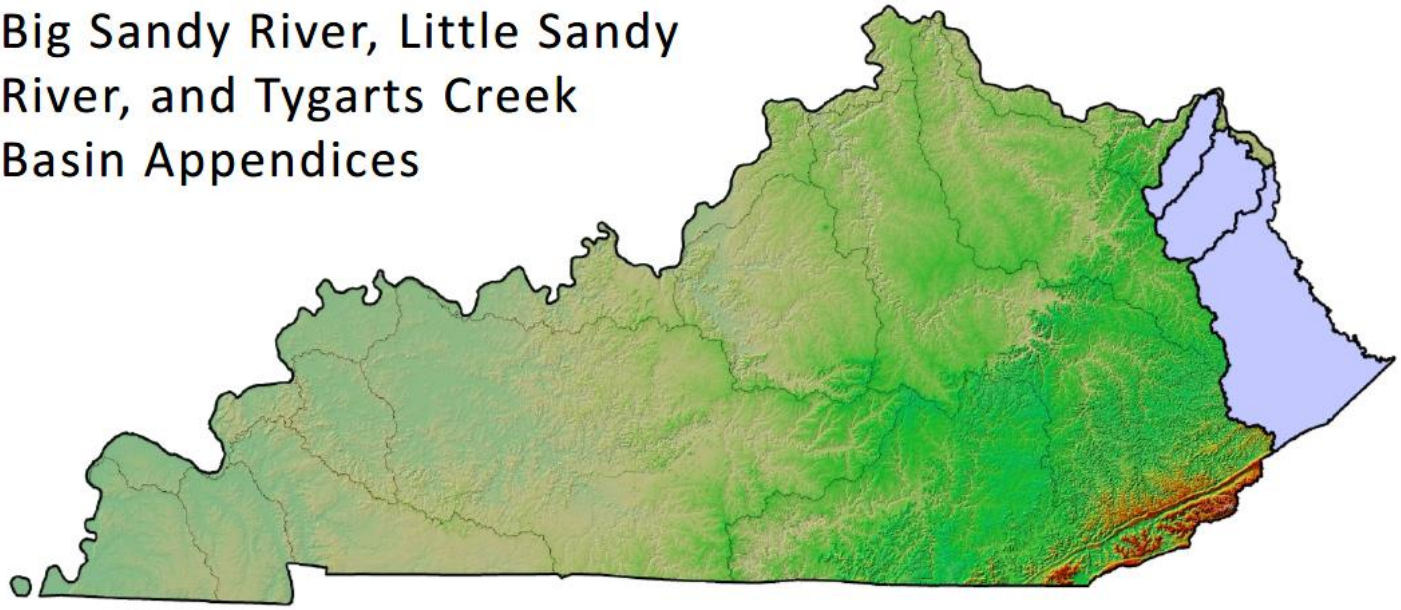
Addendum to
Kentucky Statewide Total Maximum Daily Load
for *Bacteria Impaired Waters*:

Big Sandy River, Little Sandy River, and Tygarts Creek Basin Appendices



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April 2021

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Proposed Draft
April 2021

Kentucky Department for Environmental Protection
Division of Water
Frankfort, Kentucky

This report is approved for release

_____

Carey M. Johnson, Director
Division of Water

_____

Date

DOCUMENT REVISION HISTORY

Date of Revision	Section(s) Revised	Revision Explanation

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

Co.	County
CSO	Combined Sewer Overflow
CWA	Clean Water Act
DOW	Kentucky Division of Water
EEC	Kentucky Energy and Environment Cabinet
EPA	United States Environmental Protection Agency
HUC	Hydrologic Unit Code
KAR	Kentucky Administrative Regulations
KPDES	Kentucky Pollutant Discharge Elimination System
LA	Load Allocation
ml	Milliliter
MOS	Margin of Safety
MS4	Municipal Separate Storm Sewer System
PCR	Primary Contact Recreation
RM	River Mile
SWS	Sanitary Wastewater System
TMDL	Total Maximum Daily Load
WLA	Wasteload Allocation
WQC	Water Quality Criteria
SWQMP	Storm Water Quality Management Plan

1.0 INTRODUCTION

The *Kentucky Statewide Total Maximum Daily Load* (TMDL) *for Bacteria Impaired Waters* is a new type of TMDL report that will address bacteria-impaired waters on Kentucky's 303(d) list in one streamlined report (DOW 2019). This new type of TMDL report will consist of a core document and a set of addendums. Initially, there will be a corresponding appendix for each of the 13 major river basins in Kentucky. Each appendix will contain TMDLs for the bacteria-impaired segments within that basin as of the 2016 303(d) list. The core background and methodology document and first river basin appendices (Green River and Tradewater River) were approved in 2019 by the U.S. Environmental Protection Agency (EPA). Subsequent river basin appendices will be added to the Kentucky Statewide Bacteria TMDL as they are completed. This addendum adds three new river basin appendices and provides references or updates where appropriate to the core background and methodology document.

1.1 Overview of Section 303(d) of the Clean Water Act

The Clean Water Act (CWA) requires states to designate uses for surface waters within their jurisdiction and to establish water quality standards to protect those designated uses. The designated uses assigned to waterbodies in Kentucky can be found in Kentucky Administrative Regulations (KAR) at 401 KAR 10:026. The water quality standards can be found at 401 KAR 10:031.

Section 303(d) of the CWA requires states to develop a list of impaired waters called the 303(d) list. Waterbodies placed on the 303(d) list have been assessed, have one or more designated uses impaired by one or more pollutants, and require the development of a TMDL for each pollutant causing an impairment. The TMDL establishes the allowable amount (i.e., load) of the pollutant the waterbody can naturally assimilate while continuing to meet the water quality standards for each designated use. Information from EPA on TMDLs can be found at: http://www.epa.gov/tmdl.

The Kentucky Division of Water (DOW) submits the 303(d) list to the EPA during even-numbered years. Each submittal replaces the previous list. Listings of bacteria-impaired segments can be found on DOW's most recent *Integrated Report to Congress on the Condition of Water Resources in Kentucky Volume II. 303(d) List of Surface Waters*, which can be obtained at: https://eec.ky.gov/Environmental-Protection/Water/Monitor/Pages/IntegratedReportDownload.aspx

1.2 Purpose of this Addendum

The purpose of this addendum is to:

- Add 18 bacteria TMDLs to the *Kentucky Statewide TMDL for Bacteria Impaired Waters*
- Provide the waterbody-specific information for all bacteria-impaired segments on Kentucky's 2016 303(d) list for the following river basins: 1) Big Sandy River basin, 2) Little Sandy River basin, and 3) Tygarts Creek basin

This addendum is not a stand-alone document. The method for developing a TMDL for each of the bacteria-impaired segments within this addendum (including general information and the TMDL loadings) can be found in the core TMDL document that was approved in 2019 (https://eec.ky.gov/Environmental-Protection/Water/Protection/TMDL/Pages/BactTMDL.aspx).

If an approved TMDL report existed for a bacteria-impaired segment within the Big Sandy River, Little Sandy River, or Tygarts Creek basins prior to the development of this addendum, that TMDL report is still in effect and can be found on the Watershed-Scale TMDL Reports list.

DOW will provide public notice and seek comment when subsequent appendices are added to the Statewide Bacteria TMDL.

For more information, please review the Statewide Bacteria Fact Sheet [PDF, 1.1 MB] or contact the TMDL Program at TMDL@ky.gov or call (502) 564-3410.

Additional information on bacteria TMDLs and how Kentuckians are reducing bacteria in their waterways can be found in the Understanding TMDLs Story Map.

1.3 Where to Find TMDL Information for this Addendum

The appendices within this addendum rely upon the core TMDL document for TMDL development. The bacteria TMDL water quality criteria (WQC) for all surface waters in Kentucky are promulgated in 401 KAR 10:031, which in Section 7(1)(a) states that for the Primary Contact Recreation (PCR) use and season (May 1-October 31),

Escherichia coli content shall not exceed 130 colonies per 100 ml as a geometric mean based on not less than five (5) samples taken during a thirty (30) day period. Content also shall not exceed 240 colonies per 100 ml in twenty (20) percent or more of all samples taken during a thirty (30) day period for Escherichia coli.

For the year-round Secondary Contact Recreation (SCR) use, Section 7(2)(a) states,

Fecal coliform content shall not exceed 1,000 colonies per 100 ml as a thirty (30) day geometric mean based on not less than five (5) samples; nor exceed 2,000 colonies per 100 ml in twenty (20) percent or more of all samples taken during a thirty (30) day period.

The bacteria WQC are summarized below in Table 1.3-1.

Table 1.3-1. Bacteria TMDL Water Quality Criteria for All Surface Waters[1]

Designated Use	Numeric Criterion
PCR	240 *E. coli* colonies/100 ml which must be met in at least 80% of all samples taken within a 30-day period during the Primary Contact Recreational season of May through October
PCR	130 E. coli colonies/100 ml as a geometric mean based on not less than 5 samples taken within a 30-day period during the Primary Contact Recreational season of May through October
SCR	2000 fecal coliform colonies/100 ml which must be met in at least 80% of all samples taken within a 30-day period
SCR	1000 fecal coliform colonies/100 ml as a geometric mean based on not less than 5 samples taken within a 30-day period

[1]The Primary Contact Recreation (PCR) designated use WQC are in effect from May 1 through October 31. The Secondary Contact Recreation (SCR) designated use WQC are in effect for the entire year.

Prior to November 1, 2019, PCR criteria also existed for fecal coliform. Those WQC are summarized in Table 1.3-2 for informational purposes. Prior to the expiration of the fecal coliform PCR criteria, several waterbodies in the Big Sandy, Little Sandy, and Tygarts Creek basins had been assessed as failing to meet those WQC and were listed as impaired due to fecal coliform. The TMDLs for waterbodies with PCR fecal coliform impairments are calculated in this document using the *E. coli* criteria, since the *E. coli* WQC must be met for a waterbody to support the PCR designated use.

Table 1.3-2 Expired Fecal Coliform Water Quality Criteria

Designated Use	Numeric Criterion
PCR	400 fecal coliform colonies/100_ml which must be met in at least 80% of all samples taken within a 30-day period during the Primary Contact Recreational season of May through October
PCR	200 fecal coliform colonies/100 ml as a geometric mean based on not less than 5 samples taken within a 30-day period during the Primary Contact Recreational season of May through October

A list of TMDL elements and their location within this addendum or the core TMDL document is provided in Table 1.3-3.

Table 1.3-3 Where to Find Information in this Addendum and the Core TMDL Document

TMDL Element	Description	Location
Water Quality Standards	Describes recreational uses, water quality standards, and waterbody assessment	Sections 1.0 and 2.0 of Core TMDL

TMDL Element	Description	Location
Water Quality Criteria	Provides the indicator bacteria used to assess pathogen levels in waterbodies and the bacteria standards for Kentucky's surface waters	Section 1.3 of this addendum
Physical Setting	Provides an overview of Kentucky's physical setting including soils, geology, and hydrology	Section 3.0 of Core TMDL
Source Assessment	Defines point and non-point sources of bacteria pollution and provides examples of bacteria sources that affect Kentucky's waterbodies	Section 4.0 of Core TMDL
Monitoring and Data Validation	Describes the types of data used for assessment and TMDL development	Section 5.0 of Core TMDL
TMDL Development	Provides a description of the TMDL calculation process and of required components such as the margin of safety factor, seasonality, and critical conditions	Section 6.0 of Core TMDL
Implementation	Provides a description of the implementation process (e.g. permit translation, development of watershed plans, coordination with local stakeholders, types of funding assistance and other resources)	Section 7.0 of Core TMDL
Public Participation	Provides a summary of the process used to solicit public comment on this addendum and DOW response to those comments	Section 2.0 of this addendum
MS4 Communities in Kentucky	Provides a list organized by county of Municipal Separate Storm Sewer System (MS4) communities in Kentucky (as of September 2018)	Appendix A of Core TMDL
Percent of Households Serviceable by Sewer	Provides the percent of households serviceable by sewer in Kentucky (2010). The list is organized by county and includes county population totals, and total number of households and serviceable households	Appendix B of Core TMDL
National Land Cover Database Classification Descriptions (NLCD 2011)	Defines the nationwide land cover classifications. The descriptions provide information on land cover and land use	Appendix P of Core TMDL

2.0 PUBLIC PARTICIPATION

2.1 Description of the Public Participation Process

DOW is seeking comments for the 18 segment TMDLs contained within this addendum only.

The method for developing the 18 segment TMDLs contained within this addendum rely on the core TMDL document from the *Kentucky Statewide Total Maximum Daily Load for Bacteria Impaired Waters* (DOW 2019).

DOW is not seeking further comments on information contained within the *Kentucky Statewide Total Maximum Daily Load for Bacteria Impaired Waters* (DOW 2019) as this document was approved by EPA in February 2019.

Public comments for the core TMDL document and the Green River and Tradewater River basin appendices can be found in Appendix Q of the *Kentucky Statewide Total Maximum Daily Load for Bacteria Impaired Waters* (DOW 2019).

2.2 Response to Comments

This subsection is reserved for future content.

REFERENCES

33 U.S.C. § 1251. Section 303(d). Clean Water Act. 1972.

401 KAR 10:026. Designation of uses of surface waters. Kentucky Energy and Environment Cabinet, Department for Environmental Protection, Division of Water. 2009.

401 KAR 10:031. Surface Water Standards. Kentucky Energy and Environment Cabinet, Department for Environmental Protection, Division of Water. 2009. Frankfort, KY.

DOW (Kentucky Division of Water). 2019. *Kentucky Statewide Total Maximum Daily Load for Bacteria Impaired Waters*. February 2019. Kentucky Department of Environmental Protection.

NLCD 2011. National Land Cover Database 2011 Legend and Land Cover Classification Description. Available at URL: https://www.mrlc.gov/data/legends/national-land-cover-database-2011-nlcd2011-legend.

APPENDIX C

Appendix C
Big Sandy River Basin

HUC 8: 05070201, 05070202, 05070203, 05070204

Level IV Ecoregions: Dissected Appalachian Plateau, Monongahela Transition Zone, Ohio/Kentucky Carboniferous Plateau

Drainage Area Within Kentucky: 2,283.75 square miles

Counties: Boyd, Floyd, Johnson, Knott, Lawrence, Letcher, Magoffin, Martin, Morgan, Pike

Major Cities: Pikeville, Paintsville, Prestonsburg, Louisa, Jenkins, Catlettsburg, Coal Run Village, Elkhorn City, Inez, Pippa Passes, Martin, Wheelwright

The Big Sandy River basin includes parts of Kentucky, Virginia, and West Virginia. The majority of the basin lies in far eastern Kentucky in the Eastern Coal Field physiographic region, with the remaining drainage area straddling the border with Virginia and West Virginia. This TMDL addresses only the portion within Kentucky's boundaries.

Table C.1 provides a summary of the stream segments located in the Big Sandy River basin that have been included on the Kentucky 2016 303(d) list for impairment due to fecal coliform and/or *E. coli*. The locations of the stream segments within the Kentucky portion of the Big Sandy River basin are shown in Figure C.1.

The river miles for each TMDL segment in this appendix match the 2016 303(d) list. Since the National Hydrography Dataset (NHD) is continually updated to maintain accurate waterbody information, the river mile information in this appendix may not reflect the current 1:24K NHD for Kentucky. River mile information for stream segments is updated in each new 303(d) list submitted to EPA.

Table C.1 2016 303(d) List Bacteria-impaired Stream Segments in the Big Sandy River Basin

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
Bear Creek 0.0 to 2.0	KY486557_01	PCR (nonsupport)	Fecal Coliform	*E. coli*	Animal Feeding Operations (NPS), On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
Big Creek 0.0 to 1.95	KY487161_01	PCR (nonsupport)	*E. coli*	*E. coli*	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
Blaine Creek 8.2 to 17.6	KY487428_01	PCR (partial support)	*E. coli*	*E. coli*	Non-Point Source, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Upstream/Downstream Source
Blaine Creek 35.0 to 39.7	KY487428_03	PCR (nonsupport)	*E. coli*	*E. coli*	Loss of Riparian Habitat, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Package Plant or Other Permitted Small Flows Discharges
Johns Creek 0.0 to 5.8	KY495347_01	PCR (partial support)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source, Rural (Residential Areas)
Johns Creek 24.0 to 34.3	KY495347_02	PCR (partial support)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Managed Pasture Grazing, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
Left Fork Middle Creek Levisa Fork 0.0 to 9.65	KY496241_01	PCR (nonsupport)	Fecal Coliform	*E. coli*	Source Unknown
Left Fork Middle Creek Levisa Fork 0.0 to 9.65	KY496241_01	SCR (nonsupport)	Fecal Coliform	Fecal Coliform	Source Unknown
Levisa Fork 0.0 to 5.8	KY496312_01	PCR (partial support)	*E. coli*	*E. coli*	Municipal (Urbanized High Density Area), Non-Point Source, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Residential Districts
Levisa Fork 31.2 to 54.55	KY496312_04	PCR (nonsupport)	*E. coli*	*E. coli*	Municipal (Urbanized High Density Area), Non-Point Source, Package Plant or Other Permitted Small Flows Discharges
Levisa Fork 65.05 to 97.8[2]	KY496312_06	PCR (nonsupport)	*E. coli*	TMDL not included in this document	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Package Plant or Other Permitted Small Flows Discharges, Urban Runoff/Storm Sewers
Levisa Fork 97.8 to 101.0[2]	KY496312_07	PCR (nonsupport)	Fecal Coliform	TMDL not included in this document	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Urban Runoff/Storm Sewers

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
Levisa Fork 118.5 to 127.45	KY496312_08	PCR (partial support)	Fecal Coliform	*E. coli*	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Sewage Discharges in Unsewered Areas
Middle Creek Levisa Fork 0.0 to 4.6	KY498108_01	PCR (partial support)	*E. coli*	*E. coli*	Non-Point Source, Package Plant or Other Permitted Small Flows Discharges, Urban Runoff/Storm Sewers
Paint Creek 0.0 to 7.1	KY500114_01	PCR (partial support)	*E. coli*	*E. coli*	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Residential Districts, Unspecified Domestic Waste
Paint Creek 7.1 to 8.2	KY500114_02	PCR (nonsupport)	Fecal Coliform	*E. coli*	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Unspecified Domestic Waste
Pond Creek 0.0 to 9.7[2]	KY501044_01	PCR (nonsupport)	*E. coli*	TMDL not included in this document	Package Plant or Other Permitted Small Flows Discharges
Rockcastle Creek 0.0 to 3.7	KY502158_01	PCR (nonsupport)	*E. coli*	*E. coli*	Non-Point Source, Rural (Residential Areas)
Tug Fork 0.0 to 10.45	KY1548311_01	PCR (partial support)	*E. coli*	*E. coli*	Non-Point Source, Residential Districts, Unspecified Urban Stormwater
Wolf Creek 0.0 to 6.6	KY507001_01	PCR (nonsupport)	*E. coli*	*E. coli*	Rural (Residential Areas), Unspecified Urban Stormwater

[1]Segments with PCR impairment due to fecal coliform have a TMDL developed for *E. coli* in this document.

[2]A TMDL is not included because this segment will be proposed for delisting on a future 303(d) list based on the most recent monitoring data.

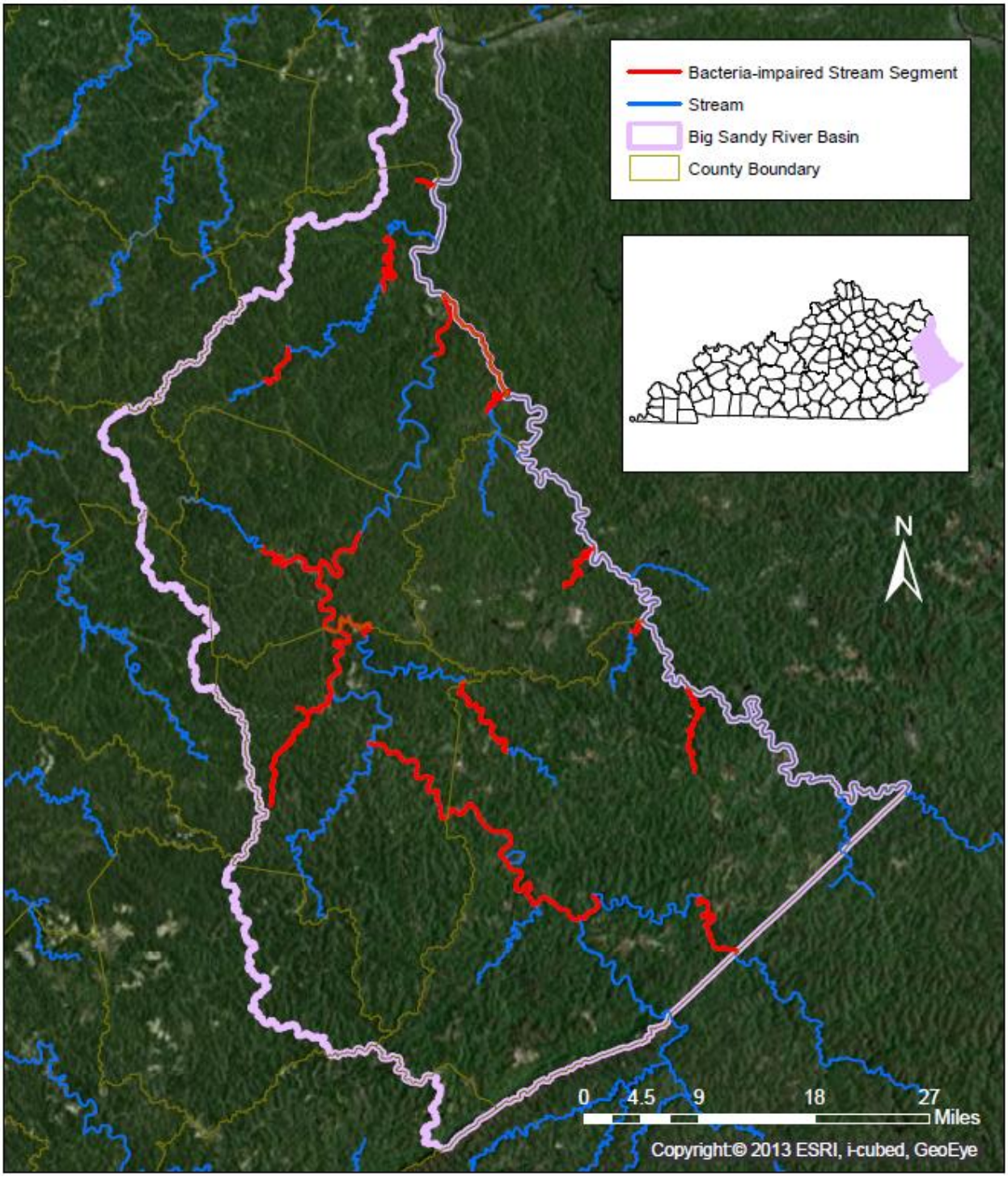

Figure C.1 Location of the Big Sandy River Basin and Bacteria-impaired Streams (May 2019)

Land cover data is summarized in Table C.2, and its geographic distribution is shown in Figure C.2. Deciduous forest is the predominant class of land cover in the Big Sandy River basin, accounting for approximately 74 percent. The next three classes by magnitude are grassland/herbaceous, open developed, and pasture/hay. Land cover classes are described in Appendix P of the core TMDL document.

Table C.2 Land Cover Classes in the Big Sandy River Basin (NLCD 2011)

Land Cover	Percent of Total Area	Square Miles	Acres
Open Water	0.53	11.99	7,674.39
Developed, Open	3.31	75.53	48,338.96
Developed, Low Intensity	2.08	47.5	30,401.80
Developed, Medium Intensity	0.86	19.6	12,540.91
Developed, High Intensity	0.21	4.88	3,125.89
Barren Land (Rock, Sand, Clay)	2.26	51.64	33,050.00
Deciduous Forest	74.12	1,692.82	1,083,402.23
Evergreen Forest	0.55	12.49	7,993.97
Mixed Forest	1.9	43.47	27,818.31
Shrub/Scrub	0.1	2.39	1,529.59
Grassland/Herbaceous	10.92	249.31	159,559.07
Pasture/Hay	2.9	66.18	42,357.83
Cultivated Crops	0.26	5.86	3,752.80
Woody Wetlands	0	0.07	44.48
Emergent Herbaceous Wetlands	0	0.02	9.79

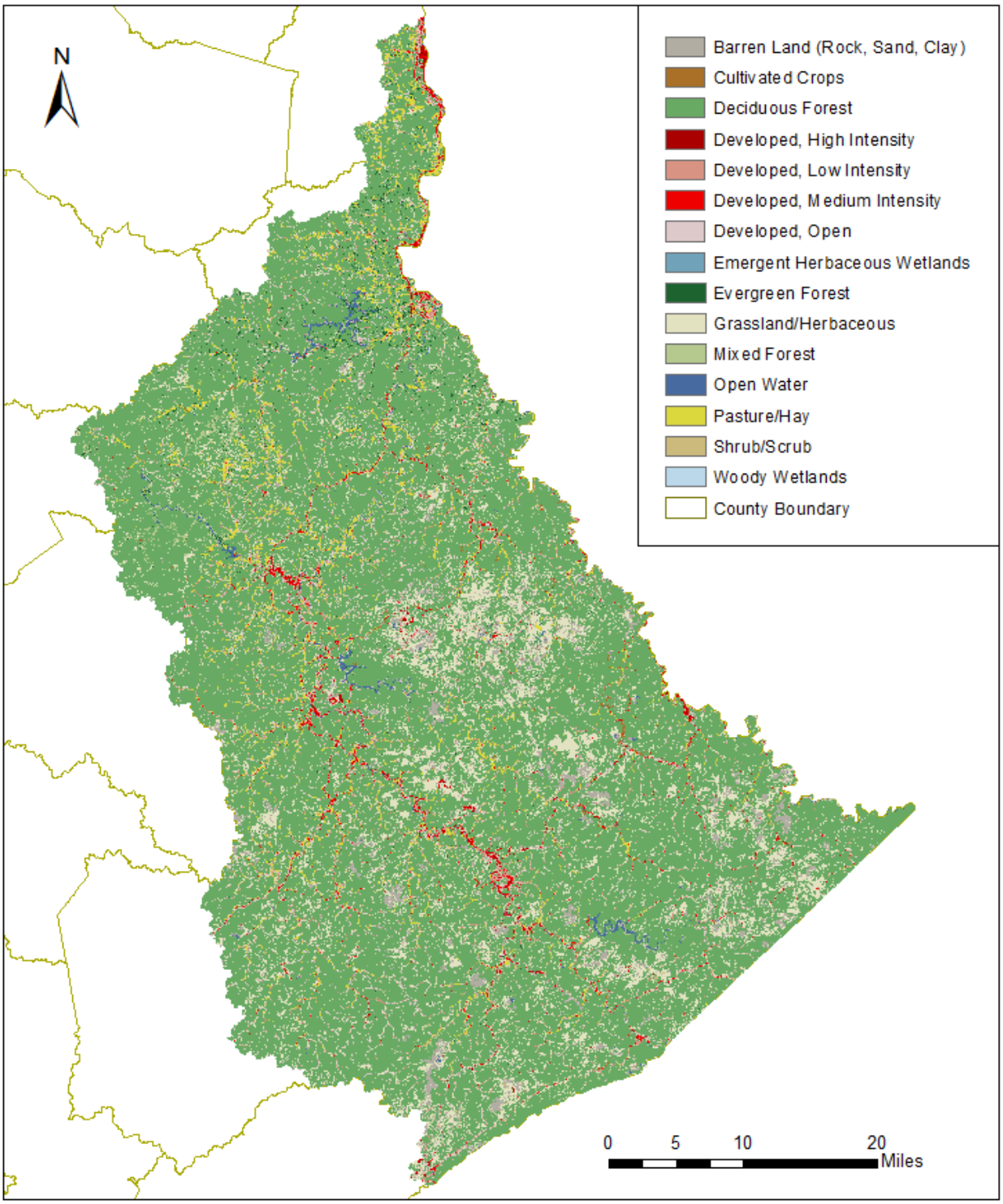

Figure C.2 Land Cover Types in the Big Sandy River Basin

Section C.1 Bear Creek 0.0 to 2.0

Waterbody ID: KY486557_01

Receiving Water: Big Sandy River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12: 050702040403

County: Lawrence

The Division of Water (DOW) collected samples from station BSW020, located near river mile 1.0, in 2002. The station was sampled four times during the PCR season in 2002 and was discontinued as an Ambient Monitoring Network Station. Table C.1-1 summarizes information about this sampling station; Table C.1-2 provides a summary of the data collected from this station.

Table C.1-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
BSW020	38.2458	- 82.6186	Bear Creek 0.0 to 2.0	1.0

Table C.1-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BSW020	fecal coliform	4	400	2,100	1,375

[(1)]The full data set for samples collected at BSW020 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Bear Creek 0.0 to 2.0 are presented in Table C.1-3.

Table C.1-3 Bear Creek 0.0 to 2.0 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	SWS-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Bear Creek. The directly discharging facility is a sanitary wastewater system (SWS). This SWS is an individual family residence with an on-site wastewater treatment system. There are no Municipal Separate Storm Sewer System (MS4) communities or Combined Sewer Overflows (CSOs) discharging directly to this segment of Bear Creek. The definitions for MS4 and CSO are found in 401 KAR 5:002. This facility is identified in Table C.1-4 and the location in the Bear Creek-Big Sandy River watershed is shown in Figure C.1-1.

Table C.1-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYG400695	Residence	0.0005	38.2475	-82.619722	08/31/2023	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft3/s) into a load (colonies/day).

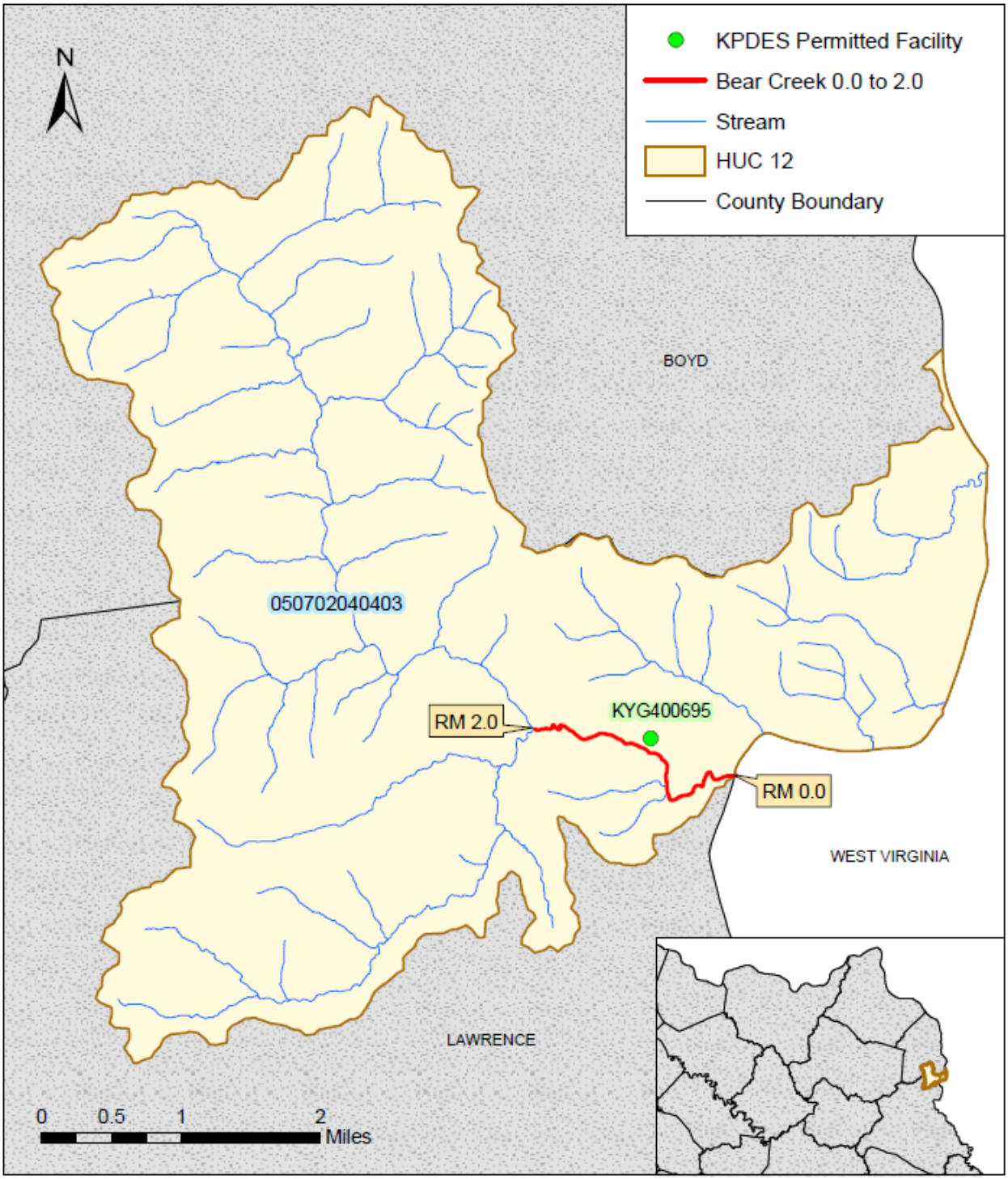

Figure C.1-1 Location of the KPDES-permitted Facility on Bear Creek 0.0 to 2.0

Section C.2 Big Creek 0.0 to 1.95

Waterbody ID: KY487161_01

Receiving Water: Tug Fork

Impaired Uses: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 050702010502

County: Pike

The Division of Water (DOW) has collected samples from station BSW016, located at river mile 0.9, since 2002. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station typically has been sampled five or more times during a monitoring year. It was not sampled in 2007. Table C.2-1 summarizes information about this sampling station; Table C.2-2 provides a summary of the data collected from this station.

Table C.2-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
BSW016	37.734175	-82.33854	Big Creek 0.0 to 1.95	0.9

Table C.2-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BSW016	fecal coliform	5	380	60,000	13,792
BSW016	*E. coli*	12	30	866	351

[(1)]The full data set for samples collected at BSW016 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Big Creek 0.0 to 1.95 are presented in Table C.2-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Big Creek. The location of the segment within the Lower Big Creek watershed is shown in Figure C.2-1.

Table C.2-3 Big Creek 0.0 to 1.95 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

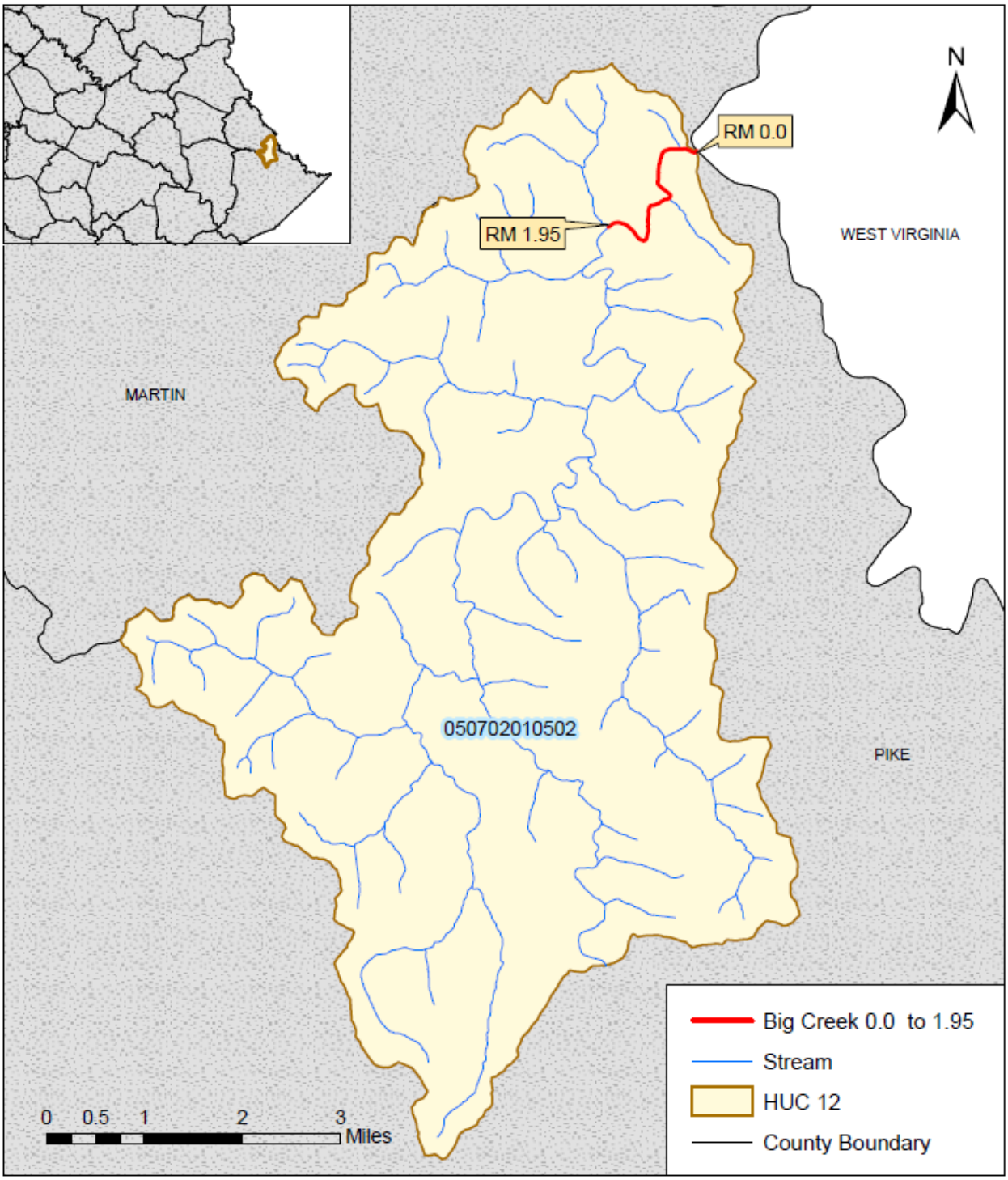

Figure C.2-1 Location of Big Creek 0.0 to 1.95

Section C.3 Blaine Creek 8.2 to 17.6

Waterbody ID: KY487428_01

Receiving Water: Big Sandy River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 050702040303, 050702040305

County: Lawrence

The Division of Water (DOW) has collected samples from station BSW019, located just past river mile 9.7, since 2002. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station typically has been sampled five to six times during a monitoring year. Table C.3-1 summarizes information about this sampling station; Table C.3-2 summarizes the data collected from this station.

Table C.3-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
BSW019	38.176297	-82.672608	Blaine Creek 8.2 to 17.6	9.7

Table C.3-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BSW019	fecal coliform	5	25	1,000	279
BSW019	*E. coli*	18	13	> 2,419	290

[(1)]The full data set for samples collected at BSW019 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in 401 KAR 10:031, Table 1.3-1, and in the core TMDL document (Table S.2 and Section 2.0).

The TMDL allocations for Blaine Creek 8.2 to 17.6 are presented in Table C.3-3.

Table C.3-3 Blaine Creek 8.2 to 17.6 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	SWS-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

There are four facilities permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharging treated effluent directly into this segment of Blaine Creek. These directly discharging facilities are sanitary wastewater systems (SWSs). Two of these SWS facilities are individual family residences with an on-site wastewater treatment system. There are no MS4 communities or CSOs discharging directly to this segment of Blaine Creek. These facilities are identified in Table C.3-4 and their locations within the Morgans Creek-Blaine Creek watershed are shown in Figure C.3-1.

Table C.3-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli* /day)
KYG402232	Residence	0.0005	38.15567	-82.67522	07/31/2018	Q_{SWS}×WQC×CF
KY0083640	Fallsburg Elementary School	0.007	38.180556	-82.679444	09/30/2021	Q_{SWS}×WQC×CF
KYG402633	Residence	0.0005	38.14466	-82.67023	08/31/2023	Q_{SWS}×WQC×CF
KY0104744	Creekside Cabin Rentals	0.0099	38.167778	-82.67750	09/30/2024	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

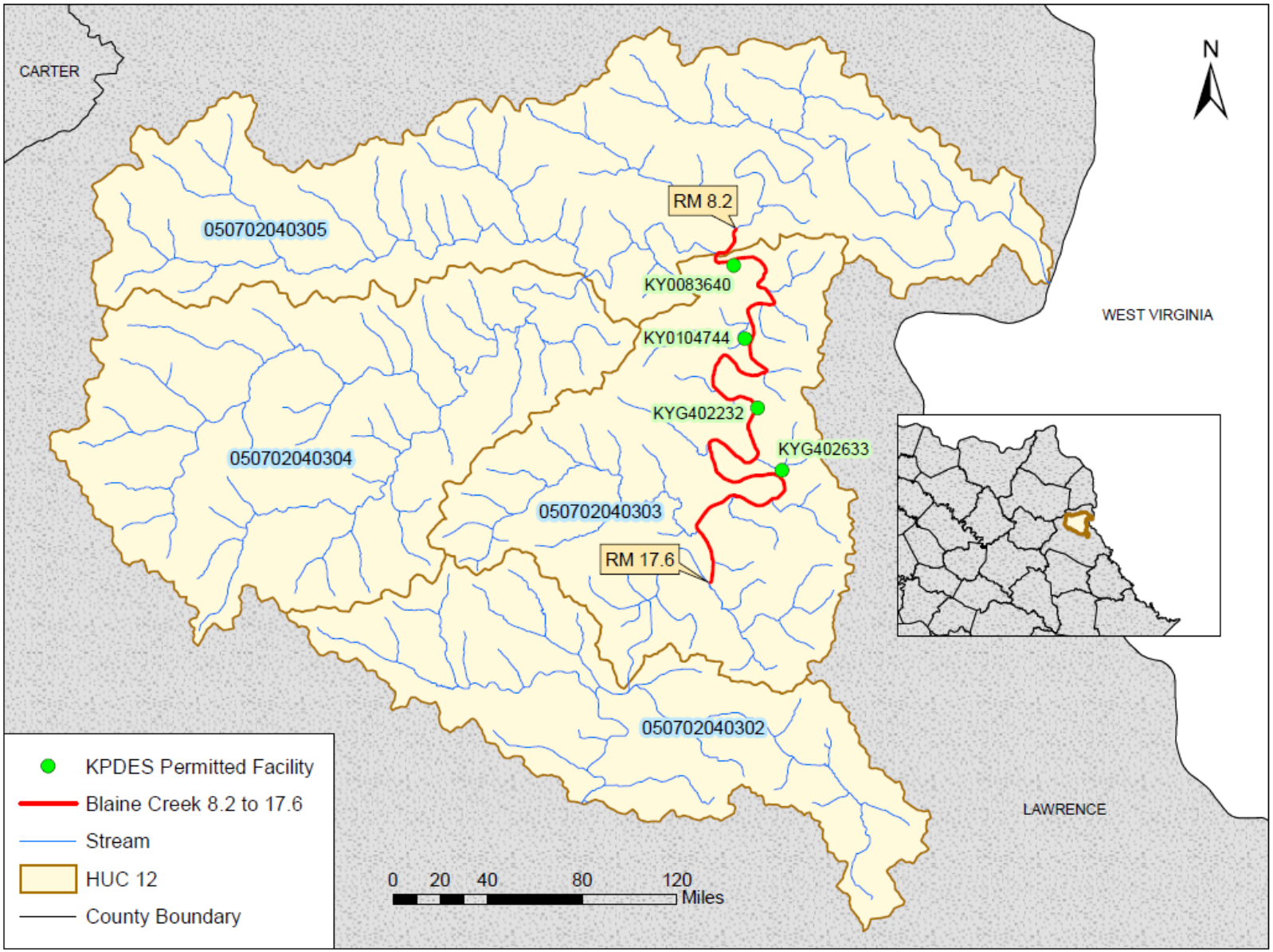

Figure C.3-1 Locations of KPDES-permitted Facilities on Blaine Creek 8.2 to 17.6

Section C.4 Blaine Creek 35.0 to 39.7

Waterbody ID: KY487428_03

Receiving Water: Big Sandy River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant *E. coli*

HUC 12: 050702040105, 050702040201

County: Lawrence

The Division of Water (DOW) has collected samples from station BSW018, located just past river mile 38.65, since 2002. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station typically has been sampled four to six times during a monitoring year. Table C.4-1 summarizes information about this sampling station; Table C.4-2 summarizes the data collected from this station.

Table C.4-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
BSW018	38.029	-82.8495	Blaine Creek 35.0 to 39.7	38.65

Table C.4-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BSW018	fecal coliform	4	30	2,000	778
BSW018	*E. coli*	18	79	9,208	1,156

[(1)]The full data set for samples collected from BSW018 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Blaine Creek 35.0 to 39.7 are presented in Table C.4-3.

Table C.4-3 Blaine Creek 35.0 to 39.7 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	SWS-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Blaine Creek. The directly discharging facility is a sanitary wastewater system. There are no MS4 communities or CSOs discharging directly to this segment of Blaine Creek. This facility is identified in Table C.4-4 and the location within the Cains Creek-Blaine Creek and Cherokee Creek-Blaine Creek watersheds is shown in Figure C.4-1.

Table C.4-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli* /day)
KY0075299	Blaine Elementary School	0.007	38.030833	-82.842222	09/30/2021	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

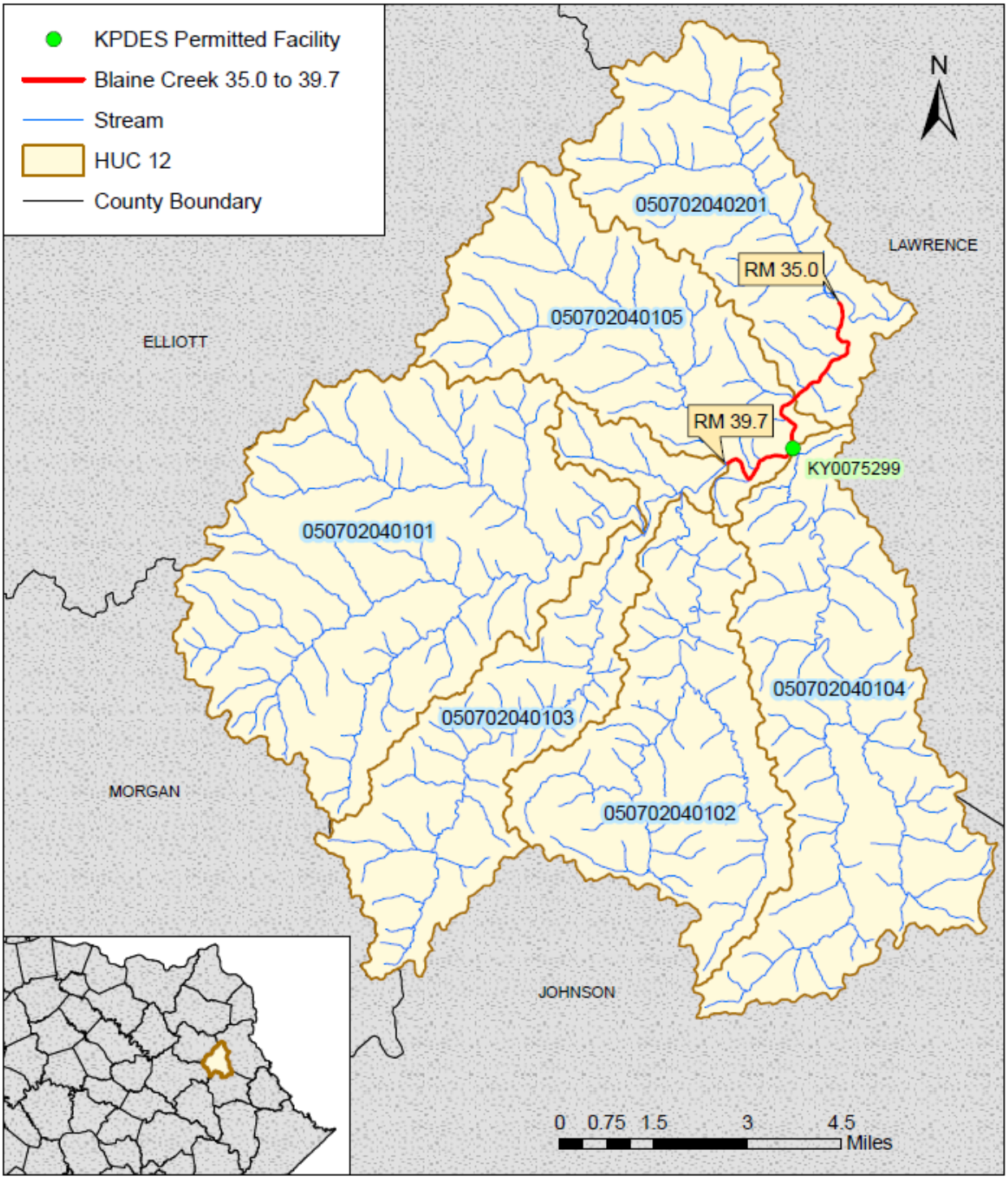

Figure C.4-1 Location of the KPDES-permitted Facility on Blaine Creek 35.0 to 39.7

Section C.5 Johns Creek 0.0 to 5.8

Waterbody ID: KY495347_01

Receiving Water: Levisa Fork

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 050702030305

Counties: Johnson, Floyd

The Division of Water (DOW) has collected samples from station BSW026, located just past river mile 4.7, since 2002. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station typically has been sampled five to six times during a monitoring year. Table C.5-1 summarizes information about this sampling station; Table C.5-2 provides a summary of the data collected from this station.

Table C.5-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
BSW026	37.7479	-82.7229	Johns Creek 0.0 to 5.8	4.7

Table C.5-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BSW026	fecal coliform	6	1	90	49
BSW026	*E. coli*	18	4	1,201	152

[(1)]The full data set for samples collected from BSW026 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Johns Creek 0.0 to 5.8 are presented in Table C.5-3.

Table C.5-3 Johns Creek 0.0 to 5.8 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	SWS-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Johns Creek. The directly discharging facility is a sanitary wastewater system. There are no MS4 communities or CSOs discharging directly to this segment of Johns Creek. This facility is identified in Table C.5-4 and the location within the Daniels Creek-Johns Creek watershed is shown in Figure C.5-1.

Table C.5-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli* /day)
KY0103578	Honey Branch Regional Sewage Treatment Plant	1.0	37.75214	-82.757	06/30/2019	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

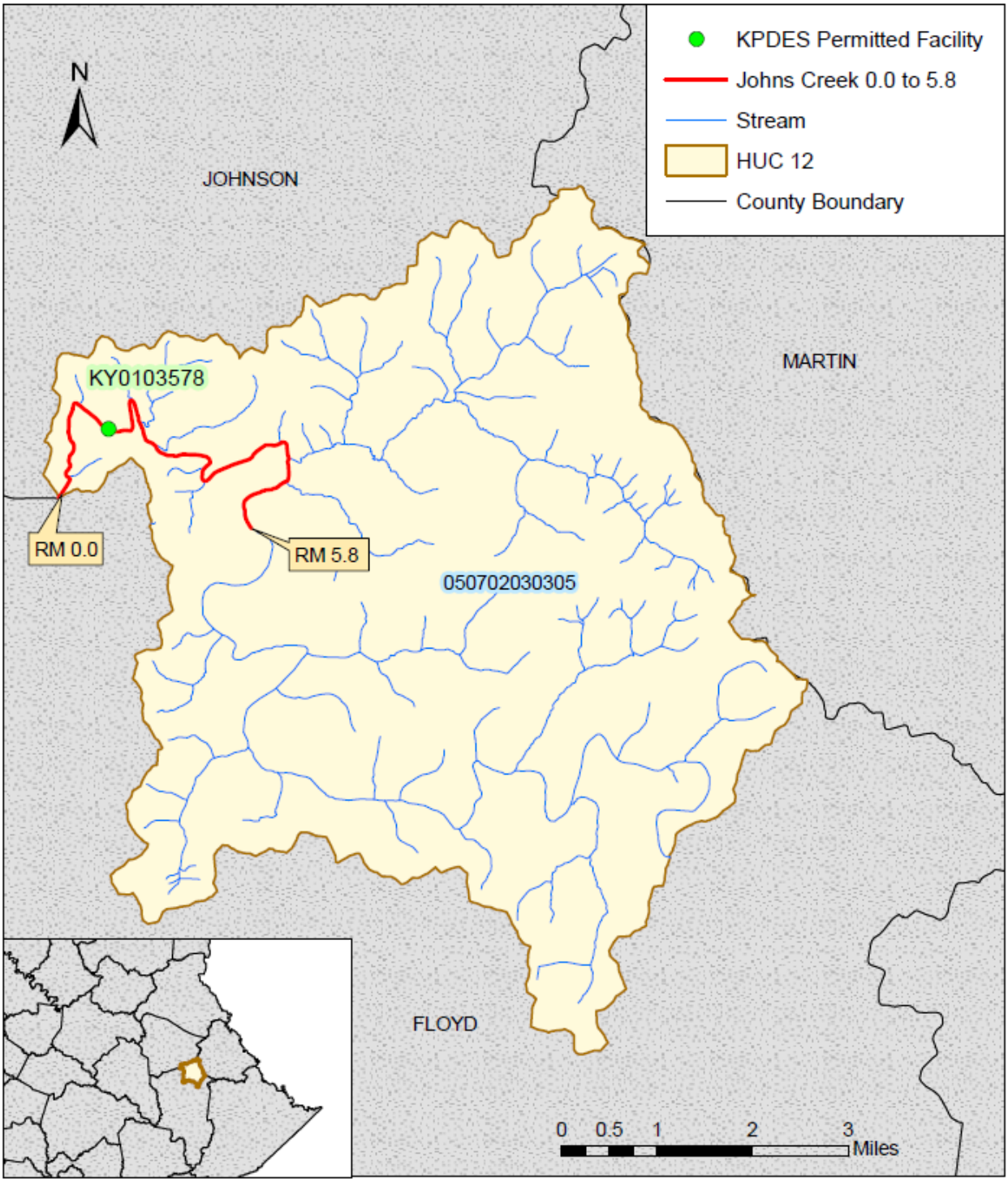

Figure C.5-1 Location of the KPDES-permitted Facility on Johns Creek 0.0 to 5.8

Section C.6 Johns Creek 24.0 to 34.3

Waterbody ID: KY495347_02

Receiving Water: Levisa Fork

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 050702030304

County: Pike

The Division of Water (DOW) collected two to six samples at station PRI096, located near river mile 26.6, every year between 1998 and 2018 except for 2004, 2005, 2007, and 2009. Table C.6-1 summarizes information about this sampling station; Table C.6-2 provides a summary of the data collected from this station.

Table C.6-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
PRI096	37.65529	-82.587115	Johns Creek 24.0 to 34.3	26.6

Table C.6-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
PRI096	fecal coliform	34	30	2,400	1,422
PRI096	*E. coli*	33	31	1,986	490

[(1)]The full data set for samples collected from PRI096 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in 401 KAR 10:031, Table 1.3-1, and in the core TMDL document (Table S.2 and Section 2.0).

The TMDL allocations for Johns Creek 24.0 to 34.3 are presented in Table C.6-3.

Table C.6-3 Johns Creek 24.0 to 34.3 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	SWS-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Two facilities permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharge treated effluent directly into this segment of Johns Creek. These directly discharging facilities are sanitary wastewater systems (SWSs). These two SWS facilities are individual family residences with an on-site wastewater treatment system. There are no MS4 communities or CSOs discharging directly to this segment of Johns Creek. These facilities are identified in Table C.6-4 and the locations within the Buffalo Creek-Johns Creek watershed are shown in Figure C.6-1.

Table C.6-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli* /day)
KYG400973	Residence	0.0005	37.619444	-82.550833	07/31/2018	Q_{SWS}×WQC×CF
KYG401180	Residence	0.0005	37.601389	-82.535278	07/31/2018	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

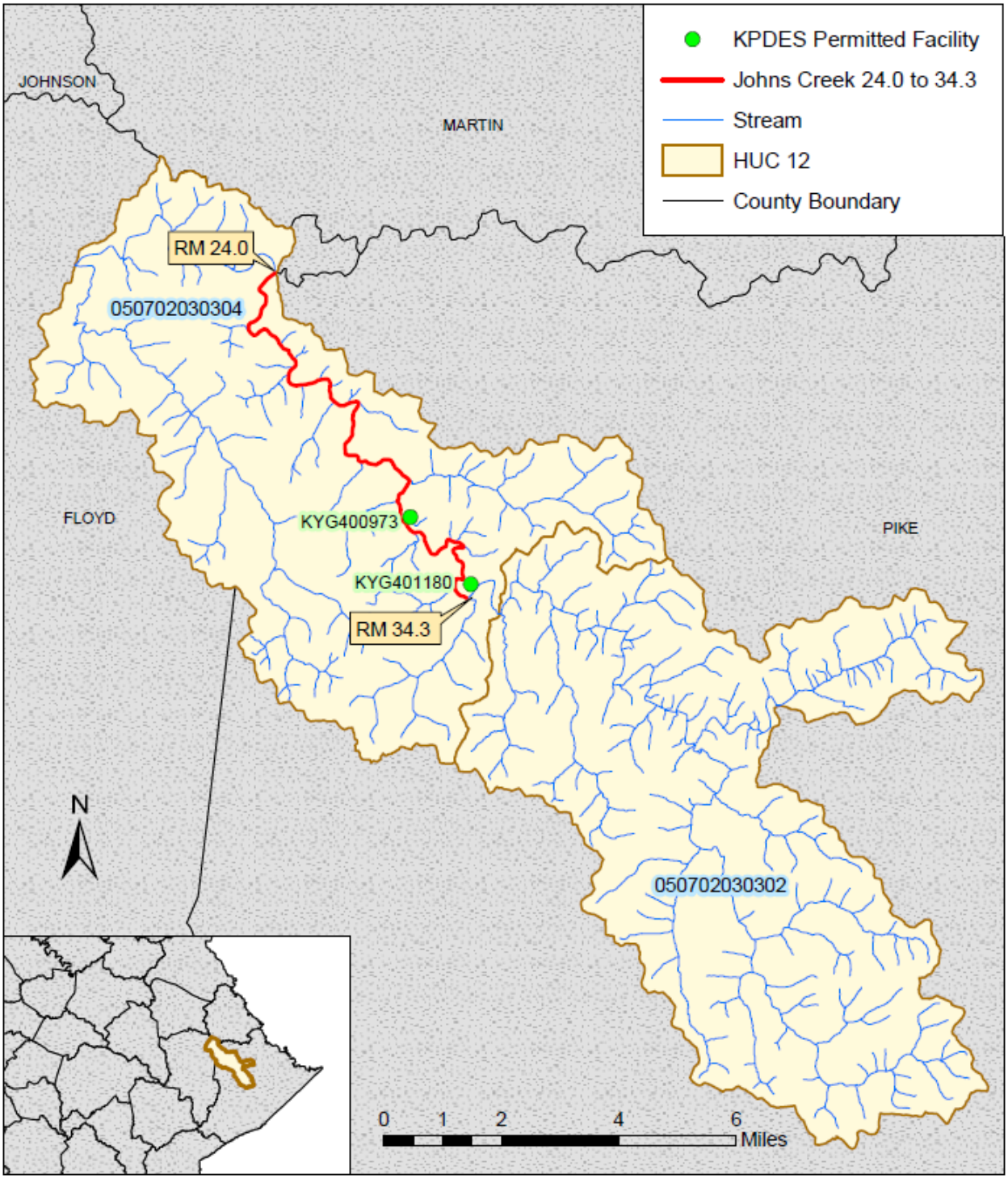

Figure C.6-1 Locations of KPDES-permitted Facilities on Johns Creek 24.0 to 34.3

Section C.7 Left Fork Middle Creek Levisa Fork 0.0 to 9.65

Waterbody ID: KY496241_01

Receiving Water: Middle Creek Levisa Fork

Impaired Use: PCR, SCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli* (PCR), fecal coliform (SCR)

HUC 12: 050702030205

County: Floyd

Sampling data from Left Fork Middle Creek Levisa Fork 0.0 to 9.65 is not available. This segment was listed based on data collected by Blackburn Contracting in 2002 and 2003. This segment was first listed on Kentucky's 2010 303(d) list.

The TMDL allocations for Left Fork Middle Creek Levisa Fork 0.0 to 9.65 are presented in Table C.7-1. The location of the segment within the Lower Middle Creek Levisa Fork watershed is shown in Figure C.7-1.

Table C.7-1 Left Fork Middle Creek Levisa Fork 0.0 to 9.65 TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	SWS-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of either *E. coli* or fecal coliform. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

(d)For SCR-impaired segments, SWS sources must meet the PCR criterion year-round as measured by *E. coli*.

Two facilities permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharge treated effluent directly into this segment of Left Fork Middle Creek Levisa Fork. These directly discharging facilities are sanitary wastewater systems (SWSs). These two SWS facilities are individual family residences with an on-site wastewater treatment system. There are no MS4 communities or CSOs discharging directly to this segment of Left Fork Middle Creek Levisa Fork. These facilities are identified in Table C.7-2 and the locations within the Lower Middle Creek Levisa Fork watershed are shown in Figure C.7-1.

Table C.7-2 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli* /day)
KYG400696	Residence	0.0005	37.60444	-82.8622	07/31/2018	Q_{SWS}×WQC×CF
KYG401964	Residence	0.0005	37.59833	-82.8639	07/31/2018	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

Figure C.7-1 Locations of KPDES-permitted Facilities on Left Fork Middle Creek Levisa Fork 0.0 to 9.65

Section C.8 Levisa Fork 0.0 to 5.8

Waterbody ID: KY496312_01

Receiving Water: Big Sandy River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 050702030505

County: Lawrence

The Division of Water (DOW) collected one to six samples at station PRI064, located near river mile 0.2, in 1994 and 1995 and every year from 2000 through 2018 except for 2004, 2005, and 2009. Table C.8-1 summarizes information about this sampling station; Table C.8-2 provides a summary of the data collected from this station.

Table C.8-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
PRI064	38.115921	-82.600416	Levisa Fork 0.0 to 5.8	0.2

Table C.8-2 Sample Data Summary[1]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
PRI064	fecal coliform	27	1	2,000	308
PRI064	*E. coli*	39	10	> 2,419	417

[1]The full data set for samples collected from station PRI064 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[2]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Levisa Fork 0.0 to 5.8 are presented in Table C.8-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Levisa Fork. The location of the segment is shown within the Griffin Creek-Levisa Fork watershed in Figure C.8-1.

Table C.8-3 Levisa Fork 0.0 to 5.8 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2] Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

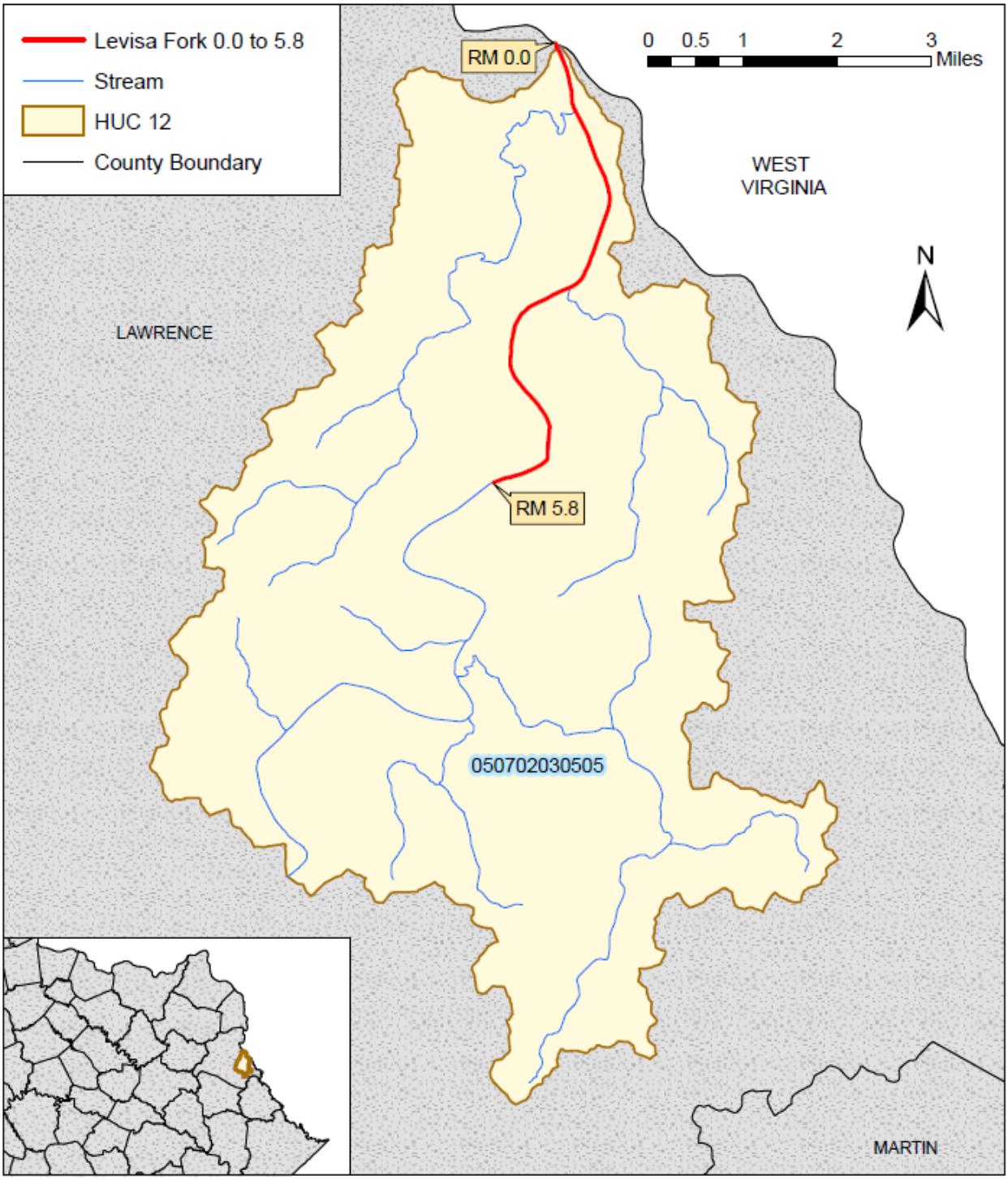

Figure C.8-1 Location of Levisa Fork 0.0 to 5.8

Section C.9 Levisa Fork 31.2 to 54.55

Waterbody ID: KY496312_04

Receiving Water: Big Sandy River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 050702030206, 050702030501, 050702030502

County: Floyd, Johnson

The Division of Water (DOW) collected one to six samples at station PRI094, located near river mile 48.3, during the PCR season for every year between 1998 and 2018, although it was not sampled in 2004, 2005, and 2009. Table C.9-1 summarizes information about this sampling station; Table C.9-2 provides a summary of the data collected from this station.

Table C.9-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
PRI094	37.729083	-82.754389	Levisa Fork 31.2 to 54.55	48.3

Table C.9-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
PRI094	fecal coliform	33	4	9,000	1,110
PRI094	*E. coli*	41	10	8,664	1,011

[(1)]The full data set for samples collected from station PRI094 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Levisa Fork 31.2 to 54.55 are presented in Table C.9-3

Table C.9-3 Levisa Fork 31.2 to 54.55 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	SWS-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Eleven facilities permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharge treated effluent directly into this segment of Levisa Fork. These directly discharging facilities are sanitary wastewater systems (SWSs). One of these SWS facilities is an individual family residence with an on-site wastewater treatment system. There are no MS4 communities or CSOs discharging directly to this segment of Levisa Fork. These facilities are identified in Table C.9-4, and their approximate locations within the Toms Creek-Levisa Fork and Miller Creek-Levisa Fork watersheds are shown in Figure C.9-1. Note that, due to outfall density along this segment, outfall locations have been generalized to optimize readability of the map.

Table C.9-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli* /day)
KY0101648	Barkwood Estates	0.01	37.754528	-82.784333	12/31/2022	Q_{SWS}×WQC×CF
KY0098183	Big Sandy Community and Technical College Hagerhill Campus	0.005	37.76528	-82.785280	09/30/2023	Q_{SWS}×WQC×CF
KY0095401	Brookside Apartments	0.018	37.831111	-82.762222	09/30/2022	Q_{SWS}×WQC×CF
KY0041084	Carl D. Perkins Comprehensive Rehab Center	0.025	37.821389	-82.769444	05/31/2021	Q_{SWS}×WQC×CF
KY0094781	Mountain Comprehensive Care Center	0.004	37.777167	-82.792778	09/30/2023	Q_{SWS}×WQC×CF
KY0020630	Paintsville Sewage Treatment Plant	0.99	37.812222	-82.791389	03/31/2025	Q_{SWS}×WQC×CF
KY0027413	Prestonsburg Sewage Treatment Plant	0.75	37.690556	-82.777778	01/31/2021	Q_{SWS}×WQC×CF
KY0094129	River Road Disposal System	0.006	37.7765	-82.787694	12/31/2022	Q_{SWS}×WQC×CF
KY0044113	Riverview Village Housing Comp.	0.02	37.824164	-82.769443	09/30/2022	Q_{SWS}×WQC×CF
KY0083208	Thelma Waste Control Inc #1	0.02	37.829722	-82.762778	12/31/2022	Q_{SWS}×WQC×CF
KYG401607	Residence	0.0005	37.778333	-82.781111	08/31/2023	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

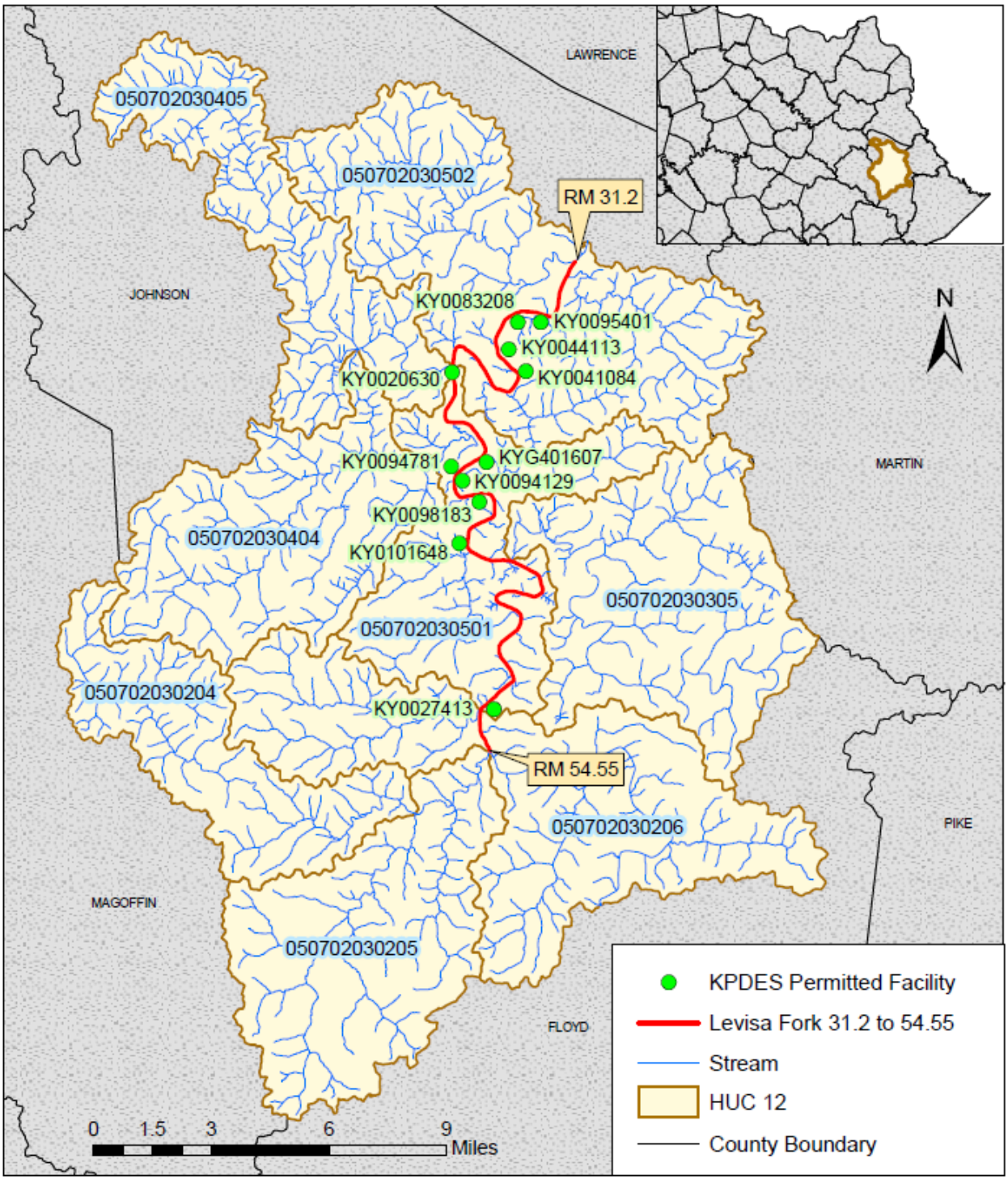

Figure C.9-1 Locations of KPDES-permitted Facilities on Levisa Fork 31.2 to 54.55

Section C.10 Levisa Fork 118.5 to 127.45

Waterbody ID: KY496312_08

Receiving Water: Big Sandy River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12: 050702020202

County: Pike

Sampling data from Levisa Fork 118.5 to 127.45 is not available. This segment was listed based on data collected prior to 1998 from an agency in the state of Virginia. This segment was first listed in Kentucky's 1998 303(d) list. A reach of Levisa Fork immediately upstream of this segment was listed by the Virginia Department of Environmental Quality (DEQ) as impaired for Recreation (*E.coli*). DEQ included this segment an EPA-approved TMDL in 2011 (*E.coli, Phased Benthic and Phased Total PCB TMDL Development for Levisa Fork, Slate Creek and Garden Creek*).

The TMDL allocations for Levisa Fork 118.5 to 127.45 are presented in Table C.10-3.

Table C.10-3 Levisa Fork 118.5 to 127.45 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	SWS-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Levisa Fork. This directly discharging facility is a sanitary wastewater system (SWS). This SWS facility is an individual family residence with an on-site wastewater treatment system. There are no MS4 communities or CSOs discharging directly to this segment of Levisa Fork. The location of the segment within the Feds Creek-Levisa Fork watershed is shown in Figure C.10-1.

Table C.10-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli* /day)
KYG401260	Residence	0.0005	37.38167	-82.2536	08/31/2023	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

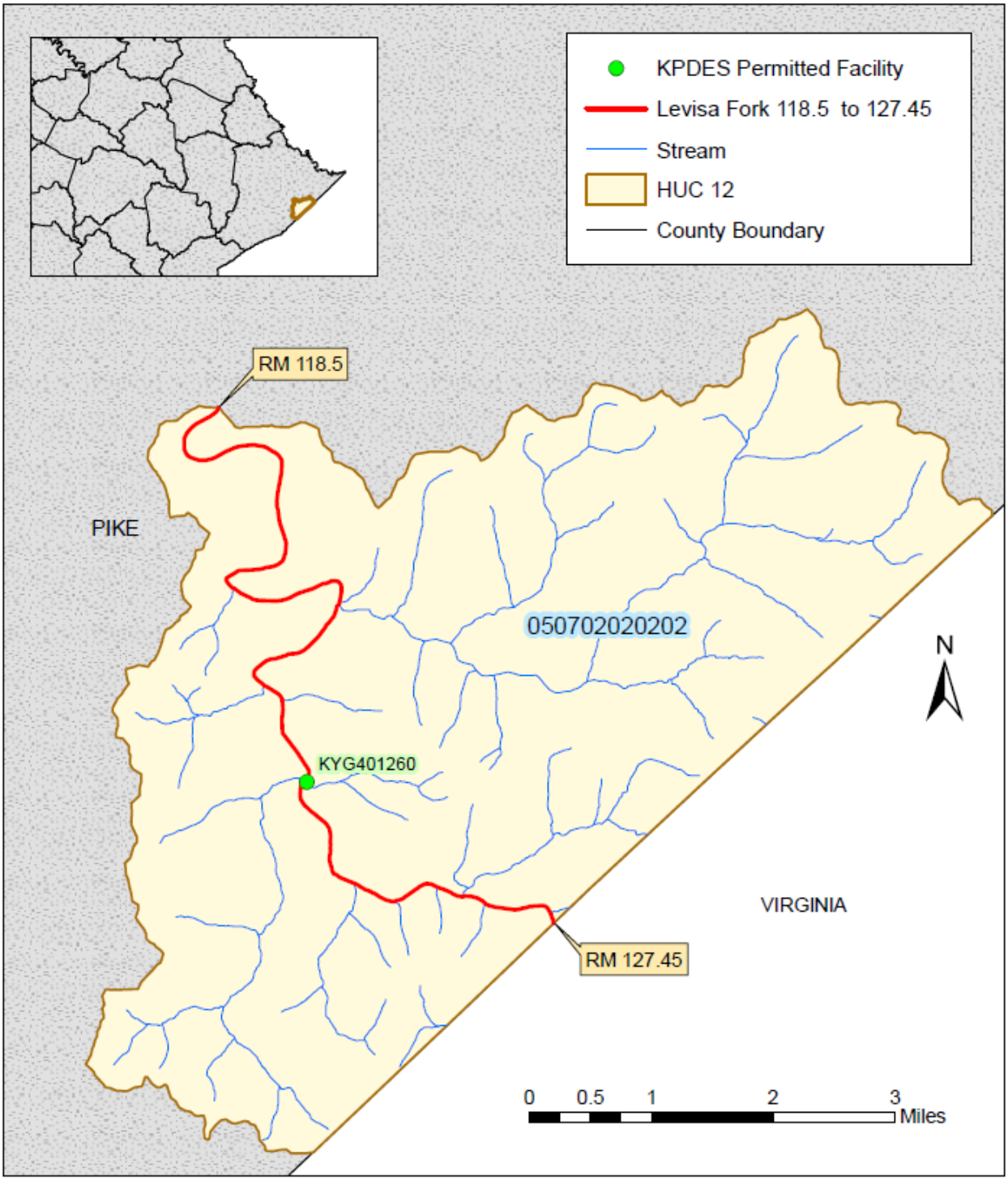

Figure C.10-1 Location of the KPDES-permitted Facility on Levisa Fork 118.5 to 127.45

Section C.11 Middle Creek Levisa Fork 0.0 to 4.6

Waterbody ID: KY498108_01

Receiving Water: Levisa Fork

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 050702030204, 050702030205

County: Floyd

The Division of Water (DOW) has collected samples from station BSW031, located near river mile 2.1, since 2007. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station typically has been sampled six times during a monitoring year. Table C.11-1 summarizes information about this sampling station; Table C.11-2 provides a summary of the data collected from this station.

Table C.11-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
BSW031	37.654917	-82.796852	Middle Creek Levisa Fork 0.0 to 4.6	2.1

Table C.11-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BSW031	*E. coli*	18	20	10,460	910

[(1)]The full data set for samples collected from BSW031 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Middle Creek Levisa Fork 0.0 to 4.6 are presented in Table C.11-3.

Table C.11-3 Middle Creek Levisa Fork 0.0 to 4.6 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	SWS-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Middle Creek Levisa Fork. The directly discharging facility is a sanitary wastewater system (SWS). This SWS is an individual family residence with an on-site wastewater treatment system. There are no MS4 communities or CSOs discharging directly to this segment of Middle Creek Levisa Fork. This facility is identified in Table C.11-4 and the location is shown within the Lower Middle Creek Levisa Fork watershed in Figure C.11-1.

Table C.11-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli* /day)
KYG402062	Residence	0.0005	37.65457	-82.7978	08/31/2023	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

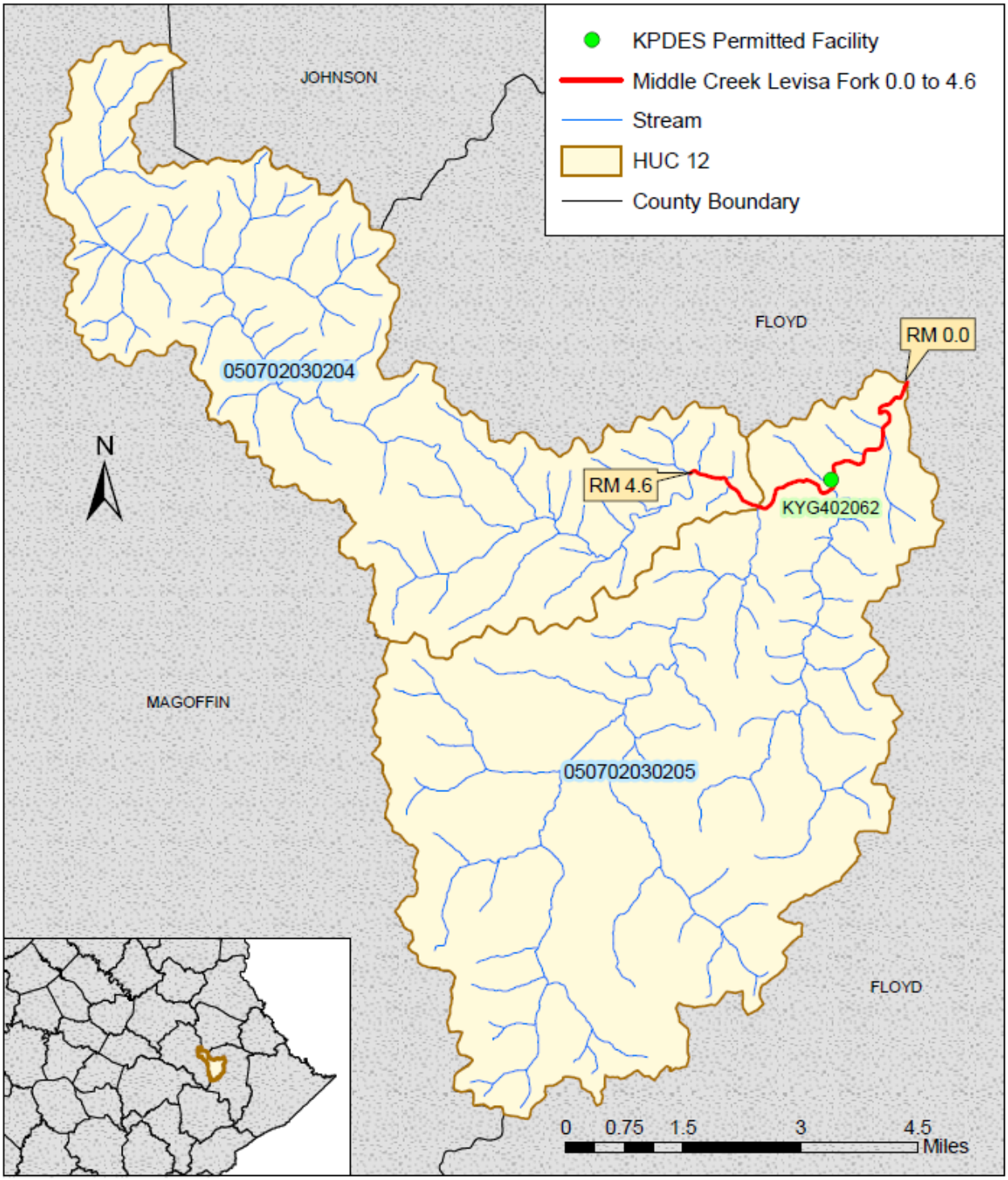

Figure C.11-1 Location of the KPDES-permitted Facility on Middle Creek Levisa Fork 0.0 to 4.6

Section C.12 Paint Creek 0.0 to 7.1

Waterbody ID: KY500114_01

Receiving Water: Levisa Fork

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12s: 050702030404, 050702030405

County: Johnson

The Division of Water (DOW) has collected samples from station BSW025, located at river mile 4.3, since 2002. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station typically has been sampled five or more times during a monitoring year. Table C.12-1 summarizes information about this sampling station; Table C.12-2 provides a summary of the data collected from this station.

Table C.12-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
BSW025	37.818699	-82.845608	Paint Creek 0.0 to 7.1	4.3

Table C.12-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BSW025	fecal coliform	5	330	3,300	1,086
BSW025	*E.coli*	18	20	1,333	287

[(1)]The full data set for samples collected from BSW025 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Paint Creek 0.0 to 7.1 are presented in Table C.12-3.

Table C.12-3 Paint Creek 0.0 to 7.1 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	SWS-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Paint Creek. The directly discharging facility is a sanitary wastewater system (SWS). This SWS is an individual family residence with an on-site wastewater treatment system. There are no MS4 communities or CSOs discharging directly to this segment of Paint Creek. This facility is identified in Table C.12-4 and the location within the Mudlick Creek-Paint Lick watershed is shown in Figure C.12-1.

Table C.12-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli* /day)
KYG400186	Residence	0.0005	37.8275	-82.8514	07/31/2018	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

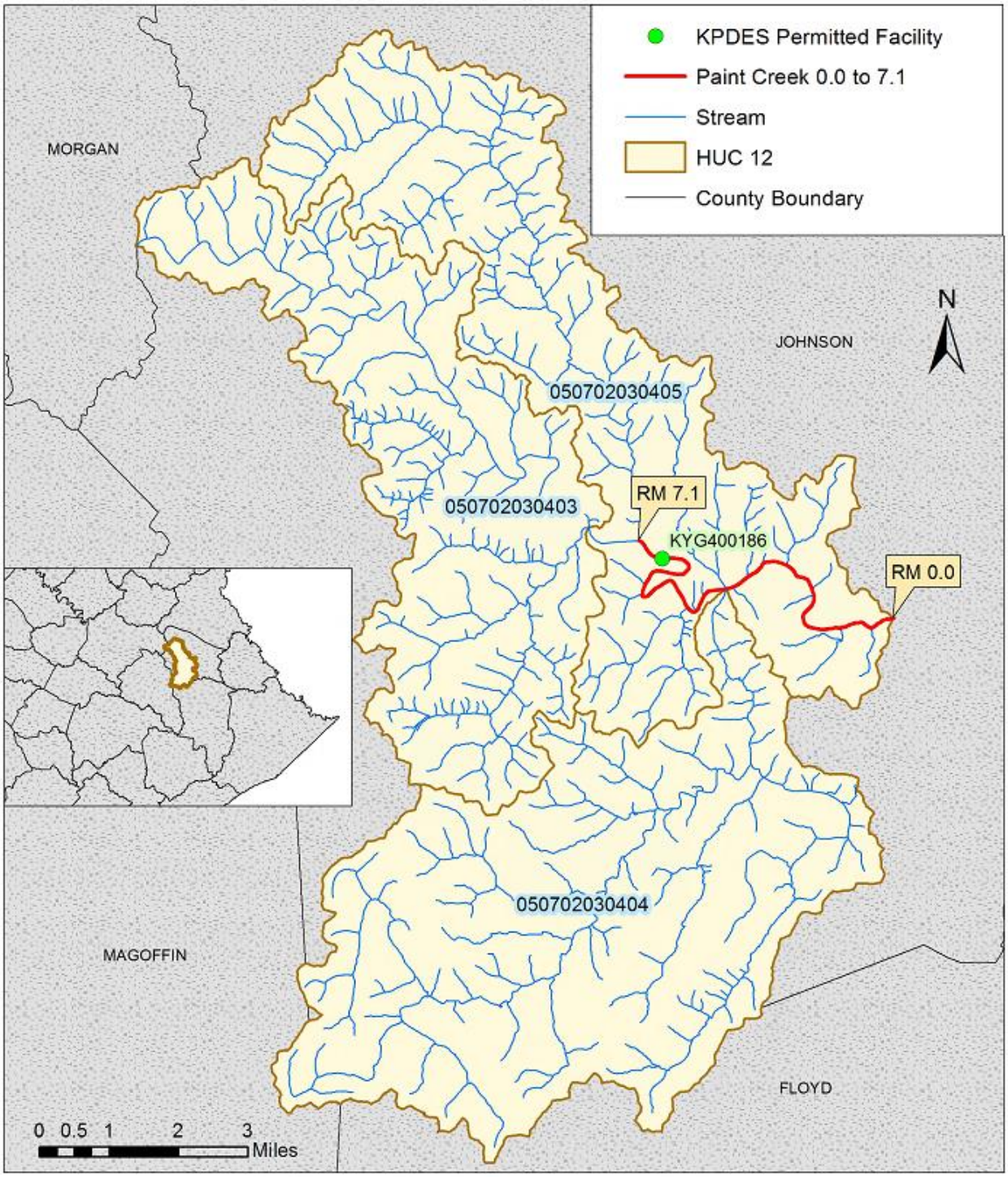

Figure C.12-1 Location of the KPDES-permitted Facility on Paint Creek 0.0 to 7.1

Section C.13 Paint Creek 7.1 to 8.2

Waterbody ID: KY500114_02

Receiving Water: Levisa Fork

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12s: 050702030403, 050702030405

County: Johnson

The Division of Water (DOW) has collected samples from station BSW025, located at river mile 4.3, since 2002. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station typically has been sampled five or more times during a monitoring year.

The data collected for Paint Creek 7.1 to 8.2 was collected from station BSW025. On the 2006 303(d) list, Paint Creek 0.0 to 7.1 (Section C.12) and Paint Creek 7.1 to 8.2 were listed as one stream segment, Paint Creek 0.0 to 7.9. This segment was split and assessed as two segments in 2007. Therefore, the data collected at station BSW025 was used for both the upper segment, Paint Creek 7.1 to 8.2, and the lower segment, Paint Creek 0.0 to 7.1 (Section C.12). Table C.13-1 summarizes information about the sampling station; Table C.13-2 provides a summary of the data collected from this station.

Table C.13-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment[1]	River Mile
BSW025	37.818699	-82.845608	Paint Creek 0.0 to 7.1	4.3

Table C.13-2 DOW Sample Data Summary[1]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BSW025	fecal coliform	5	330	3,300	1,086
BSW025	*E.coli*	18	20	1,333	287

[1]The full data set for samples collected from BSW025 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[2]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Paint Creek 7.1 to 8.2 are presented in Table C.13-3.

Table C.13-3 Paint Creek 7.1 to 8.2 *E. Coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[(5)]	Allocations for Tributary Loads to the Segment[(6)]	MOS[(7)]
	SWS-WLA[(3)]	LA[(4)]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[(2)]Q_S is the flow (ft^3/s) in the segment.

[(3)]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[(4)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[(5)]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[(6)]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[(7)]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Paint Creek. The directly discharging facility is a sanitary wastewater system (SWS). This SWS is an individual family residence with an on-site wastewater treatment system. There are no MS4 communities or CSOs discharging directly to this segment of Paint Creek. This facility is identified in Table C.13-4 and the location within the Mudlick Creek-Paint Creek watershed is shown in Figure C.13-1.

Table C.13-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli* /day)
KYG402476	Residence	0.0005	37.8317	-82.8629	08/31/2023	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

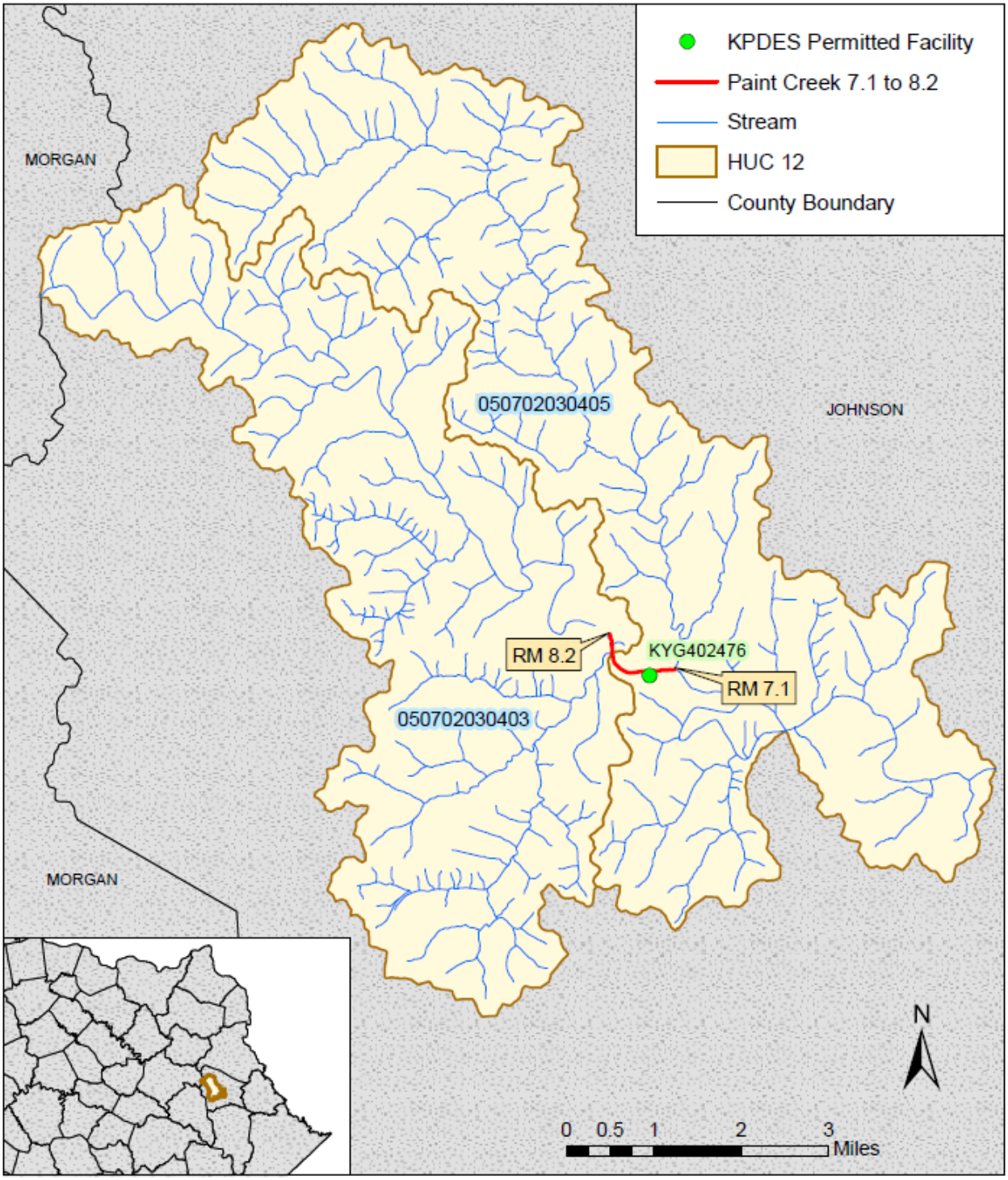

Figure C.13-1 Location of the KPDES-permitted Facility on Paint Creek 7.1 to 8.2

Section C.14 Rockcastle Creek 0.0 to 3.7

Waterbody ID: KY502158_01

Receiving Water: Tug Fork

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 050702010606

County: Lawrence

The Division of Water (DOW) has collected samples from station BSW022, located near river mile 3.5, since 2002. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station typically has been sampled five or more times during a monitoring year. Table C.14-1 summarizes information about this sampling station; Table C.14-2 provides a summary of the data collected from this station.

Table C.14-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
BSW022	37.98597	-82.545428	Rockcastle Creek 0.0 to 3.7	3.5

Table C.14-2 DOW Sample Data Summary[1]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BSW022	fecal coliform	7	31	310	149
BSW022	*E. coli*	16	135	4,611	700

[1]The full data set for samples collected from BSW022 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[2]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Rockcastle Creek 0.0 to 3.7 are presented in Table C.14-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Rockcastle Creek. The location of the segment within the Lower Rockcastle Creek watershed is shown in Figure C.14-1.

Table C.14-3 Rockcastle Creek 0.0 to 3.7 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

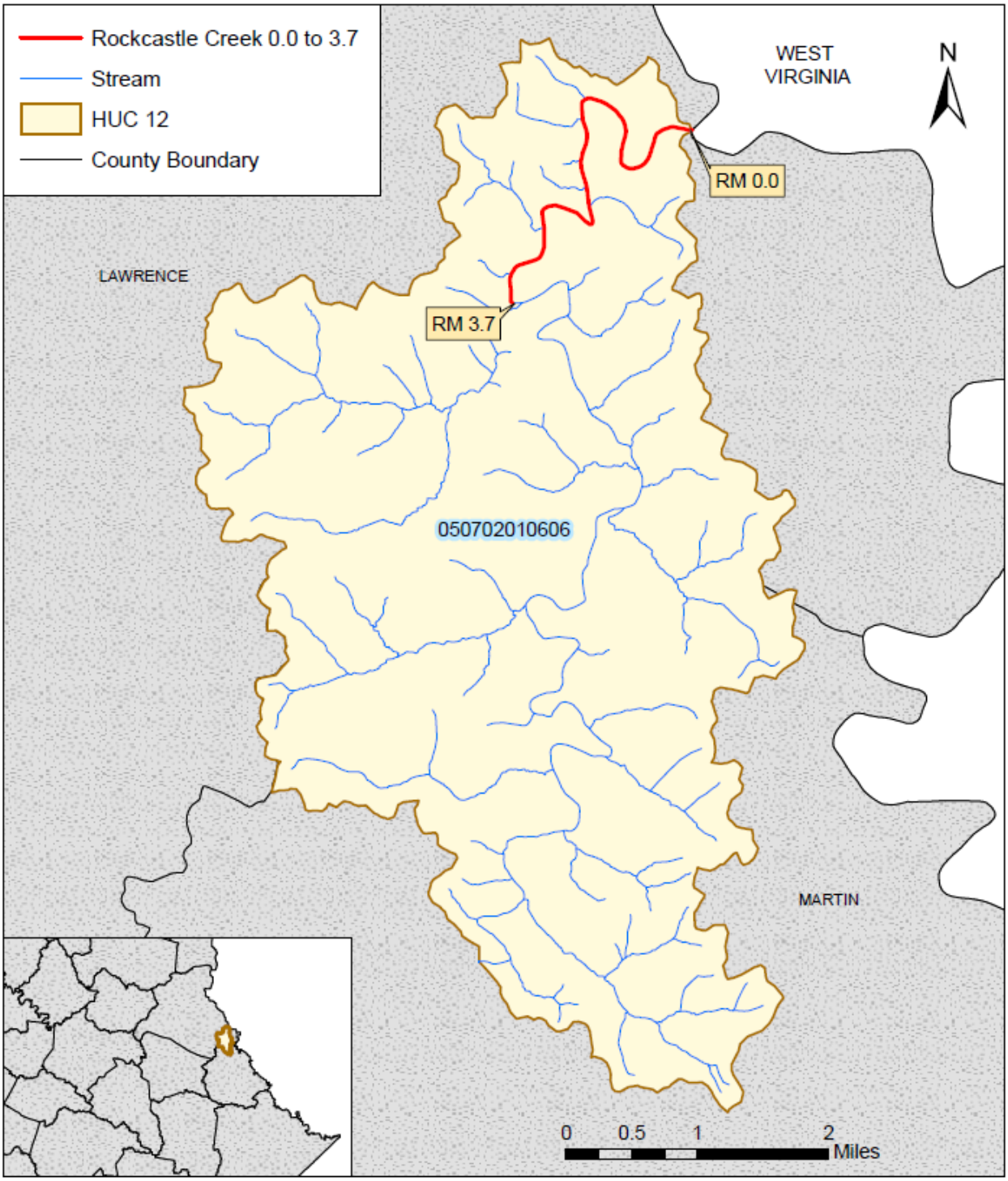

Figure C.14-1 Location of Rockcastle Creek 0.0 to 3.7

Section C.15 Tug Fork 0.0 to 10.45

Waterbody ID: KY1548311_01

Receiving Water: Big Sandy River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 050702010609

County: Lawrence

The Division of Water (DOW) has collected samples from station BSW021, located near river mile 0.2, since 2002. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station typically has been sampled five or more times during a monitoring year. Table C.15-1 summarizes information about this sampling station; Table C.15-2 provides a summary of the data collected from this station.

Table C.15-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
BSW021	38.116875	-82.598848	Tug Fork 0.0 to 10.45	0.2

Table C.15-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BSW021	fecal coliform	7	3	60	33
BSW021	*E. coli*	17	1	> 2,419	348

[(1)]The full data set for samples collected from BSW021 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Tug Fork 0.0 to 10.45 are presented in Table C.15-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Tug Fork. The location of the segment within the Kentucky portion of the Lost Creek-Tug Fork watershed is shown in Figure C.15-1.

Table C.15-3 Tug Fork 0.0 to 10.45 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

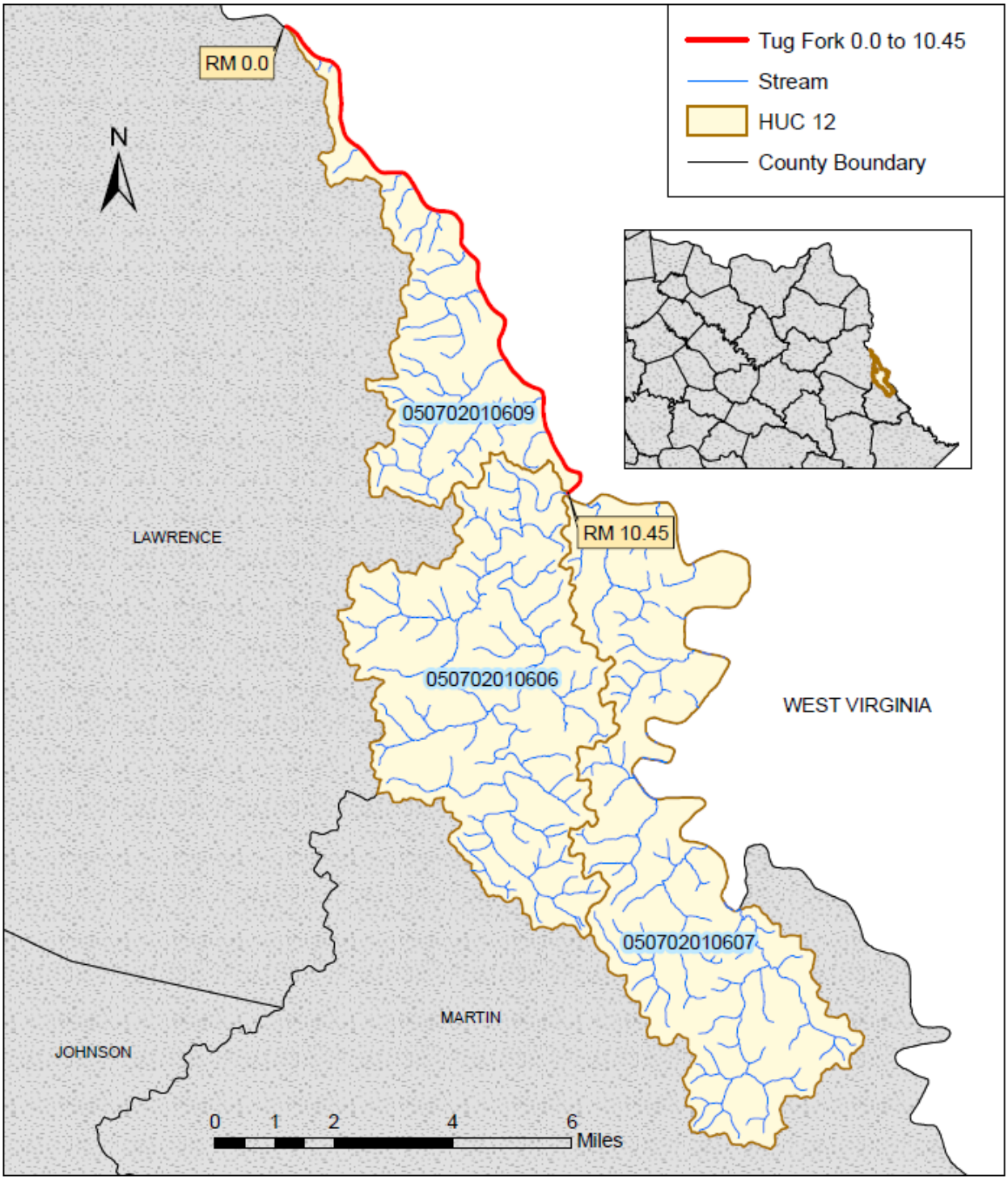

Figure C.15-1 Location of Tug Fork 0.0 to 10.45

Section C.16 Wolf Creek 0.0 to 6.6

Waterbody ID: KY507001_01

Receiving Water: Tug Fork

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 050702010505

County: Martin

The Division of Water (DOW) has collected samples from station BSW014, located near river mile 1.3, since 2002. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station was not sampled in 2007. The station typically has been sampled five or more times during a monitoring year. Table C.16-1 summarizes information about this sampling station; Table C.16-2 provides a summary of the data collected from this station.

Table C.16-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
BSW014	37.819862	-82.414066	Wolf Creek 0.0 to 6.6	1.3

Table C.16-2 DOW Sample Data Summary[1]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BSW014	fecal coliform	5	1,000	58,000	20,800
BSW014	*E. coli*	12	133	1,986	811

[1]The full data set for samples collected from BSW014 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[2]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Wolf Creek 0.0 to 6.6 are presented in Table C.16-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Wolf Creek. The location of the segment within the Lower Wolf Creek watershed is shown in Figure C.16-1.

Table C.16-3 Wolf Creek 0.0 to 6.6 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

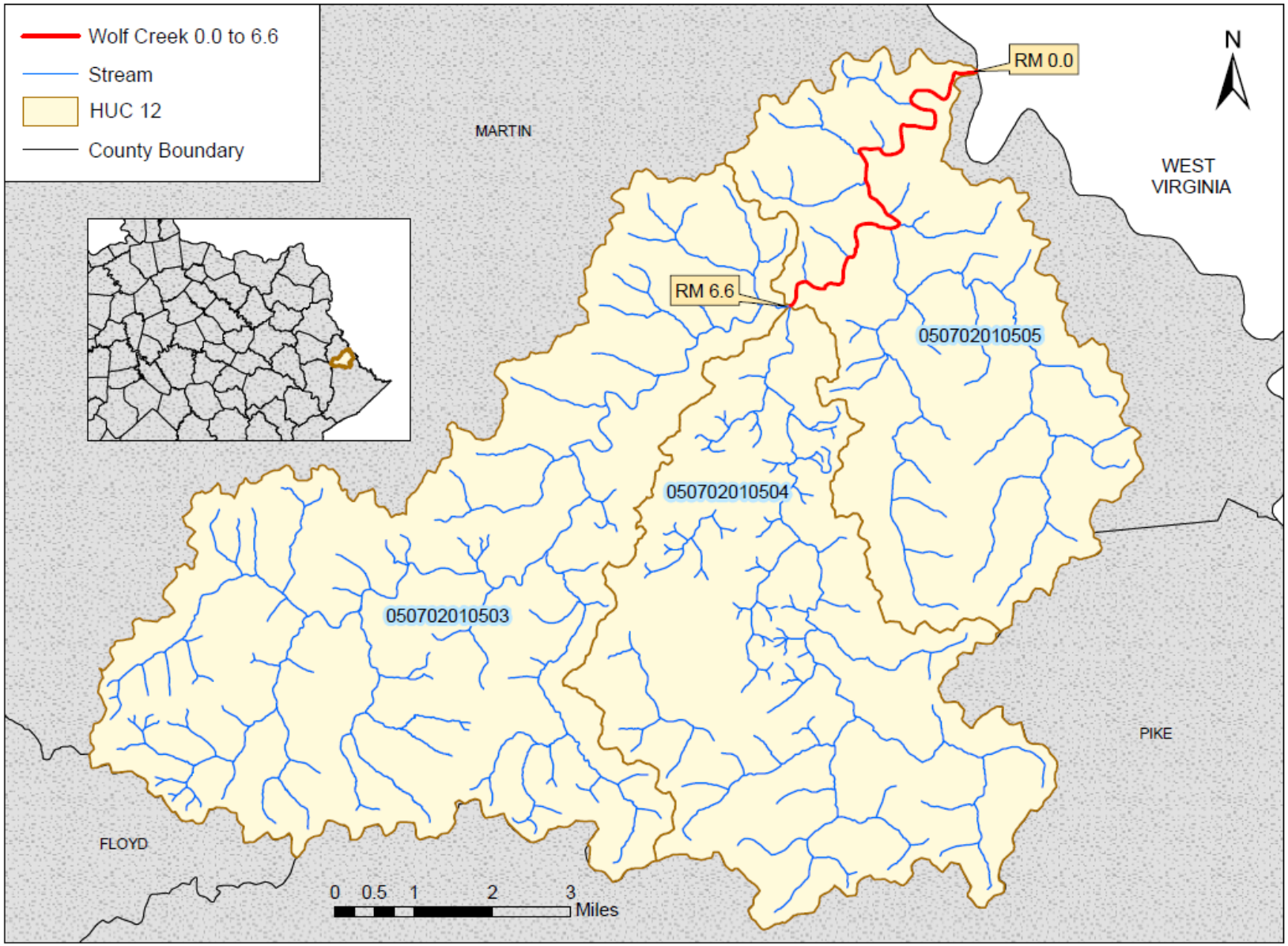

Figure C.16-1 Location of Wolf Creek 0.0 to 6.6

APPENDIX G

Appendix G
Little Sandy River Basin

HUC 8: 05090104

Level IV Ecoregions: Monongahela Transition Zone, Ohio/Kentucky Carboniferous Plateau, Carter Hills

Drainage Area Within Kentucky: 724.15 square miles

Counties: Boyd, Carter, Elliott, Greenup, Lawrence, Rowan

Major Cities: Grayson, Sandy Hook

The Little Sandy River basin lies entirely within Kentucky in the far northeast and drains an area of 724 square miles. Originating in Elliott Co., the basin is oriented southwest to northeast along the axis of the Little Sandy River. It is located entirely within the Eastern Coal Field physiographic region of the state.

Table G.1. provides a summary of the stream segments in the Little Sandy River basin that have been included on the Kentucky 2016 303(d) list for impairment due to fecal coliform and/or *E. coli*. The locations of the stream segments are shown in Figure G.1.

The river miles for each TMDL segment in this appendix match the 2016 303(d) list. Since the National Hydrography Dataset (NHD) is continually updated to maintain accurate waterbody information, the river mile information in this appendix may not reflect the current 1:24K NHD for Kentucky. River mile information for stream segments is updated in each new 303(d) list submitted to EPA.

Table G.1 2016 303(d) List Bacteria-impaired Stream Segments in the Little Sandy River Basin

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant	Suspected Source(s)
East Fork Little Sandy River 24.9 to 26.4	KY491469_03	PCR (partial support)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source
Little Sandy River 0.0 to 0.15	KY496857_01	PCR (nonsupport)	Fecal Coliform	not applicable	Package Plant or Other Permitted Small Flows Discharges

A TMDL is not included because this segment will be proposed for delisting on a future 303(d) list. The original listing was in error.

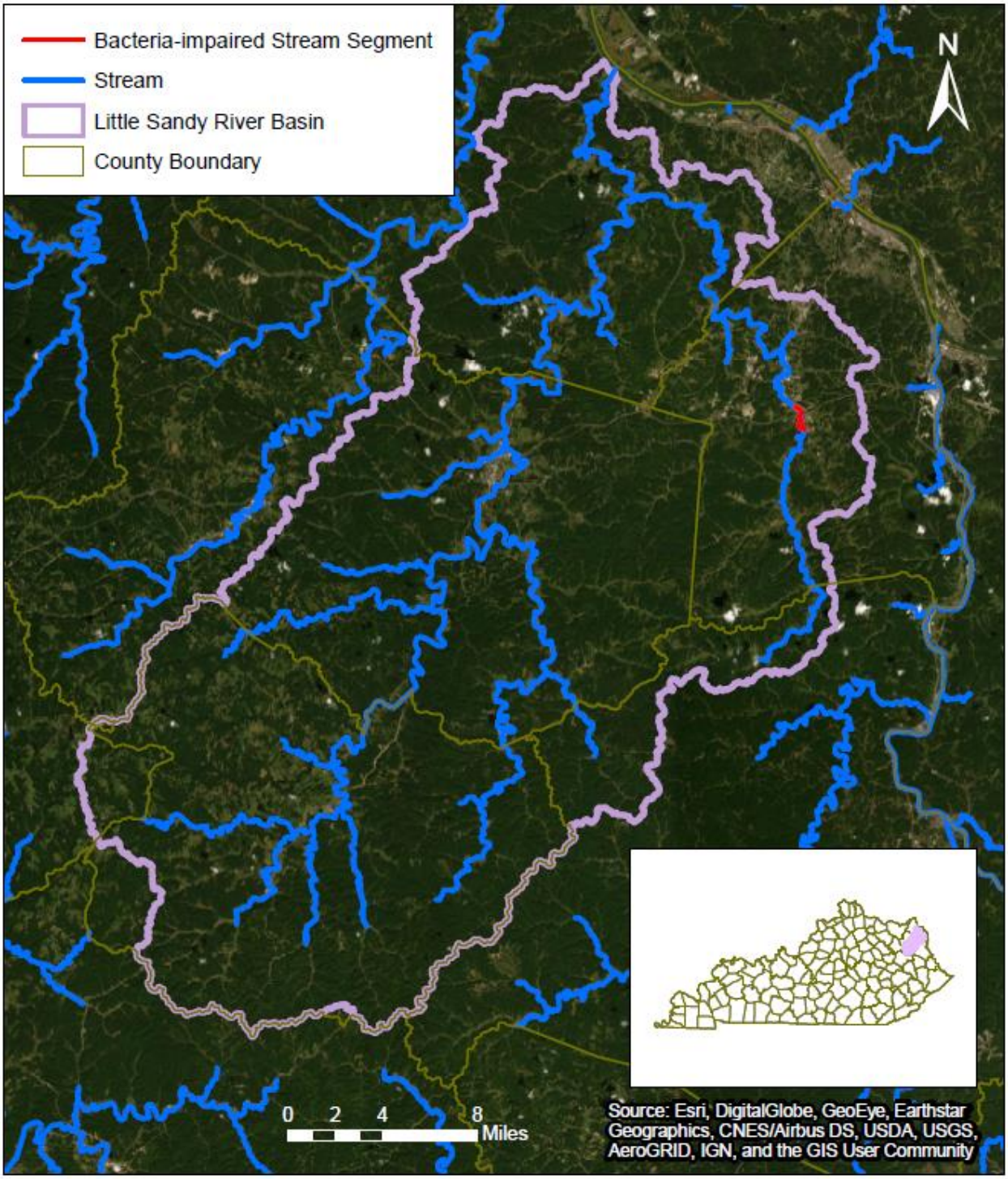

Figure G.1 Location of the Little Sandy River Basin and Bacteria-impaired Streams (May 2019; proposed delisting not shown)

Land cover data is summarized in Table G.2, and its geographic distribution is shown in Figure G.2. Deciduous forest is the predominant class of land cover in the Little Sandy River basin, accounting for approximately 68 percent. The next three classes by magnitude are pasture/hay, grassland/herbaceous, and open developed. Land cover classes are described in Appendix P of the core TMDL document.

Table G.2 Land Cover Classes in the Little Sandy River Basin (NLCD 2011)

Land Cover	Percent of Total Area	Square Miles	Acres
Open Water	0.45	3.27	2,091.19
Developed, Open	4.51	32.69	20,919.01
Developed, Low Intensity	2.36	17.1	10,945.22
Developed, Medium Intensity	0.65	4.67	2,991
Developed, High Intensity	0.18	1.3	830.43
Barren Land (Rock, Sand, Clay)	0.15	1.11	707.22
Deciduous Forest	67.78	490.86	314,150.27
Evergreen Forest	1.84	13.33	8,531.11
Mixed Forest	2.43	17.62	11,277.03
Shrub/Scrub	0.51	3.68	2,356.51
Grassland/Herbaceous	6.54	47.37	30,319.90
Pasture/Hay	12.08	87.46	55,977.06
Cultivated Crops	0.51	3.66	2,341.16
Woody Wetlands	0	0.02	10.9
Emergent Herbaceous Wetlands	0	0.01	8.01

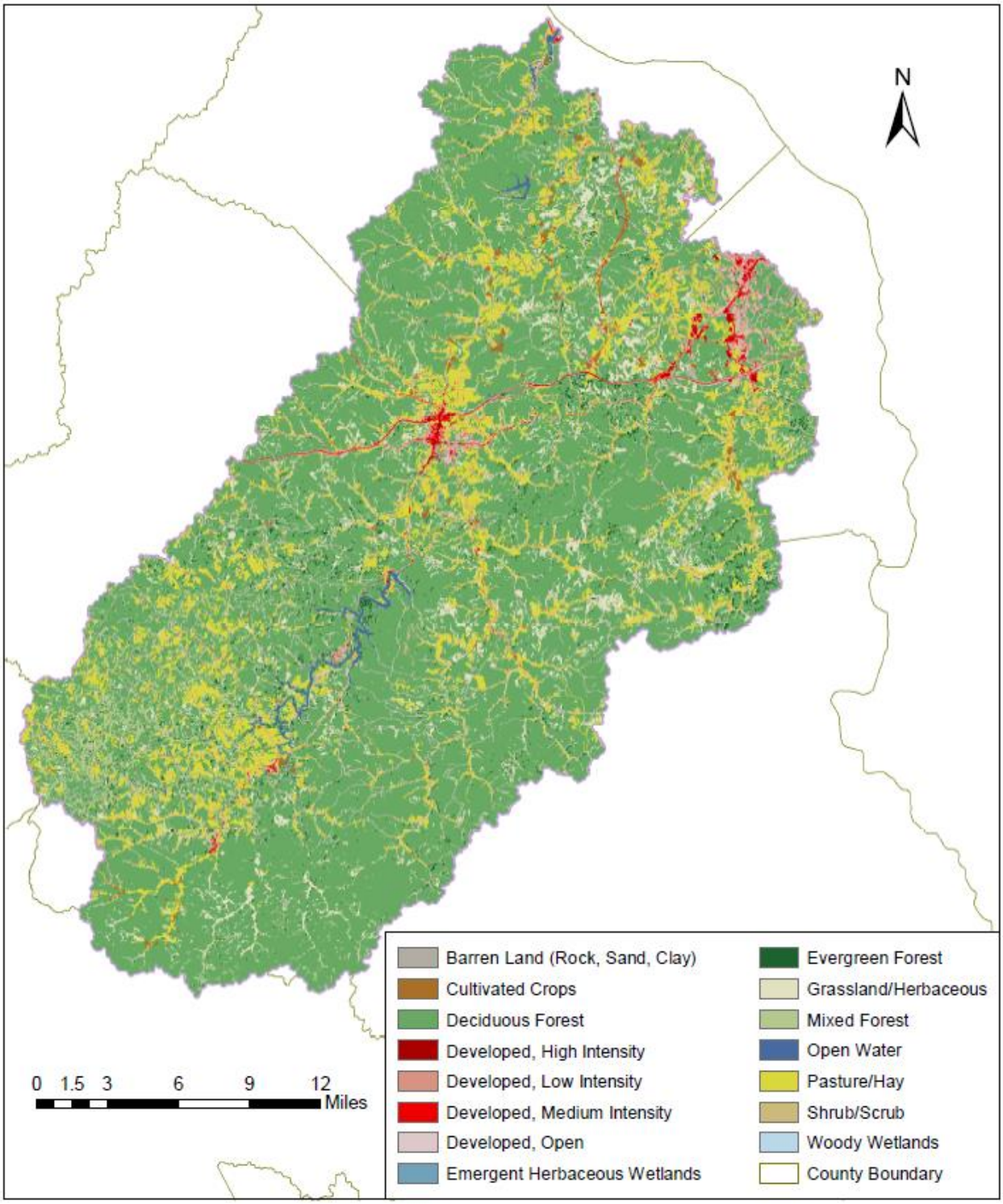

Figure G.2 Land Cover Classes in the Little Sandy River Basin

Section G.1 East Fork Little Sandy River 24.9 to 26.4

Waterbody ID: KY491469_03

Receiving Water: Little Sandy River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 050901040404

County: Boyd

The Division of Water (DOW) has collected samples from station BSW007, located near river mile 25.5, since 2002. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). This station has typically been sampled five or more times during a monitoring year. Table G.1-1 summarizes information about this sampling station; Table G.1-2 provides a summary of the data collected from this station.

Table G.1-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
BSW007	38.3659	-82.7032	East Fork Little Sandy River 24.9 to 26.4	25.5

Table G.1-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BSW007	fecal coliform	5	90	5,000	1,322
BSW007	*E. coli*	18	10	4,840	701

[(1)]The full data set for samples collected at BSW007 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for East Fork Little Sandy River 24.9 to 26.4 are presented in Table G.1-3.

Table G.1-3 East Fork Little Sandy River 24.9 to 26.4 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The Boyd County Fiscal Court and Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for the northern portion of East Fork Little Sandy River 24.9 to 26.4. Information about MS4 permits is summarized in Table G.1-4. Information concerning the Boyd County Fiscal Court MS4 permit coverage can be found as a co-permittee of the City of Ashland's MS4 permit (Permit number KYG200002). There are no other Kentucky Pollutant Discharge Elimination System (KPDES) permitted discharges of bacteria into the segment. The location of the segment is within the East Fork Little Sandy River watershed and is shown in Figure G.1-1.

Table G.1-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYG200002	Boyd County Fiscal Court	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	9/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

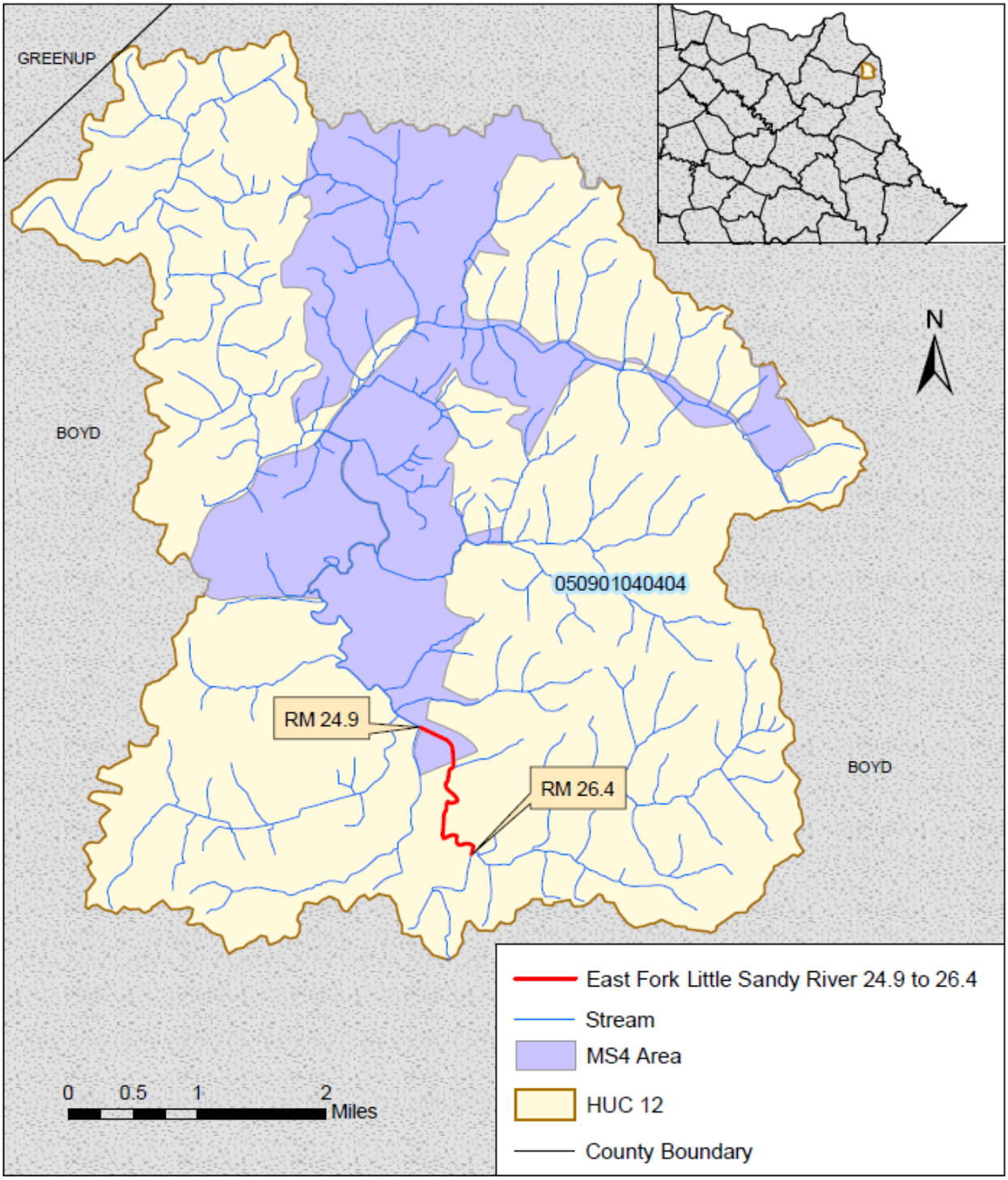

Figure G.1-1 Location of East Fork Little Sandy River 24.9 to 26.4

APPENDIX N

Appendix N
Tygarts Creek Basin

HUC 8: 05090103

Level IV Ecoregions: Knobs-Lower Scioto Dissected Plateau, Carter Hills, Ohio/Kentucky Carboniferous Plateau

Drainage Area Within Kentucky: 339.54 square miles

Counties: Greenup, Carter, Rowan

Major Cities: South Shore, Olive Hill

The Tygarts Creek basin lies entirely within Kentucky, in the far northeastern portion of the state. The basin originates in Carter Co. and is oriented southwest to northeast along the axis of Tygarts Creek. Most of the basin occurs within the Eastern Coal Field physiographic region, while a sliver in the northwestern corner forms part of the neighboring Eastern Pennyroyal region. The Tygarts Creek basin drains an area of 340 square miles.

Table N.1. provides a summary of the stream segments in the Tygarts Creek basin that have been included on the Kentucky 2016 303(d) list for impairment due to fecal coliform and/or *E. coli*. The locations of the stream segments are shown in Figure N.1.

The river miles for the TMDL segment in this appendix match the 2016 303(d) list. Since the National Hydrography Dataset (NHD) is continually updated to maintain accurate waterbody information, the river mile information in this appendix may not reflect the current 1:24K NHD for Kentucky. River mile information for stream segments is updated in each new 303(d) list submitted to EPA.

Table N.1 2016 303(d) List Bacteria-impaired Stream Segments in the Tygarts Creek Basin

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant	Suspected Source(s)
Buffalo Creek 0.0 to 6.7	KY488320_01	PCR (partial support)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source

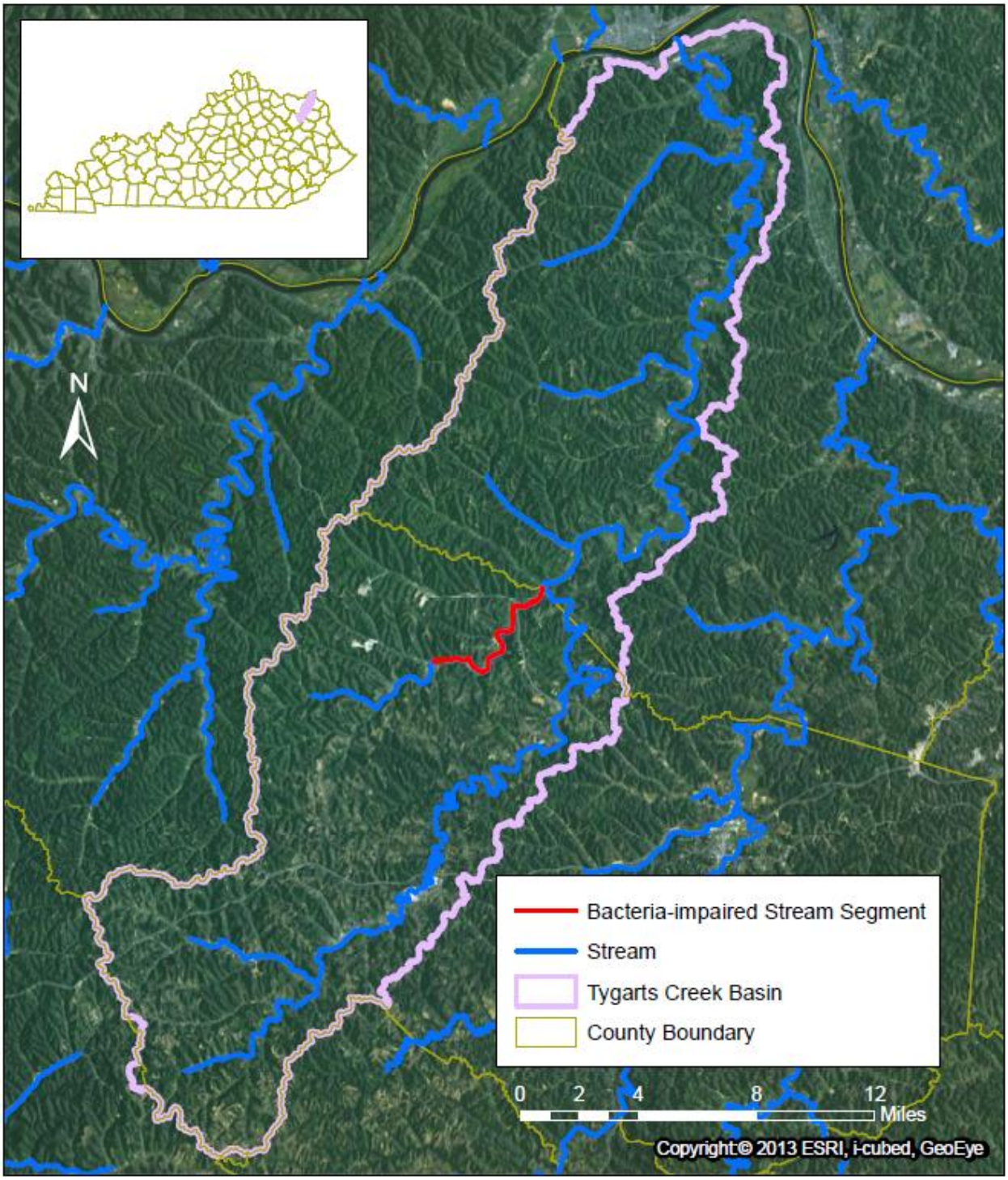

Figure N.1 Location of the Tygarts Creek Basin and Bacteria-impaired Streams (May 2019)

Land cover data is summarized in Table N.2, and its geographic distribution is shown in Figure N.2. Deciduous forest is the predominant class of land cover in the Tygarts Creek basin, accounting for 68 percent. The next three classes by magnitude are pasture/hay, grassland/herbaceous and open developed. Land cover classes are described in Appendix P of the core TMDL document.

Table N.2 Land Cover Classes in the Tygarts Creek Basin (NLCD 2011)

Land Cover	Percent of Total Area	Square Miles	Acres
Open Water	0.05	0.17	110.75
Developed, Open	5.01	17.02	10,892.16
Developed, Low Intensity	2.26	7.66	4,901.90
Developed, Medium Intensity	0.55	1.88	1,204.24
Developed, High Intensity	0.1	0.33	209.49
Barren Land (Rock, Sand, Clay)	0.36	1.21	772.13
Deciduous Forest	68.02	230.95	147,807.12
Evergreen Forest	1.08	3.67	2,347.54
Mixed Forest	0.33	1.1	706.75
Shrub/Scrub	1.13	3.84	2,458.95
Grassland/Herbaceous	7.09	24.08	15,413.54
Pasture/Hay	13.64	46.33	29,651.09
Cultivated Crops	0.38	1.29	823.95
Woody Wetlands	0	0.01	6
Emergent Herbaceous Wetlands	0	0	0

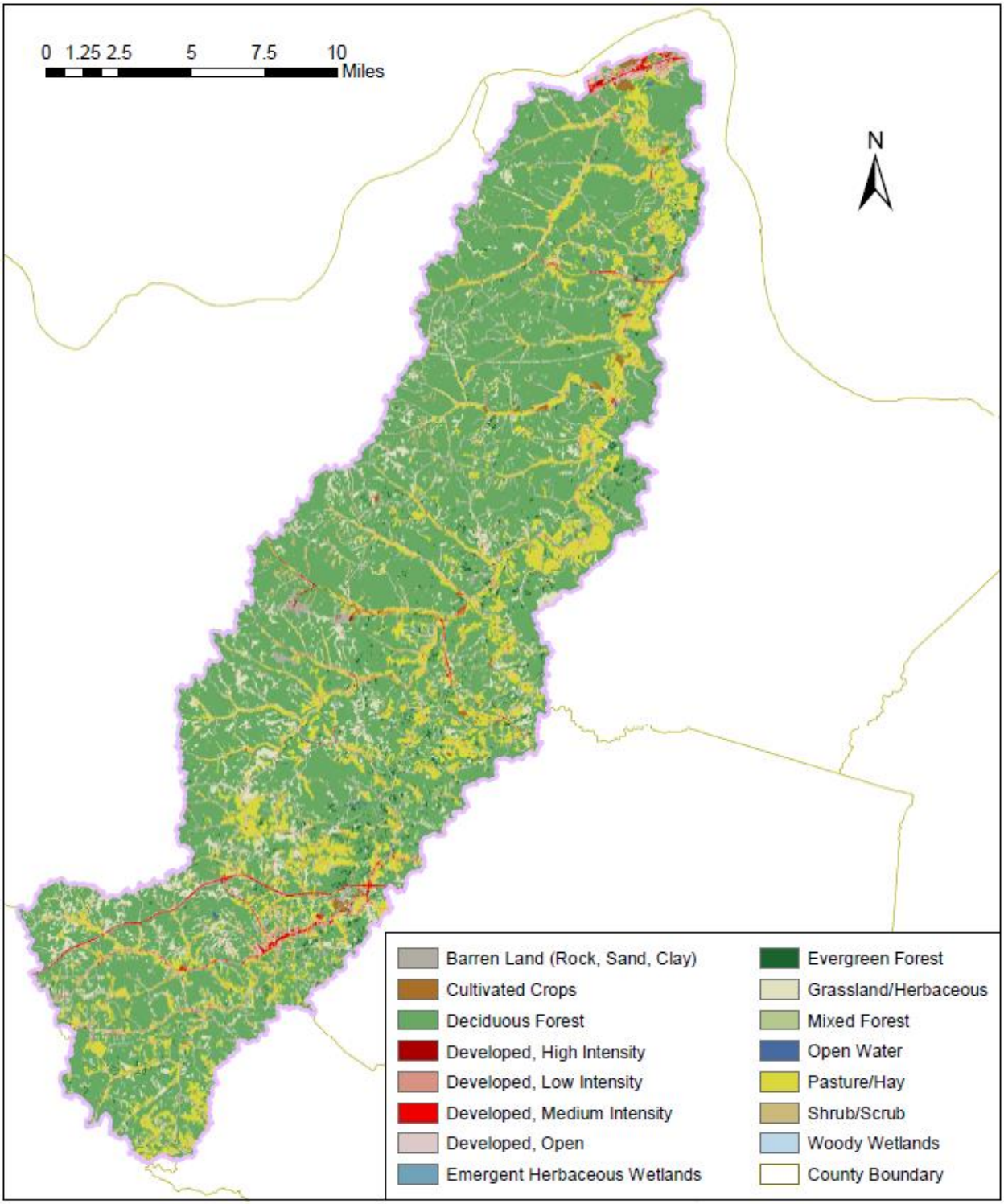

Figure N.2 Land Cover Classes in the Tygarts Creek Basin

Section N.1 Buffalo Creek 0.0 to 6.7

Waterbody ID: KY488320_01

Receiving Water: Tygarts Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 050901030304

County: Carter

The Division of Water (DOW) has collected samples from station BSW005, located at river mile 0.5, since 2002. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). This station has typically been sampled five or more times during a monitoring year. Table N.1-1 summarizes information about this sampling station; Table N.1-2 provides a summary of the data collected from this station.

Table N.1-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
BSW005	38.4594	-83.0546	Buffalo Creek 0.0 to 6.7	0.5

Table N.1-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BSW005	fecal coliform	7	3	70	32
BSW005	*E. coli*	17	20	320	102

[(1)]The full data set for samples collected at BSW005 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Buffalo Creek 0.0 to 6.7 are presented in Table N.1-3.

Table N.1-3 Buffalo Creek 0.0 to 6.7 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	SWS-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Buffalo Creek. This directly discharging facility is a sanitary wastewater system. There are no MS4 communities or CSOs discharging directly to this segment of Buffalo Creek. This facility is identified in Table N.1-4 and the location is shown within the Lower Buffalo Creek watershed in Figure N.1-1.

Table N.1-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli* /day)
KY0110469	Carter Elementary School	0.0045	38.430972	-83.114833	09/30/2022	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQC are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

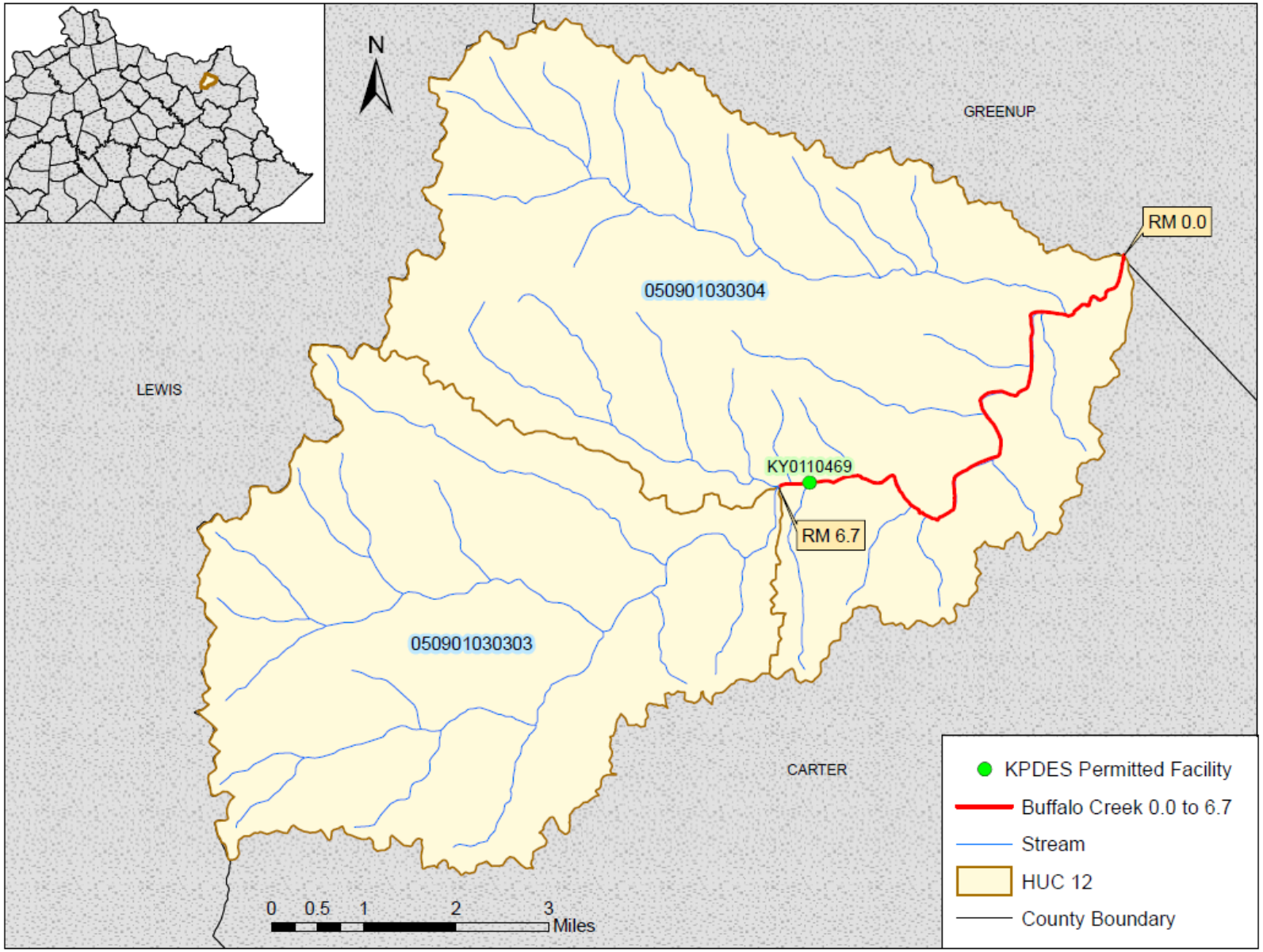

Figure N.1-1 Location of the KPDES-permitted Facility on Buffalo Creek 0.0 to 6.7