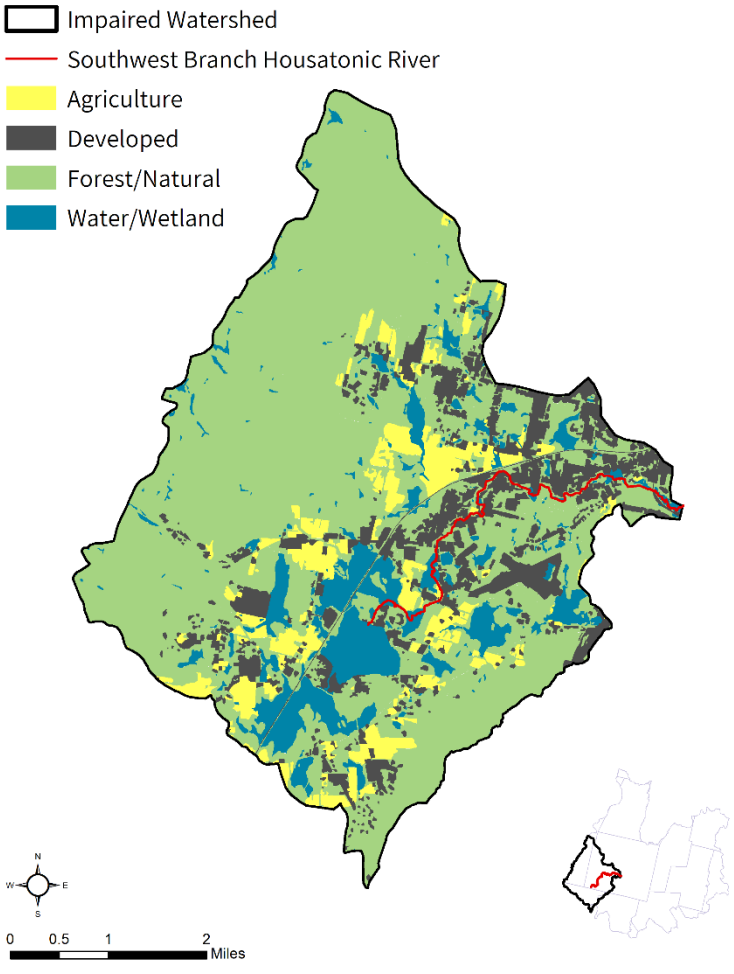
Impairment(s): *E. coli,* fecal coliform (Primary Contact Recreation)

Class (Qualifier): B (Cold Water, High Quality Water)

Impervious Area (Acres, %): 756 (5%)

DCIA Area (Acres, %): 326 (2%)





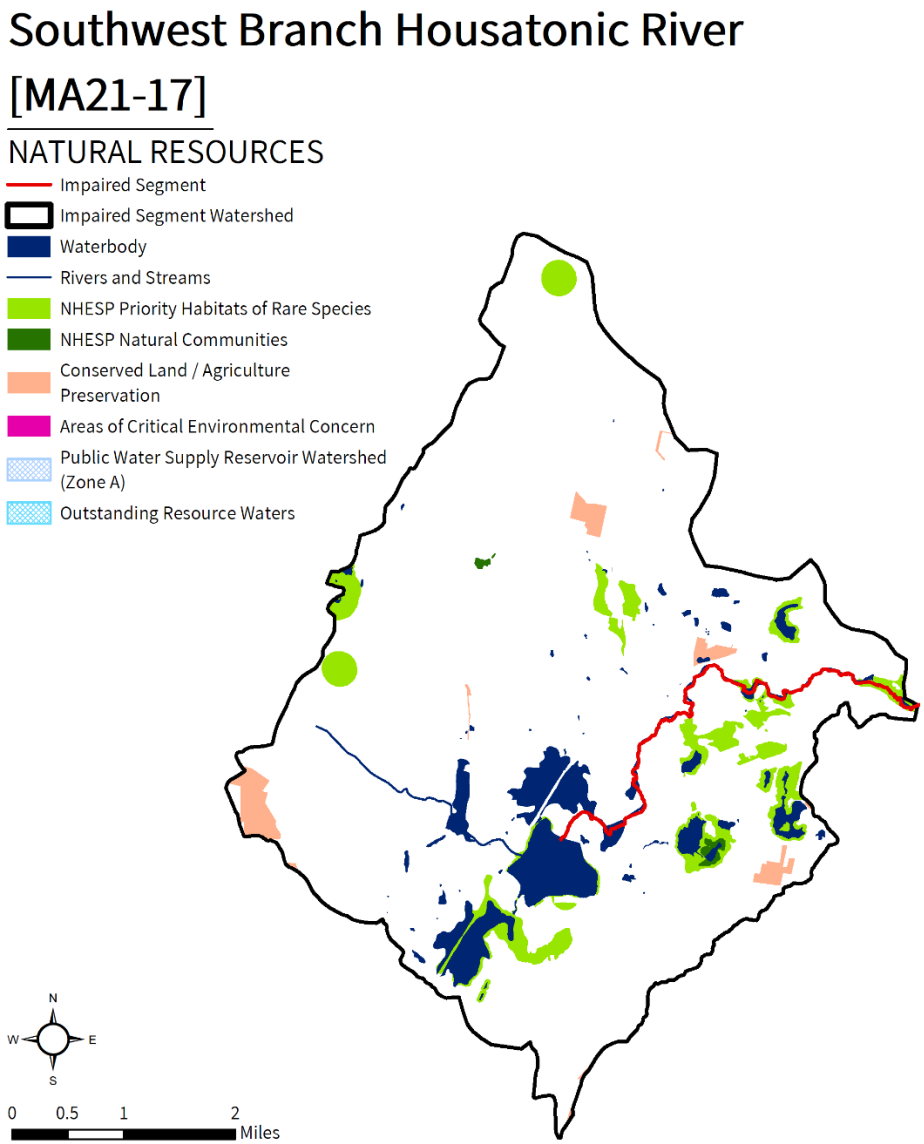
[7] Estimated percentage of developed areas with wastewater infrastructure in the watershed was based on available information: MWRA service areas, MassDEP's Water Utility Infrastructure Mapping Project https://www.mass.gov/guides/water-utility-resilience-program (MassDEP, 2020), MS4 reports, and local knowledge.

medium density residential neighborhoods west of downtown Pittsfield. Agricultural practices within the segment watershed include grazing livestock, row crops, and hayfields.

In the Southwest Branch Housatonic River (MA21-17) watershed, under the Natural Heritage and Endangered Species Program, there are 1,226 acres (8%) of Priority Habitats of Rare Species and 31 acres (<1%) of Priority Natural Vegetation Communities. There are 0.03 acres (<1%) under Public Water Supply protection in the watershed. Over 238 acres (2%) of land protected in perpetuity[8] exist within the segment watershed, which is part of a total of 5,674 acres (38%) of Protected and Recreational Open Space[9]. See Figure 5-1.

[8] Land protected in perpetuity include several interests such as conservation restriction, agricultural preservation, private deed restrictions, wetland restrictions, aquifer protection, historic preservation, etc. Refer to Mass GIS metadata for the Protected and Recreational Open Space data layer.

[9] Only land protected in perpetuity is shown on the natural resources map. Protected and Recreational Open Space estimates reflect areas in the State of Massachusetts only (and thus reflect only a portion of the total open space for watersheds that extend outside the State of Massachusetts).



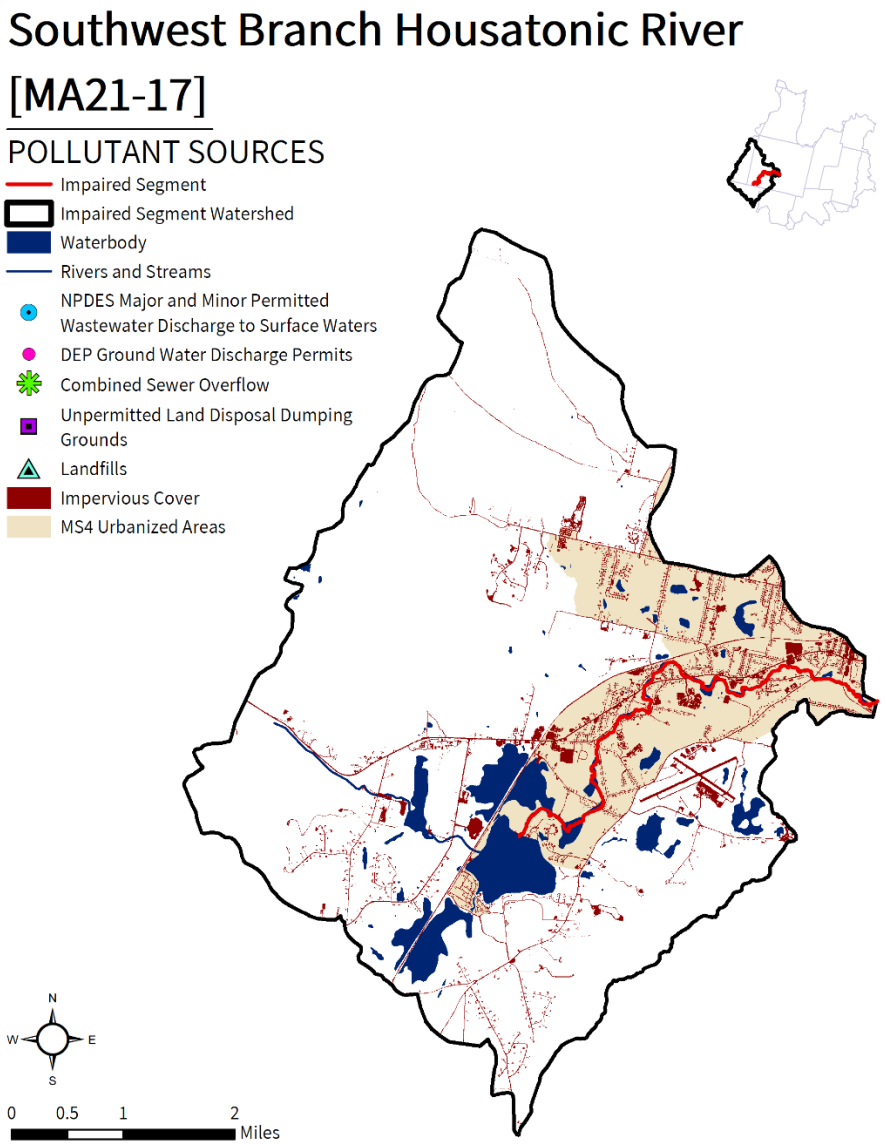


Figure 5-1. Natural resources and potential pollution sources draining to the Southwest Branch Housatonic River segment MA21-17. The map on the left shows critical habitat, water features, and conserved land. The map on the right indicates potential and known pollution sources, including impervious cover, MS4 areas, and permitted facilities.

5.2. Waterbody Impairment Characterization

The Southwest Branch Housatonic River (MA21-17) is a Class B, Cold Water and High Quality Water (MassDEP, 2021).

The Primary Contact Recreation use was assessed for attainment of SWQS using the indicator bacteria *E. coli* at the stations listed below (refer to Tables 5-1, 5-2; Figure 5-2). Data were evaluated against the SWQS geomean criterion of 126 CFU/100 mL for *E. coli* indicator bacteria and the STV criterion of 410 CFU/100 mL for *E. coli*. The geomean STV criteria for the impaired segment apply to data on a year-round, 90-day rolling basis.

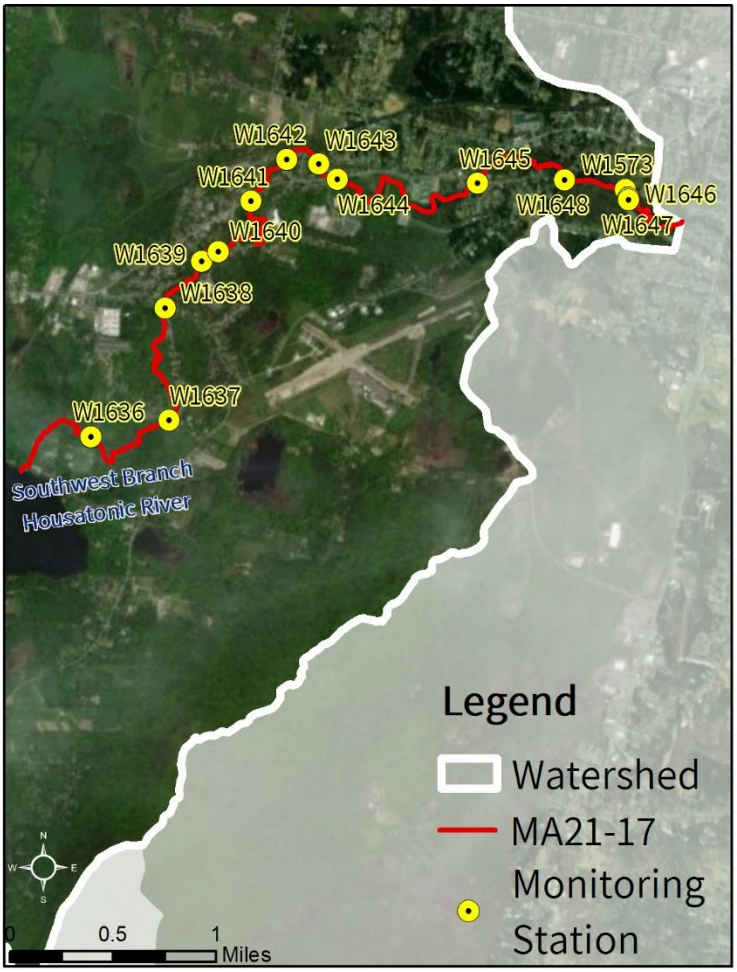


Figure 5-2. Location of monitoring station(s) along the impaired river segment.

- In 2007, five samples were collected at W1573, resulting in two days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of five samples, none exceeded the STV criterion.
- In 2006, four samples were collected at W1636, resulting in one day when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of four samples, none exceeded the STV criterion.
- In 2006, four samples were collected at W1637, resulting in two days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of four samples, none exceeded the STV criterion.
- In 2006, four samples were collected at W1638, resulting in 4 days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of four samples, one exceeded the STV criterion during wet weather.
- In 2006, four samples were collected at W1639, resulting in 4 days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of four samples, two exceeded the STV criterion during dry weather.
- In 2006, four samples were collected at W1640, resulting in 4 days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of four samples, three exceeded the STV criterion during both wet and dry weather.
- In 2006, four samples were collected at W1641, resulting in 4 days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of four samples, two exceeded the STV criterion during both wet and dry weather.

- In 2006, four samples were collected at W1642, resulting in 4 days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of four samples, one exceeded the STV criterion during wet weather.
- In 2006, four samples were collected at W1643, resulting in 4 days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of four samples, one exceeded the STV criterion during wet weather.
- In 2006, four samples were collected at W1644, resulting in 4 days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of four samples, two exceeded the STV criterion during wet and dry weather.
- In 2006, four samples were collected at W1645, resulting in 4 days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of four samples, two exceeded the STV criterion during wet and dry weather.
- In 2006, four samples were collected at W1646, resulting in 4 days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of four samples, two exceeded the STV criterion during wet and dry weather.
- In 2006, four samples were collected at W1647, resulting in 4 days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of four samples, two exceeded the STV criterion during wet and dry weather.
- In 2006, four samples were collected at W1648, resulting in 4 days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of four samples, one exceeded the STV criterion during wet weather.

Table 5-1. Summary of indicator bacteria sampling results by station for the Southwest Branch Housatonic River (MA21-17). The maximum 90-day rolling geometric mean (geomean), the number of days exceeding the geomean criterion of 126 CFU/100 mL for *E. coli* indicator bacteria, and the number of single samples exceeding the Statistical Threshold Value (STV) criterion of 410 CFU/100 mL for *E. coli* indicator bacteria are shown. The STV criterion is applied to the single sample results if less than 10 samples were collected within a calendar year at a site. The highest maximum 90-day rolling geomean of the sites is used to calculate the percent load reduction required to meet SWQS.

Unique Station ID	First Sample	Last Sample	Count	Maximum 90-Day Rolling Geomean (CFU/100mL)	Number Geomean Exceedances	Number STV Exceedances
W1573	5/8/2007	9/25/2007	5	287	2	0
W1636	6/26/2006	9/18/2006	4	240	1	0
W1637	6/26/2006	9/18/2006	4	250	2	0
W1638	6/26/2006	9/18/2006	4	461	4	1
W1639	6/26/2006	9/18/2006	4	515	4	2
W1640	6/26/2006	9/18/2006	4	579	4	3
W1641	6/26/2006	9/18/2006	4	517	4	2
W1642	6/26/2006	9/18/2006	4	435	4	1
W1643	6/26/2006	9/18/2006	4	461	4	1
W1644	6/26/2006	9/18/2006	4	1586	4	2
W1645	6/26/2006	9/18/2006	4	613	4	2
W1646	6/26/2006	9/18/2006	4	687	4	2
W1647	6/26/2006	9/18/2006	4	727	4	2
W1648	6/26/2006	9/18/2006	4	613	4	1

Table 5-2. Indicator bacteria data by station, indicator, and date for the Southwest Branch Housatonic River (MA21-17). Each sample date was designated wet or dry weather with wet weather defined as more than 0.5 inches of precipitation in the previous 72 hours. Red text highlights criteria exceedances of 410 CFU/100 mL (applied to single-sample "Result" since there were no more than 10 samples in a year to calculate the Statistical Threshold Value or STV) and 126 CFU/100 mL (applied to rolling 90-day geomean) for *E. coli* indicator bacteria.

Unique Station ID	Indicator	Date	Wet/Dry	Result (CFU/100mL)	90-Day Rolling Geomean (CFU/100mL)	90-Day Rolling STV (CFU/100mL)
W1573	*E. coli*	5/8/2007	DRY	6	6	
W1573	*E. coli*	6/12/2007	WET	368	47	
W1573	*E. coli*	7/17/2007	DRY	256	83	
W1573	*E. coli*	8/21/2007	DRY	250	287	
W1573	*E. coli*	9/25/2007	DRY	100	186	
W1636	*E. coli*	6/26/2006	WET	240	240	
W1636	*E. coli*	7/10/2006	DRY	10	49	
W1636	*E. coli*	8/2/2006	DRY	9	28	
W1636	*E. coli*	9/18/2006	DRY	20	26	
W1637	*E. coli*	6/26/2006	WET	250	250	
W1637	*E. coli*	7/10/2006	DRY	83	144	
W1637	*E. coli*	8/2/2006	DRY	29	84	
W1637	*E. coli*	9/18/2006	DRY	46	73	
W1638	*E. coli*	6/26/2006	WET	461	461	
W1638	*E. coli*	7/10/2006	DRY	140	254	
W1638	*E. coli*	8/2/2006	DRY	105	189	
W1638	*E. coli*	9/18/2006	DRY	114	167	
W1639	*E. coli*	6/26/2006	WET	365	365	
W1639	*E. coli*	7/10/2006	DRY	727	515	
W1639	*E. coli*	8/2/2006	DRY	67	261	
W1639	*E. coli*	9/18/2006	DRY	488	305	
W1640	*E. coli*	6/26/2006	WET	461	461	
W1640	*E. coli*	7/10/2006	DRY	727	579	
W1640	*E. coli*	8/2/2006	DRY	86	307	
W1640	*E. coli*	9/18/2006	DRY	461	340	
W1641	*E. coli*	6/26/2006	WET	517	517	
W1641	*E. coli*	7/10/2006	DRY	411	461	
W1641	*E. coli*	8/2/2006	DRY	72	248	
W1641	*E. coli*	9/18/2006	DRY	109	202	
W1642	*E. coli*	6/26/2006	WET	435	435	
W1642	*E. coli*	7/10/2006	DRY	108	217	
W1642	*E. coli*	8/2/2006	DRY	91	162	
W1642	*E. coli*	9/18/2006	DRY	178	166	
W1643	*E. coli*	6/26/2006	WET	461	461	
W1643	*E. coli*	7/10/2006	DRY	84	197	
W1643	*E. coli*	8/2/2006	DRY	107	161	
W1643	*E. coli*	9/18/2006	DRY	104	144	
W1644	*E. coli*	6/26/2006	WET	488	488	
W1644	*E. coli*	7/10/2006	DRY	73	189	
W1644	*E. coli*	8/2/2006	DRY	111990	1586	
W1644	*E. coli*	9/18/2006	DRY	126	842	
W1645	*E. coli*	6/26/2006	WET	613	613	
W1645	*E. coli*	7/10/2006	DRY	178	330	
W1645	*E. coli*	8/2/2006	DRY	411	355	
W1645	*E. coli*	9/18/2006	DRY	365	358	
W1646	*E. coli*	6/26/2006	WET	687	687	
W1646	*E. coli*	7/10/2006	DRY	214	383	
W1646	*E. coli*	8/2/2006	DRY	816	493	

Unique Station ID	Indicator	Date	Wet/Dry	Result (CFU/100mL)	90-Day Rolling Geomean (CFU/100mL)	90-Day Rolling STV (CFU/100mL)
W1646	*E. coli*	9/18/2006	DRY	219	403	
W1647	*E. coli*	6/26/2006	WET	727	727	
W1647	*E. coli*	7/10/2006	DRY	124	300	
W1647	*E. coli*	8/2/2006	DRY	613	381	
W1647	*E. coli*	9/18/2006	DRY	179	315	
W1648	*E. coli*	6/26/2006	WET	613	613	
W1648	*E. coli*	7/10/2006	DRY	101	249	
W1648	*E. coli*	8/2/2006	DRY	199	231	
W1648	*E. coli*	9/18/2006	DRY	249	235	

5.3. Potential Pathogen Sources

Comparing data collected during wet weather versus dry weather conditions provides an indication of the types of sources present and information that can be used to focus pollutant reduction activities. Pathogen levels (as estimated by indicator bacteria) are usually higher in wet weather conditions as storm sewer systems overflow and/or stormwater runoff carries fecal matter that has accumulated on the landscape to the river via overland flow and stormwater conduits. Wet weather sources include wildlife and domesticated animal waste (including pets), urban stormwater runoff (including MS4 areas), CSOs, and SSOs. In other cases, dry weather pathogen and associated indicator bacteria concentrations can be high when there is a constant flow of pollutants during dry weather, which then becomes diluted during periods of precipitation. Dry weather sources include leaking sewer pipes, illicit connections of sanitary sewers to storm drains, failing septic systems, recreational use (such as swimmers), and direct wildlife and domesticated animal waste (including pets).

The indicator bacteria data for the Southwest Branch Housatonic River (MA21-17) were elevated during both wet and dry weather. Elevated indicator bacteria during wet weather is consistent with urban stormwater, pet waste, and wildlife pathogen sources. Certain types of septic system malfunctions, such as rainwater infiltration or saturated disposal fields which overflow during precipitation, may also result in elevated wet weather indicator bacteria levels. Elevated indicator bacteria during dry weather suggest that baseflow sources, such as leaking pipes, illegal cross connections, other illicit discharges, and failing septic systems, are likely to be major sources of pathogens.

Each potential pathogen source is described in further detail below.

Urban Stormwater: Portions of the watershed are heavily developed, especially around the segment. The watershed has 19% of land area in MS4 and 2% as DCIA. The developed areas within and surrounding the river corridor consist of medium to high density mixed residential, commercial, industrial, and transportation development, including the Pittsfield Municipal Airport. Stormwater runoff from urban areas is likely a significant source of pathogens.

Illicit Sewage Discharges: Most of the southern and some of the northeastern portions of the watershed, including some areas along the segment, are served by public sewer. Sewer related risks include leaking infrastructure (pipes, pump stations, etc.) and sanitary sewer overflows which may be caused by undersized infrastructure, blockages, or excessive infiltration of groundwater or rainwater into pipes, exceeding system capacity. Illicit connections of wastewater to stormwater drains are also a risk.

On-Site Wastewater Disposal Systems: A portion of the watershed relies on septic systems for wastewater treatment. It is likely that a portion of septic systems are not being properly maintained and are discharging untreated effluent to groundwater.

Agriculture: Agricultural activities account for 8% of the total land use area within the watershed. Those activities visible on recent aerial photos within the watershed include open fields, hayfields, row crops, orchards, and pastureland. Agricultural activities related to manure storage and spreading, if not well managed, are a possible source of pathogens to waterbodies.

Pet Waste: The segment flows through many low and medium residential neighborhoods with several road crossings. Conservation and recreational lands, parks, ballfields, and residential streets near or along the segment which may be popular for dog-walking, especially where paths are adjacent to rivers, ponds, or wetlands, represent a possible source of pathogens.

Wildlife Waste: Most of the segment benefits from at least some wooded buffer; however, there are large lawns mowed to the water's edge near the intersection of Vista and Chapel streets in Pittsfield. Large open mowed areas such as conservation and recreational lands, fields, and wetlands with a clear sightline to a waterbody may attract excessive waterfowl and elevate indicator bacteria counts in the water.

5.4. Existing Local Management

This section identifies the municipalities immediately surrounding the impaired segment and its sub-basin. For a complete view of upstream municipalities and waterbodies, see the map in Figure 2-1.

Town of Hancock

Hancock is not within the MS4 area.

Hancock has the following relevant ordinances and bylaws:

- Stormwater Ordinance and/or Bylaws: No information available online.
- Stormwater Utility: No information available online.
- Title 5 Supplementary Regulation: Nothing beyond State of Massachusetts Title V Regulations.
- Wetland Protection Bylaw: No information available online.
- Pet Waste Ordinance: No information available online.
- Contact Recreation Ordinance: No information available online.

Hancock Town Website: http://town.hancock.ma.us/ (Town of Hancock, 2020)

The Town of Hancock has not made a Master Plan or town planning documents available online.

The Town of Hancock does not have an Open Space and Recreation Plan available.

City of Pittsfield. See Section 3.4

Town of Richmond

Richmond is not within the MS4 area.

Richmond has the following relevant ordinances and bylaws:

- Stormwater Ordinance and/or Bylaws: None found.
- Title 5 Supplementary Regulation: Nothing beyond State of Massachusetts Title V Regulations.
- Wetland Protection Bylaw: Nothing beyond State of Massachusetts wetland protection regulations.
- Pet Waste Ordinance: None found.
- Contact Recreation Ordinance: None found.

The Town of Richmond does not have a master plan available. The Open Space and Recreation Plan has an extensive Water Resources section in the Environmental Inventory and Analysis chapter. The plan does not include detailed information on bacteria or pathogen impairments. The plan briefly mentions the threat of stormwater runoff. The Community Development Plan notes that the town planned a sewer extension project adjacent to Richmond Pond to address water pollution problems. The Open Space Plan notes that this project was completed but recommends further sewer service connections to other dense communities in order to address water quality.

Richmond Town Website: http://www.richmondma.org/ (Town of Richmond, 2020)

Community Development Plan: http://www.richmondma.org/document_center/Boards%20&%20Commissions/Planning%20Board/2003_Community_Development_Plan.pdf (BRPC, 2003)

Open Space and Recreation Plan: http://www.richmondma.org/Bylaws%20&%20Regulations/Richmond_OSRP_-_11-9.pdf (BRPC and Town of Richmond, 2016)

6. MA21-18 West Branch Housatonic River

6.1. Waterbody Overview

The West Branch Housatonic River segment MA21-18 is 4.1 miles long and begins at the outlet of Pontoosuc Lake in Pittsfield, MA. The segment flows to the south to end at its confluence with Southwest Branch Housatonic River (forming the headwaters to the Housatonic River) in Pittsfield.

Tributaries to the West Branch Housatonic River segment MA21-18 include Onota Brook and several unnamed streams. Named lakes and ponds within the watershed include Pontoosuc Lake, Onota Lake, and Pecks Pond.

Key landmarks in the watershed include the Donnybrook Country Club, Mount Greylock State Reservation, Balance Rock State Park, the Skyline Country Club and GE Athletic Association golf courses, and commercial and residential neighborhoods surrounding the US-7/US-20 intersection. The segment is crossed by Hancock Road, Keller Street, New Road, Taconic Island Road, Wahconah Street (twice), Pontoosuc Avenue, Linden Street, Columbus Avenue, West Street, Hawthorne Avenue, West Housatonic Street/US-20, Atwood Avenue (twice), and Boylston Street in Pittsfield.

The West Branch Housatonic River (MA21-18) drains an area of 37 square miles, of which 2.3 mi^2 (6%) is impervious and 1.3 mi^2 (3%) is directly connected impervious area (DCIA). The watershed is partially[10] served by public sewer and 19% is subject to stormwater regulations under the NPDES General MS4 Stormwater Permit (USEPA, 2020). There are no NPDES permits on file governing point source discharges of pollutants to surface waters and no MassDEP discharge to groundwater permits for on-site wastewater discharge within the watershed. There are also no combined sewer overflows, two landfills, and no unpermitted land disposal dumping grounds within the segment watershed. See Figure 6-1.

The watershed is mostly forested (69%), especially the mountainous western side. The developed areas, however, concentrate around the segment just north of Pittsfield. These developed areas comprise medium to high density residential

Reduction from Highest Calculated Geomean: 60%

Watershed Area (Acres): 23,481

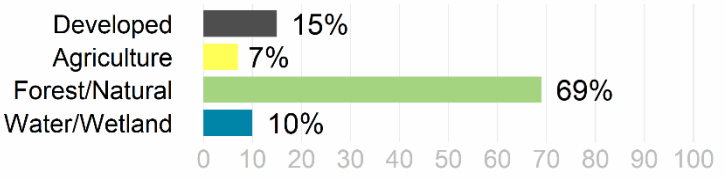
Segment Length (Miles): 4.1

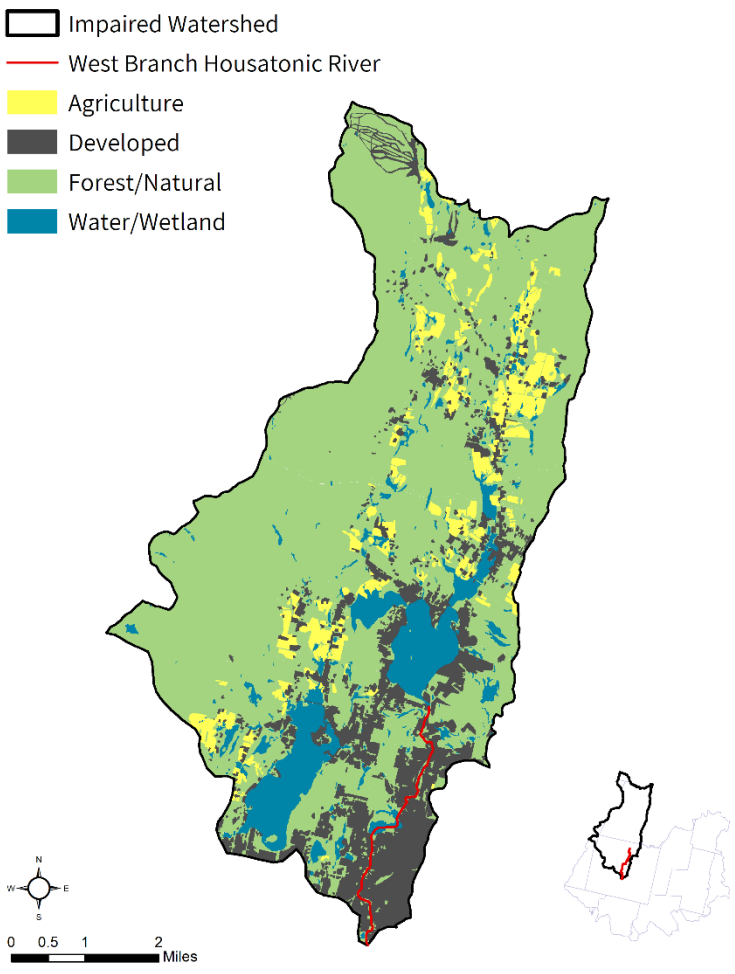
Impairment(s): *E. coli,* fecal coliform (Primary Contact Recreation)

Class (Qualifier): B (Cold Water, High Quality Water)

Impervious Area (Acres, %): 1,500 (6%)

DCIA Area (Acres, %): 813 (3%)





[10] Estimated percentage of developed areas with wastewater infrastructure in the watershed was based on available information: MWRA service areas, MassDEP's Water Utility Infrastructure Mapping Project https://www.mass.gov/guides/water-utility-resilience-program (MassDEP, 2020), MS4 reports, and local knowledge.

neighborhoods, large commercial developments with expansive parking, and industrial areas. Agriculture in the watershed consists of farms with livestock, hayfields, and row crops. While most of the river corridor has at least some wooded buffer, many roads and buildings are within a few meters of the river.

In the West Branch Housatonic River (MA21-18) watershed, under the Natural Heritage and Endangered Species Program, there are 814 acres (3%) of Priority Habitats of Rare Species and 61 acres (<1%) of Priority Natural Vegetation Communities. There are no Areas of Critical Environmental Concern, no areas under Public Water Supply protection, and no areas identified as Outstanding Resource Waters in the watershed. Over 874 acres (4%) of land protected in perpetuity[11] exist within the segment watershed, which is part of a total of 8,261 acres (35%) of Protected and Recreational Open Space[12]. See Figure 6-1.

[11] Land protected in perpetuity include several interests such as conservation restriction, agricultural preservation, private deed restrictions, wetland restrictions, aquifer protection, historic preservation, etc. Refer to Mass GIS metadata for the Protected and Recreational Open Space data layer.

[12] Only land protected in perpetuity is shown on the natural resources map. Protected and Recreational Open Space estimates reflect areas in the State of Massachusetts only (and thus reflect only a portion of the total open space for watersheds that extend outside the State of Massachusetts).

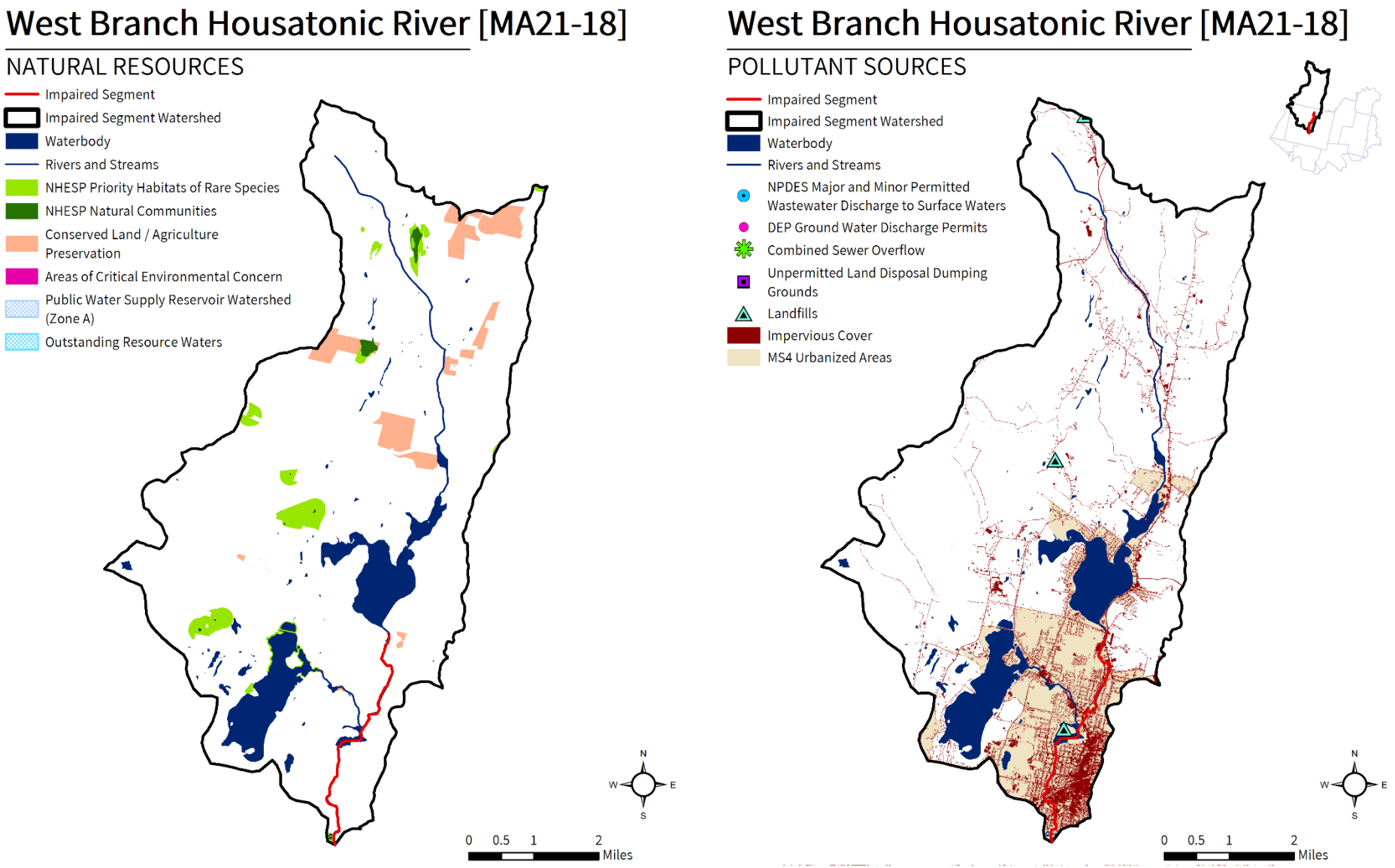


Figure 6-1. Natural resources and potential pollution sources draining to the West Branch Housatonic River segment MA21-18. The map on the left shows critical habitat, water features, and conserved land. The map on the right indicates potential and known pollution sources, including impervious cover, MS4 areas, and permitted facilities.

6.2. Waterbody Impairment Characterization

The West Branch Housatonic River (MA21-18) is a Class B, Cold Water and High Quality Water (MassDEP, 2021).

The Primary Contact Recreation use was assessed for attainment of SWQS using the indicator bacteria *E. coli* at the station identified below (refer to Tables 6-1, 6-2; Figure 6-2). Data were evaluated against the SWQS geomean criterion of 126 CFU/100 mL for *E. coli* indicator bacteria and the STV criterion of 410 CFU/100 mL for *E. coli*. The geomean STV criteria for the impaired segment apply to data on a year-round, 90-day rolling basis.

- In 2007, five samples were collected at W1575, resulting in three days when the 90-day rolling geomean exceeded the criterion. Since there were no stations and years with more than 10 samples, the STV criterion was applied to single sample results. Out of five samples, two exceeded the STV criterion during both wet and dry weather.

Figure 6-2. Location of monitoring station(s) along the impaired river segment.

Table 6-1. Summary of indicator bacteria sampling results by station for the West Branch Housatonic River (MA21-18). The maximum 90-day rolling geometric mean (geomean), the number of days exceeding the geomean criterion of 126 CFU/100 mL for *E. coli* indicator bacteria, and the number of single samples exceeding the Statistical Threshold Value (STV) criterion of 410 CFU/100 mL for *E. coli* indicator bacteria are shown. The STV criterion is applied to the single sample results if less than 10 samples were collected within a calendar year at a site. The highest maximum 90-day rolling geomean of the sites is used to calculate the percent load reduction required to meet SWQS.

Unique Station ID	First Sample	Last Sample	Count	Maximum 90-Day Rolling Geomean (CFU/100mL)	Number Geomean Exceedances	Number STV Exceedances
W1575	5/8/2007	9/25/2007	5	314	3	2

Table 6-2. Indicator bacteria data by station, indicator, and date for the West Branch Housatonic River (MA21-18). Each sample date was designated wet or dry weather with wet weather defined as more than 0.5 inches of precipitation in the previous 72 hours. Red text highlights criteria exceedances of 410 CFU/100 mL (applied to single-sample "Result" since there were no more than 10 samples in a year to calculate the Statistical Threshold Value or STV) and 126 CFU/100 mL (applied to rolling 90-day geomean) for *E. coli* indicator bacteria.

Unique Station ID	Indicator	Date	Wet/Dry	Result (CFU/100mL)	90-Day Rolling Geomean (CFU/100mL)	90-Day Rolling STV (CFU/100mL)
W1575	*E. coli*	5/8/2007	DRY	30	30	
W1575	*E. coli*	6/12/2007	WET	448	116	
W1575	*E. coli*	7/17/2007	DRY	432	180	
W1575	*E. coli*	8/21/2007	DRY	160	314	
W1575	*E. coli*	9/25/2007	DRY	140	213	

6.3. Potential Pathogen Sources

Comparing data collected during wet weather versus dry weather conditions provides an indication of the types of sources present and information that can be used to focus pollutant reduction activities. Pathogen levels (as estimated by indicator bacteria) are usually higher in wet weather conditions as storm sewer systems overflow and/or stormwater runoff carries fecal matter that has accumulated on the landscape to the river via overland flow and stormwater conduits. Wet weather sources include wildlife and domesticated animal waste (including pets), urban stormwater runoff (including MS4 areas), CSOs, and SSOs. In other cases, dry weather pathogen and associated indicator bacteria concentrations can be high when there is a constant flow of pollutants during dry weather, which then becomes diluted during periods of precipitation. Dry weather sources include leaking sewer pipes, illicit connections of sanitary sewers to storm drains, failing septic systems, recreational use (such as swimmers), and direct wildlife and domesticated animal waste (including pets).

The indicator bacteria data for the West Branch Housatonic River (MA21-18) were elevated during both wet and dry weather. Elevated indicator bacteria during wet weather is consistent with urban stormwater, pet waste, and wildlife pathogen sources. Certain types of septic system malfunctions, such as rainwater infiltration or saturated disposal fields which overflow during precipitation, may also result in elevated wet weather indicator bacteria levels. Elevated indicator bacteria during dry weather suggest that baseflow sources, such as leaking pipes, illegal cross connections, other illicit discharges, and failing septic systems, are likely to be major sources of pathogens. Given the relatively small sample set, additional sampling under both wet and dry conditions, ideally at more than one location, would likely help to identify pollutant sources.

Each potential pathogen source is described in further detail below.

Urban Stormwater: Portions of the watershed are heavily developed. The watershed has 19% of land area in MS4 and 3% as DCIA. The developed areas within the watershed include medium to high density mixed residential, commercial, industrial, and transportation development. Stormwater runoff from urban areas is likely a significant source of pathogens.

Illicit Sewage Discharges: Most of the downstream portion of the watershed along the segment is served by public sewer. Sewer related risks include leaking infrastructure (pipes, pump stations, etc.) and sanitary sewer overflows, which may be caused by undersized infrastructure, blockages, or excessive infiltration of groundwater or rainwater into pipes, exceeding system capacity. Illicit connections of wastewater to stormwater drains are also a risk.

On-Site Wastewater Disposal Systems: Most development in the upstream and northeastern portions of the watershed rely on septic systems for wastewater treatment. It is likely that a portion of septic systems are not being properly maintained and are discharging untreated effluent to groundwater.

Agriculture: Agricultural activities account for 7% of the total land use area within the watershed, though most are well upstream of the segment. Those visible on recent aerial photos within the watershed include open fields, hayfields, row crops, and pastureland. Agricultural activities related to manure storage and spreading, if not well managed, are a possible source of pathogens to waterbodies.

Pet Waste: The segment flows through many dense residential neighborhoods, and several recreational lands are adjacent to the segment, such as Wahconah Park (ballfield), Carrie Bak Park, and Dorothy Amos Park. Conservation and recreational lands, parks, ballfields, and residential neighborhoods near or along the segment which may be popular for dog-walking, especially where paths are adjacent to rivers, ponds, or wetlands, represent a possible source of pathogens.

Wildlife Waste: Most of the segment benefits from at least some wooded buffer along its banks, though there are a few isolated mowed areas close to the river's edge. Large open mowed areas such as conservation and recreational lands, fields, golf courses, and wetlands with a clear sightline to a waterbody may attract excessive waterfowl and elevate indicator bacteria counts in the water.

6.4. Existing Local Management

This section identifies the municipalities immediately surrounding the impaired segment and its sub-basin. For a complete view of upstream municipalities and waterbodies, see the map in Figure 2-1.

Town of Lanesborough. See section 4.4.

City of Pittsfield. See Section 3.4

7. References

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