

TMDL Synopsis

1. Impaired Waterbodies

State: Kentucky

Major River Basin: Kentucky River

USGS HUC8: 05100205

Counties: Boyle, Garrard, Lincoln, Rockcastle, Casey

Pollutant of Concern: E. Coli, Fecal Coliform

Impaired Use: Primary Contact Recreation

Suspected Sources: Agriculture, Animal Feeding Operations (NPS), Livestock (Grazing or Feeding Operations), Non-irrigated Crop Production, On-Site Treatment Systems (Septic Systems and Similar Decentralized Systems), Municipal Point Source Discharges, Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Unrestricted Cattle Access, Urban Runoff/Storm Sewers, Source Unknown

Table S.1 Impaired Waterbodies Addressed in This TMDL Document

Stream Name	Receiving Stream	River Miles	GNIS ID	County	Support Status
Balls Branch	Clarks Run	0.0 to 4.9	KY486303_01	Boyle	Nonsupport
Baughman Creek	Hanging Fork Creek	0.0 to 4.6	KY486477_01	Lincoln	Nonsupport
Blue Lick Creek	Hanging Fork Creek	0.0 to 4.1	KY487526_01	Lincoln	Nonsupport
Clarks Run ⁽¹⁾	Dix River	0.7 to 4.4	KY489554_01	Boyle	Nonsupport
Clarks Run ⁽¹⁾	Dix River	4.4 to 6.7	KY489554_02	Boyle	Nonsupport
Clarks Run ⁽¹⁾	Dix River	6.7 to 14.3	KY489554_03	Boyle	Nonsupport
Copper Creek	Dix River	0.0 to 2.2	KY511529_01	Lincoln	Nonsupport
Dix River	Kentucky River	33.3 to 36.1	KY517054_02	Garrard	Nonsupport
Dix River	Kentucky River	36.1 to 43.8	KY517054_03	Lincoln	Nonsupport
Dix River	Kentucky River	64.3 to 73.35	KY517054_04	Lincoln	Nonsupport
Dix River	Kentucky River	73.35 to 78.7	KY517054_05	Rockcastle	Nonsupport
Drakes Creek	Dix River	1.15 to 7.3	KY491093_01	Lincoln	Nonsupport
Frog Branch	Hanging Fork Creek	0.0 to 3.4	KY492562_01	Lincoln	Nonsupport
Gilberts Creek	Dix River	0.0 to 1.25	KY492826_01	Lincoln	Nonsupport
Hanging Fork Creek ⁽²⁾	Dix River	0.0 to 15.85	KY493684_01	Lincoln	Nonsupport
Hanging Fork Creek	Dix River	15.85 to 24.15	KY493684_02	Lincoln	Nonsupport
Hanging Fork Creek	Dix River	24.15 to 27.6	KY493684_03	Lincoln	Nonsupport
Hanging Fork Creek	Dix River	27.6 to 32.2	KY493684_04	Lincoln	Nonsupport
Harris Creek	Knoblick Creek	0.0 to 6.25	KY493804_01	Lincoln	Nonsupport
Knoblick Creek	Hanging Fork Creek	0.0 to 4.8	KY495849_01	Lincoln	Nonsupport
Logan Creek	Dix River	0.0 to 3.15	KY496980_01	Lincoln	Nonsupport

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Stream Name	Receiving Stream	River Miles	GNIS ID	County	Support Status
McKinney Branch	Hanging Fork Creek	0.0 to 1.9	KY497908_01	Lincoln	Nonsupport
Peyton Creek	Hanging Fork Creek	0.0 to 4.1	KY500504_01	Lincoln	Nonsupport
White Oak Creek	Dix River	0.0 to 2.8	KY506613_01	Garrard	Nonsupport
White Oak Creek	Knoblick Creek	0.0 to 3.4	KY506612_01	Lincoln	Nonsupport

⁽¹⁾Clarks Run segment river miles were changed from the 2008 Integrated Report to more accurately reflect the NHD.

⁽²⁾Hanging Fork 0.0 to 15.85 is Nonsupport for the PCR designated use for both E. Coli, and Fecal Coliform: All other segments are impaired for E. Coli but not Fecal Coliform.

2. TMDL Endpoints (i.e., Water Quality Criterion for the Primary Contact Recreation Designated Use): 216 E. Coli colonies/100ml (240 colonies/100ml minus a 10% Margin of Safety).

TMDL Equation and Calculations:

A TMDL calculation is performed as follows:

$$\text{TMDL} = \text{WLA} + \text{LA} + \text{MOS}$$

The WLA has three components:

$$\text{WLA} = \text{STP-WLA} + \text{MS4-WLA} + \text{Future Growth-WLA}$$

Where:

TMDL = the Water Quality Criterion. This is defined in Section 5.0 as an instantaneous concentration of 240 colonies/100 ml.

WLA = the WasteLoad Allocation, which is the allowable loading of pollutants into the stream from KPDES-permitted sources.

STP-WLA = the allowable loading from KPDES-permitted sewage treatment plants.

MS4-WLA = the allocation for the Danville MS4 area.

Future Growth-WLA = the allowable loading for future KPDES-permitted sources, including new STPs, expansion of existing STPs, new storm water sources, and growth of existing storm water sources (such as MS4s).

LA = the Load Allocation, which is the allowable loading of pollutants into the stream from sources not permitted by KPDES and from natural background.

MOS = the Margin of Safety, which can be an implicit or explicit additional reduction applied to sources of pollutants that accounts for uncertainties in the data or TMDL calculations.

TMDL Target = the TMDL minus the MOS

Percent reductions are applied to sources to bring existing conditions in line with the TMDL Target. After these reductions are calculated, the Future Growth (if any), WLA (if any) and LA (if any) represent the final allocation for sources in the watershed (i.e., the allowable loading to the stream system for those sources).

The TMDL calculation must take into account seasonality and other factors that affect the relationship between pollutant inputs and the ability of the stream to meet its designated uses, which typically involves defining a critical condition.

3. Pollutant Allocations:

Table S.2 lists the sampling stations (or sampling sites) that lie within each listed segment. Not all stations in Table S.2 contributed data to the development of the TMDL, but the data from all stations were reported for informational purposes; see Section 4.0 and Appendix A. Pollutant allocations for each impaired segment are listed in Table S.3. Table S.4 contains WLA allocations and information for KPDES-permitted continuous dischargers. Table S.5 contains information for the Danville MS4 community.

Table S.2 Sampling Stations by Impaired Segment

Waterbody, River Miles (RM)	Station Name(s) ⁽¹⁾
Balls Branch, 0.0-4.9	Balls Branch Mouth, Balls Branch West, BB01, BB03, BB06, BB07
Baughman Creek, 0.0-4.6	Baughman Creek/BA01, BA06, BA07, BA08
Blue Lick Creek, 0.0-4.1	Blue Lick Creek/BL01, BL02, BL04
Clarks Run, 0.7-4.4	Clarks DOW/Goggin Lane/CR01
Clarks Run, 4.4-6.7	Clarks Run KY 52, CR03
Clarks Run, 6.7-14.3	Clarks Run Hwy 150/Stanford Lane/CR04, Corporate Drive, S. 2nd Street/CR07, Clarks Run Bypass/CR12, CR13, CR14
Copper Creek, 0.0-2.2	Copper Creek
Dix River, 33.3-36.1	Dix DOW/PRI045
Dix River, 36.1-43.8	Dix Above HF
Dix River, 64.3-73.35	Dix/Crab Orchard
Dix River, 73.35-78.7	Gum Sulfur
Drakes Creek, 1.15-7.3	Drakes Creek
Frog Branch, 0.0-3.4	Frog Branch/FR01, FR02, FR03, FR04
Gilberts Creek, 0.0-1.25	Gilberts Creek
Hanging Fork Creek, 0.0-15.85	Hanging Fork Mouth, Hanging Fork at Hwy 150, KRW014
Hanging Fork Creek, 15.85-24.15	McCormick Church/HF01, HF02, HF03
Hanging Fork Creek, 24.15-27.6	Chicken Bristle, HF09
Hanging Fork Creek, 27.6-32.2	West Hustonville/WH01, WH04, WH06
Harris Creek, 0.0-6.25	Moore Lane (Harris Creek)
Knoblick Creek, 0.0-4.8	Knob Lick Creek
Logan Creek, 0.0-3.15	Logan Creek
McKinney Branch, 0.0-1.9	McKinney Branch/MC01, MC02, MC04
Peyton Creek, 0.0-4.1	Peyton Creek/PE01, PE02, PE06

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Waterbody, River Miles (RM)	Station Name(s) ⁽¹⁾
White Oak Creek, 0.0-2.8	White Oak Creek
White Oak Creek, 0.0-3.4	Oak Creek (White Oak Creek), Junction City (White Oak Creek), JC04, JC09

⁽¹⁾ A forward slash “/” denotes two (or more) names for the same station. Therefore, “Clarks DOW/Goggin Lane/CR01” can be read as “Clarks DOW, aka Goggin Lane, aka CR01.”

A comma separates two (or more) stations which are located within the same impaired segment, but they are not the same station (i.e., they are located at different RMs within the segment).

Parentheses are included to give the name of the creek when the station name is a place-name as opposed to a creek name, such as Junction City (White Oak Creek) or when the station name is an abbreviation of a creek name, such as Oak Creek (White Oak Creek).

Table S.3 Pollutant Allocations for Impaired Waterbodies Addressed by this TMDL

Waterbody, River Miles (RM)	STP-WLA, ⁽¹⁾ billion colonies/day	MS4-WLA, ⁽²⁾ billion colonies/day	LA, billion colonies/day	Future Growth-WLA Allocation, billion colonies/day	Margin of Safety, billion colonies/day	TMDL, ⁽³⁾ billion colonies/day	Reduction, %
Balls Branch, RM 0.0-4.9	0	0.67	22.28	0.47	2.60	26.01	98.34%
Baughman Creek, RM 0.0-4.6	0.055	0	3.08	0.02	0.35	3.50	99.80%
Blue Lick Creek, RM 0.0-4.1	0	0	22.47	0.11	2.51	25.09	99.70%
Clarks Run, RM 0.7-4.4	59.05	10.42	52.73	2.63	13.87	138.71	98.92%
Clarks Run, RM 4.4-6.7	59.05	34.14	180.58	8.95	31.41	314.13	98.69%
Clarks Run, RM 6.7-14.3	0	15.69	39.18	2.89	6.42	64.18	99.82%
Copper Creek, RM 0.0-2.2	0	0	333.74	1.68	37.27	372.68	87.87%
Dix River, RM 33.3-36.1	18.80	0	11,409.23	115.24	1,282.59	12,825.86	98.93%
Dix River, RM 36.1-43.8	18.72	0	1,928.45	19.48	218.52	2,185.17	96.07%
Dix River, RM 64.3-73.35	2.36	0	3,381.58	16.99	377.88	3,778.81	95.48%
Dix River, RM 73.35-78.7	1.36	0	801.33	8.09	90.09	900.87	93.33%

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Waterbody, River Miles (RM)	STP- WLA, ⁽¹⁾ billion colonies/ day	MS4- WLA, ⁽²⁾ billion colonies/ day	LA, billion colonies/ day	Future Growth- WLA Allocation, billion colonies/ day	Margin of Safety, billion colonies/ day	TMDL, ⁽³⁾ billion colonies/ day	Reduction, %
Drakes Creek, RM 1.15-7.3	0	0	28.66	0.14	3.20	32.00	97.40%
Frog Branch, RM 0.0-3.4	0	0	14.55	0.15	1.63	16.33	99.35%
Gilberts Creek, RM 0.0-1.25	0	0	8.48	0.09	0.95	9.52	91.69%
Hanging Fork Creek, RM 0.0- 15.85	0.086	0	2,077.98	20.99	233.23	2,332.28	98.93%
Hanging Fork Creek, RM 15.85- 24.15	0.086	0	210.36	1.06	23.50	235.01	99.87%
Hanging Fork Creek, RM 24.15- 27.6	0.086	0	44.69	0.22	4.99	49.99	99.95%
Hanging Fork Creek, RM 27.6- 32.2	0	0	26.23	0.13	2.93	29.30	99.23%
Harris Creek, RM 0.0-6.25	0	0	21.80	0.22	2.45	24.47	99.02%
Knoblick Creek, RM 0.0-4.8	0	0	78.15	0.79	8.77	87.71	99.43%
Logan Creek, RM 0.0-3.15	7.27	0	92.19	1.88	11.26	112.61	97.75%
McKinney Branch, RM 0.0-1.9	0	0	20.96	0.11	2.34	23.41	99.89%
Peyton Creek, RM 0.0-4.1	0	0	14.22	0.07	1.59	15.88	99.95%
White Oak Creek, RM 0.0-2.8	9.08	0	43.29	0.88	5.92	59.17	97.12%
White Oak Creek, RM 0.0-3.4	0	0	30.13	0.30	3.38	33.82	99.07%

⁽¹⁾ Daily allocations for the Sewage Treatment Plants (STPs) discharging to a listed segment are equal to their permit limit times their design flow. These values were derived using the instantaneous Water Quality Criterion of 240 colonies/100ml so the allocated load is in units of billions of colonies/day. See Table S.4 for allocations for individual STPs.

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The monthly average allocations for the existing WWTPs will be 54.2% of their daily allocations calculated as a geometric mean, based on the WQC of 130 colonies/100ml (as opposed to 240 colonies/100ml). Any future permitted point source must meet permit limits based on the Water Quality Standards in 401 KAR 10:031, and must not cause or contribute to an existing impairment.

Although Concentrated Animal Feeding Operations (CAFOs) receive their allocations within the WLA, there are no permitted CAFOs present in the watershed. Any future CAFO cannot legally discharge to surface water, and therefore receives a WLA of zero. The only exception is holders of a CAFO Individual Permit can discharge during a 25-year or greater storm event.

⁽²⁾ The City of Danville Municipal Separate Storm Sewer System (MS4), Permit Number KYG200014.

⁽³⁾ In the event that compliance with the WQC is determined using fecal coliform concentrations as opposed to E. Coli concentrations, the final E. Coli allocations can be converted to fecal coliform by multiplying by the figure (400/240) for instantaneous values, or by the figure (200/130) for the geometric mean, assuming 5 or more samples are taken within a 30-day period.

Table S.4 WLA for (Non-MS4) KPDES-Permitted Facilities Discharging Pathogens

KPDES Permit Number	Facility Name ⁽¹⁾	County	Receiving Water	WLA, billion colonies/day	Facility Design Flow, mgd	Latitude	Longitude
KY0047431	Brodhead STP	Rockcastle	Dix River	1.36	0.15	37.408330	-84.421110
KY0065897	Crab Orchard STP	Lincoln	Dix River	1.00	0.11	37.472500	-84.485000
KY0073750	Hustonville Elem School	Lincoln	Baughman Creek	0.055	0.006	34.472222	-84.821944
KY0097713	Hustonville Elderly Apartments	Lincoln	Hanging Fork	0.032	0.0035	34.473330	-84.813330
KY0024619	Stanford STP	Lincoln	Logan Creek	7.27	0.8	37.540280	-84.637420
KY0020974	Lancaster STP	Garrard	White Oak Creek	9.08	1.0	37.613890	-84.586390
KY0057193	Danville STP	Boyle	Clarks Run	59.05	6.5	37.630830	-84.740560

⁽¹⁾STP=Sewage Treatment Plant

Table S.5 MS4 Facilities in the WLA

KPDES Permit Number	Facility Name ⁽¹⁾	County	Subwatershed
KYG200014	City of Danville	Boyle	Clarks Run

⁽¹⁾See Table S.3 for the allocation by impaired segment for the Danville MS4.