

**Final Total Maximum Daily Load for *E. coli*
9 Stream Segments within the Cox Creek Watershed
Nelson, Bullitt and Spencer Counties, Kentucky**



Cox Creek, Nelson County, KDOW

**Submitted to:
United States Environmental Protection Agency
Region IV
Atlanta Federal Building
61 Forsyth Street SW
Atlanta, GA 30303-1534**

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9 Stream Segments within the Cox Creek Watershed**

Nelson, Bullitt and Spencer Counties, Kentucky

June 2013

**Kentucky Department for Environmental Protection
Division of Water**

This report is approved for release



Sandra L. Gruzesky, P.E., Director
Division of Water

5/17/13

Date



TABLE OF CONTENTS

| | |
|--|-----------|
| 1.0 Introduction..... | 17 |
| 2.0 Problem Definition..... | 18 |
| 2.1 303(D) LISTING HISTORY | 18 |
| 3.0 Physical Setting | 22 |
| 3.1 GEOLOGY | 22 |
| 3.2 HYDROLOGY | 23 |
| 3.3 LAND COVER DISTRIBUTION..... | 23 |
| 4.0 Monitoring..... | 27 |
| 4.1 KDOW TMDL MONITORING | 27 |
| 4.1.1 <i>KDOW TMDL Watershed Health Reports</i> | 27 |
| 5.0 Source Identification..... | 31 |
| 5.1 KPDES-PERMITTED SOURCES | 31 |
| 5.1.1 <i>Sanitary Wastewater Systems</i> | 31 |
| 5.1.2 <i>MS4 Sources</i> | 34 |
| 5.1.3 <i>Combined Animal Feeding Operations</i> | 35 |
| 5.2 NON KPDES-PERMITTED SOURCES | 35 |
| 5.2.1 <i>Kentucky No Discharge Operational Permits</i> | 36 |
| 5.2.2 <i>Agriculture</i> | 37 |
| 5.2.3 <i>Wildlife</i> | 39 |
| 5.2.4 <i>Human Waste</i> | 39 |
| 5.2.5 <i>Household Pets</i> | 40 |
| 5.3 ILLEGAL SOURCES..... | 40 |
| 6.0 Water Quality Criterion..... | 42 |
| 7.0 Total Maximum Daily Load..... | 43 |
| 7.1 TMDL EQUATION AND DEFINITIONS..... | 43 |
| 7.2 MARGIN OF SAFETY..... | 44 |
| 7.3 WASTE LOAD ALLOCATION..... | 44 |
| 7.3.1 <i>SWS-WLA</i> | 44 |
| 7.3.2 <i>Remainder</i> | 45 |
| 7.3.3 <i>Future Growth WLA</i> | 45 |
| 7.3.4 <i>MS4-WLA</i> | 46 |
| 7.4 LOAD ALLOCATION | 46 |
| 7.5 SEASONALITY | 47 |
| 7.6 CRITICAL CONDITION | 47 |
| 7.7 TMDLS CALCULATED AS A DAILY LOAD..... | 47 |
| 8.0 TMDL Calculations | 48 |
| 8.1 DATA VALIDATION | 48 |
| 8.2 INDIVIDUAL STREAM SEGMENT ANALYSIS | 48 |
| 8.2.1 <i>Cox Creek of the Salt River</i> | 49 |
| 8.2.1.1 <i>Cox Creek 18.6 to 23.9 into Salt River</i> | 52 |
| 8.2.1.2 <i>Cox Creek 11.4 to 18.6 into Salt River</i> | 54 |
| 8.2.1.3 <i>Cox Creek 4.7 to 11.4 into Salt River</i> | 57 |
| 8.2.1.4 <i>Cox Creek 0.0 to 4.7 into Salt River</i> | 59 |
| 8.2.1.5 <i>Caney Fork 0.0 to 4.0 into Cox Creek</i> | 61 |

Total Maximum Daily Load (TMDL) Synopsis

8.2.1.6 *Froman Creek 0.0 to 1.25 into Cox Creek*..... 63

8.2.1.7 *West Fork Cox Creek 0.0 to 6.9 into Cox Creek*..... 65

8.2.1.8 *East Fork Cox Creek 0.0 to 4.3 into Cox Creek* 67

8.2.1.9 *Rocky Run 0.0 to 2.3 into Cox Creek*..... 69

9.0 Implementation 72

9.1 KENTUCKY WATERSHED MANAGEMENT FRAMEWORK 73

9.2 NON-GOVERNMENTAL ORGANIZATIONS 73

9.2.1 *Watershed Watch in Kentucky* 73

9.2.2 *Kentucky Waterways Alliance*..... 73

10.0 Public Participation 74

11.0 References 75

Appendix A 78

Appendix B 80

Appendix C 85

Appendix D 87

LIST OF FIGURES

Figure S.1 Location of the Cox Creek Watershed, Sample Sites and Assessed Stream Segments 13

Figure 2.1 Cox Creek Watershed Location in Relation to the City of Bardstown, KY 21

Figure 3.1 Simplified Geologic Map of the Cox Creek Watershed 24

Figure 3.2 Karst Potential within the Cox Creek Watershed..... 25

Figure 3.3 Land Cover within the Cox Creek Watershed (MRLC NLCD 2001) 26

Figure 4.1 Locations of KDOW Sample Sites and Assessed Stream Segments within the Cox Creek Watershed..... 30

Figure 5.1 Location of KPDES-Permitted Sources, KNDOPs and Wastewater Infrastructure within the Cox Creek Watershed..... 33

Figure 8.1 Land Cover, KPDES-Permitted Sources and Wastewater Infrastructure within the Cox Creek Watershed 51

Figure 8.2 Land Cover for Cox Creek 18.6 to 23.9 53

Figure 8.3 Land Cover for Cox Creek 11.4 to 18.6..... 56

Figure 8.4 Land Cover for Cox Creek 4.7 to 11.4..... 58

Figure 8.5 Land Cover for Cox Creek 0.0 to 4.7 60

Figure 8.6 Land Cover for Caney Fork 0.0 to 4.0 62

Figure 8.7 Land Cover for Froman Creek 0.0 to 1.25 64

Figure 8.8 Land Cover for West Fork Cox Creek 0.0 to 6.9 66

Figure 8.9 Land Cover for East Fork Cox Creek 0.0 to 4.3 68

Figure 8.10 Land Cover for Rocky Run 0.0 to 2.3 70

*****All figures created by KDOW TMDL Section within a Geographic Information Systems framework (ArcMap 10.0) in 2012, unless otherwise noted. Most of the GIS data collected for the development of this document can be accessed and downloaded from the Kentucky Geography Network (<http://kygeonet.ky.gov>).

LIST OF TABLES

Table S.1 Impaired Waterbodies Addressed in this Bacteria TMDL Document 11

Table S.2 TMDLs and Allocations 16

Table 2.1 Original Assessment Information in the Cox Creek Watershed (2004 Report to Congress on Water Quality) 18

Table 2.2 Impaired Waterbodies within the Cox Creek Watershed (USGS HUC 05140102) Addressed in this TMDL Document 19

Table 3.1 Summary of Land Cover within the Cox Creek Watershed..... 25

Table 4.1 KDOW TMDL Sample Locations and Parameters Collected Within the Cox Creek Watershed (11/2008 thru 10/2009) 28

Table 4.2 Statistical Summary of *E. coli* Data Collected in the Cox Creek Watershed during the 2011 PCR Season 29

Table 4.3 Cox Creek Watershed Health Report from the 2009 TMDL Watershed Study.. 29

Table 5.1 Summary of KPDES-permitted Source Information 32

Table 5.2 KNDOP Permitted Facilities in the Cox Creek Watershed 37

Table 5.3 USDA Agricultural Statistics for Madison County (2007)..... 38

Table 5.4 Estimated Deer Populations within Cox Creek..... 39

Table 7.1 Future Growth Matrix..... 45

Table 7.2 Future Growth Percentage by Impaired Segment..... 46

Table 8.1 Land Cover in the Cox Creek Watershed (NLCD 2001)..... 49

Table 8.2 Estimated Populations in the Cox Creek Watershed According to the 2010 US Census 49

Table 8.3 *E. coli* Data Collected for Cox Creek above Murray Run Road bridge (RM 18.75) - DOW12005010 52

Table 8.4 Summary of TMDL Components for Cox Creek 18.6 to 23.9 54

Table 8.5 *E. coli* Data Collected for Cox Creek off Wheeler-Wright Lane; above Cox Creek Elementary (RM 16.55) - DOW12005008..... 54

Table 8.6 *E. coli* Data Collected for Cox Creek above Fairfield Road bridge (KY509; RM 15.4) - DOW12005007 55

Table 8.7 *E. coli* Data Collected for Cox Creek below Cox Creek Road bridge (RM 11.8) - CFD12005502 55

Table 8.8 Summary of TMDL Components for Cox Creek 11.4 to 18.6 57

Table 8.9 *E. coli* Data Collected for Cox Creek at Deatsville Rd. bridge (KY523; RM 8.3) - DOW12005005..... 57

Table 8.10 Summary of TMDL Components for Cox Creek 4.7 to 11.4 59

Table 8.11 *E. coli* Data Collected for Cox Creek off Cedar Grove Rd (RM 2.6) - DOW12005002..... 59

Table 8.12 Summary of TMDL Components for Cox Creek 0.0 to 4.7 61

Table 8.13 *E. coli* Data Collected for Caney Fork above Murray Run Road bridge (RM 0.05) - DOW12005009 61

Table 8.14 Summary of TMDL Components for Caney Fork 0.0 to 4.0 63

Table 8.15 *E. coli* Data Collected for Froman Creek at Mobley Mill Road bridge (KY 509; RM 0.55) - DOW12005007 63

Table 8.16 Summary of TMDL Components for Froman Creek 0.0 to 1.25 65

Total Maximum Daily Load (TMDL) Synopsis

Table 8.17 *E. coli* Data Collected for West Fork Cox Creek at Lutz Lane bridge (RM 4.4) - DOW12005005..... 65

Table 8.18 Summary of TMDL Components for West Fork Cox Creek 0.0 to 6.9 67

Table 8.19 *E. coli* Data Collected for East Fork Cox Creek off Grigsby Road (RM 0.6) - CFD12005502 67

Table 8.20 Summary of TMDL Components for East Fork Cox Creek 0.0 to 4.3 69

Table 8.21 *E. coli* Data Collected for Rocky Run off Cedar Grove Road (RM 0.5) - DOW12005004..... 69

Table 8.22 Summary of TMDL Components for Rocky Run 0.0 to 2.3 71

Glossary of Acronyms

| | |
|-----------------|--|
| ADD | Area Development District |
| AFO | Animal Feeding Operation |
| AWQA | Agriculture Water Quality Act |
| BMP | Best Management Practices |
| BMU | Basin Management Unit |
| CAFO | Confined Animal Feeding Operation |
| CFR | Code of Federal Regulations |
| CPP | Continuing Planning Process |
| CREP | Conservation Reserve Enhancement Program |
| CRP | Conservation Reserve Program |
| CSO | Combined Sewer Overflow |
| DEP | Department of Environmental Protection |
| DMR | Discharge Monitoring Report |
| DOC | Division of Conservation |
| ft ³ | Cubic feet |
| GIS | Geographic Information System |
| GNIS | Geographic Names Information System |
| HUC | Hydrologic Unit Code |
| KAR | Kentucky Administrative Regulations |
| KDFWR | Kentucky Division of Fish and Wildlife Resources |
| KDOC | Kentucky Division of Conservation |
| KDOW | Kentucky Division of Water |
| KGS | Kentucky Geological Survey |
| KRS | Kentucky Revised Statutes |
| KIA | Kentucky Infrastructure Authority |
| KNDOP | Kentucky No Discharge Operational Permit |
| KPDES | Kentucky Pollution Discharge Elimination System |
| L | Liter |
| LA | Load Allocations |
| LTCP | Long Term Control Plan |
| MAF | Mean Annual Flow |
| MGD | Million Gallons per Day |
| MHP | Mobile Home Park |
| ml | milliliter |
| MOS | Margin of Safety |
| MS4 | Municipal Separate Storm Sewer Systems |
| NASS | National Agricultural Statistics Service |
| NHD | National Hydrography Dataset |
| NLCD | National Landcover Database |
| NRCS | Natural Resources Conservation Service |
| NPDES | National Pollution Discharge Elimination System |
| NPS | Nonpoint Source |
| NOV | Notice of Violation |

Total Maximum Daily Load (TMDL) Synopsis

| | |
|-------|---|
| OSTDS | On Site Sewage Treatment and Disposal System |
| PCR | Primary Contact Recreation |
| PCS | Permit Compliance System |
| POTW | Publicly Owned Treatment Works |
| QAPP | Quality Assurance Project Plan |
| QA/QC | Quality Assurance/Quality Control |
| RCRA | Resource Conservation and Recovery Act |
| RM | River Mile |
| SCR | Secondary Contact Recreation |
| SOP | Standard Operating Procedures |
| SSO | Sanitary Sewer Overflow |
| STP | Sewage Treatment Plant |
| SWPB | Surface Water Permits Branch |
| SWS | Sanitary Wastewater System |
| SWQMP | Storm Water Quality Management Plan |
| TMDL | Total Maximum Daily Load |
| USACE | United States Army Corps of Engineers |
| USDA | United States Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |
| WAH | Warm Water Aquatic Habitat |
| WBID | Waterbody Identification Number |
| WBP | Watershed Based Plan |
| WLA | Waste Load Allocation |
| WMB | Watershed Management Branch |
| WQB | Water Quality Branch |
| WQC | Water Quality Criteria |
| WQS | Water Quality Standard |
| WWTP | Wastewater Treatment Plant |

Total Maximum Daily Load (TMDL) Synopsis

State: Kentucky

Major River Basin: Salt

USGS HUC8 #: 05140102

County(s): Nelson, Bullitt and Spencer

Pollutant(s) of Concern: *E. coli*

Table S.1 Impaired Waterbodies Addressed in this Bacteria TMDL Document

| Waterbody Name | Pollutant | County | GNIS Number | Suspected Sources | Impaired Use (Support Status) |
|-----------------------------------|------------------|---------------|--------------------|---|--------------------------------------|
| Cox Creek 0.0 to 4.7 | <i>E. coli</i> | Bullitt | KY490220_01 | Nonpoint Sources | PCR (not supporting) |
| Cox Creek 4.7 to 11.4 | <i>E. coli</i> | Nelson | KY490220_02 | Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access | PCR (not supporting) |
| Cox Creek 11.4 to 18.6 | <i>E. coli</i> | Nelson | KY490220_03 | Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access, Other Permitted Small Dischargers | PCR (not supporting) |
| Cox Creek 18.6 to 23.9 | <i>E. coli</i> | Nelson | KY490220_04 | Nonpoint Sources, Agriculture, Unrestricted Cattle Access, Urban Runoff/ Storm Sewers | PCR (not supporting) |
| Caney Fork 0.0 to 4.0 | <i>E. coli</i> | Nelson | KY488864_01 | Nonpoint Sources, Agriculture, Unrestricted Cattle Access, Urban Runoff/ Storm Sewers | PCR (not supporting) |
| East Fork Cox Creek 0.0 to 4.3 | <i>E. coli</i> | Bullitt | KY491454_01 | Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access | PCR (not supporting) |
| Froman Creek 0.0 to 1.25 | <i>E. coli</i> | Nelson | KY492574_01 | Nonpoint Sources, Agriculture, Unrestricted Cattle Access | PCR (not supporting) |

Total Maximum Daily Load (TMDL) Synopsis

| Waterbody Name | Pollutant | County | GNIS Number | Suspected Sources | Impaired Use (Support Status) |
|-----------------------------------|------------------|---------------|--------------------|--|--------------------------------------|
| Rocky Run 0.0 to 2.3 | <i>E. coli</i> | Bullitt | KY502264_01 | Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access | PCR (not supporting) |
| West Fork Cox Creek 0.0 to 6.9 | <i>E. coli</i> | Bullitt | KY506428_01 | Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access | PCR (not supporting) |

Kentucky Water Quality Criteria (WQC) and the TMDL Endpoint (i.e. Water Quality Standard/ TMDL Target):

Title 401 KAR 10:031 describe the standards used to “protect the surface waters of the Commonwealth, and thus protect water resources.” *Escherichia coli* (*E. coli*) bacteria are pathogen indicator organisms. *E. coli* data are used to indicate the degree of support for primary contact recreation (PCR) use. The stream is assessed as fully supporting the PCR use if the *E. coli* content does not exceed the criterion of 240 colonies per 100 ml in less than 20 percent of samples; it was assessed as partially supporting the PCR use if the criterion was not met in 25-33 percent of samples, and as not supporting the PCR use if the criterion was not met in greater than 33 percent of samples. Streams assessed as either nonsupport or partial support are considered impaired. Stream segments were sampled during twelve sampling events through the PCR season of May 1 through October 31, 2009.

The WQC in 401 KAR 10:031 (Kentucky’s Surface Water Standards) for the PCR use are based on both fecal coliform and *E. coli*. Per 401 KAR 10:031:

“The following criteria shall apply to waters designated as primary contact recreation use during the primary contact recreation season of May 1 through October 31: Fecal coliform content or Escherichia coli content shall not exceed 200 colonies per 100 ml or 130 colonies per 100 ml respectively as a geometric mean based on not less than five (5) samples taken during a thirty (30) day period. Content also shall not exceed 400 colonies per 100 ml in twenty (20) percent or more of all samples taken during a thirty (30) day period for fecal coliform or 240 colonies per 100 ml for Escherichia coli.”

The instantaneous criteria of 240 *E. coli* colonies/100 ml was applied to calculate allowable loadings to bring the watershed into compliance with the PCR designated use. The TMDL Target is defined as the WQC minus the Margin of Safety (MOS). The MOS can be an implicit or explicit additional reduction applied to the Waste Load allocation (WLA), Load Allocation (LA) or to both types of sources that accounts for uncertainties in the data or TMDL calculations. The TMDL Target is thus 216 colonies per 100ml (240 col/100ml minus a 10% MOS).

Total Maximum Daily Load (TMDL) Synopsis

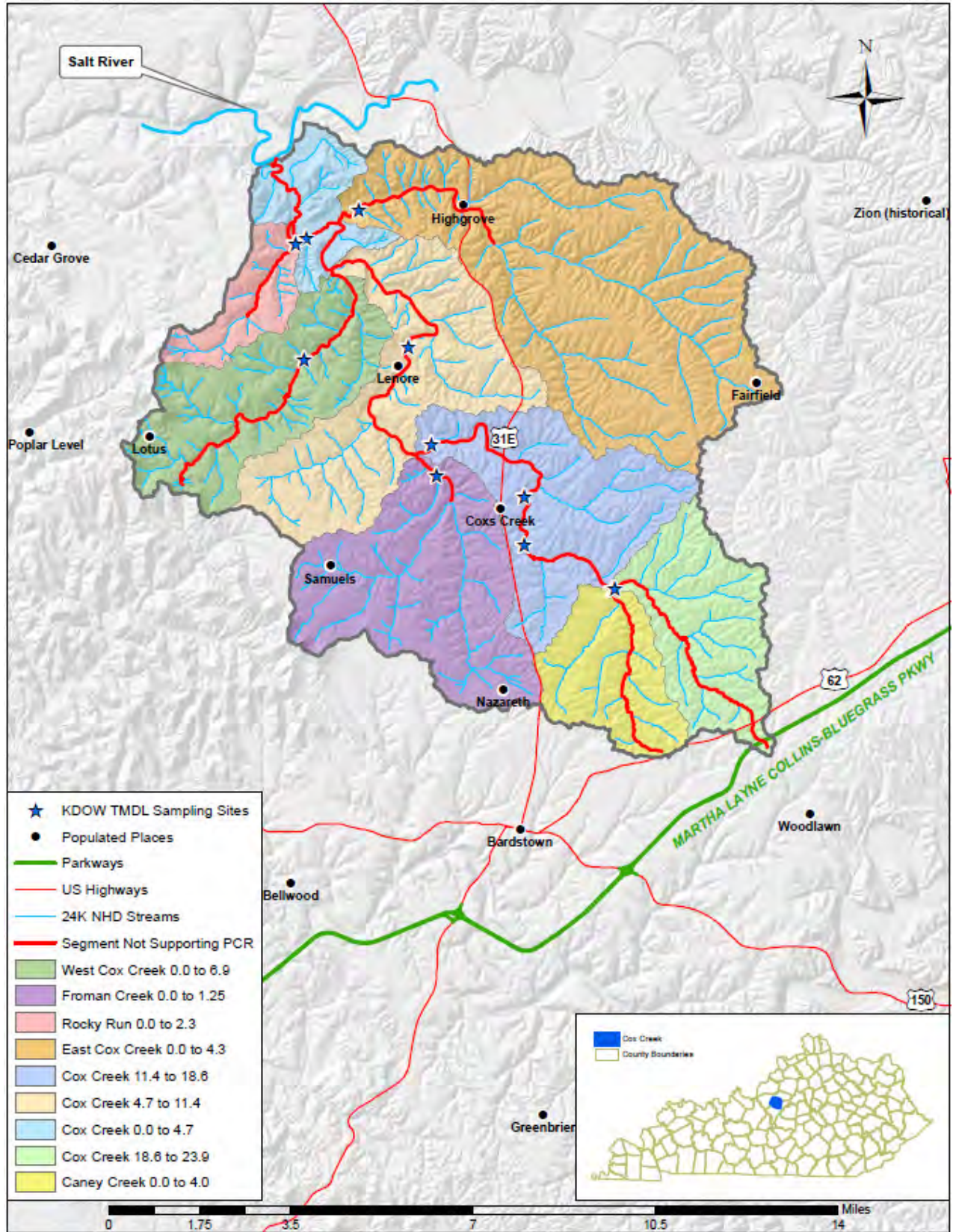


Figure S.1 Location of the Cox Creek Watershed, Sample Sites and Assessed Stream Segments

Total Maximum Daily Load (TMDL) Synopsis

TMDL Equation and Calculations:

A TMDL calculation is performed as follows:

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

(Equation 1)

The WLA has three components:

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

(Equation 2)

Where:

TMDL: the WQC, expressed as a load. The WQC is defined in Section 6.0 as an instantaneous concentration of 240 colonies/100 ml for *E. coli* or 400 colonies/100 ml for fecal coliform.

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 relationship between effluent limits and water quality.

TMDL Target: the TMDL minus the MOS.

WLA: the Wasteload Allocation, which is the allowable loading of pollutants into the stream from KPDES-permitted sources, such as SWSs and MS4s.

SWS-WLA: the WLA for KPDES-permitted sources, which have discharge limits for pathogen indicators (including wastewater treatment plants, package plants and home units).

Remainder: the TMDL minus the MOS and minus the SWS-WLA (also equal to Future Growth-WLA plus the MS4-WLA and the LA).

Future Growth-WLA: the allowable loading for future KPDES-permitted sources, including new SWSs, expansion of existing SWSs, new storm water sources, and growth of existing storm water sources (such as MS4s). Also includes the allocation for the KPDES-permitted sources that existed but were not known at the time the TMDL was written.

Remainder: the TMDL minus the MOS and minus the SWS-WLA (also equal to Future Growth-WLA plus the MS4-WLA and the LA).

MS4-WLA: the WLA for KPDES-permitted municipal separate storm water sewer systems (including cities, counties, roads and right-of-ways owned by the Kentucky Transportation Cabinet (KYTC), universities and military bases).

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

Seasonality: yearly factors that affect the relationship between pollutant inputs and the ability of the stream to meet its designated uses.

Critical Condition: the time period when the pollutant conditions are expected to be at their worst.

MAF: the Mean Annual Flow as defined by USGS.

Adjusted MAF: the MAF plus SWS-WLA design flows.

Critical Flow: the flow used to calculate the TMDL as a load (is equivalent to the Adjusted MAF for MAF TMDLs)

Existing Conditions: the load that exists in the watershed at the time of TMDL development (i.e., sampling) and is causing the impairment.

Total Maximum Daily Load (TMDL) Synopsis

Percent Reduction: the loading reduction needed to bring the existing condition in line with the TMDL target.

Load: concentration * flow * conversion factor

Concentration: colonies per 100 milliliters (colonies/100ml)

Flow (i.e. stream discharge): cubic feet per second (cfs)

Conversion Factor: the value that converts the product of concentration and flow to load (in units of colonies per day); it is derived from the calculation of the following components: $(28.31685\text{L}/\text{ft}^3 * 86400\text{seconds}/\text{day} * 1000\text{ml}/\text{L}) / (100\text{ml})$ and is equal to 24,465,758.4.

Calculation Procedure:

- 1) The MOS, if an explicit value, is calculated and subtracted from the TMDL first, giving the TMDL Target;
- 2) Percent reductions are calculated to show the difference between Existing Conditions and the TMDL Target;
- 3) The SWS-WLA is calculated and subtracted from the TMDL Target, leaving the Remainder;
- 4) The Future Growth-WLA is calculated and subtracted from the Remainder;
- 5) If there is a MS4 present upstream of the impaired segment, the MS4-WLA is subtracted from the Remainder based on percent land use, leaving the LA.

Translation of WLAs into Permit Limits

All KPDES-permitted sources must meet permit limits based on the Water Quality Criteria (WQC) 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 and 240 colonies/100 ml as a maximum weekly average or as a fecal coliform effluent gross limit of 200 colonies/100 ml as a monthly average and 400 colonies/100 ml as a maximum weekly average.

The MS4-WLA is not a numerical end-of-pipe limit; it is an in-stream allocation. The MS4-WLA will be addressed through the MS4 permit and implemented through the Stormwater Quality Management Plan (SWQMP) to the Maximum Extent Practicable (MEP).

Total Maximum Daily Load (TMDL) Synopsis

Table S.2 TMDLs and Allocations

| TMDL⁽¹⁾ | MOS⁽²⁾ | SWS-WLA⁽³⁾ | MS4-WLA | Future Growth - WLA | LA | Mean Annual Flow (cfs) |
|--|----------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|-------------------------------|
| Cox Creek 0.0 to 4.7 into Salt River | | | | | | |
| 6.68×10 ¹¹ col/day | 6.68×10 ¹⁰ col/day | 9.08×10 ⁷ col/day | 1.94×10 ⁸ col/day | 3.00×10 ⁹ col/day | 5.98×10 ¹¹ col/day | 113.7 |
| Cox Creek 4.7 to 11.4 into Salt River | | | | | | |
| 3.38×10 ¹¹ col/day | 3.38×10 ¹⁰ col/day | 9.08×10 ⁷ col/day | 1.82×10 ⁸ col/day | 1.52×10 ⁹ col/day | 3.02×10 ¹¹ col/day | 57.5 |
| Cox Creek 11.4 to 18.6 into Salt River | | | | | | |
| 1.33×10 ¹¹ col/day | 1.33×10 ¹⁰ col/day | 9.08×10 ⁷ col/day | 5.77×10 ⁷ col/day | 6.00×10 ⁸ col/day | 1.19×10 ¹¹ col/day | 22.7 |
| Cox Creek 18.6 to 23.9 into Salt River | | | | | | |
| 5.99×10 ¹⁰ col/day | 5.99×10 ⁹ col/day | n/a | n/a | 2.70×10 ⁸ col/day | 5.36×10 ¹⁰ col/day | 10.2 |
| Caney Fork 0.0 to 4.0 into Cox Creek | | | | | | |
| 4.46×10 ¹⁰ col/day | 4.46×10 ⁹ col/day | n/a | 8.21×10 ⁷ col/day | 4.02×10 ⁸ col/day | 3.97×10 ¹⁰ col/day | 7.6 |
| East Fork Cox Creek 0.0 to 4.3 into Cox Creek | | | | | | |
| 1.92×10 ¹¹ col/day | 1.92×10 ¹⁰ col/day | n/a | n/a | 8.64×10 ⁸ col/day | 1.73×10 ¹¹ col/day | 32.7 |
| Froman Creek 0.0 to 1.25 into Cox Creek | | | | | | |
| 9.75×10 ¹⁰ col/day | 9.75×10 ⁹ col/day | n/a | 1.25×10 ⁸ col/day | 4.39×10 ⁸ col/day | 8.72×10 ¹⁰ col/day | 16.6 |
| Rocky Run 0.0 to 2.3 into Cox Creek | | | | | | |
| 2.29×10 ¹⁰ col/day | 2.29×10 ⁹ col/day | n/a | n/a | 1.03×10 ⁸ col/day | 2.05×10 ¹⁰ col/day | 3.9 |
| West Fork Cox Creek 0.0 to 6.9 into Cox Creek | | | | | | |
| 5.64×10 ¹⁰ col/day | 5.64×10 ⁹ col/day | n/a | n/a | 2.54×10 ⁸ col/day | 5.05×10 ¹⁰ col/day | 9.6 |

Notes:

- (1). TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the mean annual streamflow (MAF) and the appropriate conversion factor. MAF is determined by the USGS. The TMDL is the sum of all components.
- (2). MOS is explicitly set at 10% of the Water Quality Criterion
- (3). Any future KPDES wastewater permitted sources must meet permit limits based on the Water Quality Criterion in 401 KAR 10:031, and must not cause or contribute to an existing impairment. WLA value is based on acute permit limits and design flow and represents the maximum one-day load that can be discharged to the stream segment.

1.0 Introduction

Section 303(d) of the Clean Water Act requires states to identify waterbodies within their boundaries that have been assessed and are not currently meeting their designated uses (401 KAR 10:026 and 10:031) and that require the development of a Total Maximum Daily Load (TMDL). States must establish a priority ranking for such waters, taking into account their intended uses and the severity of the pollutant. Section 303(d) also requires that states provide a list of this information called the 303(d) list. This list is submitted to the Environmental Protection Agency (EPA) during even-numbered years and each submittal replaces the previous list. The 2010-303(d) information for Kentucky can be found in the 2010 *Integrated Report to Congress on the Condition of Water Resources in Kentucky Volume II. 303(d) List of Surface Waters* (Kentucky Division of Water (KDOW) 2010) and can be obtained at: <http://water.ky.gov>.

States are also required to develop TMDLs for the pollutants that cause each waterbody to fail to meet its designated uses. The TMDL process establishes the allowable amount (i.e. “load”) of the pollutant the waterbody can naturally assimilate while continuing to meet the water quality criteria (WQC) for each designated use. The pollutant load must be established at a level necessary to implement the applicable WQC with seasonal variations and a Margin of Safety (MOS) that takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality. This load is then divided among different sources of the pollutant in a watershed. Information from EPA on TMDLs can be found at: <http://www.epa.gov/owow/tmdl>.

This TMDL document provides important bacteria allocations and reductions that could assist with developing detailed watershed plans to guide watershed restoration efforts. Watershed Plans for the bacteria impaired Cox Creek waterbodies should address both KPDES-permitted (point) and non KPDES-permitted (nonpoint) sources of bacteria loadings to the watersheds and should build on existing efforts as well as evaluate new approaches. Comprehensive Watershed Plans should consider both voluntary and regulatory approaches in order to meet water quality standards.

2.0 Problem Definition

The Salt River Basin-Cox Creek, United States Geological Survey (USGS) hydrologic unit code (HUC) 05140102 is located in west central Kentucky east of the intersection of Interstates 65 and 64. The area of interest is in the center of the Salt River basin and is mostly contained in Nelson County though portions of the watershed in the north and east extend into Bullitt and Spencer counties (Figure 2.1).

2.1 303(d) Listing History

Data collected by the Kentucky Department of Fish and Wildlife Resources (KDFWR) was used to first assess Cox Creek, from RM 11.2 to 15.5 in the 2002 Kentucky Report to Congress on Water Quality as partially supporting the aquatic life (i.e. WAH) designated use. This segment was placed on the 303(d) List of Impaired Waters, after it was determined to be impaired by excessive nutrient loading from surrounding cornfields and excessive hog waste applications from adjacent animal feeding operations. Data collected by the KDOW Ambient Monitoring Program was used to first assess Cox Creek, from RM 0.0 to 4.7 in the 2004 Kentucky Report to Congress on Water Quality, as partially supporting the swimming (i.e. PCR) designated use. This segment of Cox Creek was placed on the 303(d) List of Impaired Waters, after it was determined to be impaired by pathogens due to unknown sources. A summary of the original assessment information is listed in Table 2.1.

Table 2.1 Original Assessment Information in the Cox Creek Watershed (2004 Report to Congress on Water Quality)

| Waterbody Name | County | GNIS Number | Assessed Use (Support Status) |
|------------------------|---------|-------------|-------------------------------|
| Cox Creek RM 0.0-4.7 | Bullitt | KY490220_01 | PCR (partially supporting) |
| Cox Creek RM 11.2-15.5 | Nelson | KY490220_02 | WAH (partially supporting) |

The KDOW TMDL Section revisited Cox Creek in 2009 to conduct a watershed study. KDOW biologists sampled eleven sites throughout the watershed collecting water chemistry, bacteria and habitat information. Three of the eleven sites were also sampled for aquatic life. As a result of the sampling effort, KDOW proposes adding five tributaries and two more segments of Cox Creek to the 2012 Integrated Report to Congress on Water Quality as impaired for the PCR designated use. The *E. coli* TMDL stream segments addressed in this document are listed in Table 2.2 and illustrated on Figure 2.1.

Data used to assess these waterbodies included *E. coli* data collected by the KDOW TMDL Section. General watershed data, available from the Kentucky Geography Network (i.e., geology, land cover, location of KPDES-permitted sources, etc. <http://kygeonet.ky.gov>) was also analyzed in a geographic information systems (GIS) framework. *E. coli* data are used as an

indicator of the presence of bacteria pollution. Suspected sources of impairment include non-KPDES permitted sources (failing Onsite Sewage Treatment and Disposal Systems (OSTDSs), agriculture, livestock, illegal straight-pipe discharge and rural runoff) as well as KPDES permitted sources (other permitted small flows discharges, urban runoff and sewer infrastructure).

Table 2.2 Impaired Waterbodies within the Cox Creek Watershed (USGS HUC 05140102) Addressed in this TMDL Document

| Waterbody Name | Pollutant | County | GNIS Number | Suspected Sources | Impaired Use (Support Status) |
|--------------------------------------|------------------|---------------|--------------------|--|--------------------------------------|
| Cox Creek 0.0 to 4.7 | <i>E. coli</i> | Bullitt | KY490220_01 | Nonpoint Sources | PCR (not supporting) |
| Cox Creek 4.7 to 11.4 | <i>E. coli</i> | Nelson | KY490220_02 | Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access | PCR (not supporting) |
| Cox Creek 11.4 to 18.6 | <i>E. coli</i> | Nelson | KY490220_03 | Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access, Other Permitted Small Dischargers | PCR (not supporting) |
| Cox Creek 18.6 to 23.9 | <i>E. coli</i> | Nelson | KY490220_04 | Nonpoint Sources, Agriculture, Unrestricted Cattle Access, Urban Runoff/ Storm Sewers | PCR (not supporting) |
| Caney Fork 0.0 to 4.0 | <i>E. coli</i> | Nelson | KY488864_01 | Nonpoint Sources, Agriculture, Unrestricted Cattle Access, Urban Runoff/ Storm Sewers | PCR (not supporting) |
| East Fork Cox Creek 0.0 to 4.3 | <i>E. coli</i> | Bullitt | KY491454_01 | Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access | PCR (not supporting) |
| Froman Creek 0.0 to 1.25 | <i>E. coli</i> | Nelson | KY492574_01 | Nonpoint Sources, Agriculture, Unrestricted Cattle Access | PCR (not supporting) |
| Rocky Run 0.0 to 2.3 | <i>E. coli</i> | Bullitt | KY502264_01 | Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access | PCR (not supporting) |

| Waterbody Name | Pollutant | County | GNIS Number | Suspected Sources | Impaired Use (Support Status) |
|-----------------------------------|------------------|---------------|--------------------|---|--------------------------------------|
| West Fork Cox Creek 0.0 to 6.9 | <i>E. coli</i> | Bullitt | KY506428_01 | Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access | PCR (not supporting) |

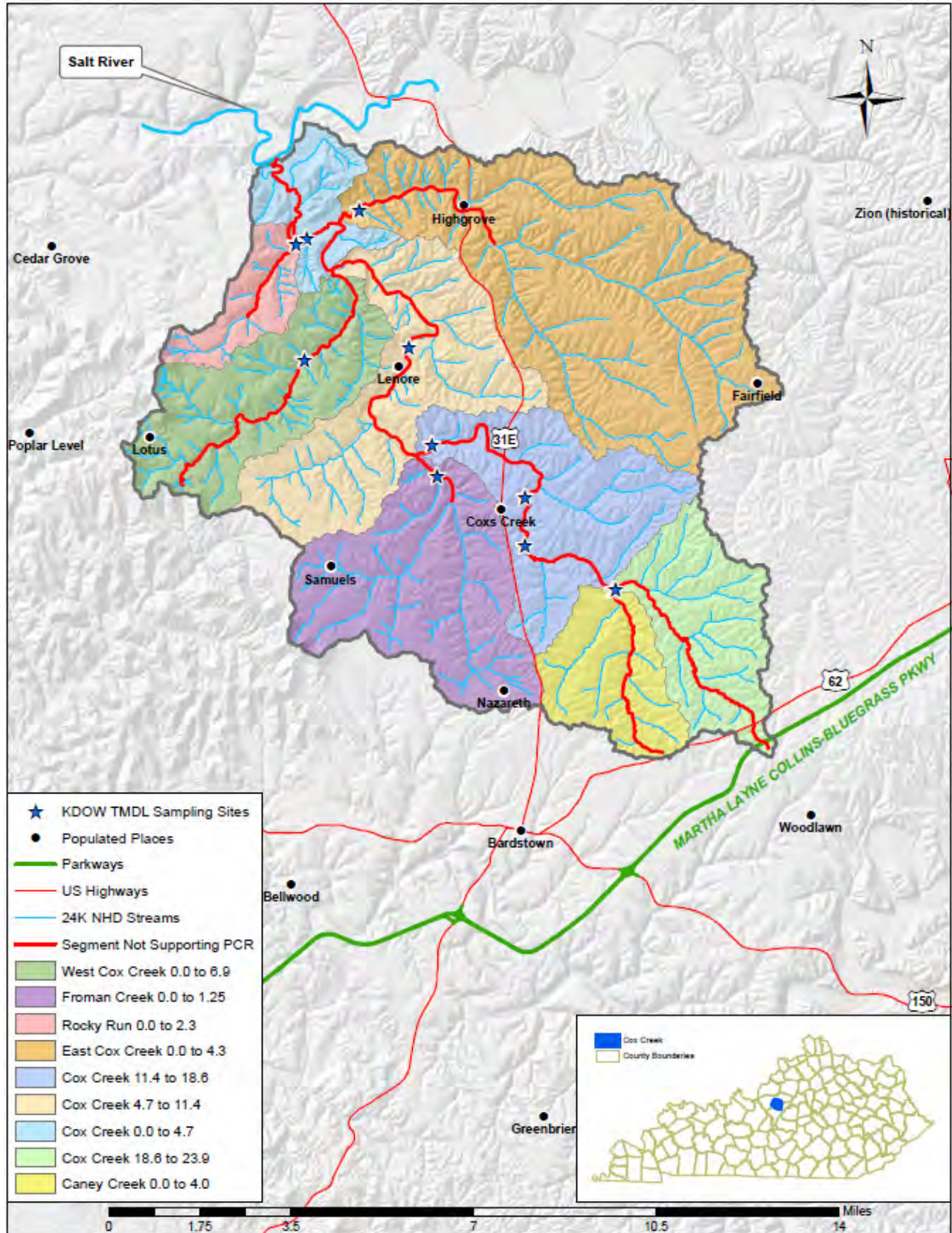


Figure 2.1 Cox Creek Watershed Location in Relation to the City of Bardstown, KY

3.0 Physical Setting

The Cox Creek watershed is located approximately two miles north of the city of Bardstown. The stream generally flows north draining five tributaries (Caney, Froman, East Cox and West Cox Creeks and Rocky Run) before emptying into the Salt River near the community of Solitude, Kentucky.

3.1 Geology

Cox Creek lies within the Outer Bluegrass physiographic region of the Interior Plateau Level III ecoregion (Woods et al 2002). The watershed is located along the boundary of the Outer Bluegrass and Knobs physiographic regions but is primarily in the Outer Bluegrass - the Outer Bluegrass is associated with the upper Ordovician period while the Knobs is associated with the Devonian, Silurian and Mississippian periods (Figure 3.1). Major formations in the area include the Drakes (a fossiliferous limestone, dolomite and shale) and Grant Lake Limestone (an interbedded fossiliferous limestone and shale) from the upper Ordovician period – these formations encompass approximately 2/3 of the watershed that lie in the Outer Bluegrass. Portions of the Laurel dolomite from the middle Silurian and New Albany Shale (an organic-rich black shale) from the Devonian period outcrop on the western side of the watershed that lie more in the Knobs physiographic region. These types of bedrock have shallow soils, carry moderate to severe limitations for septic system installation and have locally fast drainage through fractures and sinks to the water table, creating a greater potential for groundwater contamination. Those living in the western area of the watershed should consider the phenomenon of swelling shales, where this rock layer and/or soils derived from it may swell when exposed to water or oxygen (KGS 2006).

The major soil types in Cox Creek are various types of clayey residuum, mixed fine-silty alluvium and thin fine-silty loess. The major soil series present include the Beasley, Fairmount, Faywood and Lowell (USDA-NRCS, SSURGO database 2008).

Some areas of the watershed are prone or sensitive to karst features such as sinkholes, sinking streams and springs (see Figure 3.2). Official watershed boundaries may not be accurate in well-developed karst regions. Although groundwater drainage generally follows topographic basin boundaries, this is not always true in karst areas. Subsurface drainage transfer between surface watersheds in a karst region does occur, which increases or decreases the actual boundaries of an affected stream basin. This can also influence monitoring station selection when a spring draining a significant portion of the watershed is located in an adjacent basin. The KDOW and the KGS maintain a Karst Atlas of groundwater tracing data and delineated karst groundwater basins (both as static PDF maps and GIS files) that can be downloaded at <http://kygeonet.ky.gov>. These data should be consulted to determine if karst groundwater flow deviation is present. This work is ongoing and data is updated as information becomes available (Blair 2008).

Karst terrane can create geological hazards such as sudden surface collapse (due to sinkholes), flooding (if a karst pathway becomes clogged with debris or overloaded due to improper surface flow routing), and soil erosion. Karst aquifers are especially sensitive to contamination. Areas underlain by karst hydrology can have rapid groundwater flow rates, with complex routes. Storm water and associated pollutants can enter stream sinks and sinkholes with little or no

filtration or attenuation of the contaminants. Groundwater velocities within conduits are commonly measured in thousands of feet per day instead of the typical rate of inches or feet per year in non-karst systems – the maximum recorded conduit groundwater velocity in Kentucky exceeds 2600 feet per hour (Blair 2008).

Karst pathways serve as underground tributaries to surface water, and thus may become a transport pathway for pollutants to streams. Due to the dendritic pattern of karst drainage, nonpoint source pollutants from a large area can coalesce and be focused at a single spring. Conversely, some karst systems may have a radial drainage pattern from a topographic high and disperse point source pollution over a broad area. Improper waste management activities (e.g. dumping into sinkholes, poorly installed or failing OSTDs) or improper best management practices (e.g. lack of buffer strips around sinkholes and sinking streams in agricultural fields) can lead to direct contamination of water supplies. Karst also provides a challenge for nonpoint source pollution management as its pathways have long been regarded as “nature’s sewer system” – sinkhole plains, sinking streams, and springs provide a direct connection between surface water and groundwater systems

3.2 Hydrology

Cox Creek originates in northeastern Bardstown and flows in a northwesterly direction for 23.9 miles. The fifth order stream drains an area of 101.95 square miles, or 65,128 acres before entering the Salt River near River Mile (RM) 34.7; the Salt River by and large flows west/northwest before discharging into the Ohio River in West Point, Kentucky. Cox Creek drops about 400 feet in elevation from its origin to the mouth.

3.3 Land Cover Distribution

The watershed area of Cox Creek is approximately 65,128 acres. Land cover is largely agricultural pasture land (46.44%) followed by forest (37.17%). In 2001, only 3.73% of the total land area was developed and mostly located along rural roads and small towns (including Bardstown, Coss Creek, Lotus and High Grove). The 2001 National Land Cover Dataset (NLCD) overlain with individual USGS Stream Reach Drainage Polygons within a GIS framework was used to determine land cover areas in the watersheds. Table 3.1 summarizes the land cover by percentage and acres within the watershed and Figure 3.3 provides a visual demonstration. Individual land cover maps from each sample site to the headwaters are included in Section 8. Further discussion of land cover classifications is found in Appendix A.

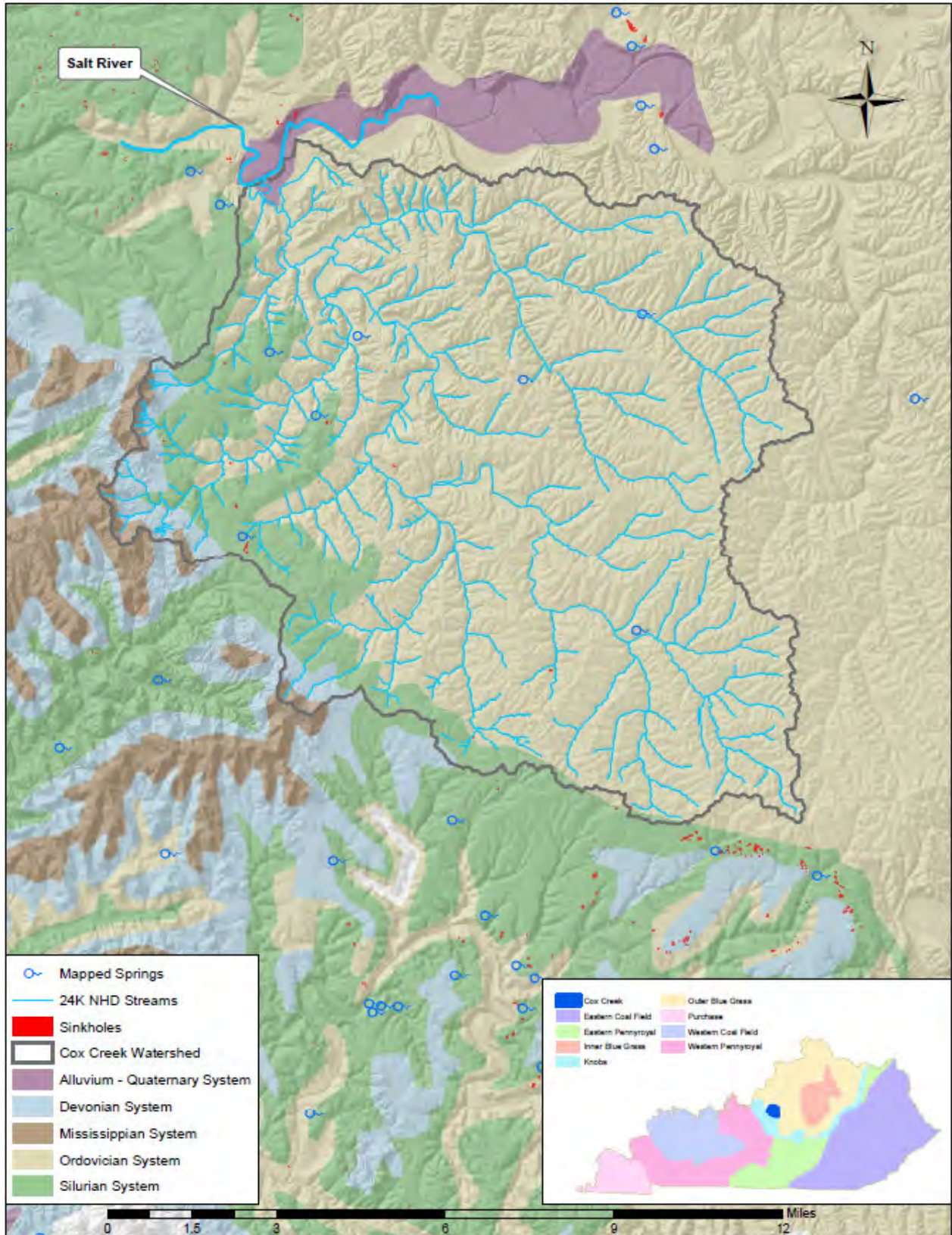


Figure 3.1 Simplified Geologic Map of the Cox Creek Watershed

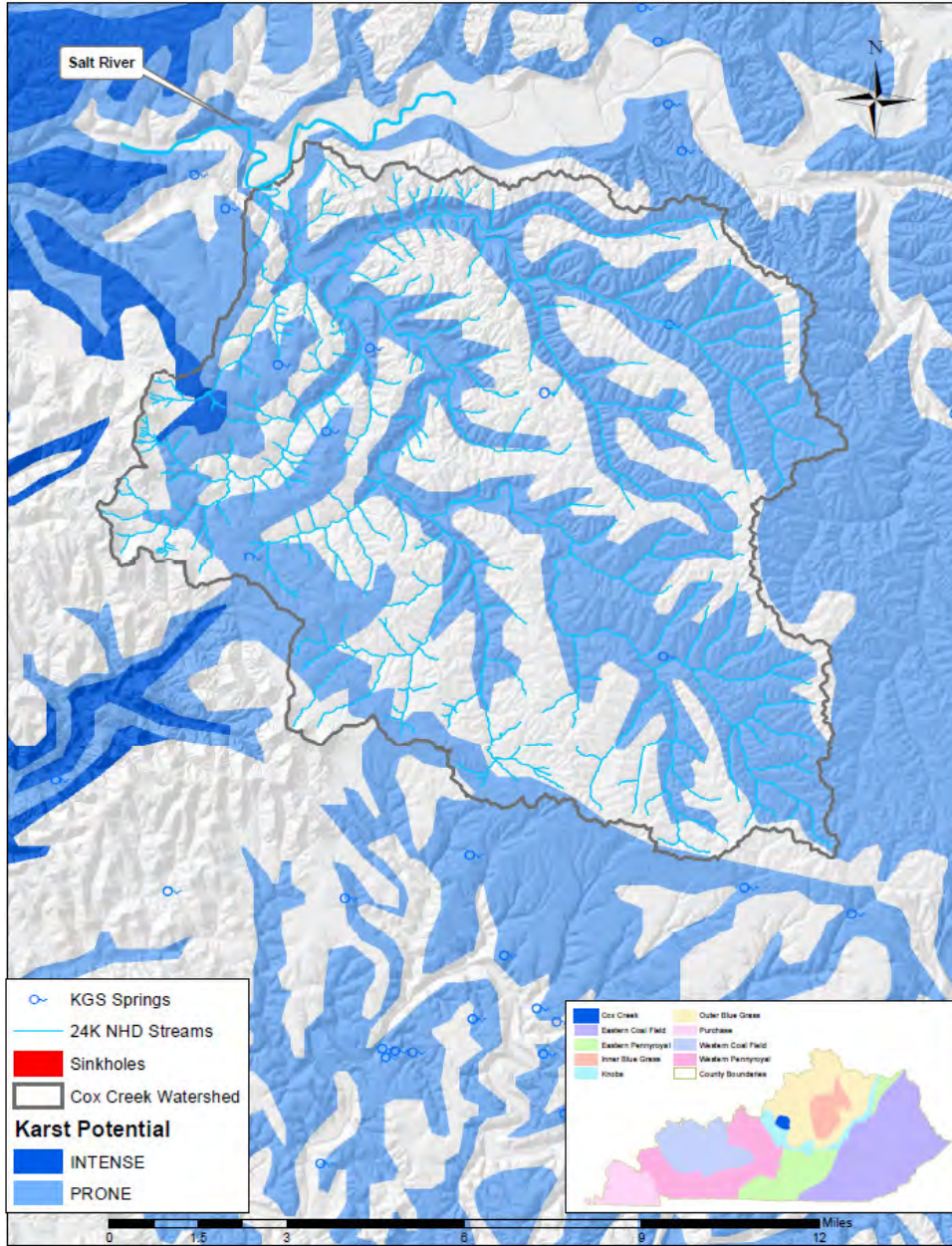


Figure 3.2 Karst Potential within the Cox Creek Watershed.

Table 3.1 Summary of Land Cover within the Cox Creek Watershed

| Land Use | % of Total Area | Acres |
|---------------------|-----------------|-----------|
| Forest | 37.17% | 24,206.90 |
| Agriculture (total) | 55.65% | 36,241.46 |
| Pasture | 46.44% | 30,244.06 |
| Row Crop | 9.21% | 5,997.40 |
| Developed | 3.73% | 2,431.47 |
| Natural Grassland | 2.35% | 1,528.87 |
| Wetland | 0.48% | 312.60 |
| Barren | 0.10% | 65.42 |

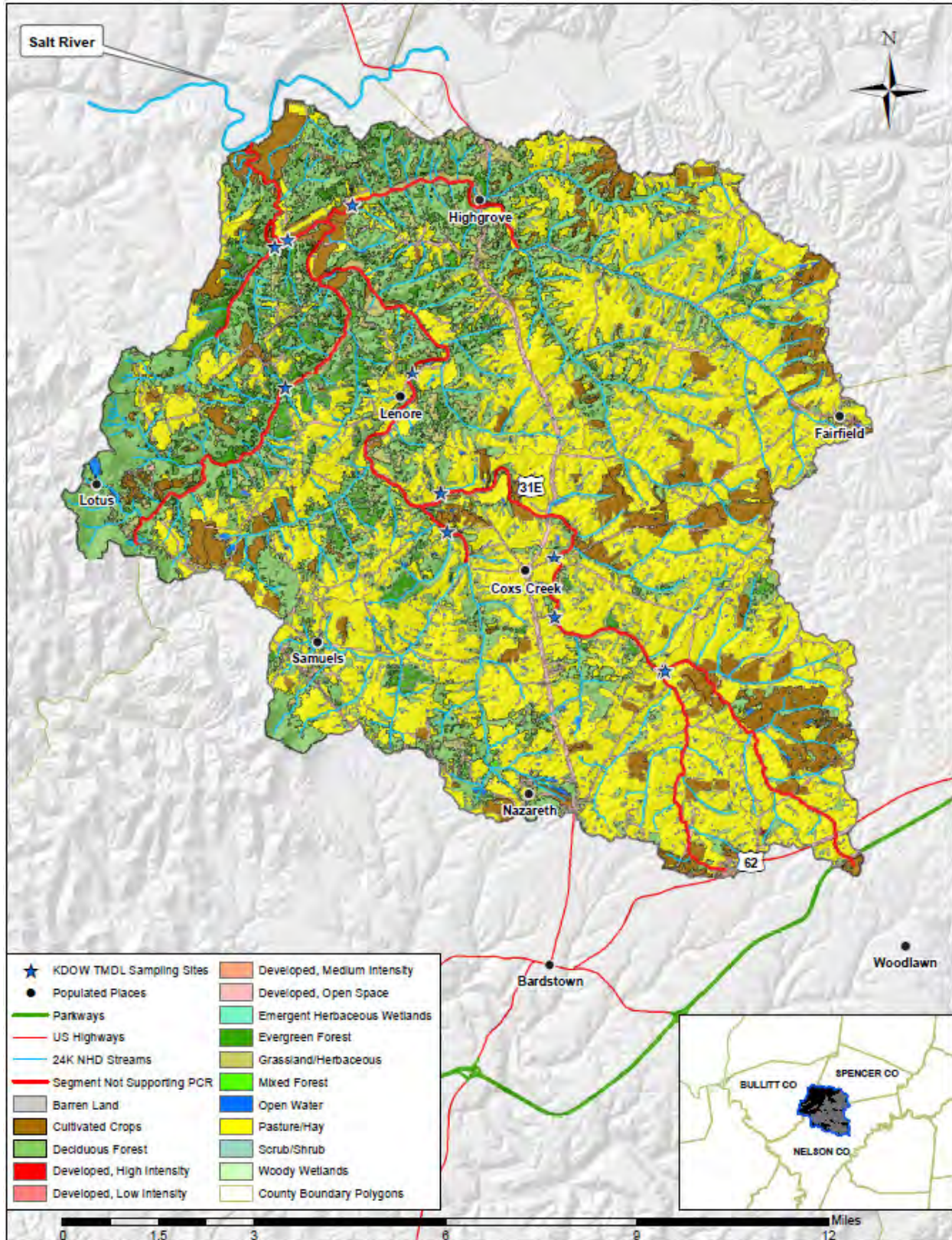


Figure 3.3 Land Cover within the Cox Creek Watershed (MRLC NLCD 2001)

4.0 Monitoring

KDOW first assessed a headwater segment of Cox Creek in the 2002 Kentucky Report to Congress on Water Quality, as partially supporting the aquatic life designated use; a segment at the mouth of the watershed was assessed in the 2004 Kentucky Report to Congress on Water Quality, as partially supporting the swimming designated use. Cox Creek was placed on the 303(d) List of Impaired Waters, after it was determined to be impaired by pathogens and excessive nutrient loading (KDOW 2002 & 2004).

4.1 KDOW TMDL Monitoring

The TMDL Section of the KDOW monitored eleven sites within the Cox Creek watershed from November 2008 – October 2009. *E. coli* and water quality parameters were collected at all sites in the watershed (Table 4.1, Figure 4.1). Nutrients TMDL nutrient parameters were collected at five of the eleven sites approximately once a month, while *E. coli* samples were collected during twelve sampling events spanning the Primary Contact Recreation (PCR) season months of May through October. Biological sampling was conducted at three sites (CFD12005502, DOW12005009 and DOW12005010). During these sampling events macroinvertebrates, algae and water chemistry were collected, and a habitat assessment and discharge measurements were completed; all sites resulted in a ranking of poor using the macroinvertebrate biotic index. Data related to riparian zone and available cover was also collected at seven of the eleven sites. Figure 4.1 shows the assessed stream segments and sampling sites where data were collected for the TMDL. Table 4.2 presents a statistical summary of the *E. coli* data.

4.1.1 KDOW TMDL Watershed Health Reports

The KDOW TMDL Section has developed a public communication tool, called a Health Report, to share the results of their year long monitoring studies with public and local government officials. The Health Report reports on the water quality and biological health of the watershed and highlights what is doing well and what needs improvement. It also highlights what can be done to help improve water quality and encourages public awareness and participation. The Cox Creek Health Report Card is presented in Table 4.3; the full Health Report can be found in Appendix B or at the following website, <http://water.ky.gov/waterquality/Pages/SaltRiverHealthReports.aspx>.









Table 4.1 KDOW TMDL Sample Locations and Parameters Collected Within the Cox Creek Watershed (11/2008 thru 10/2009)

| Station Name and ID | Latitude | Longitude | River Mile | Stream Segment | Parameters Collected |
|--|-----------------|------------------|-------------------|-----------------------------------|--|
| Cox Creek Off Cedar Grove Rd. DOW12005002 | 37.97411 | -85.54158 | 2.6 | Cox Creek 0.0 to 4.7 | E. coli; discharge; multiparameter meter |
| Rocky Run At Cedar Grove Rd. bridge DOW12005003 | 37.97262 | -85.54530 | 0.5 | Rocky Run 0.0 to 2.3 | E. coli; discharge; multiparameter meter |
| East Fork Cox Creek At Grigsby Lane bridge CFD12005501 | 37.98198 | -85.52298 | 0.6 | East Fork Cox Creek 0.0 to 4.3 | E. coli; discharge; multiparameter meter |
| West Fork Cox Creek At Lutz Lane bridge DOW12005004 | 37.94043 | -85.54237 | 4.4 | West Fork Cox Creek 0.0 to 6.9 | E. coli; discharge; multiparameter meter |
| Cox Creek At SR523 (Deatsville Rd.) bridge DOW12005005 | 37.94391 | -85.50580 | 8.3 | Cox Creek 4.7 to 11.4 | E. coli; discharge; multiparameter meter |
| Cox Creek At Lenore Rd. bridge (SR2739) CFD12005502 | 37.91674 | -85.49780 | 11.8 | Cox Creek 11.4 to 18.6 | NO2/NO3; NH3-N; TKN; Total P; Ortho-P; TOC; BOD5; E. coli; discharge; multiparameter meter |
| Froman Creek At Mobley Mill Rd. bridge DOW12005006 | 37.90798 | -85.49598 | 0.55 | Froman Creek 0.0 to 1.25 | E. coli; discharge; multiparameter meter |
| Cox Creek Above SR509 bridge; below package plant outfall DOW12005007 | 37.90202 | -85.46521 | 15.4 | Cox Creek 11.4 to 18.6 | NO2/NO3; NH3-N; TKN; Total P; Ortho-P; TOC; BOD5; E. coli; discharge; multiparameter meter |
| Cox Creek Off Wheeler-Wright Ln.; above school DOW12005008 | 37.88845 | -85.46516 | 16.55 | Cox Creek 11.4 to 18.6 | NO2/NO3; NH3-N; TKN; Total P; Ortho-P; TOC; BOD5; E. coli; discharge; multiparameter meter |
| Caney Fork Off Murray Run Rd. DOW12005009 | 37.87607 | -85.43433 | 0.05 | Caney Fork 0.0 to 4.0 | NO2/NO3; NH3-N; TKN; Total P; Ortho-P; TOC; BOD5; E. coli; discharge; multiparameter meter |
| Cox Creek Off Murray Run Rd. DOW12005010 | 37.87615 | -85.43354 | 18.75 | Cox Creek 18.6 to 23.9 | NO2/NO3; NH3-N; TKN; Total P; Ortho-P; TOC; BOD5; E. coli; discharge; multiparameter meter |

Table 4.2 Statistical Summary of *E. coli* Data Collected in the Cox Creek Watershed during the 2011 PCR Season

| Station Name | Number of Observations | % Exceeding Instantaneous WQC (240 colonies/100ml) | Minimum (colonies/100mL) | Maximum (colonies/100mL) | Average (colonies/100mL) |
|--------------|------------------------|--|--------------------------|--------------------------|--------------------------|
| DOW12005002 | 11 | 81.8 | 147 | 24190 | >3360.6 |
| DOW12005003 | 10 | 90.0 | 79 | >2419 | 785.4 |
| CFD12005501 | 12 | 83.3 | 166 | >2419 | >1406.5 |
| DOW12005004 | 10 | 80.0 | 106 | >2419 | >892.5 |
| DOW12005005 | 11 | 90.9 | 25 | >2419 | >931.1 |
| CFD12005502 | 10 | 70.0 | 12 | >2419 | >1179.3 |
| DOW12005006 | 10 | 70.0 | 20 | >2419 | >721.5 |
| DOW12005007 | 10 | 80.0 | 117 | >2419 | >1471.8 |
| DOW12005008 | 9 | 77.8 | 147 | >2419 | >2056.9 |
| DOW12005009 | 10 | 90.0 | 236 | >24190 | >3566.4 |
| DOW12005010 | 10 | 100.0 | 285 | >24190 | >4899.1 |

Table 4.3 Cox Creek Watershed Health Report from the 2009 TMDL Watershed Study

| Site ID | Stream |  |  |  |  |  |  |  |  | Site |
|-------------|---------------------|---|---|---|---|--|---|---|---|-----------|
| DOW12005002 | Cox Creek | B+ | B+ | | F | | | D | F | D |
| DOW12005003 | Rocky Run | A | C | | F | | | | | C |
| CFD12005501 | East Fork Cox Creek | B | B+ | | F | | | B | D | C |
| DOW12005004 | West Fork Cox Creek | A | C | | F | | | D | C | C- |
| DOW12005005 | Cox Creek | D | B | | F | | | D | D | D |
| CFD12005502 | Cox Creek | C | B | C- | D | F | F | D | D | D |
| DOW12005006 | Froman Creek | F+ | B | | D | | | | | C- |
| DOW12005007 | Cox Creek | C | B | C- | F | | | | | C- |
| DOW12005008 | Cox Creek | B | B | C- | D | | | | | C |
| DOW12005009 | Caney Fork | C | B | C | F | D | F | C | F | D+ |
| DOW12005010 | Cox Creek | D+ | B | C- | F | F | D | D | D | D |

Notes:

Signs of water quality and biological health from left to right are: Dissolved Oxygen, Specific Conductivity, Nitrogen & Phosphorous, *E. coli*, Aquatic Macroinvertebrates, Total Habitat, Riparian Zone and Available Cover. See Appendix B for the complete Cox Creek Watershed Health Report.

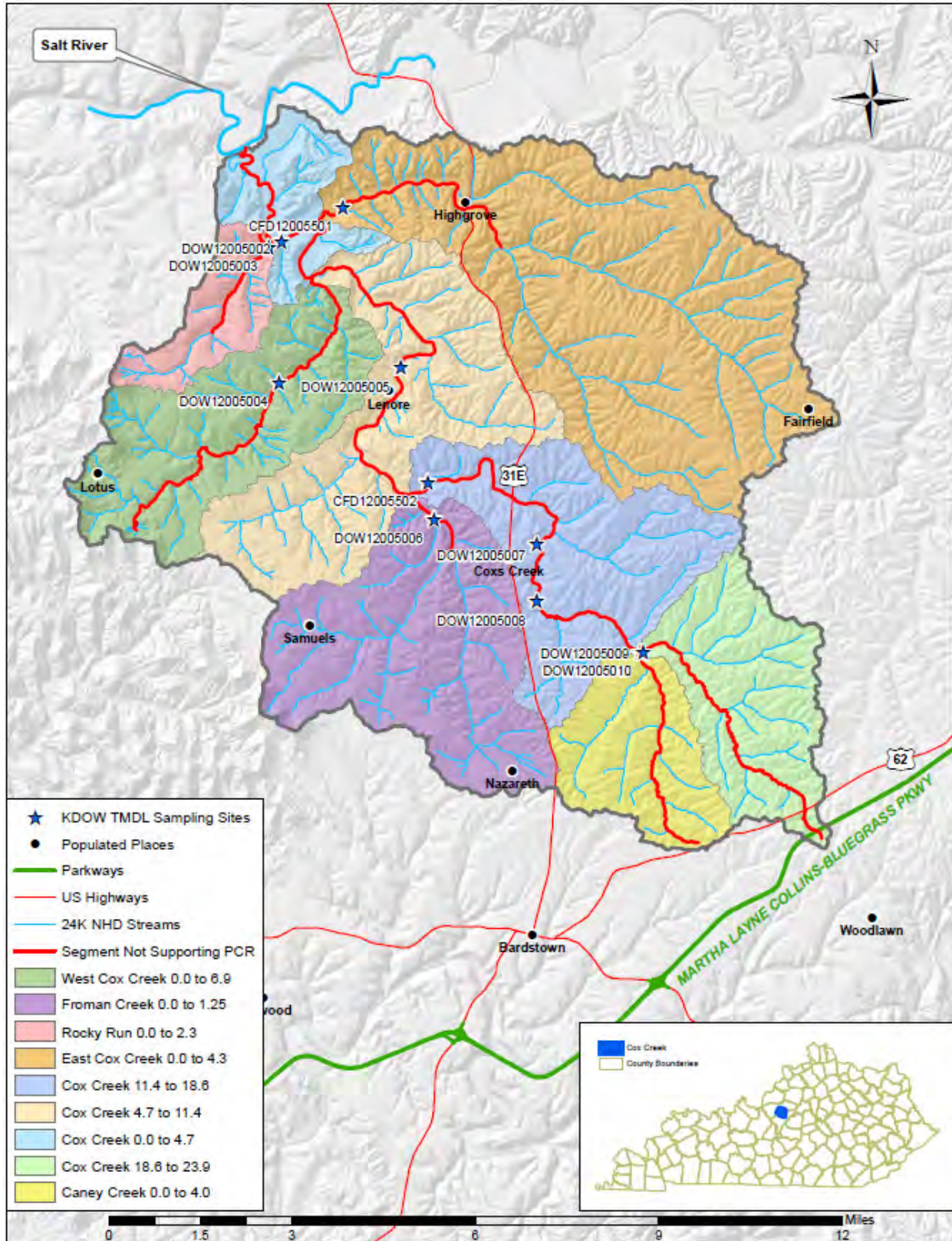


Figure 4.1 Locations of KDW Sample Sites and Assessed Stream Segments within the Cox Creek Watershed

5.0 Source Identification

For regulatory purposes, the sources of fecal coliform and *E. coli* in a watershed can be placed into two categories: KPDES-permitted and non KPDES-permitted sources. A KPDES-permitted source requires a Kentucky Pollutant Discharge Elimination System (KPDES) discharge permit, a storm water permit, or a Municipal Separate Storm Sewer System (MS4) permit from the KDOW. KPDES discharge permits include wastewater treatment facilities that discharge directly to a stream, facilities discharging storm water, and some agricultural operations (e.g. Concentrated Animal Feeding Operations (CAFOs) with an individual discharge permit). KPDES is not the only permitting program that may affect water quality or quantity within a watershed; other permitting examples include water withdrawal permits, permits to build structures within a floodplain, permits to construct an on-site sewage treatment disposal system (OSTDS), and permits to land apply waste from sewage treatment plants. However, within the framework of the TMDL process a KPDES-permitted source is defined as one regulated under the KPDES program.

Non KPDES-permitted sources include nonpoint sources of pollution. Nonpoint sources of pollution are often caused by runoff from precipitation over and/or through the ground and are correlated to land use.

5.1 KPDES-permitted Sources

KPDES- permitted sources include all sources regulated by the KPDES permitting program. KPDES permit and point source are defined in 401 KAR 10:001. A Wasteload Allocation (WLA) is assigned to KPDES-permitted sources.

5.1.1 Sanitary Wastewater Systems

Sanitary Wastewater Systems (SWSs) include all facilities with a design flow which are permitted to discharge fecal coliform or *E. coli*. This includes Wastewater Treatment Plants (WWTPs), Sewage Treatment Plants (STPs), package plants and home units. Information obtained from the Water Resource Information System (WRIS, <http://kia.ky.gov/wris/>), KDOW Surface Water Permits Branch, and Water Infrastructure Branch was used to confirm information associated with wastewater facilities in the watershed as well as acquire background information and any future planned expansions. In addition, in October 1999 and March 2000 the Lincoln Trail Area Development District (LTADD) wrote a “Summary of Wastewater Treatment Systems” as part of the “Strategic Water Resource Development Plan” (SWRDP) compiled and released by the Water Resource Development Commission of the Governor’s Office. Information from this report is for informative purposes only. There is currently one KPDES wastewater facility discharging to a bacteria-impaired segment in the watershed. Figure 5.1 shows the location of all KPDES-permitted sources within the Cox Creek watershed and Table 5.1 provides a summary of permit information. Appendix C contains DMR information from the last five years for Cox’s Creek Elementary School.

Cox’s Creek Elementary School (KY0096075) operates a small sewage treatment system for their students and employees at 5635 Louisville Road in Bardstown, KY. The package treatment plant has a design capacity of 0.01 MGD and discharges directly to Cox’s Creek. According to

DMR data submitted to KDOW in the last five years, the facility has exceeded their permit limits for ammonia nitrogen and total phosphorous a few times but has never exceeded their bacteria limits. The facility also has failed to submit many of their DMRs in a timely manner. See Section 5.1.1.2 for proposed sewer expansions to this facility.

Table 5.1 Summary of KPDES-permitted Source Information

| KPDES Permit Number | Facility | Flow (cfs)⁽¹⁾ | Permit Limit Monthly Average (<i>E. coli</i> colonies/100 ml) | Permit Limit Maximum Weekly Average (<i>E. coli</i> colonies/100 ml) | Outfall Latitude And Longitude | WLA (colonies/day) | TEMPO AI⁽²⁾ |
|----------------------------|-------------------------------|---------------------------------|--|---|---------------------------------------|---------------------------|-------------------------------|
| KY0096075 | Cox's Creek Elementary School | 0.015472 | 130 | 240 | 37.89694 -85.46861 | 9.08E+07 | 3250 |

Notes:

- (1). Flow value is based on design flow.
- (2). The TEMPO AI is an internal KDOW tracking number.

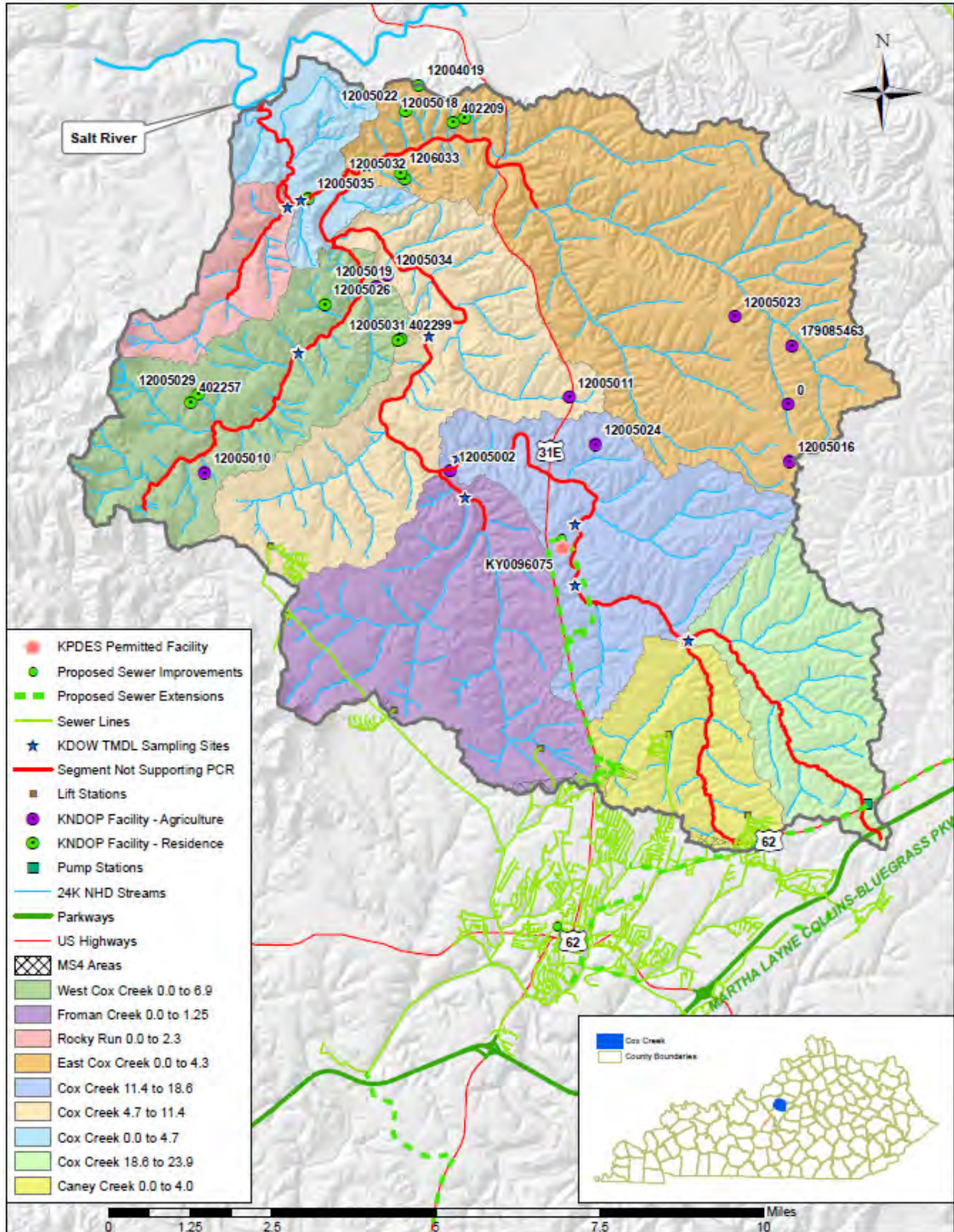


Figure 5.1 Location of KPDES-Permitted Sources, KNDOPs and Wastewater Infrastructure within the Cox Creek Watershed

5.1.1.1 Wastewater Infrastructure

There are two permitted wastewater systems that have sanitary sewer collection infrastructure within the Cox Creek watershed but do not discharge to any of its waters. The city of Bardstown operates a sanitary sewer collection system and six lift stations within upper Cox, Froman and Caney Creeks. This wastewater is treated at the Bardstown Wastewater Treatment Plant. The city of Bloomfield, located less than five miles to the east, operates one pump station in the headwaters of Cox Creek. Wastewater from this station is treated at the Bloomfield Sewage Treatment Plant. System, lift station and/or pump station malfunction as well as system overflow during periods of power outages or high precipitation are potential sources of bacteria in the watershed.

5.1.1.2 Wastewater Upgrades and Expansions

The WRIS has been developed through the cooperative efforts of water and wastewater treatment systems and local, regional, and state agencies. It is used by all of these entities, and provides much of the information needed for all aspects of water resource planning--from watershed protection to infrastructure development. This system was used to obtain more detailed information on wastewater systems and any planned upgrades or expansions. Full project profile and system reports can be found in Appendix D.

Sewer lines cover a very small portion of the Cox Creek watershed (Figure 5.1) however there are a few planned upgrades and expansions in the same area of the current infrastructure. The two systems mentioned above have several projects on the Clean Water State Revolving Fund List. These projects include sewer line extensions and pump station upgrade and construction. One of these projects involves extending the Bardstown sanitary sewer collection system to Cox Creek Elementary school and eliminating its 'inadequate package treatment plant'. These projects, once fully funded, could help reduce the potential sources of bacteria in the watershed.

As discussed in the "*Strategic Water Resource Development Plan*", portions of Cox Creek, especially to the north, are located in rural areas outside of the sewer service areas of Bardstown, Bloomfield, Mount Washington and Taylorsville. Though there are planned expansions and upgrades to the south, there are no plans to extend sewer service to the northern half of the watershed. Areas not included in these projects may be deemed impractical to extend sewer service due to the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households, a low customer per mile ratio, rugged terrain and the long distance from these houses to treatment facilities and existing sewer systems (KIA 2000).

5.1.2 MS4 Sources

In developed areas, polluted stormwater runoff is often diverted and concentrated into MS4s, where it ultimately discharges to surface waters with little or no treatment.

MS4s are defined in 401 KAR 5:002. EPA has categorized MS4s into three categories: small, medium, and large. The medium and large categories are regulated under the Phase I Storm

Water program. Large systems, such as the cities of Lexington and Louisville, have populations in excess of 250,000. Medium systems have populations in excess of 100,000 but less than 250,000; however, there are currently no medium-sized systems in Kentucky. Phase I systems have five-year permitting cycles and have annual reporting requirements. The small MS4 category includes all MS4s not covered under Phase I. Since this category covers a large number of systems, only a select group are regulated under the Phase II rule, either being automatically included based on population (i.e., having a total population over 10,000 or a population per square mile in excess of 1000) or on a case-by-case basis due to the potential to cause adverse impact on surface water. Water quality monitoring is not a requirement of Phase II MS4s, unless the waterbody has an approved TMDL and the MS4 causes or contributes to the impairment for which the TMDL was written (KDOW 2009). A WLA is assigned to all MS4 permits, including the KYTC, universities and military bases.

A small area of the city of Bardstown's MS4 community (KYG200037) clips the southwest portion of the watershed accounting for less than 0.05% of the total watershed area. The Kentucky Transportation Cabinet also has a MS4 permit (KYS000003) and is responsible for stormwater from the pavement and right of way of interstates, parkways, U.S. highways, and state routes within these MS4 boundaries. MS4 permit requirements include development of "a stormwater quality management program that is designed to reduce the discharge of pollutants to the maximum extent practicable (MEP). The MEP standard involves applying best management practices that are effective in reducing the discharge of pollutants in stormwater runoff. This requires that the permittee use known, available, and reasonable methods of prevention and control of stormwater discharges." The MS4 community boundaries are illustrated in Figure 5.1.

5.1.3 Combined Animal Feeding Operations

Operations that are defined as a CAFO pursuant to 401 KAR 5:002 are required to obtain a KPDES permit. Once defined as a CAFO, the operation can be permitted under a KPDES General Permit or a KPDES Individual Permit depending upon the nature of the operation. Conditions of both types of permits include no discharge to surface waters; however, holders of a KPDES Individual Permit may discharge to surface waters during a 25-year (24-hour) or greater storm event.

There is one CAFO in the Cox Creek Watershed, the IPKY Hog Farm (#12005002) located toward the bottom of the Cox Creek 11.4 to 18.6 impaired segment.

5.2 Non KPDES-permitted Sources

Non KPDES-permitted sources include all sources not permitted by the KPDES permitting program and are often associated with land use. The loads to surface water from non-KPDES permitted sources are regulated by laws such as the Kentucky Agricultural Water Quality Act (AWQA, KRS 224.71-100 through 224.71-145, i.e., implementation of individual agriculture water quality plans and corrective measures), the federal Clean Water Act (i.e., the TMDL process) and 401 KAR 5:037 (Groundwater Protection Plans (GPPs)), among others. A Load Allocation (LA) is assigned to non KPDES-permitted sources.

Unlike KPDES-permitted sources, non KPDES-permitted sources typically discharge pollutants to surface water in response to rain events (MS4s are a notable exception, as they are a KPDES-permitted source that discharges to surface water in response to rain events through a system of storm drains, curbs, gutters, etc.). Non KPDES-permitted sources for bacteria exist in the watershed and fall into various categories including agriculture, properly functioning OSTDS, failing OSTDS, household pets and natural background, which in the case of bacteria in a rural watershed means wildlife. Straight-pipes are a type of illegal, non KPDES-permitted source that may exist in the watershed, but none are known to exist with certainty.

As mentioned in Section 3, this watershed is located in a karst region. The KGS has developed Generalized Geologic Maps for Land-Use Planning (<http://www.uky.edu/KGS/>) for every county of the State to inform individuals of the general geologic bedrock condition that can affect a site and its intended uses. For example, this watershed is underlain with mostly limestone bedrock – according to the planning guidance, this type of rock carries severe limitations for septic tank disposal systems depending on the amount of soil cover and depth to bedrock. A severe limitation is defined as one that is “difficult to overcome and commonly is not feasible because of the expense involved.”

5.2.1 Kentucky No Discharge Operational Permits

As stated in 401 KAR 5:005, facilities with agricultural waste handling systems or that dispose of their effluent by spray irrigation but do not discharge to surface waters are required to obtain a Kentucky No Discharge Operational Permit (KNDOP) from the KDOW prior to construction and operation. Animal Feeding Operations (AFOs) receive KNDOP permits. These operations handle liquid waste in a storage component of the operation (e.g. lagoon, pit, or tank) and may land apply the waste via spray irrigation or injection to cropped acreages. Land application of the waste that results in runoff to a stream is prohibited. Facilities that handle animal waste as a liquid are required to submit a Short Form B, construction plans, and a Comprehensive Nutrient Management Plan to the KDOW. Also included in KNDOP requirements are golf courses that land apply treated wastewater via spray irrigation, typically from a holding pond - some industrial operations also spray-irrigate.

There are twelve individual residence KNDOPs in the watershed (see Figure 5.1), mostly located in East and West Cox Creeks. Per discussion with the Surface Water Permits Branch of the KDOW, these residences operate a home unit that are not designed to discharge and are connected to a spray irrigation system. They are regulated under KNDOP provisions not KPDES; their permit information is summarized in Table 5.2.

There are ten agricultural KNDOPs in the Cox Creek watershed, the location of these facilities is depicted on Figure 5.1 and their permit information is summarized in Table 5.2.

Table 5.2 KNDOP Permitted Facilities in the Cox Creek Watershed

| KNDOP Number | Facility | KNDOP Type | Latitude | Longitude | TEMPO AI |
|--------------|---------------------------|---------------------------|-----------|------------|----------|
| 12005029* | Home Unit | Individual Residence | 37.931111 | -85.570278 | 15958 |
| KYG402299 | Home Unit | Individual Residence | 37.943333 | -85.513611 | 11829 |
| KYG402257 | Home Unit | Individual Residence | 37.929444 | -85.5725 | 10072 |
| 12005022* | Home Unit | Individual Residence | 37.994167 | -85.512222 | 10078 |
| 12005018* | Home Unit | Individual Residence | 37.9925 | -85.495833 | 10080 |
| 12005026* | Home Unit | Individual Residence | 37.9511 | -85.5349 | 9486 |
| 12004019* | Home Unit | Individual Residence | 37.999694 | -85.508528 | 70996 |
| 12005032* | Home Unit | Individual Residence | 37.979167 | -85.5125 | 75062 |
| 12005035* | Home Unit | Individual Residence | 37.974722 | -85.539389 | 97045 |
| 12005031* | Home Unit | Individual Residence | 37.943056 | -85.514444 | 71055 |
| 1206033* | Home Unit | Individual Residence | 37.980278 | -85.513611 | 75137 |
| KYG402209 | Home Unit | Individual Residence | 37.991424 | -85.498934 | 10079 |
| 179085463 | Oliver Rogers Dairy Farm | Cattle Ranching & Farming | 37.941528 | -85.404389 | 85463 |
| 12005023 | Lutz Dairy Farm | Dairy Farming | 37.948056 | -85.420278 | 10703 |
| 12005010 | Ulrich Dairy Farm | Dairy Farming | 37.913611 | -85.568611 | 10740 |
| 12005016 | John McClaskey Dairy Farm | Dairy Farming | 37.915833 | -85.405278 | 10769 |
| In review | Robert Lutz Dairy Farm | Dairy Farming | 37.928489 | -85.405411 | 82013 |
| 12005024 | Wright Hog Farm | Hog & Pig Farming | 37.919722 | -85.459444 | 10714 |
| 12005011 | Chris Hurst Hog Farm | Hog & Pig Farming | 37.930278 | -85.466667 | 10735 |
| 12005002 | Ipky Hog Farm 1 & 2 | Hog & Pig Farming | 37.913889 | -85.5 | 10744 |
| 12005019 | Robinson Hog Farm | Hog & Pig Farming | 37.955 | -85.520554 | 10763 |
| 12005034 | Bob Robinson Hog Farm | Hog & Pig Farming | 37.9575 | -85.5175 | 44111 |

Notes:

* All KNDOPs classified as home units are being migrated to KYG4 permit numbers for tracking purposes. Some permits have already been migrated, as seen in the table above; others will follow in the coming year.

5.2.2 Agriculture

The Kentucky AWQA was passed by the 1994 General Assembly. The law focuses on the protection of surface water and groundwater resources from agricultural and silvicultural activities. The Act created the Kentucky Agriculture Water Quality Authority (KAWQA), a 15-member peer group comprising farmers and representatives from various agencies and organizations. The Act requires farms greater than 10 acres in size to adhere to the Best Management Practices (BMPs) specified in the Kentucky Agriculture Water Quality Plan. Specific BMPs have been designated for all operations. More information on the Kentucky AWQA and Water Quality Plans can be found at <http://conservation.ky.gov/Pages/AgricultureWaterQuality.aspx>.

The USDA National Agricultural Statistics Service (NASS) compiles Census of Agriculture data by County for virtually every facet of U.S. agriculture (USDA 2009). The “Census of Agriculture Act of 1997” (Title 7, United States Code, Section 2204g) directs the Secretary of Agriculture to conduct a census of agriculture on a 5-year cycle collecting data for the years ending in 2 and 7. Selected agricultural data from the latest Census of Agriculture reports for

Nelson, Spencer and Bullitt Counties are listed in Table 5.3. These data are based on countywide data with no assumptions made on a watershed level. The percentage of agricultural types of land cover is calculated for the entire watershed in Table 3.1 (Section 3.3) and for each sub-watershed in Section 8.

The Cox Creek watershed has a considerable agricultural resource with 55.65% of its land use devoted to agricultural operations, 46% of which is devoted to pasture land (Figure 3.3; MRLC NLCD 2001). The prevalent threat to streams from agriculture is bacteria loading from animal wastes. Livestock often lay in or near the streams in search of shade or drinking water. Livestock with access to streams can have a direct impact on water quality when feces are deposited on stream banks or directly in the stream. Animals grazing in pasture often deposit feces on the land - bacteria that do not decay will runoff into streams during wet weather events. Table 3.1 conveys that there are approximately 30,244 acres or 47 square miles of agricultural pastureland use within the 102 square miles of this watershed.

The Ohio State University Agricultural Extension Service released a guidance document for the management of livestock manure. The document contains manure characteristics, handling/storage and application procedures and also addresses some of the issues and considerations involved with manure management (James 2006). A similar (though as not detailed) document is available from the North Carolina State University College of Agriculture and Life Sciences (Shaffer 2005). These documents could be used to estimate pathogenic contributions from livestock if it could be determined how much manure actually made it to a stream since it is unrealistic that an animal would be directly contributing to a stream throughout the day. However if Standard Operating Procedures for wastewater collection systems and BMPs are utilized, pathogenic contributions to surface waters from livestock operations should not cause an exceedance of the WQC.

Crops may be a source of bacteria if manure is used as a fertilizer. However if BMPs are utilized (as discussed on the KAWQA webpage, <http://www.conservation.ky.gov/programs/kawqa/>) pathogenic contributions to surface waters should not cause an exceedance of the WQC.

Table 5.3 USDA Agricultural Statistics for Madison County (2007)

| Statistic | Bullitt County | Nelson County | Spencer County |
|--|----------------|----------------|----------------|
| Farms (number/acres) | 519/ 51,148 | 1,406/ 196,225 | 596/ 73,289 |
| Cattle and Calves Inventory (farms/ total number) | 241/ 6,124 | 817/ 46,329 | 303/ 13,097 |
| Beef Cows (farms/total number) | 218/ 3,693 | 684/ 18,185 | 282/ 6,985 |
| Milk Cows (farms/total number) | 5/ 237 | 40/ 2,820 | 7/ 401 |
| Hogs and Pigs (farms/ total number) | 13/ 445 | 38/ 27,869 | 14/ 248 |
| Horses and Ponies (total number) | 1,138 | 2,737 | 882 |
| Layers 20 weeks old or older (farms/total number) | 42/ 1,457 | 88/ 6,862 | 29/ 1,860 |
| Broilers & other meat-type chickens sold (farm/total number) | - | 3/ 2,400 | 2/ (D)* |
| Corn for grain (acres) | 38/ 2,075 | 120/ 15,522 | 31/ 2,060 |
| Tobacco (acres) | 54 | 1,080 | 597 |
| Wheat for grain (acres) | 7/ 703 | 27/ 3,635 | 9/ 706 |
| Soybeans for beans (acres) | 3,578 | 15,088 | 2,264 |

* Withheld by USDA to avoid disclosing data for individual farms.

5.2.3 Wildlife

Wildlife undoubtedly contributes to bacteria loading. The Kentucky Department of Fish and Wildlife Resources estimate deer densities per square mile for all counties of Kentucky (Yancy, Personal Communication, 2008). There are approximately 21 deer per square mile in Bullitt County (4,191 total), 24 deer per square mile in Nelson County (8,385 total) and 51 deer per square mile in Spencer County (7,771 total).

Estimates of deer populations are shown for the watershed in Table 5.4. The assumption was made that deer remain constant throughout the year and are present (and evenly distributed) on all land classified as agricultural, forested, grasslands, and wetlands – because this is a rural watershed developed land was also included. Estimates of numbers of other types of wildlife are not available for Kentucky.

As stated above, although wildlife contributes bacteria to surface water, such contributions represent natural background conditions and receive no reductions within a TMDL. Wildlife such as opossums, raccoons, rats, and birds that may reside within subdivisions may be a larger contributor to bacteria runoff as these areas tend to have less permeable surfaces.

Table 5.4 Estimated Deer Populations within Cox Creek

| County/ Stream | Watershed Area within County (sq mi) | Deer per Square Mile of Land | Estimated Deer Population in Watershed |
|------------------------------|--------------------------------------|------------------------------|--|
| Bullitt County/ Cox Creek | 16.26 | 21 | 341.46 |
| Nelson County/ Cox Creek | 74.92 | 24 | 1,798.08 |
| Spencer County/ Cox Creek | 10.58 | 51 | 539.58 |

5.2.4 Human Waste

Human waste disposal is of particular concern in rural areas. Areas not served by sewers either employ an Onsite Sewage Treatment and Disposal System (OSTDS) or do not treat their sewage. There are few sewer lines located in the Cox Creek watershed (Figure 5.1). The rural area not serviced by sewer must either have an OSTDS or may not be treating their sewage. The U.S. Census of 2010 estimated that there was an average of 250.2 persons per square mile in Bullitt County, 104 persons per square mile in Nelson County and 91.4 persons per square mile in Spencer County. OSTDS including septic tank systems are commonly used in areas where providing a centralized sewage collection and treatment system is not cost effective or practical. When properly sited, designed, constructed, maintained, and operated, septic systems are an effective means of disposing and treating domestic waste. The effluent from a well-functioning OSTDS is comparable to secondarily treated wastewater from a sewage treatment plant. When not functioning properly, they can be a source of nutrients (nitrogen and phosphorus), bacteria and other pollutants to both groundwater and surface water.

The USDA Natural Resources Conservation Service (NRCS) National Geospatial Management Center archived and distributed the Soil Survey Geographic (SSURGO) Database which contains

the most recent soil survey information in a geographic area. The SSURGO rates the performance of septic tank absorption fields, defined as the area in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Soil ratings are based on soil properties, site features, and the observed performance of the soils - permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of septic tank effluents. Soils in the study area include the Beasley, Fairmount, Faywood and Lowell series. USDA rates these soil series as very limited for installation of septic tank absorption fields due to slope and severely eroded soils (i.e. shallow soil profiles). Based on the soil ratings and prevailing bedrock formations it is likely many of the septic systems in the watershed are not functioning properly.

A type of non KPDES-permitted source that may exist in the watershed is straight-pipes, which are discrete conveyances that discharge sewage, gray water (i.e., water from household sinks, laundry, etc.) and stormwater to the surface waters of the Commonwealth without treatment. Although straight-pipes meet the definition of a point source as defined in 401 KAR 10:002, EPA considers them to be part of the LA as they are a non KPDES-permitted source.

5.2.5 Household Pets

Although household pets undoubtedly exist in Cox Creek, their contribution to the LA is deemed to be minimal compared to other sources in the rural portions of the watershed. Pet waste may, however, be a larger contributor to bacteria runoff within subdivisions where there is a tendency to have a higher density of households and less permeable surfaces.

According to the American Veterinary Medical Association, by the end of 2011, 36.5% of all households (nationally) owned an average 1.6 dogs and 30.4% owned an average 2.1 cats.

5.3 Illegal Sources

Both KPDES-permitted and non KPDES-permitted sources can discharge bacteria to surface water illegally. This includes sources that are illegal simply by their existence, such as straight-pipes and SSOs, which receive no allocation. There may also be legal sources that are operating illegally (e.g., outside of regulations, permit limits or conditions, etc.), such as a WWTP bypass or a failing OSTDSs, which receive no allocation above that of a properly functioning system (see Section 7.0 for TMDL allocations).

Another potential illegal source is livestock on farms that have no BMPs (as required under the AWQA) as well as farms where BMPs are present but are insufficient or failing in a manner that causes or contributes to surface water impairment; such farms receive no allocation above that of a farm with properly installed and functioning BMPs. Also included are KNDOPs, AFOs and CAFOs not in compliance with the appropriate regulations that cause or contribute to a surface water impairment.

KDOW expects implementation of these TMDLs to begin with the elimination of illegal sources. This is intended to prevent legally operating sources from having to effect reductions in order to

accommodate the pollutant loading of illegal sources. Note this Section of the TMDL is not intended to summarize the universe of potential illegal sources that may discharge pollutants into surface waters, nor does it attempt to summarize the universe of legal sources that may be operating illegally. Instead, it gives examples of illegal sources known to be present or that could be present in the watersheds (e.g., straight-pipes).

6.0 Water Quality Criterion

Title 401 KAR 10:031 describe the standards used to “protect the surface waters of the Commonwealth, and thus protect water resources.” *Escherichia coli* (*E. coli*) bacteria are pathogen indicator organisms. *E. coli* data are used to indicate the degree of support for primary contact recreation (PCR) use. The stream is assessed as fully supporting the PCR use if the *E. coli* content does not exceed the criterion of 240 colonies per 100 ml in less than 20 percent of samples; it was assessed as partially supporting the PCR use if the criterion was not met in 25-33 percent of samples, and as not supporting the PCR use if the criterion was not met in greater than 33 percent of samples. Streams assessed as either nonsupport or partial support are considered impaired. Stream segments were sampled twice a month in addition to a geometric mean in the spring and fall during the PCR season of May 1 through October 31, 2011.

The WQC in 401 KAR 10:031 (Kentucky’s Surface Water Standards) for the PCR use are based on both fecal coliform and *E. coli*. Per 401 KAR 10:031:

“The following criteria shall apply to waters designated as primary contact recreation use during the primary contact recreation season of May 1 through October 31: Fecal coliform content or Escherichia coli content shall not exceed 200 colonies per 100 ml or 130 colonies per 100 ml respectively as a geometric mean based on not less than five (5) samples taken during a thirty (30) day period. Content also shall not exceed 400 colonies per 100 ml in twenty (20) percent or more of all samples taken during a thirty (30) day period for fecal coliform or 240 colonies per 100 ml for Escherichia coli.”

Both the geomean and instantaneous criteria of 130 and 240 *E. coli* colonies/100 ml, respectively, were applied to calculate allowable loadings to bring the watershed into compliance with the PCR designated use. The loading requiring the greatest percent reduction was used to set the TMDL for a segment. See Section 7.0 for TMDL loading calculations.

Because Kentucky has a dual standard for the PCR designated use, development of TMDLs using the *E. Coli* criterion are sufficient to provide TMDLs for fecal coliform-listed segments and vice versa (i.e., development of *E. Coli* TMDLs will protect the PCR use regardless of whether a segment is impaired for *E. Coli*, fecal coliform, or both). Additionally, because the instantaneous limit is lower for PCR than for SCR (400 colonies/100 ml versus 2000 colonies/100 ml), development of TMDLs for the PCR season also protects segments impaired for the SCR use due to fecal coliform.

7.0 Total Maximum Daily Load

The USEPA defines a TMDL as “a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant’s sources. Water quality standards are set by States, Territories, and Tribes. They identify the uses for each waterbody, for example, drinking water supply, contact recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure that the waterbody can be used for the purposes the State has designated. The calculation must also account for seasonal variation in water quality. The Clean Water Act, section 303, establishes the water quality standards and TMDL programs (USEPA 2008c).”

7.1 TMDL Equation and Definitions

A TMDL calculation is performed as follows:

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

Where:

TMDL: the WQC or the maximum load the waterbody can naturally assimilate while still meeting the WQC of 240 colonies per 100 ml at a given flow, in units of colonies per day.

MOS: the Margin of Safety, which can be an implicit or explicit additional reduction applied to the WLA, LA or both types of sources that accounts for uncertainties in the data or TMDL calculations. The MOS for these TMDLs was set at 10% to generate an explicit MOS.

TMDL Target: the TMDL minus the MOS.

WLA: the Waste Load Allocation (allowable loadings from KPDES-permitted sources such as SWSs and MS4s).

SWS-WLA: the WLA for KPDES-permitted sources, which have discharge limits for bacteria (including wastewater treatment plants, package plants and home units).

Remainder: the TMDL Target minus the WLA

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

MS4-WLA: the WLA for KPDES-permitted municipal separate storm water sewer systems (including, but not limited to cities, counties, KYTC, universities and military bases).

LA: the Load Allocation, including natural background and non-KPDES permitted sources.

Seasonality: Yearly factors that affect the relationship between pollutant inputs and the ability of the stream to meet its designated uses.

Critical Condition: When the pollutant conditions are expected to be at their worst.

MAF: the Mean Annual Flow as defined by USGS.

Adjusted MAF: the MAF plus SWS-WLA design flows (where applicable).

Critical Flow: the flow used to calculate the TMDL as a load (equivalent to the Adjusted MAF)

Existing Conditions: the load that exists in the watershed at the time of TMDL development (i.e., sampling) and is causing the impairment, see Section 7.6.

Percent Reduction: the reduction needed to bring the existing conditions (i.e., the existing non-SWS sources) in line with the Remainder, see Section 7.7.

Load: Concentration * Flow * Conversion Factor in colonies per day

Concentration: colonies per 100 milliliters (col/100ml)

Flow (i.e. stream discharge): cubic feet per second (cfs)

Conversion Factor: the value which converts the product of Concentration and Flow to Load (in units of colonies per day); it is derived from the calculation of the following components: (28.31685L/cf * 86400sec/day * 1000ml/L)/ (100ml) and is equal to 24465758.4.

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. Once a critical flow is obtained (see Sections 7.5 and 7.8), it is then multiplied by the WQC minus the MOS (10%) times the appropriate conversion factors to obtain the TMDL Target load. Allowable loadings from KPDES-permitted sources are then subtracted from the Target load to produce the Remainder. Future growth calculations are then performed and subtracted from the Remainder, leaving the LA.

However, regardless of the procedure used to calculate the TMDL, reductions from existing conditions ultimately must be effected within the watershed only until all stream segments meet the PCR use, or until all sources (except wildlife) are discharging in compliance with the WQC. Once the WQC is met, all sources (apart from wildlife) must continue to discharge at a load that meets the WQC.

7.2 Margin of Safety

The MOS can be an implicit (using conservative assumptions) or explicit (a reserved portion) additional reduction applied to the WLA, LA or to both types of sources that accounts for uncertainties in the data or TMDL calculations. For these TMDLs, a 10% explicit MOS (i.e., 10% of the WQC or 24 colonies/100ml) was reserved to address uncertainties involving loading from non-SWS sources. SWS sources have an implicit MOS based on the fact that they seldom operate at their design flow. The explicit MOS load was calculated using the following equation:

$$\text{MOS (colonies/day)} = \frac{\text{Critical Flow (cfs)}}{\text{(cfs)}} \times \frac{24}{\text{(colonies/100ml)}} \times \text{Conversion Factor } 24465758.4$$

7.3 Waste Load Allocation

The WLA is the portion of the TMDL allocated to KPDES-permitted sources within the watershed. There is currently one KPDES-permitted source within Cox Creek.

7.3.1 SWS-WLA

The WLA for KPDES-permitted sources discharging to an impaired segment were calculated using their permitted effluent limits for *E. coli* (i.e. the WQC of 240 col/100 ml) and facility

design flow (or average daily flow for facilities with comingled waste streams) by means of the following equation:

$$\text{WLA (colonies/day)} = \frac{\text{Design Flow or Average Daily Flow (cfs)}}{240 \text{ (colonies/100ml)}} \times \text{Conversion Factor } 24465758.4$$

The individual SWS-WLAs for each facility that discharges to an impaired segment are summed to create a final SWS-WLA for that segment. There are a total of twelve SWS-WLAs in Cox Creek.

7.3.2 Remainder

The Remainder is not part of the TMDL however; it is used in the TMDL calculations. It is defined as the TMDL Target load minus the sum of all SWS-WLAs.

7.3.3 Future Growth WLA

A TMDL document will often account for future growth of current or new KPDES-permitted sources in order to avoid having to re-open the TMDL when new sources come online or current ones expand. Future growth is represented by a portion of the Remainder which is set aside (i.e. it is not part of the LA nor is it part of the WLA for current/known sources). It can also include existing storm water sources which are later discovered to discharge the pollutant of concern, even though this fact may not be known at the time the TMDL was written. The loading amount reserved for future growth is determined by using Table 7.1 which assumes that growth occurs more rapidly in a developed area (which is determined by the sum of developed open space, developed low intensity, developed medium intensity and developed high intensity areas as defined by the 2001 USGS NLCD) than in rural areas. The Future Growth WLA for each impaired segment is shown in Table 7.2 and calculated using the following formula:

$$\text{Future Growth-WLA} = \text{Remainder} \times \text{Future Growth-WLA percentage}$$

Table 7.1 Future Growth Matrix

| Percent Developed Area in the Subwatershed | Future Growth WLA Percentage |
|--|------------------------------|
| ≥25% | 5% |
| ≥20% – <25% | 4% |
| ≥15% – <20% | 3% |
| ≥10% – <15% | 2% |
| ≥5% – <10% | 1% |
| <5% | 0.5% |

Table 7.2 Future Growth Percentage by Impaired Segment

| Waterbody Segment and RMs | Percent Developed Area | Percent of Remainder Set Aside for Future Growth |
|--------------------------------|------------------------|--|
| Cox Creek 0.0 to 4.7 | 3.73% | 0.5% |
| Cox Creek 4.7 to 11.4 | 4.22% | 0.5% |
| Cox Creek 11.4 to 18.6 | 4.56% | 0.5% |
| Cox Creek 18.6 to 23.9 | 3.98% | 0.5% |
| Caney Fork 0.0 to 4.0 | 5.1% | 1% |
| Froman Creek 0.0 to 1.25 | 4.3% | 0.5% |
| East Fork Cox Creek 0.0 to 4.3 | 3.75% | 0.5% |
| West Fork Cox Creek 0.0 to 6.9 | 2.68% | 0.5% |
| Rocky Run 0.0 to 2.3 | 1.84% | 0.5% |

7.3.4 MS4-WLA

If there is a MS4 within the upstream area of the impaired segment, a MS4-WLA must be calculated. A larger MS4 will not be responsible for other MS4s present within its boundaries (e.g. a City-MS4 is not responsible for a University or KYTC-MS4 within its permitted boundary). The MS4-WLA is calculated using the following equation:

$$\text{Remainder} \times \frac{\% \text{ of (developed acres in MS4 boundary)}}{\text{(total acres in subwatershed)}} = \text{MS4-WLA}$$

7.4 Load Allocation

The LA is the portion of the TMDL where non KPDES-permitted sources (e.g., nonpoint sources, or those not permitted by KPDES) receive their allocation within the TMDL. Within Cox Creek, these sources can include properly functioning OSTDS (i.e. septic systems), wildlife, household pets and facilities with properly functioning BMPs (e.g. agricultural farms or landfarms for municipal SWS sludge). LAs were calculated using the following equation:

$$\text{LA} = \text{Remainder} - \frac{\text{Future Growth}}{\text{WLA}} - \text{MS4-WLA}$$

The available sampling data were insufficient to apportion the existing loading among the various LA sources; therefore, it is attributed to all LA sources. LAs for each impaired segment are presented and discussed in Section 8. As discussed in Section 5.3, implementation of these bacteria TMDLs is expected to begin with the elimination of illegal sources such as failing OSTDS and straight-pipes if present in the watershed. In addition, facilities not in compliance with KNDOP regulations or BMP requirements under the AWQA are also illegal and are expected to come into compliance.

7.5 Seasonality

Seasonality is defined as yearly factors such as temporal variations on source behavior and stream loading than can affect the relationship between pollutant inputs and the ability of the stream to meet its designated uses. This TMDL addresses seasonality by only using samples collected within the PCR season (May - October).

7.6 Critical Condition

The critical condition for nonpoint source bacteria loading typically occurs after a runoff event, preceded by an extended dry period - bacteria accumulate on the land surface (during the dry period) and are subsequently washed off by the rainfall. The critical condition for point source loading typically occurs during periods of low streamflow when dilution (of effluent) is minimized. The Cox Creek watershed contains both types of sources; therefore the critical condition for each bacteria-impaired segment is defined by the sample showing the highest exceedance.

7.7 TMDLs Calculated as a Daily Load

Federal guidelines of the Clean Water Act require a TMDL to be expressed in terms of a daily load. Due to the limited amount of data available, particularly the absence of stream gages or in-stream flow data, a method was developed utilizing the WQC and Mean Annual Streamflow (MAF). The USGS has generated a MAF value for streams across Kentucky. The MAF values were calculated using the equation found in the USGS Water-Resources Investigations Report 02-4206 "Estimating Mean Annual Streamflow of Rural Streams in Kentucky" (http://ky.water.usgs.gov/pubs/wrir_2002_4206.pdf). The MAF values can be found on the Kentucky Watershed Viewer webpage (<http://gis.gapsky.org/watershed/>) or downloaded from the Kentucky Geography Network (<http://kygeonet.ky.gov/>). Once obtained, major inputs (i.e., WWTP design capacity) were added to the MAF to generate a critical flow. The critical flow is then multiplied by the WQC minus the MOS (10%) times the appropriate conversion factors to obtain the TMDL Target (i.e., the allowable daily load).

8.0 TMDL Calculations

Bacteria TMDLs have been developed using a range of techniques from sophisticated watershed-based computer modeling to qualitative assumptions and simple mass balance. An approach focusing on the WQC and MAF was utilized for development of these bacteria TMDLs. The best available data from various sources was analyzed and spatial analysis was performed within a GIS framework to obtain MAF values, assess KPDES-permitted and non KPDES-permitted sources, and appropriately assign TMDL loads. Development of these TMDLs follows the procedures outlined in Kentucky's *Quality Assurance Project Plan (QAPP) for Data Analysis for TMDL Development* and maintains the guidelines set in the *Pathogen TMDL Standard Operating Procedures* for evaluating the TMDL approach (KDOW 2011).

8.1 Data Validation

Data validation was performed as follows:

- Only samples collected from a flowing stream were considered in analysis.
- Quality Analysis/Quality Control Samples (e.g. duplicates and blanks) were excluded from the dataset.
- The data tables show both *E. coli* concentrations and flows; in some cases the flows were measured in-stream at the time the sample was collected. On other occasions no flow data were collected; this may have been due to a high water event that precluded samplers from entering the stream due to safety reasons, or other considerations.
- Some samples were reported using either the *less than* (denoted using the “<”) symbol or the *greater than* (denoted using the “>”) symbol, indicating the true concentration was unknown but it was either below or above the reported value, respectively. For samples *less than* the reported value, the reported value was used verbatim. For *greater than* values, the values were used verbatim because all showed exceedances of the WQC. While in such cases the exact value of the exceedance is unknown and likely higher than the number reported, the sample still gave insight into the status of the waterbody at the time the sample was taken.

8.2 Individual Stream Segment Analysis

Data collection and analysis from various sources (including Federal, State and local government, and public entities) was carried out for each individually listed stream segment and its associated drainage area. Spatial analysis was also performed within a GIS framework. Most of the data collected for the development of this document can be accessed and downloaded from the Kentucky Geography Network (<http://kygeonet.ky.gov>).

Results from the watershed sampling event in 2009 indicated new impaired segments in several tributaries of the watershed. An overview of the watershed is followed by a brief discussion of each segment and along Cox Creek and then tributaries, beginning in the headwaters.

8.2.1 Cox Creek of the Salt River

Cox Creek of the Salt River is a fourth order stream that is mostly contained within Nelson County with northern areas extending into Bullitt and Spencer Counties. Cox Creek originates in northeastern Bardstown and flows in a northwesterly direction for 23.9 miles. The stream drains an area of 101.95 square miles before entering the Salt River near the community of Solitude, KY. Cox Creek drops about 400 feet in elevation from its origin to the mouth.

Land cover in Cox Creek is largely agricultural pastureland (46.44%) followed by forest (37.17%; Table 8.1). In 2001, only 3.73% of the total land area was developed and mostly located along rural roads and small towns (including Bardstown, Coxs Creek, Lotus and High Grove; Figure 8.1). Approximately 2/3 of the watershed is sensitive or prone to karst features with several mapped springs and sinkholes dotting the watershed (see Figure 3.2). The soil and bedrock properties of the watershed can provide a challenge for septic system and basement installation and maintenance but can also provide good farmland in many areas.

Table 8.1 Land Cover in the Cox Creek Watershed (NLCD 2001)

| Land Use | % of Total Area | Acres | Square Miles |
|---------------------|-----------------|-----------|--------------|
| Forest | 37.17% | 24,206.90 | 37.82 |
| Agriculture (total) | 55.65% | 36,241.46 | 56.63 |
| Pasture | 46.44% | 30,244.06 | 47.26 |
| Row Crop | 9.21% | 5,997.40 | 9.37 |
| Developed | 3.73% | 2,431.47 | 3.80 |
| Natural Grassland | 2.35% | 1,528.87 | 2.39 |
| Wetland | 0.48% | 312.60 | 0.49 |
| Barren | 0.10% | 65.42 | 0.10 |

As of the last Census (2010), there were an estimated 250.2, 91.4 and 104 persons per square mile in Bullitt, Spencer and Nelson Counties, respectively. Estimates of the population in the Cox Creek watershed are provided in Table 8.2. Sewer lines cover a very small portion of the watershed but there are planned upgrades and expansions extending service to some individuals and Coxs Creek Elementary in the south central area of the watershed (Figure 8.1 and Section 5.1.1.2). All other areas of the watershed rely on OSTDS or do not treat their sewage.

Table 8.2 Estimated Populations in the Cox Creek Watershed According to the 2010 US Census

| County/ Stream | Watershed Area within County (sq mi) | Persons per Square Mile | Estimated Population in Watershed |
|------------------------------|--------------------------------------|-------------------------|-----------------------------------|
| Bullitt County/ Cox Creek | 16.26 | 250.2 | 4,068.25 |
| Nelson County/ Cox Creek | 74.92 | 104 | 7,791.68 |
| Spencer County/ Cox Creek | 10.58 | 91.4 | 967.01 |
| Cox Creek Watershed Total | 101.76 | | 12,826.94 |

According to the latest KDOW watershed study the sampling site with the highest percent exceedance of the WQC (90.9%) was the site on Cox Creek near RM 8.3 (DOW12005005). Two other sites on Rocky Run (DOW12005003) and Caney Fork (DOW12005009) were close behind with 90% exceedance of the WQC; none of the sites had a percent exceedance lower than 70%. The Cox Creek watershed to RM 4.7 and Caney Fork are dominated by agricultural pasture land, have very few sewers, fair to poor dissolved oxygen (DO) levels and a lack of habitat, riparian zone and available cover around the waterbody. Rocky Run is dominated by forest land though it is completely contained within the Bullitt County MS4 community and also has no sewers.

Conductivity levels across the watershed were fairly good indicating reasonably low dissolved solids. DO levels were suitable at most sites, the few sites that had poor levels likely resulted from lack of shade around the waterbody, coupled with nutrient runoff. The site on Cox Creek near RM 16.5 (DOW12005008) had the best overall water quality though biology and habitat data were not collected. The site on East Fork Cox Creek (CFD12005501) had one of the best overall scores, tying with Rocky Run (DOW12005003) despite the fact that both had bacteria exceedances of the WQC higher than 80%. Though East Fork is dominated by pasture land in the headwaters and has a poor riparian zone, much of the subwatershed toward the mouth is forested; Rocky Run is also mostly forested though its riparian zone is lacking toward the mouth.

More information from the watershed study can be found in Section 4 or Appendix B. More information on what you can do to improve the health of Cox Creek can be found in Section 9.

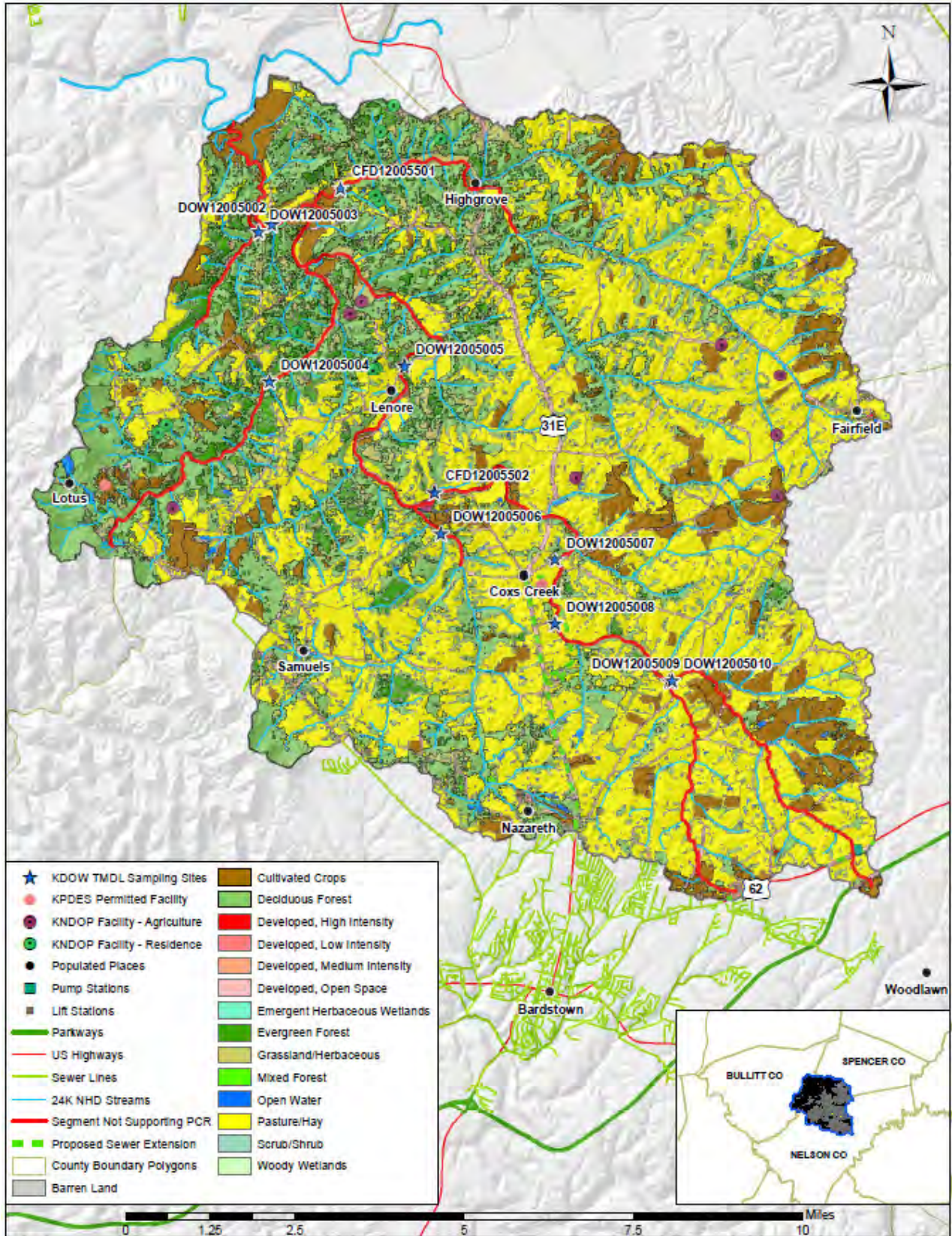


Figure 8.1 Land Cover, KPDES-Permitted Sources and Wastewater Infrastructure within the Cox Creek Watershed

8.2.1.1 Cox Creek 18.6 to 23.9 into Salt River

Cox Creek quickly becomes a third order stream in the middle of this segment. Exceedance of the WQC (240 col/100ml) was observed in 100% of the samples collected – the highest concentration of all samples was greater than 24,190 colonies per 100 ml (Table 8.3). *E. coli* concentrations appear to increase with increased or little precipitation suggesting the loading may be caused by both KPDES-permitted and non KPDES-permitted sources in the watershed. There is one pump station and one proposed sewer extension but no other KPDES-permitted sources upstream of RM 18.6. Therefore this loading suggests nonpoint sources in the watershed such as straight-pipes, animals in streams or failing OSTDS. There are no sewer lines so residents to this point must rely on OSTDS or do not treat their sewage.

Table 8.3 *E. coli* Data Collected for Cox Creek above Murray Run Road bridge (RM 18.75) - DOW12005010

| Collection Date | Discharge (cfs) | E Coli (CFU/100 ml) | Field Precipitation Notes |
|--------------------------|-----------------------|-----------------------|--|
| 05/07/09 | 6.880 | >2420 | heavy and steady rain through the last 48 hours, ~1" |
| 05/13/09 | 6.880 | 1553 | About 3 days since last rainfall of 0.1" |
| 06/02/09 | 0.254 | 2419 | About 4 days since last rainfall of 0.1" |
| 06/09/09 | 0.081 | 1203 | More than 5 days since last rainfall of more than 0.1" |
| 06/22/09 | n/a | >24190 | Showers through the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1" |
| 07/29/09 | 0.654 | 285 | Showers in the last 24 hours, ~0.1" |
| 08/11/09 | 0.366 | 345 | Showers in the last 24 hours, ~0.3" |
| 09/22/09 | 0.623 | 14140 | Showers and rain through the last 48 hours, ~2.5" |
| 10/13/09 | 5.972 | 1270 | 4 days since last rainfall; ~2.3" 10/8-9 |
| 10/29/09 | 22.009 | 1203 | Showers through the last 48 hours |
| Exceedance of WQC | Rain in last 24 hours | Rain in last 48 hours | No rain in last 48 hours |

The predominant land cover in the watershed to the bottom of this impaired segment is agricultural pastureland (59.19%) followed by row crops (22.19%; Figure 8.2). Based on the WQC and the MAF, the *E. coli* TMDL for the 5.3 mile impaired segment of Cox Creek is 5.99×10^{10} colonies per day (Table 8.4). In addition, any future KPDES-permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

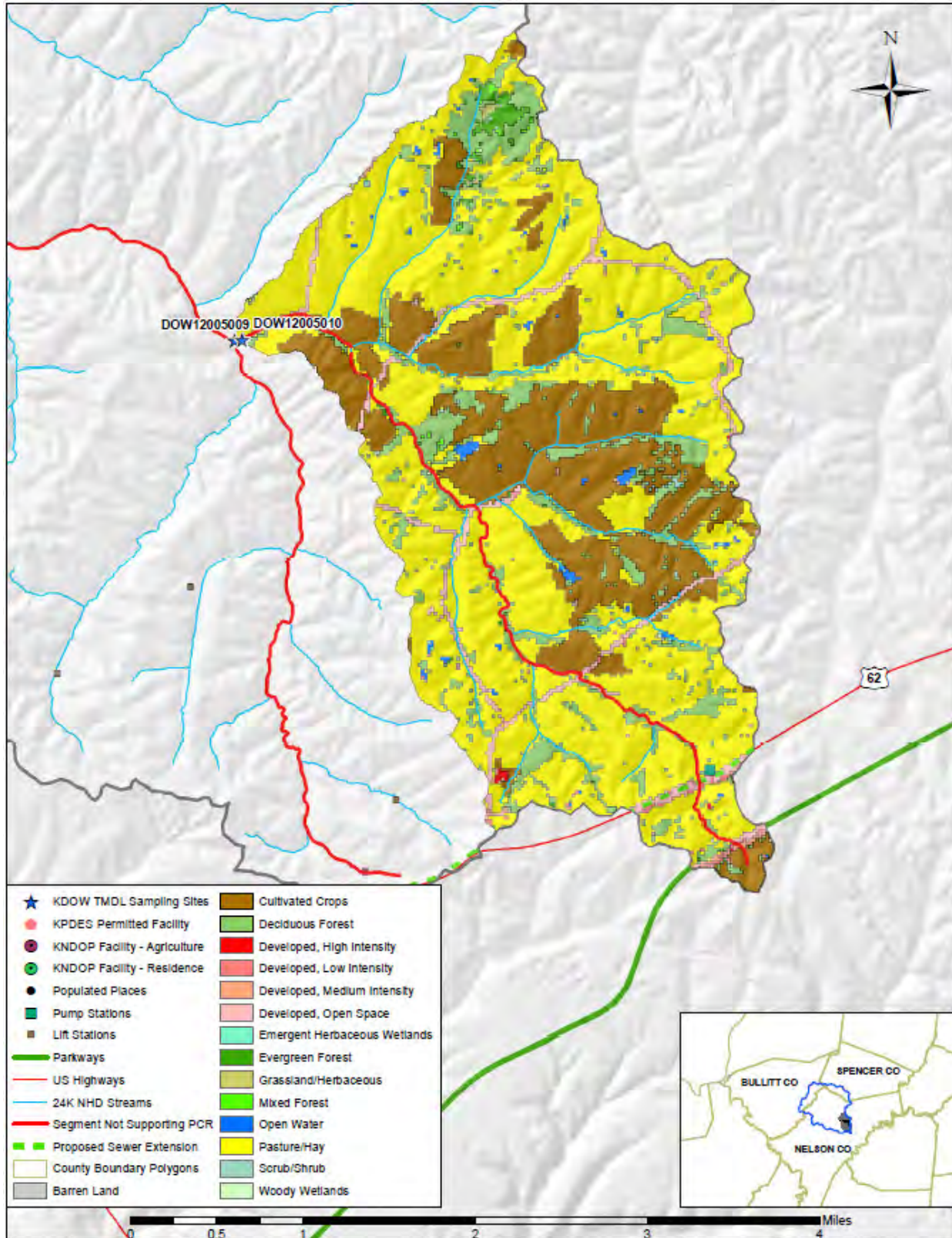


Figure 8.2 Land Cover for Cox Creek 18.6 to 23.9

Table 8.4 Summary of TMDL Components for Cox Creek 18.6 to 23.9

| TMDL ⁽¹⁾ | MOS ⁽²⁾ | SWS-WLA | MS4 - WLA | Future Growth - WLA | LA | Mean Annual Flow (cfs) |
|-------------------------------|------------------------------|---------|-----------|------------------------------|-------------------------------|------------------------|
| 5.99×10 ¹⁰ col/day | 5.99×10 ⁹ col/day | n/a | n/a | 2.70×10 ⁸ col/day | 5.36×10 ¹⁰ col/day | 10.2 |

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.

8.2.1.2 Cox Creek 11.4 to 18.6 into Salt River

Cox Creek becomes a fourth order stream near the top of this segment after collecting flow from Caney Fork. KDOW monitored three sites within the segment – site DOW12005008 near RM 16.5 showed the highest exceedance from the WQC and therefore was used to set the TMDL for the segment. Exceedance of the WQC (240 col/100ml) was observed in 77.8% of the samples collected – the highest concentration of all samples was greater than 2,420 colonies per 100 ml (Table 8.5). *E. coli* concentrations appear to increase with increased or little precipitation suggesting the loading may be caused by both KPDES-permitted and non KPDES-permitted sources in the watershed. There are two KPDES-permitted sources (Coxs Creek Elementary and the city of Bardstown MS4 community), one CAFO (IPKY Hog Farm), one KNDOP (Wright Hog Farm) and some wastewater infrastructure upstream of RM 11.4. See Table 5.1 for individual WLAs. There are few sewer lines (in the headwaters of Caney Fork) so residents to this point mostly rely on OSTDS or do not treat their sewage.

Table 8.5 *E. coli* Data Collected for Cox Creek off Wheeler-Wright Lane; above Cox Creek Elementary (RM 16.55) - DOW12005008

| Collection Date | Discharge (cfs) | E Coli (CFU/100 ml) | Field Precipitation Notes |
|--------------------------|-----------------------|-----------------------|---|
| 05/07/09 | 18.947 | >2420 | heavy and steady rain in the last 48 hours, ~1" |
| 05/13/09 | 15.656 | 2419 | About 3 days since last rainfall of 0.1" |
| 06/02/09 | 0.141 | 147 | About 4 days since last rainfall of 0.1" |
| 06/09/09 | 0.409 | 192 | More than 5 days since last rainfall of more than 0.1" |
| 06/22/09 | n/a | 770 | Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1" |
| 07/29/09 | 1.393 | n/a | Showers in the last 24 hours, ~0.1" |
| 08/11/09 | 0.756 | 387 | Showers in the last 24 hours, ~0.3" |
| 09/22/09 | 1.612 | 9210 | Showers and rain in the last 48 hours, ~2.5" |
| 10/13/09 | 11.364 | 1414 | 4 days since last rainfall; ~2.3" 10/8-9 |
| 10/29/09 | 42.103 | 1553 | Showers in the last 48 hours |
| Exceedance of WQC | Rain in last 24 hours | Rain in last 48 hours | No rain in last 48 hours |

Table 8.6 *E. coli* Data Collected for Cox Creek above Fairfield Road bridge (KY509; RM 15.4) - DOW12005007

| Collection Date | Discharge (cfs) | E Coli (CFU/100 ml) | Field Precipitation Notes |
|--------------------------|-----------------------|-----------------------|---|
| 05/07/09 | 21.509 | >2420 | heavy and steady rain in the last 48 hours, ~1" |
| 05/13/09 | 16.903 | 2419 | About 3 days since last rainfall of 0.1" |
| 06/02/09 | 0.659 | 228 | About 4 days since last rainfall of 0.1" |
| 06/09/09 | 0.394 | 117 | More than 5 days since last rainfall of more than 0.1" |
| 06/22/09 | n/a | 1733 | Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1" |
| 07/29/09 | 1.425 | >2419 | Showers in the last 24 hours, ~0.1" |
| 08/11/09 | 0.670 | 517 | Showers in the last 24 hours, ~0.3" |
| 09/22/09 | 1.827 | 1400 | Showers and rain in the last 48 hours, ~2.5" |
| 10/13/09 | 12.190 | 1046 | 4 days since last rainfall; ~2.3" 10/8-9 |
| 10/29/09 | 37.922 | 2419 | Showers in the last 48 hours |
| Exceedance of WQC | Rain in last 24 hours | Rain in last 48 hours | No rain in last 48 hours |

Table 8.7 *E. coli* Data Collected for Cox Creek below Cox Creek Road bridge (RM 11.8) - CFD12005502

| Collection Date | Discharge (cfs) | E Coli (CFU/100 ml) | Field Precipitation Notes |
|--------------------------|-----------------------|-----------------------|---|
| 05/07/09 | 29.950 | >2420 | heavy and steady rain in the last 48 hours, ~1" |
| 05/13/09 | 17.982 | 770 | About 3 days since last rainfall of 0.1" |
| 06/02/09 | 1.035 | 12 | About 4 days since last rainfall of 0.1" |
| 06/09/09 | 0.638 | 31 | More than 5 days since last rainfall of more than 0.1" |
| 06/22/09 | n/a | 1986 | Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1" |
| 07/29/09 | 3.217 | 816 | Showers in the last 24 hours, ~0.1" |
| 08/11/09 | 1.079 | 120 | Showers in the last 24 hours, ~0.3" |
| 09/22/09 | 3.079 | 800 | Showers and rain in the last 48 hours, ~2.5" |
| 10/13/09 | 16.545 | >2419 | 4 days since last rainfall; ~2.3" 10/8-9 |
| 10/29/09 | 56.857 | >2419 | Showers in the last 48 hours |
| Exceedance of WQC | Rain in last 24 hours | Rain in last 48 hours | No rain in last 48 hours |

The predominant land cover in the watershed to the bottom of this impaired segment is agricultural pastureland (64.17%) followed by forest (16.76%; Figure 8.3). Based on the WQC and the MAF, the *E. coli* TMDL for the 7.2 mile impaired segment of Cox Creek is 1.33×10^{11} colonies per day (Table 8.8). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

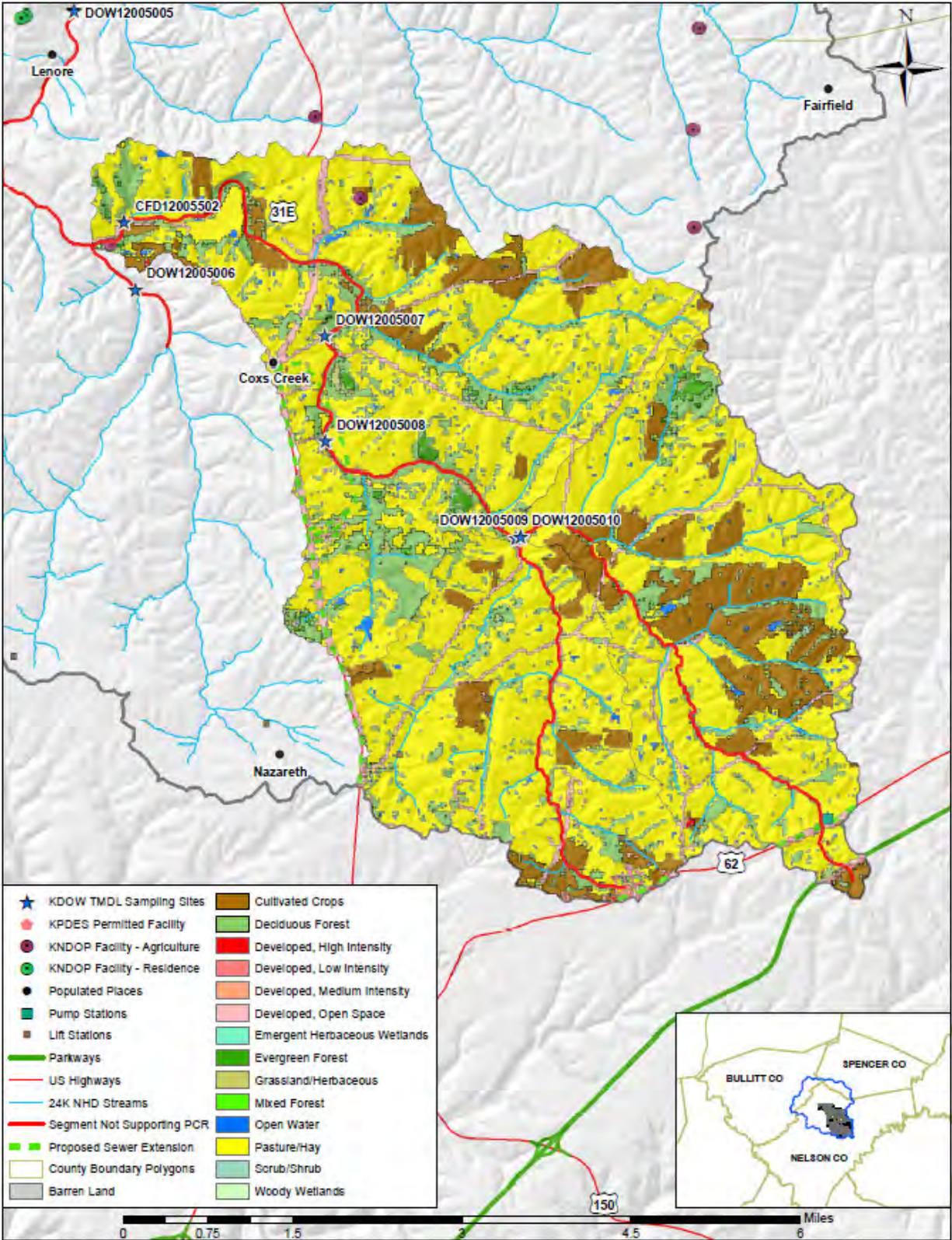


Figure 8.3 Land Cover for Cox Creek 11.4 to 18.6

Table 8.8 Summary of TMDL Components for Cox Creek 11.4 to 18.6

| TMDL ⁽¹⁾ | MOS ⁽²⁾ | SWS-WLA ⁽³⁾ | MS4 - WLA | Future Growth - WLA | LA | Mean Annual Flow (cfs) |
|----------------------------------|----------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|------------------------|
| 1.33×10 ¹¹ col/day | 1.33×10 ¹⁰ col/day | 9.08×10 ⁷ col/day | 5.77×10 ⁷ col/day | 6.00×10 ⁸ col/day | 1.19×10 ¹¹ col/day | 22.7 |

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.
- (3). WLA value is based on design flow and acute permit limits and represents the maximum one-day load that can be discharged to the stream segment.

8.2.1.3 Cox Creek 4.7 to 11.4 into Salt River

Cox Creek becomes a fifth order stream after collecting flow from Froman Creek at the top of the segment. In addition to the KPDES-permitted sources listed for the upstream segment, there are two home units (permits 12005031 and 120012005028) and two additional KNDOPs (Chris Hurst and Bob Robinson Hog Farms). There is additional wastewater infrastructure in the headwaters of Froman Creek and another tributary to its west. There are few sewer lines so residents must rely on OSTDS or do not treat their sewage. Exceedance of the WQC (240 col/100ml) was observed in 90.9% of the samples collected – the highest concentration of all samples was greater than 2,420 colonies per 100 ml (Table 8.9). *E. coli* concentrations appear to increase with little or no precipitation suggesting the loading may be caused by both KPDES-permitted and non KPDES-permitted sources in the watershed such as aging/ inadequate wastewater infrastructure, illegal straight-pipes, animals in streams or failing OSTDS.

Table 8.9 *E. coli* Data Collected for Cox Creek at Deatsville Rd. bridge (KY523; RM 8.3) - DOW12005005

| Collection Date | Discharge (cfs) | E Coli (CFU/100 ml) | Field Precipitation Notes |
|-----------------|-----------------|---------------------|---|
| 05/07/09 | 68.221 | >2420 | heavy and steady rain in the last 48 hours, ~1" |
| 05/13/09 | 31.659 | 248 | About 3 days since last rainfall of 0.1" |
| 06/02/09 | 3.235 | 25 | About 4 days since last rainfall of 0.1" |
| 06/09/09 | 2.263 | 365 | More than 5 days since last rainfall of more than 0.1" |
| 06/22/09 | n/a | 435 | Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1" |
| 07/29/09 | 7.104 | 770 | Showers in the last 24 hours, ~0.1" |
| 08/11/09 | 3.461 | 299 | Showers in the last 24 hours, ~0.3" |
| 08/26/09 | 0.107 | 548 | 5 days since last rainfall of more than 0.1" |
| 09/22/09 | 6.611 | 980 | Showers and rain in the last 48 hours, ~2.5" |
| 10/13/09 | 29.209 | 1733 | 4 days since last rainfall; ~2.3" 10/8-9 |
| 10/29/09 | 98.149 | >2419 | Showers in the last 48 hours |

| | | | |
|--------------------------|-----------------------|-----------------------|--------------------------|
| Exceedance of WQC | Rain in last 24 hours | Rain in last 48 hours | No rain in last 48 hours |
|--------------------------|-----------------------|-----------------------|--------------------------|

The predominant land cover in the watershed to the bottom of this impaired segment is agricultural pastureland (55.29%) followed by forest (29.47%; Figure 8.4). Based on the WQC and the MAF, the *E. coli* TMDL for the 6.7 mile impaired segment of Cox Creek is 3.38×10^{11} colonies per day (Table 8.10). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

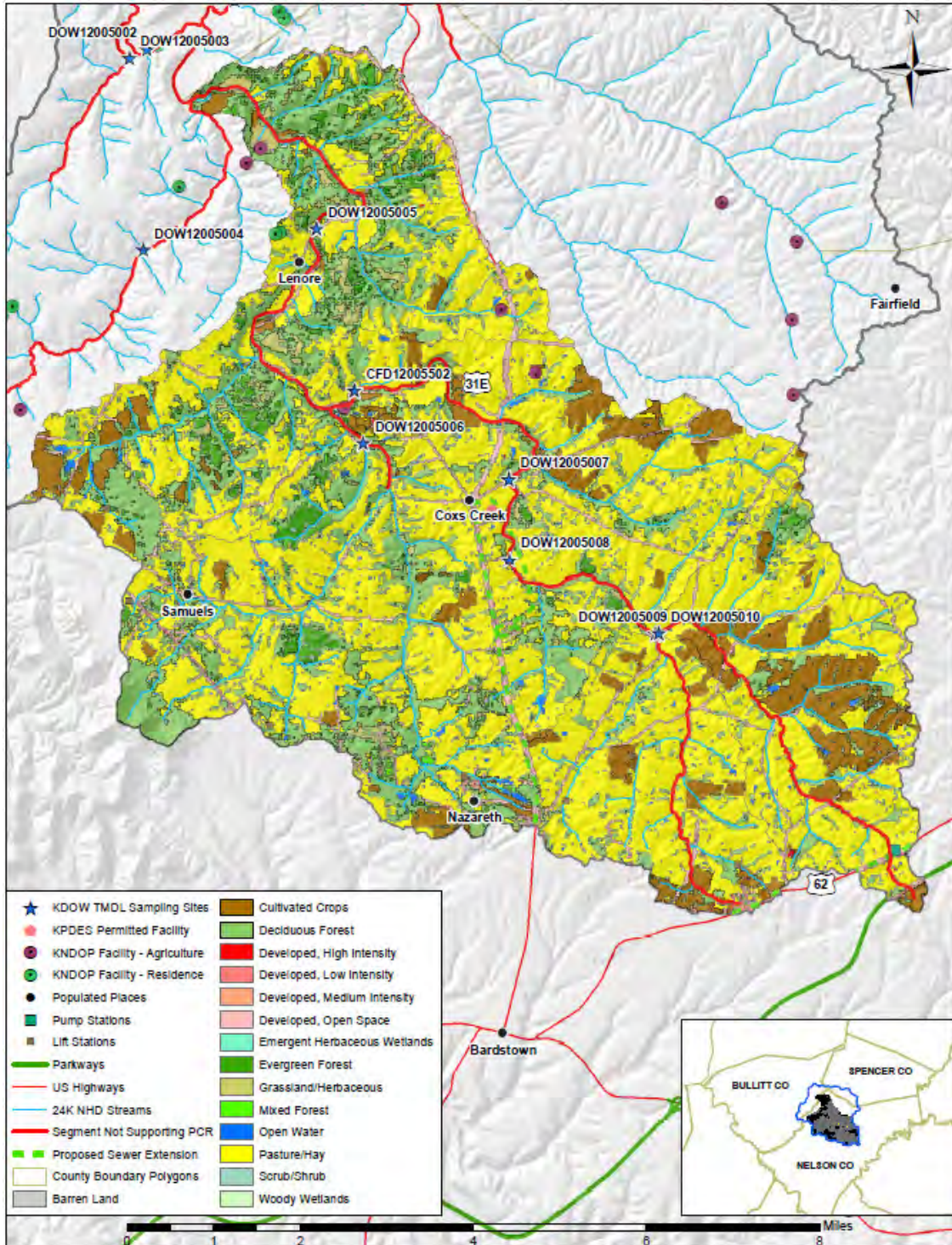


Figure 8.4 Land Cover for Cox Creek 4.7 to 11.4

Table 8.10 Summary of TMDL Components for Cox Creek 4.7 to 11.4

| TMDL ⁽¹⁾ | MOS ⁽²⁾ | SWS-WLA | MS4 - WLA | Future Growth - WLA | LA | Mean Annual Flow (cfs) |
|----------------------------------|----------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|------------------------|
| 3.38×10 ¹¹ col/day | 3.38×10 ¹⁰ col/day | 9.08×10 ⁷ col/day | 1.82×10 ⁸ col/day | 1.52×10 ⁹ col/day | 3.02×10 ¹¹ col/day | 57.5 |

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.
- (3). WLA value is based on design flow and acute permit limits and represents the maximum one-day load that can be discharged to the stream segment.

8.2.1.4 Cox Creek 0.0 to 4.7 into Salt River

Cox Creek remains a fifth order stream before discharging to the Salt River at the bottom of this segment. In addition to the KPDES-permitted sources listed in the upstream segments there are nine additional home units (permits 1206033, 12005032, 12005022, 12005018, 12004019, 12005027, 12005029, 12005026 and 12005035) and six additional KNDOPs (Lutz, Oliver Rogers, Robert Lutz, John McClaskey and Ulrich Dairy farms and Robinson Hog Farm). There are no sewer lines (other than those located in the headwaters of Caney Fork and Froman Creek) so residents must rely on OSTDS or do not treat their sewage. Exceedance of the WQC (240 col/100ml) was observed in 81.8% of the samples collected – the highest concentration of all samples was greater than 24,190 colonies per 100 ml (Table 8.11). *E. coli* concentrations appear to increase with little or no precipitation suggesting the loading may be caused by both KPDES-permitted and non KPDES-permitted sources in the watershed such as aging/inadequate wastewater infrastructure, illegal straight-pipes, animals in streams or failing OSTDS.

Table 8.11 *E. coli* Data Collected for Cox Creek off Cedar Grove Rd (RM 2.6) - DOW12005002

| Collection Date | Discharge (cfs) | E Coli (CFU/100 ml) | Field Precipitation Notes |
|-----------------|-----------------|---------------------|---|
| 05/07/09 | 59.000 | >2420 | heavy and steady rain in the last 48 hours, ~1" |
| 05/13/09 | n/a | 326 | About 3 days since last rainfall of 0.1" |
| 06/02/09 | 7.665 | 147 | About 4 days since last rainfall of 0.1" |
| 06/09/09 | 5.138 | 157 | More than 5 days since last rainfall of more than 0.1" |
| 06/22/09 | n/a | 2419 | Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1" |
| 07/29/09 | 19.786 | 2419 | Showers in the last 24 hours, ~0.1" |
| 08/11/09 | 6.164 | 249 | Showers in the last 24 hours, ~0.3" |
| 08/26/09 | 2.759 | 488 | 5 days since last rainfall of more than 0.1" |
| 09/22/09 | 20.330 | 24190 | Showers and rain in the last 48 hours, ~2.5" |
| 10/13/09 | 68.809 | 1733 | 4 days since last rainfall; ~2.3" 10/8-9 |
| 10/29/09 | 141.000 | >2419 | Showers in the last 48 hours |

| | | | |
|--------------------------|-----------------------|-----------------------|--------------------------|
| Exceedance of WQC | Rain in last 24 hours | Rain in last 48 hours | No rain in last 48 hours |
|--------------------------|-----------------------|-----------------------|--------------------------|

The watershed is dominated by agricultural land (55.65%) in the headwaters and central areas while forested land (37.17%) dominates the northern areas toward the mouth (Figure 8.5). Based on the WQC and the MAF, the *E. coli* TMDL for the 4.7 mile impaired segment of Cox Creek is 6.68×10^{11} colonies per day (Table 8.12). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

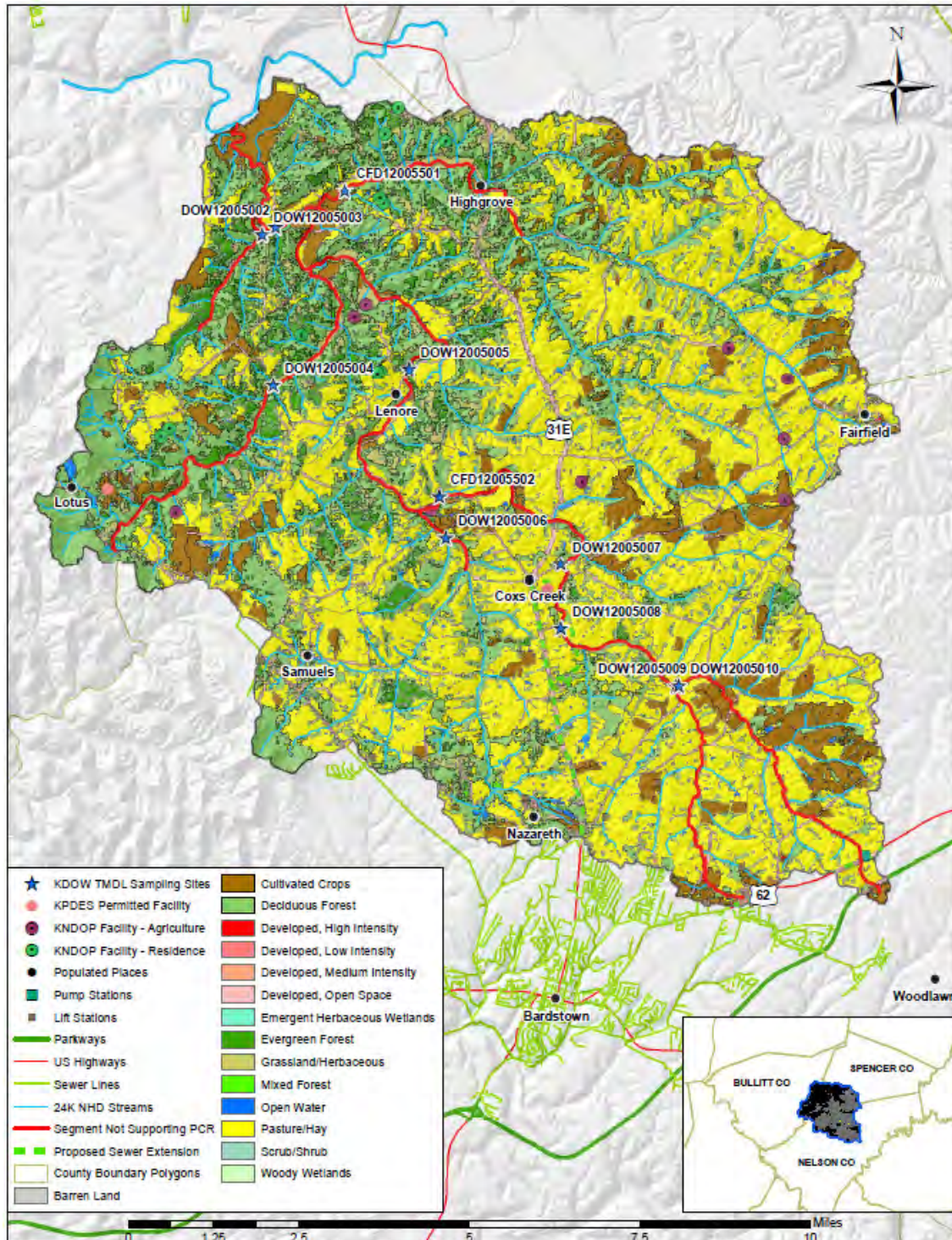


Figure 8.5 Land Cover for Cox Creek 0.0 to 4.7

Table 8.12 Summary of TMDL Components for Cox Creek 0.0 to 4.7

| TMDL ⁽¹⁾ | MOS ⁽²⁾ | SWS-WLA ⁽³⁾ | MS4 - WLA | Future Growth - WLA | LA | Mean Annual Flow (cfs) |
|-------------------------------|-------------------------------|------------------------------|------------------------------|------------------------------|-------------------------------|------------------------|
| 6.68×10 ¹¹ col/day | 6.68×10 ¹⁰ col/day | 9.08×10 ⁷ col/day | 1.94×10 ⁸ col/day | 3.00×10 ⁹ col/day | 5.98×10 ¹¹ col/day | 113.7 |

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.
- (3). WLA value is based on design flow and acute permit limits and represents the maximum one-day load that can be discharged to the stream segment.

8.2.1.5 Caney Fork 0.0 to 4.0 into Cox Creek

Caney Fork is a third order stream that discharges to Cox Creek near RM 18.6. There is one KPDES-permitted source (city of Bardstown MS4 community) and wastewater infrastructure including sewer lines and lift stations in the headwaters. There are no sewer lines in the bottom portion of the subwatershed so residents must rely on OSTDS or do not treat their sewage. The subwatershed is dominated by nearly 72% agricultural pastureland followed by forest (12.16%; Figure 8.6). Exceedance of the WQC (240 col/100ml) was observed in 90% of the samples collected – the highest concentration of all samples was greater than 24,190 colonies per 100 ml (Table 8.13). *E. coli* concentrations appear to increase with little or no precipitation suggesting the loading may be caused by both KPDES-permitted and non KPDES-permitted sources in the watershed such as aging/inadequate wastewater infrastructure, illegal straight-pipes, animals in streams or failing OSTDS.

Table 8.13 *E. coli* Data Collected for Caney Fork above Murray Run Road bridge (RM 0.05) - DOW12005009

| Collection Date | Discharge (cfs) | E Coli (CFU/100 ml) | Field Precipitation Notes |
|-----------------|-----------------|---------------------|---|
| 05/07/09 | 7.733 | 1986 | heavy and steady rain in the last 48 hours, ~1" |
| 05/13/09 | 7.110 | >2419 | About 3 days since last rainfall of 0.1" |
| 06/02/09 | 0.176 | >2419 | About 4 days since last rainfall of 0.1" |
| 06/09/09 | 0.061 | 1986 | More than 5 days since last rainfall of more than 0.1" |
| 06/22/09 | n/a | >24190 | Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1" |
| 07/29/09 | 0.582 | 236 | Showers in the last 24 hours, ~0.1" |
| 08/11/09 | 0.130 | 308 | Showers in the last 24 hours, ~0.3" |
| 09/22/09 | 0.498 | 290 | Showers and rain in the last 48 hours, ~2.5" |
| 10/13/09 | 3.439 | 850 | 4 days since last rainfall; ~2.3" 10/8-9 |
| 10/29/09 | 10.601 | 980 | Showers in the last 48 hours |

| | | | |
|--------------------------|-----------------------|-----------------------|--------------------------|
| Exceedance of WQC | Rain in last 24 hours | Rain in last 48 hours | No rain in last 48 hours |
|--------------------------|-----------------------|-----------------------|--------------------------|

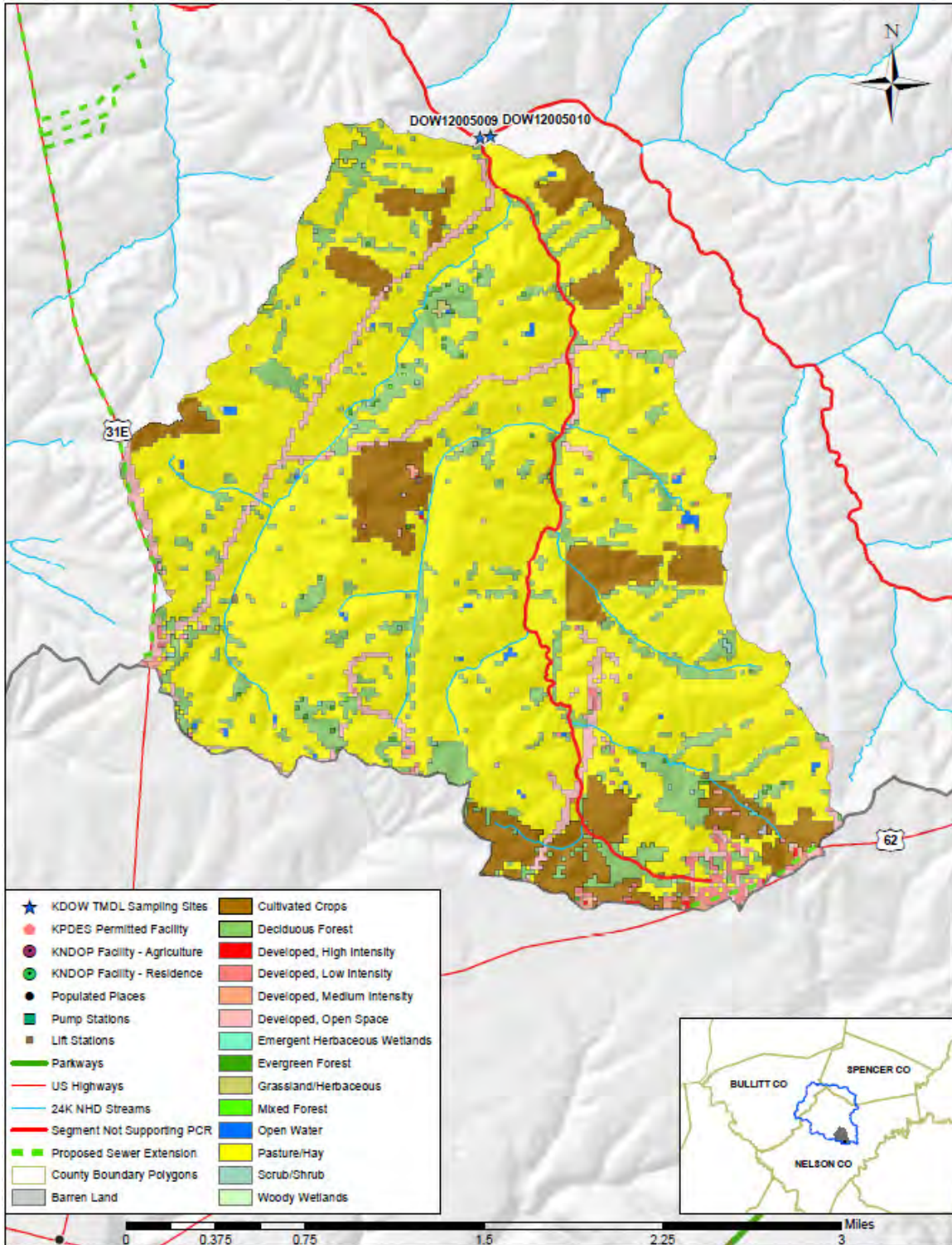


Figure 8.6 Land Cover for Caney Fork 0.0 to 4.0

Based on the WQC and the MAF, the *E. coli* TMDL for the 4.0 mile impaired segment of Caney Fork is 4.46×10^{10} colonies per day (Table 8.14). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

Table 8.14 Summary of TMDL Components for Caney Fork 0.0 to 4.0

| TMDL ⁽¹⁾ | MOS ⁽²⁾ | SWS-WLA | MS4 - WLA | Future Growth - WLA | LA | Mean Annual Flow (cfs) |
|----------------------------------|---------------------------------|---------|---------------------------------|---------------------------------|----------------------------------|------------------------|
| 4.46×10 ¹⁰ col/day | 4.46×10 ⁹ col/day | n/a | 8.21×10 ⁷ col/day | 4.02×10 ⁸ col/day | 3.97×10 ¹⁰ col/day | 7.6 |

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.

8.2.1.6 Froman Creek 0.0 to 1.25 into Cox Creek

Froman Creek is a fourth order stream that discharges to Cox Creek near RM 11.3. There is one KPDES-permitted source (city of Bardstown MS4 community) and wastewater infrastructure including sewer lines and lift stations in the headwaters. There are no sewer lines throughout most of the subwatershed so residents must rely on OSTDS or do not treat their sewage. The subwatershed is largely agricultural pastureland (54.03%) followed by forest (36.22%; Figure 8.7). Exceedance of the WQC (240 col/100ml) was observed in 70% of the samples collected – the highest concentration of all samples was greater than 2,419 colonies per 100 ml (Table 8.15). *E. coli* concentrations appear to increase with little or no precipitation suggesting contribution from various types of sources in the watershed such as aging/inadequate wastewater infrastructure, illegal straight-pipes, animals in streams or failing OSTDS.

Table 8.15 *E. coli* Data Collected for Froman Creek at Mobley Mill Road bridge (KY 509; RM 0.55) - DOW12005007

| Collection Date | Discharge (cfs) | E Coli (CFU/100 ml) | Field Precipitation Notes |
|--------------------------|-----------------------|-----------------------|---|
| 05/07/09 | 19.275 | 1553 | heavy and steady rain in the last 48 hours, ~1" |
| 05/13/09 | 16.922 | 579 | About 3 days since last rainfall of 0.1" |
| 06/02/09 | 0.874 | 20 | About 4 days since last rainfall of 0.1" |
| 06/09/09 | 0.781 | 64 | More than 5 days since last rainfall of more than 0.1" |
| 06/22/09 | n/a | 548 | Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1" |
| 07/29/09 | 7.756 | >2419 | Showers in the last 24 hours, ~0.1" |
| 08/11/09 | 1.485 | 228 | Showers in the last 24 hours, ~0.3" |
| 09/22/09 | 0.245 | 430 | Showers and rain in the last 48 hours, ~2.5" |
| 10/13/09 | 6.055 | 687 | 4 days since last rainfall; ~2.3" 10/8-9 |
| 10/29/09 | 21.630 | 687 | Showers in the last 48 hours |
| Exceedance of WQC | Rain in last 24 hours | Rain in last 48 hours | No rain in last 48 hours |

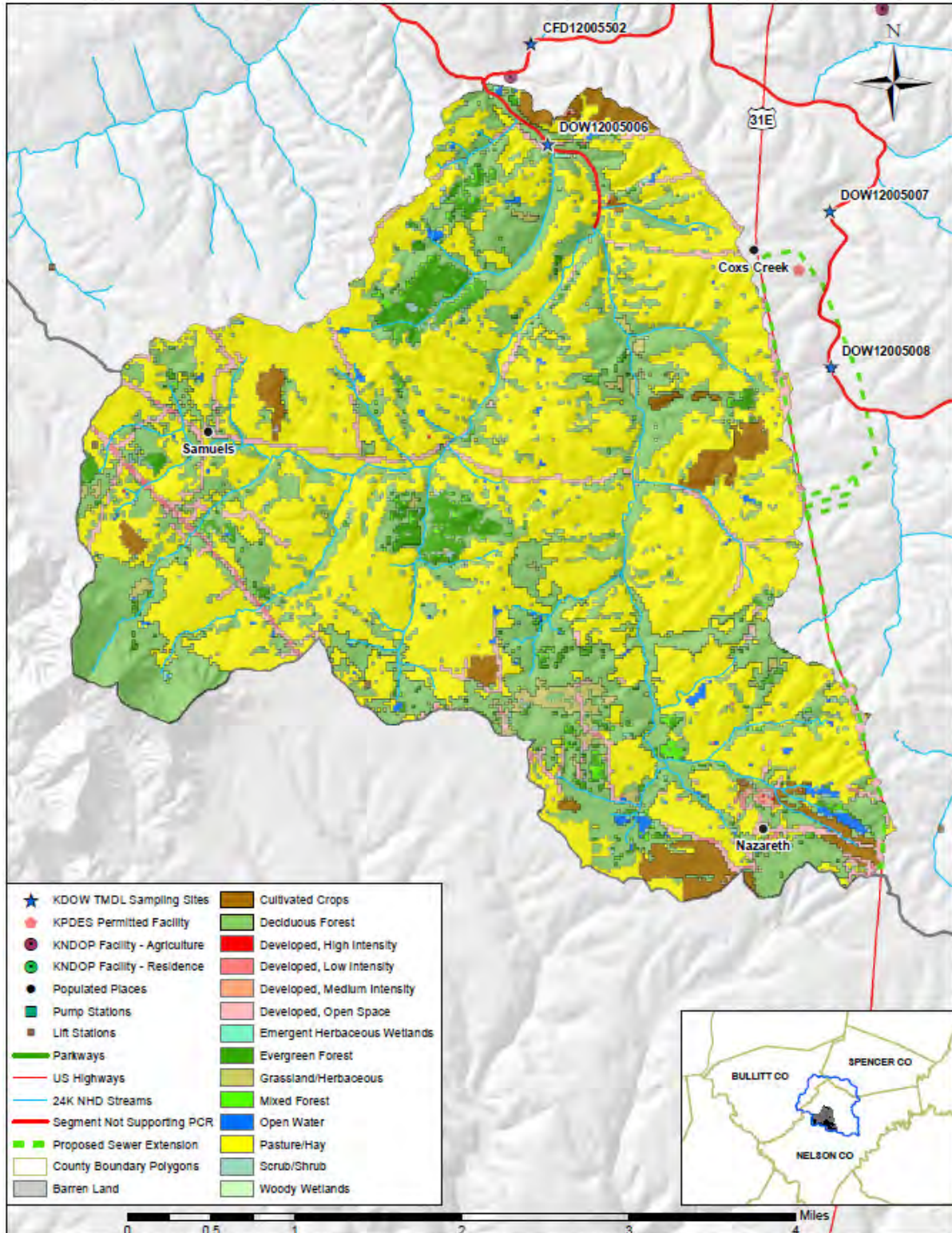


Figure 8.7 Land Cover for Froman Creek 0.0 to 1.25

Based on the WQC and the MAF, the *E. coli* TMDL for the 1.25 mile impaired segment of Froman Creek is 9.75×10^{10} colonies per day (Table 8.16). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

Table 8.16 Summary of TMDL Components for Froman Creek 0.0 to 1.25

| TMDL ⁽¹⁾ | MOS ⁽²⁾ | SWS-WLA | MS4 - WLA | Future Growth - WLA | LA | Mean Annual Flow (cfs) |
|----------------------------------|---------------------------------|---------|---------------------------------|---------------------------------|----------------------------------|------------------------|
| 9.75×10 ¹⁰ col/day | 9.75×10 ⁹ col/day | n/a | 1.25×10 ⁸ col/day | 4.39×10 ⁸ col/day | 8.72×10 ¹⁰ col/day | 16.6 |

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.

8.2.1.7 West Fork Cox Creek 0.0 to 6.9 into Cox Creek

West Fork Cox Creek is a fourth order stream that discharges to Cox Creek near RM 4.7. There are two KNDOPs (Ulrich Dairy and Robinson Hog Farm) and three home units (permits 12005027, 12005029 and 12005026) but no KPDES-permitted sources in the subwatershed. There are no sewer lines so residents must rely on OSTDS or do not treat their sewage. The subwatershed is dominated by forest land (66.72%) followed by agricultural pastureland (19.03%; Figure 8.8). Exceedance of the WQC (240 col/100ml) was observed in 80% of the samples collected – the highest concentration of all samples was greater than 2,419 colonies per 100 ml (Table 8.17). *E. coli* concentrations appear to increase with little to no precipitation suggesting contribution from various types of sources in the watershed such as animals in streams, illegal straight-pipes or failing OSTDS.

Table 8.17 *E. coli* Data Collected for West Fork Cox Creek at Lutz Lane bridge (RM 4.4) - DOW12005005

| Collection Date | Discharge (cfs) | E Coli (CFU/100 ml) | Field Precipitation Notes |
|--------------------------|-----------------------|-----------------------|---|
| 05/07/09 | 18.771 | 1203 | heavy and steady rain in the last 48 hours, ~1" |
| 05/13/09 | 8.327 | 326 | About 3 days since last rainfall of 0.1" |
| 06/02/09 | 0.681 | 214 | About 4 days since last rainfall of 0.1" |
| 06/09/09 | 0.679 | 106 | More than 5 days since last rainfall of more than 0.1" |
| 06/22/09 | n/a | 1300 | Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1" |
| 07/29/09 | 9.350 | >2419 | Showers in the last 24 hours, ~0.1" |
| 08/11/09 | 2.019 | 461 | Showers in the last 24 hours, ~0.3" |
| 09/22/09 | 1.668 | 1260 | Showers and rain in the last 48 hours, ~2.5" |
| 10/13/09 | 6.488 | 770 | 4 days since last rainfall; ~2.3" 10/8-9 |
| 10/29/09 | 15.546 | 866 | Showers in the last 48 hours |
| Exceedance of WQC | Rain in last 24 hours | Rain in last 48 hours | No rain in last 48 hours |

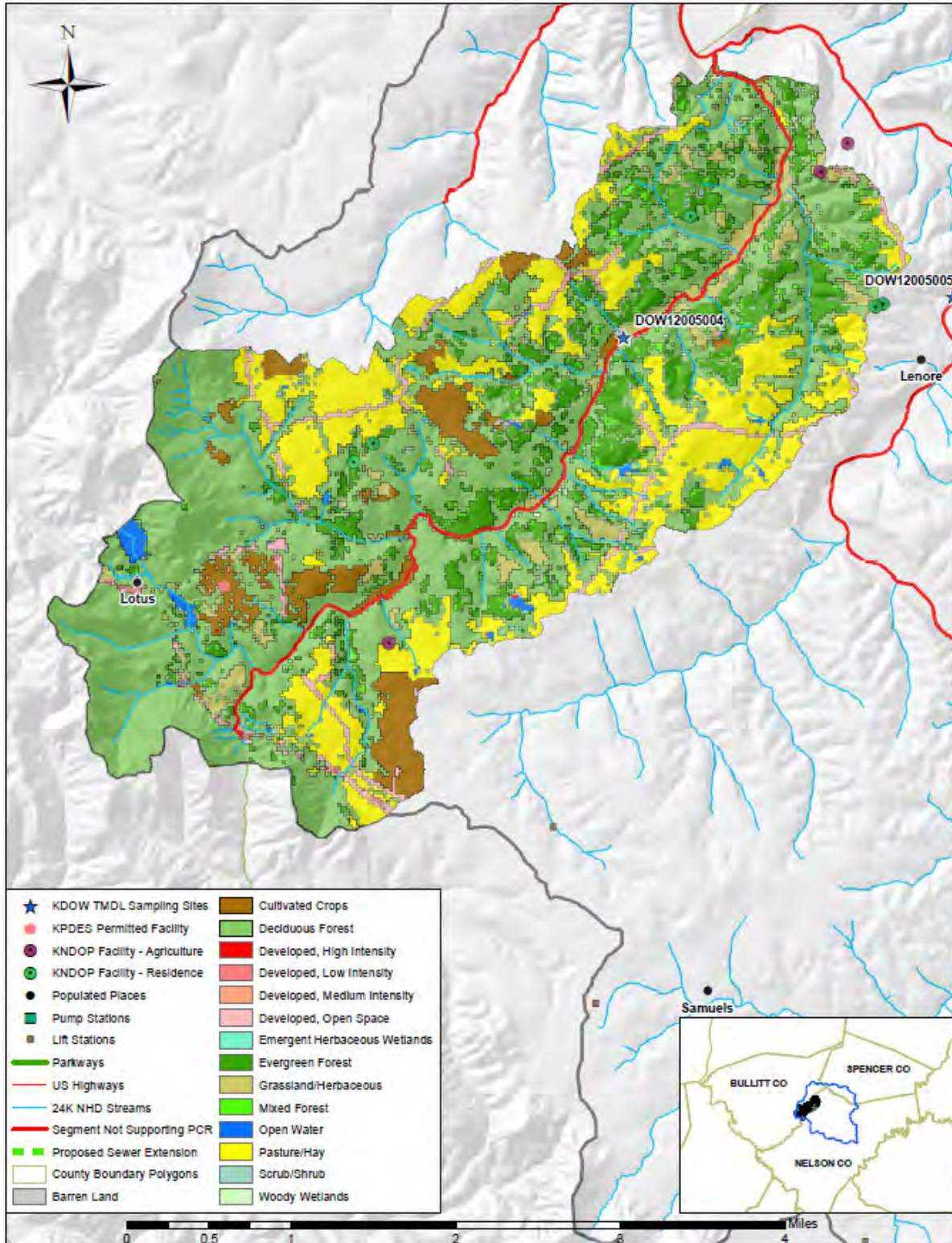


Figure 8.8 Land Cover for West Fork Cox Creek 0.0 to 6.9

Based on the WQC and the MAF, the *E. coli* TMDL for the 6.9 mile impaired segment of West Fork Cox Creek is 5.64×10^{10} colonies per day (Table 8.18). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

Table 8.18 Summary of TMDL Components for West Fork Cox Creek 0.0 to 6.9

| TMDL ⁽¹⁾ | MOS ⁽²⁾ | SWS-WLA ⁽³⁾ | MS4 - WLA | Future Growth - WLA | LA | Mean Annual Flow (cfs) |
|-------------------------------|------------------------------|------------------------|-----------|------------------------------|-------------------------------|------------------------|
| 5.64×10 ¹⁰ col/day | 5.64×10 ⁹ col/day | n/a | n/a | 2.54×10 ⁸ col/day | 5.05×10 ¹⁰ col/day | 9.6 |

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.
- (3). WLA value is based on design flow and acute permit limits and represents the maximum one-day load that can be discharged to the stream segment

8.2.1.8 East Fork Cox Creek 0.0 to 4.3 into Cox Creek

East Fork Cox Creek is a fourth order stream that discharges to Cox Creek near RM 3.5. There are four KNDOPs (Lutz, Oliver Rogers, Robert Lutz and John McClaskey dairy farms) and five home units (permits 12006033, 12005032, 12005022, 12005018 and 12004019) but no KPDES-permitted sources in the subwatershed. There are no sewer lines so residents must rely on OSTDS or do not treat their sewage. The subwatershed is dominated by agricultural pastureland (49.51%) in the headwaters and forest land toward the mouth (34%; Figure 8.9). Exceedance of the WQC (240 col/100ml) was observed in 83.3% of the samples collected – the highest concentration of all samples was greater than 2,419 colonies per 100 ml (Table 8.19). *E. coli* concentrations appear to increase with little to no precipitation suggesting contribution from various types of sources in the watershed such as animals in streams, illegal straight-pipes or failing OSTDS.

Table 8.19 *E. coli* Data Collected for East Fork Cox Creek off Grigsby Road (RM 0.6) - CFD12005502

| Collection Date | Discharge (cfs) | E Coli (CFU/100 ml) | Field Precipitation Notes |
|--------------------------|-----------------------|-----------------------|---|
| 05/07/09 | 28.275 | 2419 | heavy and steady rain in the last 48 hours, ~1" |
| 05/13/09 | 22.933 | 435 | About 3 days since last rainfall of 0.1" |
| 06/02/09 | 2.751 | 185 | About 4 days since last rainfall of 0.1" |
| 06/09/09 | 1.045 | 248 | More than 5 days since last rainfall of more than 0.1" |
| 06/22/09 | n/a | 1986 | Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1" |
| 07/29/09 | 8.580 | 1986 | Showers in the last 24 hours, ~0.1" |
| 08/11/09 | 2.812 | 166 | Showers in the last 24 hours, ~0.3" |
| 08/26/09 | 0.189 | 921 | 5 days since last rainfall of more than 0.1" |
| 09/15/09 | 0.056 | 1414 | 7 days since last rainfall of more than 0.1" |
| 09/22/09 | 2.641 | 2280 | Showers and rain in the last 48 hours, ~2.5" |
| 10/13/09 | 19.475 | 2419 | 4 days since last rainfall; ~2.3" 10/8-9 |
| 10/29/09 | 57.378 | >2419 | Showers in the last 48 hours |
| Exceedance of WQC | Rain in last 24 hours | Rain in last 48 hours | No rain in last 48 hours |

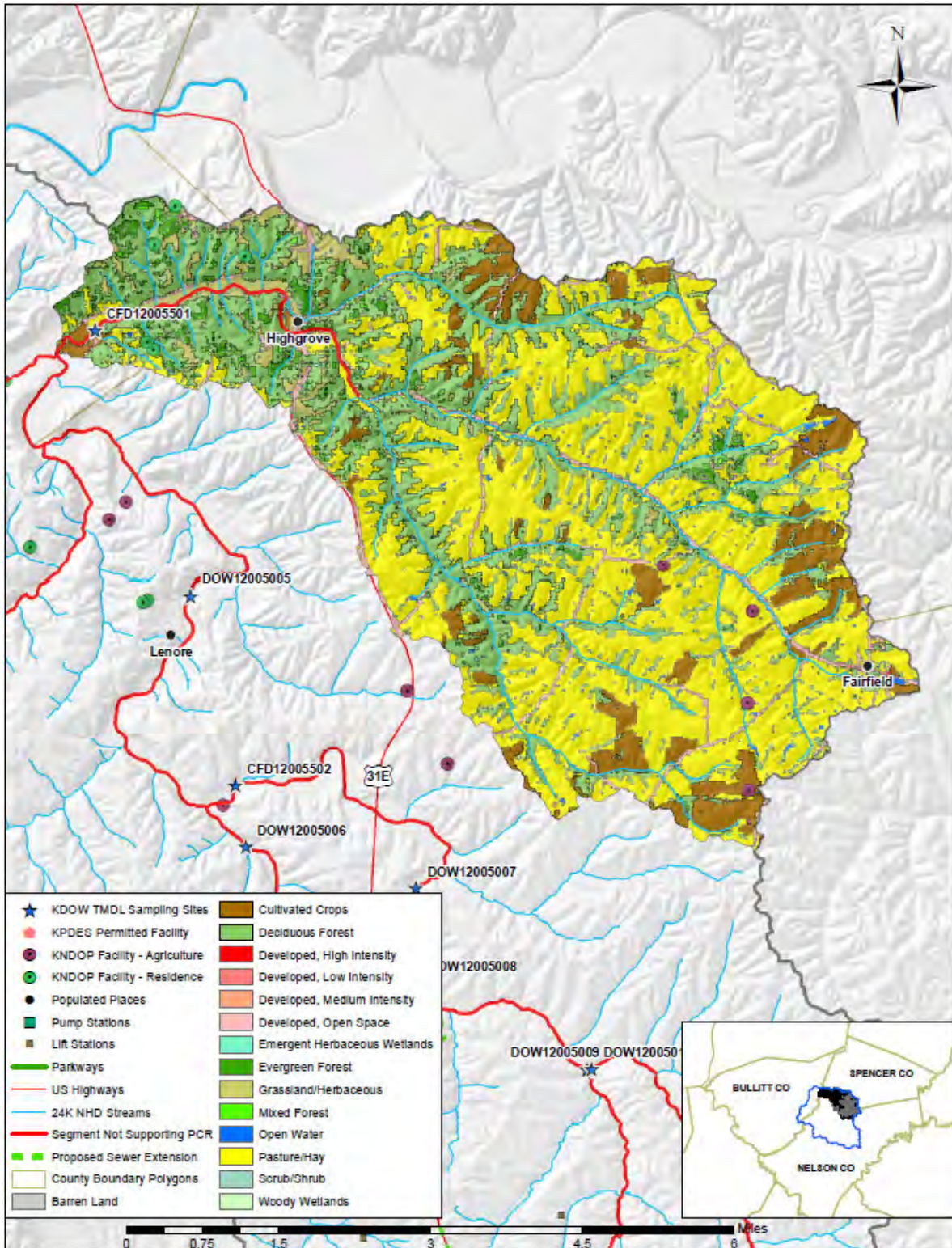


Figure 8.9 Land Cover for East Fork Cox Creek 0.0 to 4.3

Based on the WQC and the MAF, the *E. coli* TMDL for the 4.3 mile impaired segment of East Fork Cox Creek is 1.92×10^{11} colonies per day (Table 8.20). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

Table 8.20 Summary of TMDL Components for East Fork Cox Creek 0.0 to 4.3

| TMDL ⁽¹⁾ | MOS ⁽²⁾ | SWS-WLA ⁽³⁾ | MS4 - WLA | Future Growth - WLA | LA | Mean Annual Flow (cfs) |
|-------------------------------|-------------------------------|------------------------|-----------|----------------------------|-------------------------------|------------------------|
| 1.92×10^{11} col/day | 1.92×10^{10} col/day | n/a | n/a | 8.64×10^8 col/day | 1.73×10^{11} col/day | 32.7 |

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.
- (3). WLA value is based on design flow and acute permit limits and represents the maximum one-day load that can be discharged to the stream segment

8.2.1.9 Rocky Run 0.0 to 2.3 into Cox Creek

Rocky Run is a third order stream that discharges to Cox Creek near RM 2.2. There are no KPDES-permitted sources. There are no sewer lines so residents must rely on OSTDS or do not treat their sewage. The subwatershed is dominated by forest land (67.66%) followed by agricultural pastureland (17.71%; Figure 8.10). Exceedance of the WQC (240 col/100ml) was observed in 90% of the samples collected – the highest concentration of all samples was greater than 2,419 colonies per 100 ml (Table 8.21). *E. coli* concentrations appear to increase with little to no precipitation suggesting contribution from various types of sources in the watershed such as animals in streams, illegal straight-pipes or failing OSTDS.

Table 8.21 *E. coli* Data Collected for Rocky Run off Cedar Grove Road (RM 0.5) - DOW12005004

| Collection Date | Discharge (cfs) | E Coli (CFU/100 ml) | Field Precipitation Notes |
|--------------------------|-----------------------|-----------------------|---|
| 05/07/09 | 7.423 | 687 | heavy and steady rain in the last 48 hours, ~1" |
| 05/13/09 | 3.037 | 649 | About 3 days since last rainfall of 0.1" |
| 06/02/09 | 0.241 | 79 | About 4 days since last rainfall of 0.1" |
| 06/09/09 | 0.175 | 726 | More than 5 days since last rainfall of more than 0.1" |
| 06/22/09 | n/a | 980 | Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1" |
| 07/29/09 | 4.052 | >2419 | Showers in the last 24 hours, ~0.1" |
| 08/11/09 | 0.653 | 579 | Showers in the last 24 hours, ~0.3" |
| 09/22/09 | 0.347 | 1040 | Showers and rain in the last 48 hours, ~2.5" |
| 10/13/09 | 1.979 | 260 | 4 days since last rainfall; ~2.3" 10/8-9 |
| 10/29/09 | 5.274 | 435 | Showers in the last 48 hours |
| Exceedance of WQC | Rain in last 24 hours | Rain in last 48 hours | No rain in last 48 hours |

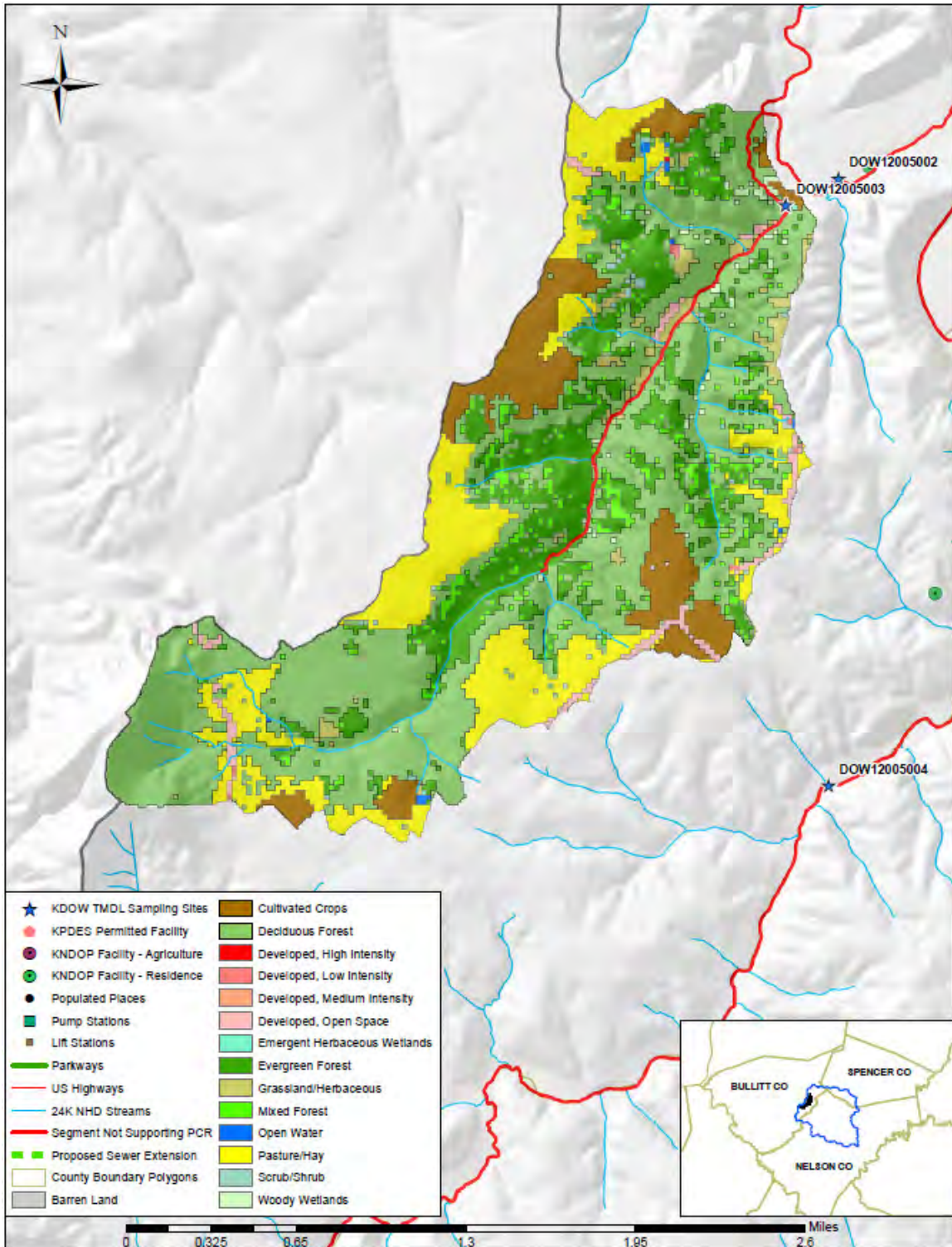


Figure 8.10 Land Cover for Rocky Run 0.0 to 2.3

Based on the WQC and the MAF, the *E. coli* TMDL for the 2.3 mile impaired segment of Rocky Run is 2.29×10^{10} colonies per day (Table 8.22). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

Table 8.22 Summary of TMDL Components for Rocky Run 0.0 to 2.3

| TMDL⁽¹⁾ | MOS⁽²⁾ | SWS-WLA | MS4 - WLA | Future Growth - WLA | LA | Mean Annual Flow (cfs) |
|----------------------------------|---------------------------------|----------------|------------------|---------------------------------|----------------------------------|-------------------------------|
| 2.29×10 ¹⁰ col/day | 2.29×10 ⁹ col/day | n/a | n/a | 1.03×10 ⁸ col/day | 2.05×10 ¹⁰ col/day | 3.9 |

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.

9.0 Implementation

Section 303(e) of the Clean Water Act and 40 CFR Part 130, Section 130.5, require states to have a continuing planning process (CPP) composed of several parts specified in the Act and the regulation. The CPP provides an outline of agency programs and the available authority to address water issues. Under the CPP umbrella, the Watershed Management Branch of KDOW will provide technical support and leadership with developing and implementing watershed plans to address water quality and quantity problems and threats. Developing watershed plans enables more effective targeting of limited restoration funds and resources, thus improving environmental benefit, protection and recovery.

Watershed plans provide an integrative approach for identifying and describing how, when, who and what actions should be taken in order to meet water quality standards. At this time, a comprehensive watershed restoration plan for the Cox Creek watershed has not been developed. This TMDL document provides bacteria allocations and reduction goals that may assist with developing a detailed watershed plan to guide watershed restoration efforts. In addition, the Cox Creek Watershed Health Report may also assist with development of a plan as it encourages public awareness and participation and highlights what can be done to help improve water quality such as

- keeping animals out of the stream,
- properly disposing of pet waste,
- reporting sewage leaks and overflows,
- working with local officials to extend or upgrade sewer service,
- properly maintaining septic systems and package treatment plants,
- leaving in place or establishing vegetation along the streams which provide natural filters that stabilize stream banks, minimize erosion, regulate water flow, provide shade, and absorb excess nutrients,
- limiting the use of chemicals, pesticides and fertilizers (or using them according to labels and soil test results),
- keeping storm drains clear of debris, trash or hazardous materials such as petroleum products and
- allowing fallen trees, other woody vegetation and gravel, cobble and boulders to remain in the stream to create habitat for aquatic life.

A watershed plan for the Cox Creek watershed should address both point and nonpoint sources of pollution in the watershed and should build on existing efforts as well as evaluate new approaches. Because of the specific landscape and location of the impairments in the Cox Creek watershed, a watershed plan should incorporate all available restoration and protection mechanisms, including any existing Groundwater Protection Plans, storm water or wastewater KPDES permits. A comprehensive watershed plan should consider both voluntary and regulatory approaches to meet water quality standards.

9.1 Kentucky Watershed Management Framework

A Watershed Management Framework approach to Water Quality Management was adopted by the KDOW in 1998. The plan divides Kentucky's major drainage basins into five groups of basins which are cycled through a five year staggered process that involves monitoring, assessment, prioritization, plan development, and plan implementation. As part of the process, a basin coordinator is assigned to each river basin to work with the citizens of the basin to develop a local Watershed Management Team associated with each priority watershed. For more information about the river basins see <http://water.ky.gov/watershed/Pages/Basins.aspx>.

9.2 Non-Governmental Organizations

There are several Non-Governmental Organizations (NGO) that may be operating in the Cox Creek watershed that may help to implement the TMDL, particularly with regard to nonpoint source issues. These organizations include Watershed Watch in Kentucky groups and Kentucky Waterways Alliance.

9.2.1 Watershed Watch in Kentucky

Watershed Watch is a citizen's water monitoring effort that relies exclusively on volunteers to provide administration, training, and volunteer and equipment coordination. The volunteers measure basic parameters of stream health to determine whether streams meet important "uses" under the Clean Water Act including aquatic life, human recreation, and drinking water.

Several water quality measurements are taken annually by Watershed Watch groups. Volunteers collect physical measurements, such as temperature, pH, dissolved oxygen, and conductivity. Stream monitoring may also include macroinvertebrate and habitat assessments. Data from annual monitoring is routinely used to help identify problems in the watershed, and assist with prioritizing streams for restoration and protection activities.

For more information about Watershed Watch see:
<http://water.ky.gov/wsw/Pages/default.aspx>.

9.2.2 Kentucky Waterways Alliance

The formation of Kentucky Waterways Alliance (KWA) was the result of a series of meetings sponsored by the Kentucky Environmental Quality Commission. The KWA has a mission to protect and restore Kentucky's waterways and their watersheds through alliances for watershed stewardship. This includes strengthening community and governmental stewardship for the restoration and preservation of Kentucky's water resources. The Alliance promotes networking, communication and mutual support among groups, government agencies, and businesses working on waterway issues.

For more information about KWA see:
<http://www.kwalliance.org>.

10.0 Public Participation

This TMDL document was published for a 30-day public comment period between November 21, 2012 and December 21, 2012. A public notice was sent to all newspapers in the Commonwealth of Kentucky and advertisements purchased in the Kentucky Standard and Pioneer News newspapers. Additionally, the public notice was distributed electronically through the 'Nonpoint Source Pollution Control' mailing list (<http://www.water.ky.gov/sw/nps/Mailing+List.htm>) of persons interested in water quality issues as well as the 'Press Release' mailing list maintained by the Governor's Office of media outlets across the Commonwealth.

Two comments were received during the public notice period that were incorporated into the administrative record for this TMDL. After consideration of the comments, revisions were made accordingly to the final TMDL document and responses prepared and mailed to the individuals participating in the public notice process. In addition, several residents of the watershed requested copies of the document and expressed interest in doing something to improve the water quality of the watershed. A public forum may be held in the future.

11.0 References

- 33 U.S.C. § 1251, Section 303(e). Clean Water Act. 1972.
- 40 CFR Part 130, Section 130.5. Continuing Planning Process. 1985.
- 401 KAR 5:002. Natural Resources and Environmental Protection Cabinet, Department for Environmental Protection, Division of Water. 2005.
- 401 KAR 5:005. Natural Resources and Environmental Protection Cabinet, Department for Environmental Protection, Division of Water. 2005.
- 401 KAR 5:0031. Natural Resources and Environmental Protection Cabinet, Department for Environmental Protection, Division of Water. 2005.
- 401 KAR 5:037. Natural Resources and Environmental Protection Cabinet, Department for Environmental Protection, Division of Water. 2005.
- 401 KAR 5:060. Natural Resources and Environmental Protection Cabinet, Department for Environmental Protection, Division of Water. 2005.
- American Veterinary Medical Association. 2002. U.S. Pet Ownership and Demographics Sourcebook. Schaumburg, Illinois.
- Beck, E. Glynn, David A. Williams, and Daniel Carey. 2005. Generalized Geologic Map for Land-Use Planning: Caldwell, Crittenden, Livingston, and Lyon counties. Kentucky Geological Survey. Lexington, Kentucky.
- Cox, Peter et al. May 2005. Concentrations of Pathogens and Indicators in Animal Feces in the Sydney Watershed. Volume 71, No.10. Applied and Environmental Microbiology, October 2005, p. 5929-5934.
- Friends of the Earth, Inc., v. EPA, et. al. No 05-5015 (D.C. Cir 2006). Decision on the Anacostia River TMDL.
- James, Randall et.al. 2006. Ohio Livestock Manure Management Guide, Bulletin 604. Ohio State University Extension Office, Columbus, Ohio.
- Harter, Thomas. June 26, 2007. How long will pathogens persist in groundwater and surface water? Cooperative Extension Office, University of California, Davis. Available online <http://www.extension.org/faq/26430>
- Homer, C. C. Huang, L. Yang, B. Wylie and M. Coan. 2004. [Development of a 2001 National Landcover Database for the United States. Photogrammetric Engineering and Remote Sensing](#), Vol. 70, No. 7, July 2004, pp. 829-840. www.mrlc.gov

Kentucky Department of Fish & Wildlife Resources. 2008. Personal communication with David Yancy, Senior Wildlife Biologist and Scarlett Stapleton, KDOW, March 2008.

Kentucky Division of Conservation. 2008. Personal communication with Stephen Coleman, KDOC, Paulette Akers, KDOW and Corrine Mulberry, KDOW, February 25, 2008

Kentucky Division of Waste Management. 2008. Personal communication with Bob Bickner, KDWM and Scarlett Stapleton, KDOW, February, 2008.

Kentucky Division of Water. 2004 2004 Kentucky Report to Congress on Water Quality

Kentucky Division of Water. 2002 2002 Kentucky Report to Congress on Water Quality

Kentucky Division of Water. 2006. FFY 2007 Project Application Kentucky Nonpoint Source Pollution Control Program – Groundwater Impacts to Surface Water Quality in Portions of Basin Management Units 3 & 4, Kentucky. Kentucky Division of Water, Watershed Management Branch, 14 Reilly Road, Frankfort, KY 40601

Kentucky Division of Water. 2008. Personal communication with Robert Blair and the TMDL Section, KDOW, August, 2008

Kentucky Division of Water. 2010. 2010 303(d) List of Impaired Waters; 2010 Integrated Reports to Congress on Water Quality in Kentucky

Kentucky Division of Water. 2011. Quality Assurance Project Plan for Data Analysis for TMDL Development, KDOW-TMDL Section, Frankfort, Kentucky, July 2011

Kentucky Division of Water. 2012. Pathogen TMDL Standard Operating Procedures, KDOW-TMDL Section, Frankfort, Kentucky, April 2012

Kentucky Division of Water. 2012. KDOW Wastewater Discharge Webpage. Accessed at URL <http://water.ky.gov/permitting/Pages/WastewaterDischarge.aspx>.

Kentucky Geological Survey. 2002. Geology of Kentucky. Based on Geologic Map of Kentucky, 1988.

Kentucky Geological Survey. 2006. Madison County Land-Use Planning Maps. University of Kentucky, Lexington, Kentucky

Kentucky Infrastructure Authority. 1999. Water Resource Development: A Strategic Plan. Summary of Water Systems. 2000. Strategic Water Resource Development Plan. Summary of Wastewater Treatment Systems. Area Development District. <http://www.kia.ky.gov/wris/>.

Kentucky Infrastructure Authority. 2008. Water Resource Information System. Last accessed August 2010 at <http://www.kia.ky.gov/wris/>.

KRS 224.71-100 through 224.71-145. 1994. Kentucky Agricultural Water Quality Act.

McDowell, Robert C. 2001. The Geology of Kentucky – A Text to Accompany the Geologic Map of Kentucky. U.S. Geological Survey Professional Paper 1151-H. Online Version 1.0

McGrain, Preston. 1983. The Geologic Story of Kentucky. Special Publication 8, Series XI. Kentucky Geological Survey. Lexington, Kentucky.

Shaffer, K.A. and F.R. Walls. 2005. Livestock Manure Production Rates and Nutrient Content. North Carolina Department of Agriculture and Consumer Services. Raleigh, North Carolina.

United States Census Bureau. Census 2000, 2010 and Demographic Profiles.
<http://www.census.gov/html>

United States Department of Agriculture, National Agricultural Statistics Service. 2002. 2002 Census of Agriculture. <http://www.nass.usda.gov/census/>

United States Department of Agriculture, Natural Resources Conservation Service, KY Digital Soils Data (SSURGO). 2008 SSURGO Soils. <http://www.ky.nrcs.usda.gov/technical/GIS/>

United States Environmental Protection Agency. 2001. Protocol for Developing Pathogen TMDLs. First Edition. EPA 841-R-00-002, U.S. Environmental Protection Agency.

United States Environmental Protection Agency. 2002. Onsite Wastewater Treatment Systems Manual. 2002. EPA 625-R-00-008, U.S. Environmental Protection Agency.

United States Environmental Protection Agency. 2010a. Permit Compliance System. Last accessed August 2010 at http://www.epa.gov/enviro/html/pcs/pcs_query_java.html

United States Environmental Protection Agency. 2010b. Envirofacts Data Warehouse. Last accessed August 2010 at <http://oaspub.epa.gov/enviro/index.html>

United States Environmental Protection Agency. 2010c. Introduction to Total Maximum Daily Loads <http://www.epa.gov/owow/tmdl/intro.html>

United States Geologic Survey. 1986. The Geology of Kentucky – A Text to Accompany the Geologic Map of Kentucky. U.S. Geological Survey Professional Paper 1151-H.

United States Geological Survey in cooperation with the U.S. Environmental Protection Agency. 2003. National Hydrography Dataset.

Vogelmann, J.E., S.M. Howard, L. Yang, C. R. Larson, B. K. Wylie, and J. N. Van Driel, 2001, Completion of the 1990's National Land Cover Data Set for the conterminous United States, Photogrammetric Engineering and Remote Sensing 67:650-662. www.mrlc.gov

Appendix A

- Land Use Analysis -

The land uses generated by the 2001 NLCD were consolidated for presentation purposes within the report. All forested land (deciduous, evergreen and mixed) and shrubbery was aggregated and reported as one category. Further, all residential land use area was aggregated and reported as one category; developed land. The NLCD returned small but positive values for three types of residential land uses—Developed Open Space, Low-Intensity Residential, and High-Intensity Residential. Developed Open Space is a term applied to differing types of land use, within urban areas it is the designation given to parkland and other green areas. However, in rural watersheds such as Cox Creek, it denotes residential areas with insufficient density to be classified as Low-Intensity Residential but is mainly composed of single family residences on large lots (James Seay, 2006, Personal Communication). Further descriptions of the NLCD classifications are provided below.

National Land Cover Database Class Descriptions (Homer et al, 2004)

(11) Open Water - All areas of open water, generally with less than 25% cover of vegetation or soil.

(21) Developed, Open Space - Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes

(22) Developed, Low Intensity - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49 percent of total cover. These areas most commonly include single-family housing units.

(23) Developed, Medium Intensity - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-79 percent of the total cover. These areas most commonly include single-family housing units.

(24) Developed, High Intensity - Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to 100 percent of the total cover.

(31) Barren Land (Rock/Sand/Clay) - Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.

(41) Deciduous Forest - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.

(42) Evergreen Forest - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. Canopy is never without green foliage.

(43) Mixed Forest - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of total tree cover.

(52) Shrub/Scrub - Areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20 percent of total vegetation. This class includes true shrubs, young trees in an early successional stage, or trees stunted from environmental conditions.

(71) Grassland/Herbaceous - Areas dominated by grammanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.

(81) Pasture/Hay - Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.

(82) Cultivated Crops - Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled.

(90) Woody Wetlands - Areas where forest or shrubland vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

(95) Emergent Herbaceous Wetlands - Areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Appendix B

- Cox Creek Watershed Health Report -

September 14th, 2010

Kentucky Division of Water
200 Fair Oaks Lane, 4th Floor
Frankfort, KY 40601
Phone: 502-564-3410
Website: <http://water.ky.gov>

Cox Creek Watershed Health Report

Department for Environmental Protection - Division of Water

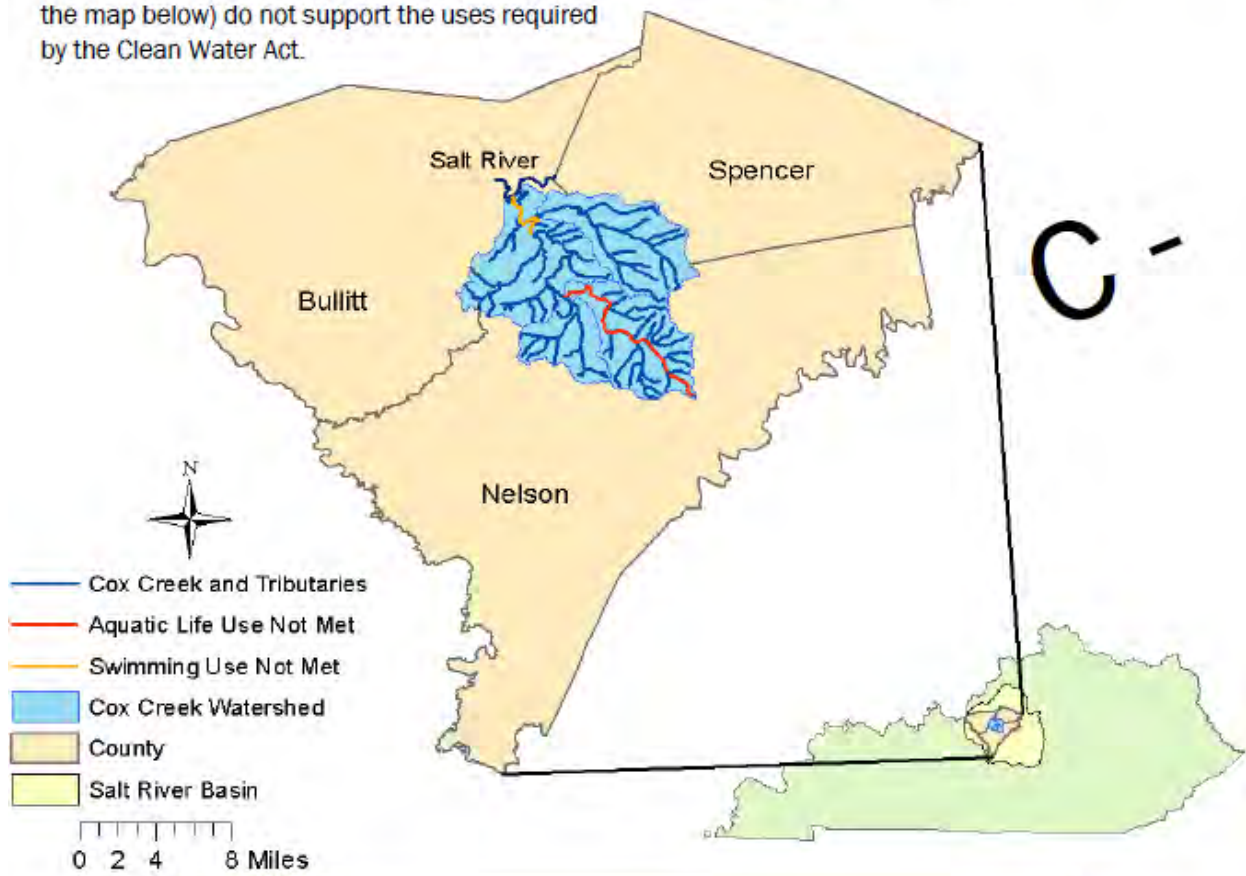
The Kentucky Division of Water (DOW) is the state agency responsible for carrying out the requirements of the Clean Water Act to reach the goal of making all waters in Kentucky safe for swimming and fishing (called **uses**).

DOW has developed this health report to inform the residents of Bullitt, Spencer and Nelson counties of efforts to examine the health of Cox Creek and the area of land that drains into Cox Creek, which is called a **watershed**.

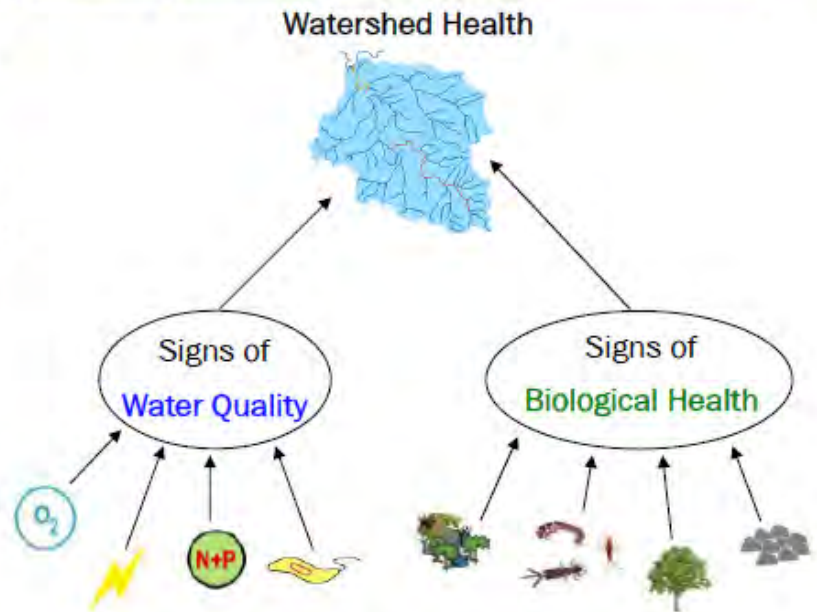
Upon initial evaluation, it was determined that parts of Cox Creek (shown in red and orange on the map below) do not support the uses required by the Clean Water Act.

The U.S. Environmental Protection Agency (EPA) requires that states conduct watershed studies on all such waters to calculate the maximum amount of pollution a creek can receive and still support a healthy watershed. This amount is known as a **Total Maximum Daily Load**, or TMDL.

Following a year-long study in 2009 by DOW to gather scientific data, the division has given a "report card grade" of a **C-** to the watershed. This health report explains the signs of health that went into assigning that grade and provides information on how the grade can be improved.



1. Data collected were divided into signs of **water quality** or signs of **biological health**.
2. Each sign received a grade, A through F, according to the results of our study, which were compared to health and science requirements and DOW scientific information.
3. The grades from each biological health sign were averaged to achieve a biological health score.
4. Similarly, each sign of water quality was averaged to achieve a water quality score.
5. These two scores were averaged to achieve a **watershed health grade**.



Signs of Water Quality



Dissolved Oxygen: Concentration of oxygen dissolved in water and readily available to fish and other aquatic organisms.



Specific Conductivity: A measure of the ability of water to conduct an electrical current, which is used for approximating the total dissolved solids content of water. Low specific conductivity is desired, and increasing specific conductivity negatively impacts fish and aquatic bugs.



Nitrogen and Phosphorus (Nutrients): Although natural sources of nutrients exist, major sources of nutrient pollution are typically caused by man's activities and include municipal sewage-treatment plants, industrial outflows, commercial fertilizers and animal waste.



E. Coli: A type of bacteria that lives in the intestinal tract of man and other warm-blooded animals. For a site to receive an F, the *E. coli* concentration was above the level considered safe for swimming 80 to 100 percent of the time.

Signs of Biological Health



Total Habitat: Stream habitat is assessed by scoring 10 habitat signs, which are both living and nonliving parts of the surroundings that support an organism, population or community.











Aquatic Macroinvertebrates (bugs): An animal without a backbone, large enough to be seen with the naked eye. They are often the immature forms of insects that live on land as adults and are an important food source for fish. Different species prefer different habitats, and some are more tolerant of pollution than others.



Riparian Zone: Land adjacent to a stream that has distinct soil types and plant communities, which aid in absorbing water and shading the stream. To receive an A, the riparian zone must be at least 18 yards wide on each side of the stream.



Available Cover: The quantity and variety of structures in the creek that provide a place for aquatic organisms to hide, feed, reproduce and raise young. Examples include cobble and boulders, fallen trees, logs, branches, root mats, undercut banks and aquatic vegetation.

| DOW Number | Creek Name |  |  |  |  |  |  |  |  | Site Grade |
|-----------------|---------------------|---|---|---|---|--|---|---|---|------------|
| 1) DOW12005002 | Cox Creek | B+ | B+ | | F | | | D | F | D |
| 2) DOW12005003 | Rocky Run | A | C | | F | | | | | C |
| 3) CFD12005501 | East Fork Cox Creek | B | B+ | | F | | | B | D | C |
| 4) DOW12005004 | West Fork Cox Creek | A | C | | F | | | D | C | C- |
| 5) DOW12005005 | Cox Creek | D | B | | F | | | D | D | D |
| 6) CFD12005502 | Cox Creek | C | B | C- | D | F | F | D | D | D |
| 7) DOW12005006 | Froman Creek | F+ | B | | D | | | | | C- |
| 8) DOW12005007 | Cox Creek | C | B | C- | F | | | | | C- |
| 9) DOW12005008 | Cox Creek | B | B | C- | D | | | | | C |
| 10) DOW12005009 | Caney Fork | C | B | C | F | D | F | C | F | D+ |
| 11) DOW12005010 | Cox Creek | D+ | B | C- | F | F | D | D | D | D |
| 12) DOW12005001 | Cox Creek UT | | | | | F | A | B | C | C+ |





0 0.5 1 2 Miles

Watershed Grade: C-



- Sampling Sites
- Cox Creek and Tributaries
- Failing Segments
- Roads
- Spencer County
- Bullitt County
- Nelson County

Summary: Room for Improvement

| POSITIVES | NEGATIVES | GRAY AREA |
|---|--|---|
| <p> * Specific conductivity was fairly good, indicating reasonably low dissolved solids.</p> <p> * Dissolved oxygen (DO) levels were, for the most part, suitable for fish and bugs. Lower DO grades at a few sites probably resulted from over growth of algae that occurs when loss of tree cover reduces stream shading and nutrients runoff into streams.</p> | <p> * From May to November 2009, 8 of the 11 sites had <i>E. coli</i> concentrations above the safe standard for swimming 80 to 100 percent of the time. These levels may cause gastrointestinal illness if the water is swallowed or infection if contact is made with an open sore or wound.</p> <p>* Decreasing numbers and types of fish and bugs were related to loss of habitat, riparian zone and cover. This cover provides habitat for beneficial bacteria, which are eaten by the bugs that are then eaten by the fish. This cover also provides habitat for fish and bugs to live, feed, mate and hide from predators.</p> <p>* Rising water temperatures due to loss of shading when trees are cut and banks cleared.</p> | <p> * For the most part, nitrogen and phosphorous levels were reasonable but rose following rain events due to pollution entering the stream with runoff or sewer overflow.</p> <p>* To reduce these periodic increases in nutrients, land management should include introduction of permeable surfaces, sewer line extension, use of rain barrels and rain gardens, increased stream bank vegetation and correct use of fertilizers.</p> |

What can you do?

- **Trees are the best way to protect and restore water quality and biological health.**
 - ◊ Leave in place or establish vegetation alongside streams to provide natural filters that stabilize stream banks, minimize erosion, regulate water flow, provide shade, and absorb excess nutrients.
 - ◊ Plant trees and do not mow within 18 yards of the stream bank.
- **To keep water safe for swimming,** keep animals out of the streams, which will limit the amount of animal waste entering the waterways, reduce excess nutrients, and protect habitat.
- **To improve habitat,** allow fallen trees, logs, leaves, gravel, cobble and boulders to remain in the stream to create habitat for fish and bugs to feed, find refuge and reproduce.
- **To reduce nutrients**
 - ◊ Use chemicals and pesticides according to labels and fertilizers based on soil test results. Limit uses and store and dispose of properly.
 - ◊ Report sewer leaks and overflow problems.
 - ◊ Properly dispose of pet waste.
- Keep grass clippings, petroleum products, trash, and litter out of storm drains; this material enters the stream directly without treatment.
- Service your vehicle regularly to prevent oil and anti-freeze leaks and reduce noxious emissions.
- Become a certified citizen volunteer water quality monitor or establish a program in your local community or watershed.
- Talk to your local legislators about improving the health of your watershed. Stress the importance of **land management** as land is developed.

Where to go for more information

| | |
|--|--|
| <p>Volunteering</p> <p>* Watershed Watch in Kentucky: water.ky.gov/wsw/Pages/default.aspx or contact Jo Ann Palmer at 800-928-0045 or JoAnn.Palmer@ky.gov</p> <p>Purchasing or planting native trees and plants</p> <p>* Division of Forestry: forestry.ky.gov/Pages/default.aspx</p> <p>* Kentucky Native Plant Society: www.knps.org/plant_resources.html</p> | <p>Grants and programs</p> <p>* KY's Nonpoint Source (Runoff) Pollution program: water.ky.gov/nsp/Pages/default.aspx</p> <p>* KY's Natural Resource Conservation Service: www.ky.nrcs.usda.gov/</p> <p>* KY's 319 Grant program: water.ky.gov/Funding/Pages/NonpointSource.aspx or contact James Roe at 502-564-3410 or James.Roe@ky.gov</p> <p>Making changes at home and work</p> <p>* Bluegrass PRIDE: www.bgpride.org/gallery1.htm</p> |
|--|--|

Appendix C

- Discharge Monitoring Report (DMR) Information for KPDES-permitted Sources -

DMR Numeric Violations

Nitrogen, ammonia total

| NPDES ID | Monitoring | Outfall | Limit Set | DMR Value | Limit Value | Limit Units |
|-----------|------------|---------|-----------------------|-----------|-------------|----------------------|
| KY0096075 | 8/1/2007 | 001 | 1-SANITARY WASTEWATER | 6.9 | 4. | Milligrams per Liter |
| KY0096075 | 9/1/2007 | 001 | 1-SANITARY WASTEWATER | 6.9 | 4. | Milligrams per Liter |
| KY0096075 | 10/1/2007 | 001 | 1-SANITARY WASTEWATER | 6.9 | 4. | Milligrams per Liter |
| KY0096075 | 5/1/2008 | 001 | 1-SANITARY WASTEWATER | 4.6 | 4. | Milligrams per Liter |
| KY0096075 | 8/1/2008 | 001 | 1-SANITARY WASTEWATER | 4.1 | 4. | Milligrams per Liter |
| KY0096075 | 7/1/2011 | 001 | 1-SANITARY DISCHARGE | 7.2 | 4. | Milligrams per Liter |
| KY0096075 | 7/1/2011 | 001 | 1-SANITARY DISCHARGE | 7.2 | 6. | Milligrams per Liter |

Phosphorous, total

| NPDES ID | Monitoring | Outfall | Limit Set | DMR Value | Limit Value | Limit Units |
|-----------|------------|---------|----------------------|-----------|-------------|----------------------|
| KY0096075 | 7/1/2009 | 001 | 1-SANITARY DISCHARGE | 7.48 | 1. | Milligrams per Liter |
| KY0096075 | 10/1/2009 | 001 | 1-SANITARY DISCHARGE | 7.48 | 1. | Milligrams per Liter |
| KY0096075 | 1/1/2010 | 001 | 1-SANITARY DISCHARGE | 3.15 | 1. | Milligrams per Liter |
| KY0096075 | 4/1/2010 | 001 | 1-SANITARY DISCHARGE | 6.13 | 1. | Milligrams per Liter |
| KY0096075 | 7/1/2010 | 001 | 1-SANITARY DISCHARGE | 7.63 | 1. | Milligrams per Liter |
| KY0096075 | 10/1/2010 | 001 | 1-SANITARY DISCHARGE | 3.28 | 1. | Milligrams per Liter |
| KY0096075 | 7/1/2011 | 001 | 1-SANITARY DISCHARGE | 4.02 | 1. | Milligrams per Liter |

Solids, total suspended

| NPDES ID | Monitoring | Outfall | Limit Set | DMR Value | Limit Value | Limit Units |
|-----------|------------|---------|----------------------|-----------|-------------|----------------------|
| KY0096075 | 7/1/2009 | 001 | 1-SANITARY DISCHARGE | 50 | 30. | Milligrams per Liter |

Appendix D

- WRIS Reports -

The following paragraphs explaining the WRIS and WRIS portal were copied from their website in July 2012 and can be accessed at <http://kia.ky.gov/wris/>.

The Water Resource Information System (WRIS) has been developed through the cooperative efforts of water and wastewater treatment systems and local, regional, and state agencies. It is used by all these entities, and provides much of the information needed for all aspects of water resource planning--from watershed protection to infrastructure development. The WRIS includes a geographic information system (GIS), and information on water resources, drinking water systems, wastewater treatment systems, project development, emergency response, regulations, and planning.

The WRIS is comprised of strategic plans, water resource maps and publications, systems management information, reporting and regulatory requirements, guidance and training documents, procedural guidance and forms for project implementation and funding, and internet links to support services. Interactive maps in the system support planning and regionalization efforts. The interactive maps also facilitate drought monitoring and response, and rapid response to contamination emergencies. The GIS contains data for water and wastewater treatment facilities, water lines, water sources, storage facilities, sewer lines, and a database of non-spatial systems information. The GIS provides the fundamental data needed for the planning and emergency response activities. Using the GIS infrastructure data in computer models allows for cost-effective analysis of engineering alternatives, and facilitates the efficiencies needed to meet the needs of Kentucky's infrastructure development.

WRIS system reports can be generated using system data accessed via the WRIS portal. Likewise project profile forms can be generated using project profile data accessed via the WRIS portal. There are two permitted wastewater systems that have sanitary sewer collection infrastructure within the Cox Creek watershed but do not discharge to any of its waters. The city of Bardstown operates a sanitary sewer collection system and six lift stations within upper Cox, Froman and Caney Creeks. This wastewater is treated at the Bardstown Wastewater Treatment Plant. The city of Bloomfield, located less than five miles to the east, operates one pump station in the headwaters of Cox Creek. Wastewater from this station is treated at the Bloomfield Sewage Treatment Plant. Both systems have several projects on the Clean Water State Revolving Fund List. These projects include sewer line extensions and pump station upgrade and construction. One of these projects involves extending the Bardstown sanitary sewer collection system to Cox Creek Elementary school in order to eliminate its 'inadequate package treatment plant'. These systems and projects are discussed further in Sections 5 and 8 of the document. The WRIS system reports and project profiles are included below.



WRIS System Data Report

KY0021237 - Bardstown Sewer System



| | |
|---|---|
| DOW Permit ID: KY0021237 | Link: EPA PCS Report |
| DOW Permit Type: WASTE WATER (KPDES) | Link: EPA ECHO Report |
| DOW Permit Name: Bardstown STP | |
| WRIS System Name: Bardstown Sewer System | |
| System Type: Wastewater | Receiving Waters: Town Crk & Rowan Crk Junction |
| ADD ID: LTADD | Primary County: Nelson Dow Field Office: Columbia |
| Permit Dates: Issued: 06.23.2005 | Expired: 07.31.2010 Inactivated: |

SYSTEM CONTACT INFORMATION

Contact: **Larry Hamilton**
 Title: **Public Works Director**
 Address Line 1: **220 N Fifth St**
 Address Line 2:
 City: **Bardstown** State: **KY** Zip: **40004**
 Phone: **502-348-5947** Email: lahamilton@bardstowncable.net
 Data Source: **KENTUCKY INFRASTRUCTURE AUTHORITY**

Date Last Modified: 06.04.2010

OWNER ENTITY INFORMATION

| | |
|--|---|
| Entity Type: City / Municipal Utility | PSC Group ID: 8800300 |
| Entity Name: City of Bardstown | |
| Web URL: | |
| Office EMail: bbryant@bardstowncable.net | |
| Office Phone: 502-348-5947 | Toll Free: Fax: 502-348-2433 |
| Mail Address Line 1: 220 N Fifth St | Phys Address Line 1: |
| Mail Address Line 2: | Phys Address Line 2: |
| Mail City, State Zip: Bardstown, KY 40004 | Phys City, State Zip: |
| Contact: Bobbe Blincoe | Manager: Larry Hamilton |
| Contact Title: City Clerk | Manager Title: Public Works Director |
| Contact EMail: bblincoe@bardstowncable.net | Manager EMail: lahamilton@bardstowncable.net |
| Contact Phone: 502-331-7006 | Manager Phone: 502-331-7087 |
| Contact Cell: | Manager Cell: |
| Authorized Official: William S Sheckles | |
| Auth. Official Title: Mayor | |
| Auth. Official EMail: mayorsheckles@bardstowncable.net | |
| Auth. Official Phone: 502-331-7007 | Auth. Official Cell: |
| Data Source: KENTUCKY DEPARTMENT FOR LOCAL GOVERNMENT | Date Last Modified: 09.12.2012 |

DEMOGRAPHIC INFORMATION

Counties Directly Served: **1**
 Directly Serviceable Population: **21,621**
 Indirectly Serviceable Population:
 Total Serviceable Population: **21,621**

| County Served | Connection Count | Serviceable Population |
|---------------|------------------|------------------------|
| Nelson | 6,900 | 21,621 |
| Totals | 6,900 | 21,621 |

Note: Population counts are based on KIA census block overlay with WRIS mapped features.

| | | |
|-------------------|---------|------|
| System Respondent | ADD WMP | Date |
|-------------------|---------|------|



WRIS System Data Report

KY0021237 - Bardstown Sewer System



DOW Permit ID: **KY0021237** [Link: EPA PCS Report](#)
DOW Permit Type: **WASTE WATER (KPDES)** [Link: EPA ECHO Report](#)
DOW Permit Name: **Bardstown STP**
WRIS System Name: **Bardstown Sewer System**
System Type: **KPDES Public Wastewater** Receiving Waters: **Town Crk & Rowan Crk Junction**
ADD ID: **LTADD** Primary County: **Nelson** Dow Field Office: **Columbia**
Permit Dates: Issued: **06.23.2005** Expired: **07.31.2010** Inactivated:

FISCAL ATTRIBUTES

Date Established: **01.01.1960** Employees: **2**

Does this system:

- (a) Operate a wastewater treatment facility? **Yes**
- (b) Send wastewater to other systems to be treated? **No**
- (c) Treat wastewater from other systems? **No**

What is the customer cost per 4,000 gallons of treated water? **\$18.02**

Comments:

Date Last Modified: **06.29.2010**



WRIS System Data Report

KY0021237 - Bardstown Sewer System



| | |
|---|---|
| DOW Permit ID: KY0021237 | Link: EPA PCS Report |
| DOW Permit Type: WASTE WATER (KPDES) | Link: EPA ECHO Report |
| DOW Permit Name: Bardstown STP | |
| WRIS System Name: Bardstown Sewer System | |
| System Type: KPDES Public Wastewater | Receiving Waters: Town Crk & Rowan Crk Junction |
| ADD ID: LTADD | Primary County: Nelson Dow Field Office: Columbia |
| Permit Dates: Issued: 06.23.2005 | Expired: 07.31.2010 Inactivated: |

SYSTEM PLANNING

Wastewater Treatment Plants (KIA):

| Facility Name | Design Capacity (MGD) | Max Hydr. Capacity (MGD) | Ave. Daily Flow (MGD) |
|----------------|-----------------------|--------------------------|-----------------------|
| BARDSTOWN WWTP | 3.000 | 3.000 | 2.500 |

- ✓ This system has an approved facility plan.
- Estimated percentage of facility plan constructed: %
- Date facility plan last revised or amended: **01.01.2002**
- Number of manholes in collection system:
- Percentage of sewer lines 20 years or older: **60**

DOW Design Capacity (MGD): **3.000**
 Annual Volume Treated (MG): **436.800**
 KISOP Volume Sent (MG):
 Total Annual Volume (MG): **436.800**

KISOP Customers:
 Residential Customers: **6,678**
 Commercial Customers:
 Institutional Customers:
 Industrial Customers: **22**
 Other Customers: **200**
 Total Customers: **6,900**
 Comments:

Date Last Modified: 06.29.2010

WMP Site Visit - Survey Information:

Site Visit / Survey Date: **10.17.2011**
 Survey Administrator: **LTADD**
 Principal Respondent: **Larry Hamilton**
 Other Respondent(s): **Jessica Filiatreau**
 Comments: **Jessica Filiatreau has joined the City's staff.**

Date Last Modified: 04.10.2012



WRIS System Data Report

KY0021237 - Bardstown Sewer System



DOW Permit ID: **KY0021237**
DOW Permit Type: **WASTE WATER (KPDES)**
DOW Permit Name: **Bardstown STP**
WRIS System Name: **Bardstown Sewer System**

[Link: EPA PCS Report](#)
[Link: EPA ECHO Report](#)

System Type: **Wastewater** Receiving Waters: **Town Crk & Rowan Crk Junction**
ADD ID: **LTADD** Primary County: **Nelson** Dow Field Office: **Columbia**
Permit Dates: Issued: **06.23.2005** Expired: **07.31.2010** Inactivated:

SYSTEM MAINTENANCE

This system has a policy manual in place containing the following items:

- ✓ Personnel Policies
- ✓ Standard Operating Procedures
- ✓ Operation and Maintenance Procedures
- ✓ Routine Maintenance Program
- ✓ Emergency Operation Procedures
- ✓ Backup Sources

- ✓ The management of this system participates in regular training activities.
- ✓ System operator(s) participate in regular training activities.
- ✓ This system utilizes standard specifications.

Date standard specifications last revised:
Date of last infiltration analysis: **01.01.2006**

- ✓ This system has periodic service outages.
Cause(s): **Storms - substation failures**
- ✓ This system experiences problematic weather.
Weather: **Severe storms can cause isolated short - term outages**
- ✓ This system has localized problems.

The following components are associated with localized problems:
Problem location(s): **Low lying areas**
Problem diameter(s): **0**
Problem Material(s): **Clay**
Problem cause(s):

Other problem characteristics:

- ✓ This system has as-built plans (record drawings).
Est. degree of accuracy for as-built plans (%):
- ✓ This system uses an on-staff inspector(s) for construction projects.

Date of last infiltration analysis: **01.01.2006**

Maintenance notes for this system:

Date Last Modified: 06.29.2010



WRIS System Data Report

KY0021237 - Bardstow Sewer System



The following projects are associated with this system:

| PNUM | Applicant | Project Status | Funding Status | Schedule | Project Title | Profile Modified | GIS Modified |
|------------|----------------------------|----------------|------------------|-----------|---|------------------|--------------|
| SX21179008 | City of Bloomfield | Approved | Fully Funded | 0-2 Years | Bloomfield Pump Station and Forcemain to Bardstow | 04.10.2012 | 09.21.2010 |
| SX21179014 | City of Bardstow | Approved | Not Funded | 3-5 Years | BARDSTOWN COX | 07.29.2011 | 09.21.2010 |
| SX21179016 | City of Bardstow | Approved | Partially Funded | 3-5 Years | City of Bardstow-Town Creek Interceptor | 04.10.2012 | 09.21.2010 |
| SX21179018 | Nelson County Fiscal Court | Approved | Not Funded | 0-2 Years | NELSON COUNTY INDUSTRIAL PARK WASTEWATER PROJECT | 07.29.2011 | 09.21.2010 |
| SX21179019 | City of Bardstow | Approved | Fully Funded | 0-2 Years | BARDSTOWN-BLOOMFIELD SEWER CONNECTION PROJECT | 04.10.2012 | 09.21.2010 |
| SX21179024 | City of Bardstow | Approved | Not Funded | 0-2 Years | Bardstow SSES | 09.07.2012 | 09.21.2010 |



WRIS System Data Report

KY0096075 - Coxs Creek Elementary School



| | | |
|---|-----------------------------------|---------------------------------------|
| DOW Permit ID: KY0096075 | | Link: EPA PCS Report |
| DOW Permit Type: WASTE WATER (KPDES) | | Link: EPA ECHO Report |
| DOW Permit Name: Coxs Creek Elem School | | |
| WRIS System Name: Coxs Creek Elementary School | | |
| KPDES | | |
| Non-Public | | |
| System Type: Wastewater | Receiving Waters: Coxs Crk | |
| ADD ID: LTADD | Primary County: Nelson | Dow Field Office: Columbia |
| Permit Dates: Issued: 03.27.2009 | Expired: 04.30.2014 | Inactivated: |

SYSTEM CONTACT INFORMATION

Contact: **Charles Thompson**
 Title:
 Address Line 1: **Nelson Co Bd of Ed**
 Address Line 2: **1200 Cardinal Dr**
 City: **Bardstown** State: **KY** Zip: **40004**
 Phone: **502-349-0951** Email:
 Data Source: **KENTUCKY DIVISION OF WATER**

Date Last Modified: 06.03.2010

OWNER ENTITY INFORMATION

| | |
|--|--|
| Entity Type: School | PSC Group ID: |
| Entity Name: Coxs Creek Elementary School | |
| Web URL: | |
| Office EMail: | |
| Office Phone: 502-349-7050 | Toll Free: Fax: 502-349-7024 |
| Mail Address Line 1: 5635 Louisville Rd | Phys Address Line 1: 5635 Louisville Rd |
| Mail Address Line 2: | Phys Address Line 2: |
| Mail City, State Zip: Coxs Creek, KY 40013 | Phys City, State Zip: Coxs Creek, KY 40013 |
| Contact: Jan Lanham | Manager: Jan Lanham |
| Contact Title: School Principal | Manager Title: School Principal |
| Contact EMail: jan.lanham@nelson.kyschools.us | Manager EMail: jan.lanham@nelson.kyschools.us |
| Contact Phone: 502-349-7050 | Manager Phone: 502-349-7050 |
| Contact Cell: | Manager Cell: |
| Authorized Official: Anthony Orr | |
| Auth. Official Title: School District Superintendent | |
| Auth. Official EMail: anthony.orr@nelson.kyschools.us | |
| Auth. Official Phone: 502-349-7000 | Auth. Official Cell: |
| Data Source: KENTUCKY DEPARTMENT OF EDUCATION | Date Last Modified: 09.12.2012 |

DEMOGRAPHIC INFORMATION

| | | | |
|---|----------------------|-------------------------|-------------------------------|
| Counties Directly Served: 1 | County Served | Connection Count | Serviceable Population |
| Directly Serviceable Population: 155 | Nelson | 1 | 155 |
| Indirectly Serviceable Population: | Totals | 1 | 155 |
| Total Serviceable Population: 155 | | | |

Note: Population counts are based on KIA census block overlay with WRIS mapped features.



WRIS System Data Report

KY0096075 - Coxs Creek Elementary School



| | | |
|---|-----------------------------------|---------------------------------------|
| DOW Permit ID: KY0096075 | | Link: EPA PCS Report |
| DOW Permit Type: WASTE WATER (KPDES) | | Link: EPA ECHO Report |
| DOW Permit Name: Coxs Creek Elem School | | |
| WRIS System Name: Coxs Creek Elementary School | | |
| KPDES | | |
| Non-Public | | |
| System Type: Wastewater | Receiving Waters: Coxs Crk | |
| ADD ID: LTADD | Primary County: Nelson | Dow Field Office: Columbia |
| Permit Dates: Issued: 03.27.2009 | Expired: 04.30.2014 | Inactivated: |

SYSTEM MAINTENANCE

This system has a policy manual in place containing the following items:

- | | |
|--|---|
| <input checked="" type="checkbox"/> Personnel Policies | <input checked="" type="checkbox"/> Standard Operating Procedures |
| <input checked="" type="checkbox"/> Operation and Maintenance Procedures | <input checked="" type="checkbox"/> Routine Maintenance Program |
| <input checked="" type="checkbox"/> Emergency Operation Procedures | <input checked="" type="checkbox"/> Backup Sources |

The management of this system participates in regular training activities.

System operator(s) participate in regular training activities.

This system utilizes standard specifications.

Date standard specifications last revised: **05.01.2001**

Date of last infiltration analysis:

This system has periodic service outages.

Cause(s): **Weather**

This system experiences problematic weather.

Weather: **Severe winter weather (ice storms)**

This system has localized problems.

The following components are associated with localized problems:

Problem location(s):

Problem diameter(s):

Problem Material(s):

Problem cause(s):

Other problem characteristics:

This system has as-built plans (record drawings).

Est. degree of accuracy for as-built plans (%):

This system uses an on-staff inspector(s) for construction projects.

Date of last infiltration analysis:

Maintenance notes for this system:

Date Last Modified: 05.23.2002



Clean Water Project Profile

Legal Applicant: **City of Bloomfield**

Project Title: **Bloomfield Pump Station and Forcemain to Bardstown**

Project Number: **SX21179008** [View Map](#)

Submitted By: **LTADD**

Funding Status: **Fully Funded**

Primary County: **Nelson**

Project Status: **Approved**

Planning Unit: **Nelson**

Project Schedule: **0-2 Years**

Multi-County: **No**

E-Clearinghouse SA#: **KY200806240782**

ECH Status: **Endorse With Condition**

Applicant Entity Type: **City / Municipal Utility**

Date Approved (AWMPC): **06-14-2005**

Project Description:

This proposed transport system includes the construction of a new pump station located at the site of the existing Bloomfield WWTP. The pump station would be designed to pump 1,000Gpm of wastewater from the Bloomfield collection system. The pump station would utilize a 12-inch force main from Bloomfield to Bardstown along KY Hwy 62, approx. 11 miles. It would connect with the Bardstown collection system at the existing town creek interceptor (Hwy 162). This project would allow for the removal of the existing Bloomfield WWTP from active service and allow it to be used for wet weather storage. The Bloomfield WWTP is not equipped to handle existing and future flows, and would otherwise require an upgrade. Initial work would also include sludge removal and lagoon preparation for conversion.

Need for Project:

Briefly describe how this project promotes public health or achieves and/or maintains compliance with the Clean Water Act or Safe Drinking Water Act. Project will eliminate an inadequate and failing treatment plant at Bloomfield and a new pump station at Bloomfield May allow unsewered communities of chaplain & Fairfield to have a conduit to municipal wastewater treatment at Bardstown.

Project Alternatives:

Alternate A:

Build new Bloomfield WWTP (oxidation ditch)

Alternate B:

Build new bloomfield WWTP (contact stabilization)

Alternate C:

Do nothing

Legal Applicant:

Entity Type: **City / Municipal Utility**

PSC Group ID:

Entity Name: **City of Bloomfield**

Web URL:

Office EMail: bfield06@bardstowncable.net

Office Phone: **502-252-5235**

Toll Free:

Fax: **502-252-9013**

Mail Address Line 1: **PO Box 206**

Phys Address Line 1:

Mail Address Line 2:

Phys Address Line 2:

Mail City, State Zip: **Bloomfield, KY 40008**

Phys City, State Zip:

Contact: **Jean M Jury**

Manager: **Craig Werner**

Contact Title: **City Clerk**

Manager Title: **Public Works Director**

Contact EMail: bfield06@bardstowncable.net

Manager EMail: cr.werner@bardstowncable.net

Contact Phone: **502-252-5235**

Manager Phone: **502-252-5746**

Contact Cell:

Manager Cell:

Authorized Official: **Rhonda K Hagan**

Auth. Official Title: **Mayor**

Auth. Official EMail: rhagan@bardstowncable.net

Auth. Official Phone: **502-252-5235**

Auth. Official Cell:

Data Source: **KENTUCKY DEPARTMENT FOR LOCAL GOVERNMENT**

Date Last Modified: **09.12.2012**



Clean Water Project Profile
SX21179008 - City of Bloomfield
Bloomfield Pump Station and Forcemain to Bardstown

Project Administrator (PA) Information

Name: **Ashley S Willoughby**
Title: **Community Development Specialist**
Organization: **Lincoln Trail Area Development District**
Address Line 1: **613 College St Rd**
Address Line 2: **PO Box 604**
City: **Elizabethtown** State: **KY** Zip: **42701**
Phone: **270-769-2393** Fax: **270-769-2993**

Project Engineer (PE) Information:

This project requires a licensed Professional Engineer.

License No: **PE 18511**

PE Name: **Mark A. Sneve**

Phone: **502-583-7020** Fax: **502-583-7026**

E-Mail: **mark.sneve@strand.com**

Firm Name: **Strand Associates, Incorporated**

Addr Line 1: **Strand Associates, Inc.**

Addr Line 2: **325 W. Main St., Ste. 710**

Addr Line 3:

City: **Louisville** State: **KY** Zip: **40202**

Status: **Current** Disciplinary Actions: **NO**

Issued: **11-02-1994** Expires: **06-30-2014**

Engineering Firm Information:

Permit No: **663**

Firm Name: **Strand Associates, Incorporated**

Phone: **502-583-1138** Fax:

Web URL: **http://strand.com/**

E-Mail: **chuck.anderson@strand.com**

Addr Line 1: **910 W. Wingra Dr.**

Addr Line 2:

City: **Madison** State: **WI** Zip: **53715**

Status: **Current** Disciplinary Actions: **NO**

Issued: **11-02-1993** Expires: **12-31-2012**



Clean Water Project Profile
 SX21179008 - City of Bloomfield
 Bloomfield Pump Station and Forcemain to Bardstown

Estimated Budget

Project Cost Classification:

| | |
|----------------------------------|---------------------|
| Administrative Exp.: | \$ 25,750 |
| Legal Exp.: | \$ 4,500 |
| Land, Appraisals, Easements: | \$ 207,000 |
| Relocation Exp. & Payments: | |
| Planning: | |
| Engineering Fees - Design: | \$ 235,700 |
| Engineering Fees - Construction: | \$ 56,000 |
| Engineering Fees - Inspection: | \$ 129,350 |
| Engineering Fees - Other: | |
| Construction: | \$ 3,310,000 |
| Equipment: | |
| Miscellaneous: | \$ 50,000 |
| Contingencies: | \$ 600,000 |
| Total Project Cost: | \$ 4,618,300 |

Construction Cost Categories:

| | |
|--|---------------------|
| WWTP Secondary Portion: | |
| WWTP Advanced Portion: | |
| Inflow & Infiltration Correction: | |
| Major Sewer Rehabilitation: | |
| Collector Sewers: | |
| Interceptor Sewers, including Pump Stations: | \$ 3,310,000 |
| Combined Sewer Overflow Correction: | |
| NPS Urban: | |
| Non-Categorized Cost: | |
| Total Construction: | \$ 3,310,000 |

Total Sustainable Infrastructure Costs:

Note: Total Sustainability Infrastructure Costs are included within construction and other costs reported in this section. This breakout is provided for SRF review purposes.

Project Funding Sources:

Total Project Cost: **\$4,618,300**
 Total Committed Funding: **\$4,618,300**
 Funding Gap: **\$0 (Fully Funded)**

This project will be requesting SRF funding for Federal FY 2014.

Detailed Project Schedule:

Environmental Review Status:
 RD Approval:
 CDBG Approval:
 No approval, but Cross-Cutter Scoping Completed:

Construction Permit Application Date: **07-01-2011**
 Construction Permit Application Status: **Submitted**
 KPDES Permit Application Date: **07-01-2011**
 KPDES Permit Application Status: **Submitted**
 Estimated Bid Date: **06-30-2012**
 Estimated Construction Start Date: **07-30-2012**

| Funding Source | Amount | Funding Status | Applicable Date |
|--------------------------|--------------------|----------------|-----------------|
| HB 380 NonCoal Grant | \$2,300,000 | Committed | 8/19/2008 |
| RD Loan | \$2,318,300 | Committed | 1/25/2012 |
| KIA SRF Fund A Loan (CW) | \$2,341,000 | Anticipated | N/A |
| Total: | \$6,959,300 | | |



Clean Water Project Profile
 SX21179008 - City of Bloomfield
 Bloomfield Pump Station and Forcemain to Bardstown

The following systems are beneficiaries of this project:

| DOW PERMIT ID | System Name |
|---------------|-------------------------|
| KY0021237 | Bardstown Sewer System |
| KY0034436 | Bloomfield Sewer System |

Project Ranking by AWMPC:

Regional Ranking(s):

Planning Unit Ranking:

Total Points:

Demographic Impacts (GIS Census Overlay):

| | For Project Area | For Included Systems(s) |
|------------------------|------------------|-------------------------|
| Serviceable Population | | 22,988 |
| Serviceable households | | 9,789 |
| Med. Household Income | | \$47,525 |

Economic Impacts:

| | |
|---------------|--|
| Jobs Created | |
| Jobs Retained | |

Plans and Specifications:

- Plans and specs have been sent to DOW. 12/1/2010
- Plans and specs have been reviewed by DOW. 4/19/2011
- Plans and specs have been sent to PSC.
- Plans and specs have been reviewed by PSC.

New or Improved Service:

| | Survey Based | GIS Census Overlay |
|---------------------------|--------------|--------------------|
| To Unserved Households | | |
| To Underserved Households | | |
| To Total Households | | |

CW Specific Impacts:

Wastewater Volumes (MGD):

| | |
|--------------------------|-------|
| For this project: | |
| For included system(s): | 3.350 |
| Reduced by this project: | |

Other CW Specific Impacts:

- This project provides regionalization and/or consolidation of wastewater treatment systems.
- This project includes an on-site mound, and/or decentralized WW treatment system.
- This project is necessary to achieve full or partial compliance with a court order, agreed order, or a judicial or administrative consent decree.
- This project achieves voluntary compliance (violation with no order).
- This project is consistent with the approved facility plan.
- This project will have a positive impact on drinking water sources within a 5 mile radius.



Clean Water Project Profile
 SX21179008 - City of Bloomfield
 Bloomfield Pump Station and Forcemain to Bardstown

Planning Needs:

- Combined Sewer Overflow (CSO) Correction.
- Sanitary Sewer Overflow (SSO) Correction.
- Replacement or Rehabilitation of Aging Infrastructure.
- New Treatment Plant.
- New Collector Sewers and Appurtenances.
- Decentralized Wastewater Treatment Systems.
- Upgrade to Advanced Treatment.
- Rehab/Upgrade/Expansion of Existing Treatment Plant.
- New Interceptor Sewers and Appurtenances.
- Storm Water Control.
- Non-Point Source (NPS) Pollution Control.
- Recycled Water Distribution.
- Planning.
- Other (specify):

Project Inventory (Mapped Features):

Point Features:

| DOW Permit ID | Count | FeatureType | Purpose | Status | Existing Capacity | Proposed Capacity | Units |
|---------------|-------|-------------|---------|--------|-------------------|-------------------|-------|
| KY0034436 | 2 | LIFTSTATION | | NEW | | | |

Line Features:

| DOW Permit ID | Line Type | Purpose | Activity | Size (in.) | Material | Length (LF) |
|---------------|------------|-------------|-----------|------------|--------------|-------------|
| KY 0034436 | SEWER LINE | INTERCEPTOR | EXTENSION | 12.00 | PVC | 54,203 |
| | | | | | Total Length | 54,203 |

Administrative Components:

- Planning
 Design
 Construction
 Management

Wastewater Treatment Plants Eliminated:

- This project includes the elimination of wastewater treatment plant(s).

| DOW Permit ID | Facility Type | System Name | Eliminated Plants | Hydrolic Capacity (MGD) |
|---------------|---------------|-------------------------|-------------------|-------------------------|
| KY 0034436 | PTP | Bloomfield Sewer System | Bloomfield | 0.350 |
| | | | Total | 0.350 |



Clean Water Project Profile
 SX21179008 - City of Bloomfield
 Bloomfield Pump Station and Forcemain to Bardstown

Sanitary Sewer Components:

- This project includes a new wastewater treatment plant.
 Proposed design capacity (MGD): 0.000

- This project includes an expansion of an existing wastewater treatment plant.
 Current design capacity (MGD): 0.000
 Current treatment volume (MGD): 0.000
 Proposed design capacity (MGD): 0.000

- This project includes rehabilitation of an existing wastewater treatment plant.
- This project includes upgrades to an existing wastewater treatment plant.
- This project includes rehabilitation or replacement of aging infrastructure.
 Total length of replaced infrastructure (LF): 0
- This project includes new collector sewers.
 Total length of replaced infrastructure (LF): 0
- This project includes new interceptor sewers.
 Total length of new interceptor sewer (LF): 54,203
- This project includes elimination of existing sewer system components.
 Number of raw sewage discharges eliminated: 1
 Number of failing septic systems eliminated:
 Number of non-failing septic systems eliminated:

Sustainable Infrastructure - Green Infrastructure:

Green stormwater infrastructure includes a wide array of practices at multiple scales that manage wet weather and that maintains and restores natural hydrology by infiltrating, evapotranspiring and harvesting and using stormwater. On a regional scale, green infrastructure is the preservation and restoration of natural landscape features, such as forests, floodplains, and wetlands, coupled with policies such as infill and redevelopment that reduce overall imperviousness in a watershed. On the local scale, green infrastructure consists of site and neighborhood-specific practices, such as:

| Component | Cost |
|--|------------|
| <input type="checkbox"/> Bioretention | \$0 |
| <input type="checkbox"/> Trees | \$0 |
| <input type="checkbox"/> Green Roofs | \$0 |
| <input type="checkbox"/> Permeable Pavement | \$0 |
| <input type="checkbox"/> Cisterns | \$0 |
| <input type="checkbox"/> Constructed Wetlands | \$0 |
| <input type="checkbox"/> Urban Forestry Programs | \$0 |
| <input type="checkbox"/> Downspout Disconnection | \$0 |
| <input type="checkbox"/> Riparian Buffers and Wetlands | \$0 |
| <input type="checkbox"/> Sustainable Landscaping and Site Design | \$0 |
| <input type="checkbox"/> Purchase of land or easements on land for riparian and wetland protection or restoration. | \$0 |
| <input type="checkbox"/> Fencing to divert livestock from streams and stream buffers.* | \$0 |
| Total Green Infrastructure Cost: | \$0 |

* Indicates a business case may be required for this item.

There are no Green Infrastructure components specified for this project.



Clean Water Project Profile
 SX21179008 - City of Bloomfield
 Bloomfield Pump Station and Forcemain to Bardstown

Sanitary Sewer Components:

- This project includes a new wastewater treatment plant.
Proposed design capacity (MGD): 0.000
- This project includes an expansion of an existing wastewater treatment plant.
Current design capacity (MGD): 0.000
Current treatment volume (MGD): 0.000
Proposed design capacity (MGD): 0.000
- This project includes rehabilitation of an existing wastewater treatment plant.
- This project includes upgrades to an existing wastewater treatment plant.
- This project includes rehabilitation or replacement of aging infrastructure.
Total length of replaced infrastructure (LF): 0
- This project includes new collector sewers.
Total length of replaced infrastructure (LF): 0
- This project includes new interceptor sewers.
Total length of new interceptor sewer (LF): 54,203
- This project includes elimination of existing sewer system components.
Number of raw sewage discharges eliminated: 1
Number of failing septic systems eliminated:
Number of non-failing septic systems eliminated:

Sustainable Infrastructure - Green Infrastructure:

Green stormwater infrastructure includes a wide array of practices at multiple scales that manage wet weather and that maintains and restores natural hydrology by infiltrating, evapotranspiring and harvesting and using stormwater. On a regional scale, green infrastructure is the preservation and restoration of natural landscape features, such as forests, floodplains, and wetlands, coupled with policies such as infill and redevelopment that reduce overall imperviousness in a watershed. On the local scale, green infrastructure consists of site and neighborhood-specific practices, such as:

| Component | Cost |
|--|------------|
| <input type="checkbox"/> Bioretention | \$0 |
| <input type="checkbox"/> Trees | \$0 |
| <input type="checkbox"/> Green Roofs | \$0 |
| <input type="checkbox"/> Permeable Pavement | \$0 |
| <input type="checkbox"/> Cisterns | \$0 |
| <input type="checkbox"/> Constructed Wetlands | \$0 |
| <input type="checkbox"/> Urban Forestry Programs | \$0 |
| <input type="checkbox"/> Downspout Disconnection | \$0 |
| <input type="checkbox"/> Riparian Buffers and Wetlands | \$0 |
| <input type="checkbox"/> Sustainable Landscaping and Site Design | \$0 |
| <input type="checkbox"/> Purchase of land or easements on land for riparian and wetland protection or restoration. | \$0 |
| <input type="checkbox"/> Fencing to divert livestock from streams and stream buffers.* | \$0 |
| Total Green Infrastructure Cost: | \$0 |

* Indicates a business case may be required for this item.

There are no Green Infrastructure components specified for this project.



Clean Water Project Profile

Legal Applicant: **City of Bardstown**
 Project Title: **BARDSTOWN COX**
 Project Number: **SX21179014** [View Map](#)
 Funding Status: **Not Funded**
 Project Status: **Approved**
 Project Schedule: **3-5 Years**
 E-Clearinghouse SAI:
 Applicant Entity Type: **City / Municipal Utility**
 Date Approved (AWMPC): **10-20-2005**

Submitted By: **LTADD**
 Primary County: **Nelson**
 Planning Unit: **Nelson**
 Multi-County: **No**
 ECH Status:

Project Description:

THIS PROPOSED TRANSPORT SYSTEM INCLUDES THE CONSTRUCTION OF A NEW PUMP STATION LOCATED AT THE SITE OF THE EXISTING COX'S CREEK ELEMENTARY SCHOOL PACKAGE TREATMENT PLANT. THE PUMP STATION WOULD BE DESIGNED TO PUMP 180 GPM OF WASTEWATER FROM THE SCHOOL AS WELL AS THE COX'S CREEK COLLECTION SYSTEM. THE PUMP STATION WOULD UTILIZE A 6-INCH FORCE MAIN ALON HWY 31E TO THE BRADSTOWN COLLECTION SYSTEM.

Need for Project:

Briefly describe how this project promotes public health or achieves and/or maintains compliance with the Clean Water Act or Safe Drinking Water Act:
PROJECT WILL ELIMINATE AN INADEQUATE ON-SITE PACKAGE SYSTEM FOR A SCHOOL.

Project Alternatives:

- Alternate A:
CONSTRUCT A INTERCEPTOR LINE TO CONNECT AND ACCOMMODATE FLOW FROM COX'S CREEK ELEMENTARY SCHOOL.
- Alternate B:
UPGRADE EXISTING PACKAGE PLANT.
- Alternate C:
DO NOTHING

Legal Applicant:

Entity Type: **City / Municipal Utility** PSC Group ID: **8800300**
 Entity Name: **City of Bardstown**
 Web URL:
 Office EMail: bbryant@bardstowncable.net
 Office Phone: **502-348-5947** Toll Free: Fax: **502-348-2433**

| | |
|---|---|
| Mail Address Line 1: 220 N Fifth St | Phys Address Line 1: |
| Mail Address Line 2: | Phys Address Line 2: |
| Mail City, State Zip: Bardstown, KY 40004 | Phys City, State Zip: |
| Contact: Bobbe Blincoe | Manager: Larry Hamilton |
| Contact Title: City Clerk | Manager Title: Public Works Director |
| Contact EMail: bblincoe@bardstowncable.net | Manager EMail: lahamilton@bardstowncable.net |
| Contact Phone: 502-331-7006 | Manager Phone: 502-331-7087 |
| Contact Cell: | Manager Cell: |

Authorized Official: **William S Sheckles**
 Auth. Official Title: **Mayor**
 Auth. Official EMail: mayorsheckles@bardstowncable.net
 Auth. Official Phone: **502-331-7007** Auth. Official Cell:

Data Source: **KENTUCKY DEPARTMENT FOR LOCAL GOVERNMENT**

Date Last Modified: 09.12.2012



Clean Water Project Profile

SX21179014 - City of Bardstown
BARDSTOWN COX

Project Administrator (PA) Information

Name: **Larry Hamilton**
Title: **Public Works Director**
Organization: **City of Bardstown**
Address Line 1: **220 N Fifth St**
Address Line 2:
City: **Bardstown** State: **KY** Zip: **40004**
Phone: **502-348-5947** Fax:

Project Engineer (PE) Information:

This project requires a licensed Professional Engineer.

License No: **PE 15746**

PE Name: **Phillip Benton Hanson**

Phone: **859-223-3755** Fax:

E-Mail: **benton.hanson@hdrinc.com**

Firm Name: **Quest Engineers, Inc.**

Addr Line 1: **Quest Engineers**

Addr Line 2: **881 Corporate Dr., Ste. 100**

Addr Line 3:

City: **Lexington** State: **KY** Zip: **40503**

Status: **Current** Disciplinary Actions: **NO**

Issued: **02-06-1989** Expires: **06-30-2013**

Engineering Firm Information:

Permit No: **157**

Firm Name: **Quest Engineers, Inc.**

Phone: **402-399-1000** Fax: **402-399-1339**

Web URL: **<http://www.hdrinc.com/>**

E-Mail: **bonnie.kudron@hdrinc.com**

Addr Line 1: **8404 Indian Hills Drive**

Addr Line 2:

City: **Omaha** State: **NE** Zip: **68114**

Status: **Current** Disciplinary Actions: **NO**

Issued: **03-29-1993** Expires: **12-31-2012**



Clean Water Project Profile
 SX21179014 - City of Bardstown
 BARDSTOWN COX

Project Cost Classification:

| | |
|----------------------------------|---------------------|
| Administrative Exp.: | |
| Legal Exp.: | |
| Land, Appraisals, Easements: | |
| Relocation Exp. & Payments: | |
| Planning: | |
| Engineering Fees - Design: | |
| Engineering Fees - Construction: | |
| Engineering Fees - Inspection: | |
| Engineering Fees - Other: | |
| Construction: | \$ 1,960,000 |
| Equipment: | |
| Miscellaneous: | |
| Contingencies: | |
| Total Project Cost: | \$ 1,960,000 |

Construction Cost Categories:

| | |
|--|---------------------|
| WWTP Secondary Portion: | \$ 0 |
| WWTP Advanced Portion: | \$ 0 |
| Inflow & Infiltration Correction: | \$ 0 |
| Major Sewer Rehabilitation: | \$ 0 |
| Collector Sewers: | \$ 1,960,000 |
| Interceptor Sewers, including Pump Stations: | \$ 0 |
| Combined Sewer Overflow Correction: | \$ 0 |
| NPS Urban: | \$ 0 |
| Non-Categorized Cost: | |
| Total Construction: | \$ 1,960,000 |

Total Sustainable Infrastructure Costs:

Note: Total Sustainability Infrastructure Costs are included within construction and other costs reported in this section. This breakout is provided for SRF review purposes.

Project Funding Sources:

Total Project Cost: **\$1,960,000**
 Total Committed Funding: **\$0**
 Funding Gap: **\$1,960,000 (Not Funded)**
 This project will be requesting SRF funding for Federal FY 2014.

Detailed Project Schedule:

Environmental Review Status:
 RD Approval:
 CDBG Approval:
 No approval, but Cross-Cutter Scoping Completed:
 Construction Permit Application Date:
 Construction Permit Application Status:
 KPDES Permit Application Date:
 KPDES Permit Application Status:
 Estimated Bid Date:
 Estimated Construction Start Date:

| Funding Source | Amount | Funding Status | Applicable Date |
|-------------------------|--------------------|----------------|-----------------|
| Pending State Line Item | \$1,960,000 | Anticipated | N/A |
| Total: | \$1,960,000 | | |



Clean Water Project Profile
 SX21179014 - City of Bardstow
 BARDSTOWN COX

The following systems are beneficiaries of this project:

| DOW PERMIT ID | System Name |
|---------------|------------------------|
| KY0021237 | Bardstown Sewer System |

Project Ranking by AWMPC:

Regional Ranking(s):

Planning Unit Ranking:

Total Points:

Demographic Impacts (GIS Census Overlay):

| | For Project Area | For Included Systems(s) |
|------------------------|------------------|-------------------------|
| Serviceable Population | 831 | 21,621 |
| Serviceable households | 331 | 9,188 |
| Med. Household Income | \$60,076 | \$47,205 |

Economic Impacts:

| | |
|---------------|--|
| Jobs Created | |
| Jobs Retained | |

Plans and Specifications:

- Plans and specs have been sent to DOW.
- Plans and specs have been reviewed by DOW.
- Plans and specs have been sent to PSC.
- Plans and specs have been reviewed by PSC.

New or Improved Service:

| | Survey Based | GIS Census Overlay |
|---------------------------|--------------|--------------------|
| To Unserved Households | | 331 |
| To Underserved Households | | |
| To Total Households | | 331 |

CW Specific Impacts:

Wastewater Volumes (MGD):

| | |
|--------------------------|-------|
| For this project: | |
| For included system(s): | 3.000 |
| Reduced by this project: | |

Other CW Specific Impacts:

- This project provides regionalization and/or consolidation of wastewater treatment systems.
- This project includes an on-site mound, and/or decentralized WW treatment system.
- This project is necessary to achieve full or partial compliance with a court order, agreed order, or a judicial or administrative consent decree.
- This project achieves voluntary compliance (violation with no order).
- This project is consistent with the approved facility plan.
- This project will have a positive impact on drinking water sources within a 5 mile radius.



Clean Water Project Profile

SX21179014 - City of Bardstown
BARDSTOWN COX

Planning Needs:

- Combined Sewer Overflow (CSO) Correction.
- Sanitary Sewer Overflow (SSO) Correction.
- Replacement or Rehabilitation of Aging Infrastructure.
- New Treatment Plant.
- New Collector Sewers and Appurtenances.
- Decentralized Wastewater Treatment Systems.
- Upgrade to Advanced Treatment.
- Rehab/Upgrade/Expansion of Existing Treatment Plant.
- New Interceptor Sewers and Appurtenances.
- Storm Water Control.
- Non-Point Source (NPS) Pollution Control.
- Recycled Water Distribution.
- Planning.
- Other (specify):

Project Inventory (Mapped Features):

Point Features:

| DOW Permit ID | Count | FeatureType | Purpose | Status | Existing Capacity | Proposed Capacity | Units |
|---------------|-------|-------------|---------|--------|-------------------|-------------------|-------|
| KY0021237 | 1 | LIFTSTATION | | NEW | | 180.00 | GPM |

Line Features:

| DOW Permit ID | Line Type | Purpose | Activity | Size (in.) | Material | Length (LF) |
|---------------|------------|-------------|-----------|------------|----------|-------------|
| KY 0021237 | SEWER LINE | INTERCEPTOR | EXTENSION | 8.00 | PVC | 21,284 |
| KY 0021237 | SEWER LINE | COLLECTOR | EXTENSION | 8.00 | PVC | 13,660 |
| Total Length | | | | | | 34,944 |

Administrative Components:

- Planning
 Design
 Construction
 Management

Wastewater Treatment Plants Eliminated:

- This project includes the elimination of wastewater treatment plant(s).

| DOW Permit ID | Facility Type | System Name | Eliminated Plants | Hydrolic Capacity (MGD) |
|---------------|---------------|------------------------------|------------------------|-------------------------|
| KY 0096075 | PTP | Coxs Creek Elementary School | Coxs Creek Elem School | 0.000 |
| Total | | | | 0.000 |



Clean Water Project Profile
 SX21179014 - City of Bardstovwn
 BARDSTOVWN COX

Sanitary Sewer Components:

- This project includes a new wastewater treatment plant.
 Proposed design capacity (MGD): 0.000
- This project includes an expansion of an existing wastewater treatment plant.
 Current design capacity (MGD): 0.000
 Current treatment volume (MGD): 0.000
 Proposed design capacity (MGD): 0.000
- This project includes rehabilitation of an existing wastewater treatment plant.
- This project includes upgrades to an existing wastewater treatment plant.
- This project includes rehabilitation or replacement of aging infrastructure.
 Total length of replaced infrastructure (LF): 0
- This project includes new collector sewers.
 Total length of replaced infrastructure (LF): 13,660
- This project includes new interceptor sewers.
 Total length of new interceptor sewer (LF): 21,284
- This project includes elimination of existing sewer system components.
 Number of raw sewage discharges eliminated: 0
 Number of failing septic systems eliminated: 0
 Number of non-failing septic systems eliminated: 0

Sustainable Infrastructure - Green Infrastructure:

Green stormwater infrastructure includes a wide array of practices at multiple scales that manage wet weather and that maintains and restores natural hydrology by infiltrating, evapotranspiring and harvesting and using stormwater. On a regional scale, green infrastructure is the preservation and restoration of natural landscape features, such as forests, floodplains, and wetlands, coupled with policies such as infill and redevelopment that reduce overall imperviousness in a watershed. On the local scale, green infrastructure consists of site and neighborhood-specific practices, such as:

| Component | Cost |
|--|------------|
| <input type="checkbox"/> Bioretention | \$0 |
| <input type="checkbox"/> Trees | \$0 |
| <input type="checkbox"/> Green Roofs | \$0 |
| <input type="checkbox"/> Permeable Pavement | \$0 |
| <input type="checkbox"/> Cisterns | \$0 |
| <input type="checkbox"/> Constructed Wetlands | \$0 |
| <input type="checkbox"/> Urban Forestry Programs | \$0 |
| <input type="checkbox"/> Downspout Disconnection | \$0 |
| <input type="checkbox"/> Riparian Buffers and Wetlands | \$0 |
| <input type="checkbox"/> Sustainable Landscaping and Site Design | \$0 |
| <input type="checkbox"/> Purchase of land or easements on land for riparian and wetland protection or restoration. | \$0 |
| <input type="checkbox"/> Fencing to divert livestock from streams and stream buffers.* | \$0 |
| Total Green Infrastructure Cost: | \$0 |

** Indicates a business case may be required for this item.*

There are no Green Infrastructure components specified for this project.



Clean Water Project Profile

Legal Applicant: **City of Bardstown**
 Project Title: **BARDSTOWN-BLOOMFIELD SEWER CONNECTION PROJECT**
 Project Number: **SX21179019** [View Map](#) Submitted By: **LTADD**
 Funding Status: **Fully Funded** Primary County: **Nelson**
 Project Status: **Approved** Planning Unit: **Nelson**
 Project Schedule: **0-2 Years** Multi-County: **No**
 E-Clearinghouse SAJ: **KY200912152025** ECH Status: **Endorse With Condition**
 Applicant Entity Type: **City / Municipal Utility**
 Date Approved (AWMPC): **03-13-2009**

Project Description:

THE CITY OF BARDSTOWN WILL CONSTRUCT APPROXIMATELY 12,500 L.F. OF 12"-14" SEWER FORCE MAIN ALONG U.S. HWY 62 FROM THE KY 162 / U.S. 62 INTERSECTION TO CONNECT THE TOWN CREEK INTERCEPTOR SEWER NEAR BARDSTOWN RESERVOIR NO. 3. THIS PROJECT WILL CONVEY WASTEWATER FROM BLOOMFIELD FOR TREATMENT AT BARDSTOWN'S WWTP AND IS A NECESSARY COMPONENT FOR ELIMINATION OF BLOOMFIELD'S CURRENT WWTP. (ASSOCIATED WITH SX21179008 - BLOOMFIELD CONVEYANCE LINE). THE CITY WILL ALSO INCLUDE REPLACEMENT OF AN EXISTING 8" FORCEMAIN FROM THE POTTERSHP RD. PUMP STATION TO THE TOWN CREEK INTERCEPTOR SEWER WITH A 12-14" FORCEMAIN, ELIMINATING A BOTTLENECK IN THE CONVEYANCE SYSTEM.

Need for Project:

Briefly describe how this project promotes public health or achieves and/or maintains compliance with the Clean Water Act or Safe Drinking Water Act:

PROJECT WILL IMPROVE FLOW IN THE SYSTEM, ELIMINATING OVERFLOWS AND HELP ACCOMMODATE FLOWS FROM BLOOMFIELD COLLECTION SYSTEM.

Project Alternatives:

Alternate A:

CONSTRUCT NEW FORCEMAIN CONNECTOR TO ACCEPT FLOW FROM BLOOMFIELD AND CONVEY IT TO THE BARDSTOWN WWTP.

Alternate B:

DO NOTHING.

Alternate C:

MAKE IMPROVEMENTS DOWNSTREAM TO BLOOMFIELD GRAVITY SEWERS.

Legal Applicant:

Entity Type: **City / Municipal Utility** PSC Group ID: **8800300**
 Entity Name: **City of Bardstown**
 Web URL:
 Office EMail: **bbryant@bardstowncable.net**
 Office Phone: **502-348-5947** Toll Free: Fax: **502-348-2433**

Mail Address Line 1: **220 N Fifth St**

Phys Address Line 1:

Mail Address Line 2:

Phys Address Line 2:

Mail City, State Zip: **Bardstown, KY 40004**

Phys City, State Zip:

Contact: **Bobbe Blincoe**

Manager: **Larry Hamilton**

Contact Title: **City Clerk**

Manager Title: **Public Works Director**

Contact EMail: **bblincoe@bardstowncable.net**

Manager EMail: **lahamilton@bardstowncable.net**

Contact Phone: **502-331-7006**

Manager Phone: **502-331-7087**

Contact Cell:

Manager Cell:

Authorized Official: **William S Sheckles**

Auth. Official Title: **Mayor**

Auth. Official EMail: **mayorsheckles@bardstowncable.net**

Auth. Official Phone: **502-331-7007**

Auth. Official Cell:

Data Source: **KENTUCKY DEPARTMENT FOR LOCAL GOVERNMENT**

Date Last Modified: **09.12.2012**



Clean Water Project Profile
SX21179019 - City of Bardstown
BARDSTOWN-BLOOMFIELD SEWER CONNECTION PROJECT

Project Administrator (PA) Information

Name: **Larry Hamilton**
Title: **Public Works Director**
Organization: **City of Bardstown**
Address Line 1: **220 N Fifth St**
Address Line 2:
City: **Bardstown** State: **KY** Zip: **40004**
Phone: **502-348-5947** Fax:

Applicant Contact (AC) Information

Name: **Larry Hamilton**
Title: **Public Works Director**
Organization: **City of Bardstown**
Address Line 1: **220 N Fifth St**
Address Line 2:
City: **Bardstown** State: **KY** Zip: **40004**
Phone: **502-348-5947** Fax:

Project Engineer (PE) Information:

This project requires a licensed Professional Engineer.

License No: **PE 20849**

PE Name: **Richard Kyle Smith**
Phone: **859-223-3755** Fax: **859-223-3150**
E-Mail: **rich.smith@hdrinc.com**

Firm Name: **Quest Engineers, Inc.**
Addr Line 1: **HDR Engineering Inc.**
Addr Line 2: **2517 Sir Barton Way**
Addr Line 3:
City: **Lexington** State: **KY** Zip: **40509**
Status: **Current** Disciplinary Actions: **NO**
Issued: **04-29-1999** Expires: **06-30-2014**

Engineering Firm Information:

Permit No: **157**
Firm Name: **Quest Engineers, Inc.**
Phone: **402-399-1000** Fax: **402-399-1339**
Web URL: **http://www.hdrinc.com/**
E-Mail: **bonnie.kudron@hdrinc.com**
Addr Line 1: **8404 Indian Hills Drive**
Addr Line 2:
City: **Omaha** State: **NE** Zip: **68114**
Status: **Current** Disciplinary Actions: **NO**
Issued: **03-29-1993** Expires: **12-31-2012**



Clean Water Project Profile
 SX21179019 - City of Bardstown
 BARDSTOWN-BLOOMFIELD SEWER CONNECTION PROJECT

Project Cost Classification:

| | |
|----------------------------------|---------------------|
| Administrative Exp.: | \$ 20,000 |
| Legal Exp.: | \$ 10,000 |
| Land, Appraisals, Easements: | \$ 10,000 |
| Relocation Exp. & Payments: | |
| Planning: | \$ 20,000 |
| Engineering Fees - Design: | \$ 90,200 |
| Engineering Fees - Construction: | \$ 22,550 |
| Engineering Fees - Inspection: | \$ 70,270 |
| Engineering Fees - Other: | \$ 44,000 |
| Construction: | \$ 1,336,000 |
| Equipment: | |
| Miscellaneous: | \$ 42,980 |
| Contingencies: | \$ 134,000 |
| Total Project Cost: | \$ 1,800,000 |

Construction Cost Categories:

| | |
|--|---------------------|
| WWTP Secondary Portion: | |
| WWTP Advanced Portion: | |
| Inflow & Infiltration Correction: | |
| Major Sewer Rehabilitation: | |
| Collector Sewers: | |
| Interceptor Sewers, including Pump Stations: | \$ 1,336,000 |
| Combined Sewer Overflow Correction: | |
| NPS Urban: | |
| Non-Categorized Cost: | |
| Total Construction: | \$ 1,336,000 |

Total Sustainable Infrastructure Costs:

Note: Total Sustainability Infrastructure Costs are included within construction and other costs reported in this section. This breakout is provided for SRF review purposes.

Project Funding Sources:

Total Project Cost: **\$1,800,000**
 Total Committed Funding: **\$1,800,000**
 Funding Gap: **\$0 (Fully Funded)**

This project will be requesting SRF funding for Federal FY 2014.

| Funding Source | Amount | Funding Status | Applicable Date |
|--------------------------|--------------------|----------------|-----------------|
| KIA SRF Fund A Loan (CW) | \$1,800,000 | Committed | 12/9/2010 |
| Total: | \$1,800,000 | | |

Detailed Project Schedule:

Environmental Review Status:
 RD Approval:
 CDBG Approval:
 No approval, but Cross-Cutter Scoping Completed:

Construction Permit Application Date:
 Construction Permit Application Status:
 KPDES Permit Application Date:
 KPDES Permit Application Status:
 Estimated Bid Date:
 Estimated Construction Start Date:



Clean Water Project Profile
 SX21179019 - City of Bardstown
 BARDSTOWN-BLOOMFIELD SEWER CONNECTION PROJECT

The following systems are beneficiaries of this project:

| DOW PERMIT ID | System Name |
|---------------|------------------------|
| KY0021237 | Bardstown Sewer System |

Project Ranking by AWMPC:

Regional Ranking(s):

Planning Unit Ranking:

Total Points:

Demographic Impacts (GIS Census Overlay):

| | For Project Area | For Included Systems(s) |
|------------------------|------------------|-------------------------|
| Serviceable Population | | 21,621 |
| Serviceable households | | 9,188 |
| Med. Household Income | | \$47,205 |

Economic Impacts:

| | |
|---------------|--|
| Jobs Created | |
| Jobs Retained | |

Plans and Specifications:

- Plans and specs have been sent to DOW.
- Plans and specs have been reviewed by DOW.
- Plans and specs have been sent to PSC.
- Plans and specs have been reviewed by PSC.

New or Improved Service:

| | Survey Based | GIS Census Overlay |
|---------------------------|--------------|--------------------|
| To Unserved Households | | |
| To Underserved Households | | |
| To Total Households | | |

CW Specific Impacts:

Wastewater Volumes (MGD):

| | |
|--------------------------|-------|
| For this project: | |
| For included system(s): | 3.000 |
| Reduced by this project: | |

Other CW Specific Impacts:

- This project provides regionalization and/or consolidation of wastewater treatment systems.
- This project includes an on-site mound, and/or decentralized WW treatment system.
- This project is necessary to achieve full or partial compliance with a court order, agreed order, or a judicial or administrative consent decree.
- This project achieves voluntary compliance (violation with no order).
- This project is consistent with the approved facility plan.
- This project will have a positive impact on drinking water sources within a 5 mile radius.



Clean Water Project Profile
 SX21179019 - City of Bardstown
 BARDSTOWN-BLOOMFIELD SEWER CONNECTION PROJECT

Planning Needs:

- Combined Sewer Overflow (CSO) Correction.
- Sanitary Sewer Overflow (SSO) Correction.
- Replacement or Rehabilitation of Aging Infrastructure.
- New Treatment Plant.
- New Collector Sewers and Appurtenances.
- Decentralized Wastewater Treatment Systems.
- Upgrade to Advanced Treatment.
- Rehab/Upgrade/Expansion of Existing Treatment Plant.
- New Interceptor Sewers and Appurtenances.
- Storm Water Control.
- Non-Point Source (NPS) Pollution Control.
- Recycled Water Distribution.
- Planning.
- Other (specify):

Project Inventory (Mapped Features):

Point Features:

| DOW Permit ID | Count | FeatureType | Purpose | Status | Existing Capacity | Proposed Capacity | Units |
|---------------|-------|-------------|---------|--------|-------------------|-------------------|-------|
|---------------|-------|-------------|---------|--------|-------------------|-------------------|-------|

Line Features:

| DOW Permit ID | Line Type | Purpose | Activity | Size (in.) | Material | Length (LF) |
|---------------|------------|-------------|-----------|------------|--------------|-------------|
| KY 0021237 | SEWER LINE | INTERCEPTOR | EXTENSION | 12.00 | PVC | 17,752 |
| | | | | | Total Length | 17,752 |

Administrative Components:

- Planning
 Design
 Construction
 Management

Wastewater Treatment Plants Eliminated:

- This project includes the elimination of wastewater treatment plant(s).

| DOW Permit ID | Facility Type | System Name | Eliminated Plants | Hydrolic Capacity (MGD) |
|---------------|---------------|-------------------------|---|-------------------------|
| KY 0034436 | PTP | Bloomfield Sewer System | City of Bloomfield Wastewater Treatment Plant | 0.350 |
| | | | Total | 0.350 |



Clean Water Project Profile
 SX21179019 - City of Bardstow
 BARDSTOWN-BLOOMFIELD SEWER CONNECTION PROJECT

Sanitary Sewer Components:

- This project includes a new wastewater treatment plant.
 Proposed design capacity (MGD): 0.000
- This project includes an expansion of an existing wastewater treatment plant.
 Current design capacity (MGD): 0.000
 Current treatment volume (MGD): 0.000
 Proposed design capacity (MGD): 0.000
- This project includes rehabilitation of an existing wastewater treatment plant.
- This project includes upgrades to an existing wastewater treatment plant.
- This project includes rehabilitation or replacement of aging infrastructure.
 Total length of replaced infrastructure (LF): 0
- This project includes new collector sewers.
 Total length of replaced infrastructure (LF): 0
- This project includes new interceptor sewers.
 Total length of new interceptor sewer (LF): 17,752
- This project includes elimination of existing sewer system components.
 Number of raw sewage discharges eliminated: 0
 Number of failing septic systems eliminated: 0
 Number of non-failing septic systems eliminated: 0

Sustainable Infrastructure - Green Infrastructure:

Green stormwater infrastructure includes a wide array of practices at multiple scales that manage wet weather and that maintains and restores natural hydrology by infiltrating, evapotranspiring and harvesting and using stormwater. On a regional scale, green infrastructure is the preservation and restoration of natural landscape features, such as forests, floodplains, and wetlands, coupled with policies such as infill and redevelopment that reduce overall imperviousness in a watershed. On the local scale, green infrastructure consists of site and neighborhood-specific practices, such as:

| Component | Cost |
|--|------------|
| <input type="checkbox"/> Bioretention | \$0 |
| <input type="checkbox"/> Trees | \$0 |
| <input type="checkbox"/> Green Roofs | \$0 |
| <input type="checkbox"/> Permeable Pavement | \$0 |
| <input type="checkbox"/> Cisterns | \$0 |
| <input type="checkbox"/> Constructed Wetlands | \$0 |
| <input type="checkbox"/> Urban Forestry Programs | \$0 |
| <input type="checkbox"/> Downspout Disconnection | \$0 |
| <input type="checkbox"/> Riparian Buffers and Wetlands | \$0 |
| <input type="checkbox"/> Sustainable Landscaping and Site Design | \$0 |
| <input type="checkbox"/> Purchase of land or easements on land for riparian and wetland protection or restoration. | \$0 |
| <input type="checkbox"/> Fencing to divert livestock from streams and stream buffers.* | \$0 |
| Total Green Infrastructure Cost: | \$0 |

* Indicates a business case may be required for this item.

There are no Green Infrastructure components specified for this project.