Missouri Department of Natural Resources
Water Protection Program

Bacteria
Total Maximum Daily Load
Implementation Plan

For

Coldwater Creek
Water Body ID No. 1706
St. Louis County

Completed: Dec. 31, 2014

Water Body Summary – Coldwater Creek
Pollutant: *Escherichia coli*

Stream Name: Coldwater Creek

Location:
St. Louis County near Black Jack

12-digit Hydrologic Unit Codes (HUC) and Names:
103002000802 – Headwaters Coldwater Creek
103002000803 – Coldwater Creek

Water Body Identification Number (WBID) and Hydrologic Class:[1]
WBID 1706 – Class C

Designated Uses:[2]
Livestock and wildlife protection (LWP)
Irrigation (IRR)
Protection of warm water habitat (WWH)
Human health protection (HHP)
Industrial water supply (IND)
Secondary contact recreation (SCR)
Whole body contact recreation category B (WBC-B)

Other Designations:
Metropolitan no-discharge stream[3]

Use that is Impaired:
Whole body contact recreation category B (WBC-B)

Length and Location of Impaired Segment:[4]
6.9 miles, from mouth to Section 13, Township 47N, Range 6E

Universal Transverse Mercator [Zone 15 north] coordinates:
E: 741382, N: 4301819 to E: 735227, N: 4299568

Pollutant on 2014 303(d) List:
Bacteria (*Escherichia coli, or E. coli*)

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[1] For hydrologic classes see 10 CSR 20-7.031(1)(F). Class P streams maintain flow during drought conditions. Class C streams may cease flow during dry periods, but maintain permanent pools that support aquatic life. Class E streams have ephemeral surface flow.
[2] For designated uses see 10 CSR 20-7.031(1)(C) and 10 CSR 20-7.031 Table H.
[3] For metropolitan no-discharge stream designations, see 10 CSR 20-7.031 Table F.
[4] The water body segment length was revised in 10 CSR 20-7.031 Table H, effective October 2009. This revision reflects a more accurate measurement of length. The location and the starting and ending points of this segment have not changed. This length differs from what is presented in the U.S. Environmental Protection Agency's Aug. 26, 2014 decision letter approving the listing of Coldwater Creek as impaired by bacteria..

TABLE OF CONTENTS

1. Introduction 1
2. Stream and Watershed Characteristics 2
3. Designated Uses and Applicable Water Quality Criteria 5
4. Review of TMDL Development 6
5. TMDL Source Assessment Summary 7
  5.1 Point Sources 8
    5.1.1 Sanitary Sewer System Overflows 8
    5.1.2 MS4 Regulated Urban Runoff 8
  5.2 Nonpoint Sources 9
    5.2.1 Onsite Wastewater Treatment Systems 9
6. TMDL Allocations 10
7. Estimates of Existing Loads and Needed Reductions 11
8. Implementation of TMDL 12
  8.1 Point Source Implementation 12
    8.1.1 Sanitary Sewer Overflows 13
    8.1.2 MS4 Regulated Urban Runoff 13
  8.2 Nonpoint Source Implementation 14
9. Critical Areas and Recommended Actions 15
10. Measurable Goals, Timeline and Milestones 16
  10.1 Point Sources – Goals and Timeline 17
  10.2 Nonpoint Sources – Goals and Timeline 18
11. Targeted Participants and Implementation Roles 19
12. Potential Funding Sources 20
13. Public Participation – Availability for Comment 21
14. Administrative Record and Supporting Documentation 22
15. References 22

LIST OF APPENDICES

Appendix A. Addressing the Nine Elements of a Successful Watershed Plan 24

LIST OF TABLES

Table 1. Municipalities in the Coldwater Creek watershed 3
Table 2. Selected *E. coli* TMDL and allocation values for Coldwater Creek 10
Table 3. Estimated load reductions needed to achieve water quality standards at various flows 11
Table 4. Goals and timelines established in the MSD MS4 stormwater management plan 18
Table 5. Online resources for potential funding sources 20

LIST OF FIGURES

Figure 1. Location of the Coldwater Creek watershed 2
Figure 2. Hydrologic soil groups in the Coldwater Creek watershed 4
Figure 3. Land use in the Coldwater Creek watershed 5
Figure 4. Coldwater Creek load duration curve 7

1. Introduction

This document serves as the Total Maximum Daily Load, or TMDL, implementation plan for the Coldwater Creek watershed in St. Louis County. This implementation plan addresses the Coldwater Creek bacteria impairment to whole body contact recreation using the *E. coli* targets established in the Coldwater Creek bacteria TMDL. The Missouri Department of Natural Resources developed the Coldwater Creek bacteria TMDL and made it available for public comment from June 29, 2012 through Aug. 13, 2012. Following revisions to the TMDL, a second public comment period was held from May 23, 2014 through Aug. 21, 2014 and was extended to Oct. 21, 2014. Although separate, this implementation plan serves as a companion to the TMDL and references figures, tables and information found in the TMDL document. While the TMDL establishes the maximum bacteria loading Coldwater Creek can assimilate and still meet water quality standards, this implementation plan provides information regarding best management practices (BMPs), potential participants in the watershed, and calculations of pollutant reductions in order to guide implementation activities and eventually restore Coldwater Creek to an unimpaired condition. The ultimate goal of the Coldwater Creek bacteria TMDL and this implementation plan is to achieve water quality standards in Coldwater Creek through full attainment of the whole body contact category B criterion. The bacteria TMDL for Coldwater Creek is available from the department's website at dnr.mo.gov/env/wpp/tmdl/1706-coldwater-ck-record.htm. The loads and allocations established in the TMDL are subject to change pending approval by the U.S. Environmental Protection Agency. Questions regarding this or other TMDLs may be submitted to the department by email to tmdl@dnr.mo.gov or by calling the department's Water Protection Program at 800-361-4827.

States are not required to develop TMDL implementation plans and EPA does not approve or disapprove them. However, the department recognizes that technical guidance and support are critical to achieving the goals of the TMDL. The purpose of this implementation plan is to serve as a guide and provide supplemental information to local professionals, permitted entities, watershed managers, and citizen groups who may be developing management plans or actively implementing BMPs in the Coldwater Creek watershed or any greater watershed for which the Coldwater Creek watershed is a part. Progress toward meeting water quality standards in Coldwater Creek is expected to be long-term and will primarily be a continuation of current, ongoing or legally required activities, such as the consent decree established as part of the *United States of America and the State of Missouri, and Missouri Coalition for the Environment Foundation v. Metropolitan St. Louis Sewer District*, No. 4:07-CV-1120.[5] It is not the department's intent with this implementation plan to impose any additional activities beyond those already undertaken to satisfy existing regulations or legal requirements. Any known management practices or watershed plans already in place or under development that will aid in meeting the goals established in the TMDL are referenced in this plan in order to facilitate these efforts without duplicating the work.

This TMDL implementation plan will incorporate many of EPA's nine elements for a successful watershed plan, where appropriate (EPA 2008).[6] Appendix A summarizes where and how these nine elements are addressed in this plan, but additional detail may be necessary when developing a watershed-based plan funded through grants from the department's Section 319 Nonpoint Source Implementation Program. This implementation plan may also be revised should there be significant changes to watershed conditions or pollutant sources. TMDL implementation uses an iterative adaptive

[5] Although an original party to the lawsuit, the department was not a part to the final consent decree. The consent decree was lodged with the U.S. District Court for the Eastern District of Missouri on Aug. 4, 2011 and approved on April 27, 2012. The text of the consent decree is available online at www.epa.gov/region7/enforcement_compliance/MSD_consent_decree_cwa.htm

[6] These nine elements are also referred to as the "nine minimum elements to be included in a watershed plan for impaired waters funded using incremental section 319 funds."

management process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities.

In addition to bacteria, Coldwater Creek is also on Missouri's 2014 303(d) List of impaired waters as impaired by chloride. A separate TMDL will be developed at a later date to address this pollutant. The most current TMDL schedule can be found on the department's website at dnr.mo.gov/env/wpp/tmdl/wpc-tmdl-progress.htm. Although this implementation plan does not directly address the chloride or low dissolved oxygen impairments, the BMPs and abatement methods recommended, in some instances, may also address these other pollutants and conditions. Furthermore, groups or individuals using this TMDL implementation plan as guidance for developing a watershed management plan are encouraged to address other pollutants or conditions that may be negatively affecting water quality in the Coldwater Creek watershed. Development of additional TMDLs in the Coldwater Creek watershed will require revisions or replacement of this implementation plan to incorporate new TMDL targets.

2. Stream and Watershed Characteristics

A detailed discussion pertaining to the geology, physiography, soils, climate and land use in the Coldwater Creek watershed is provided in Section 2 of the Coldwater Creek bacteria TMDL. Information pertinent for implementation of BMPs and pollutant abatement are presented here for convenience, but developers of a nine-element watershed based plan or a stormwater management plan should consult the full TMDL document for additional information. Because stormwater runoff can play a significant role in the transport of bacteria, there is an emphasis in this section on factors potentially influencing runoff. Figure 1 shows the extent of the Coldwater Creek watershed and its location in St. Louis County.

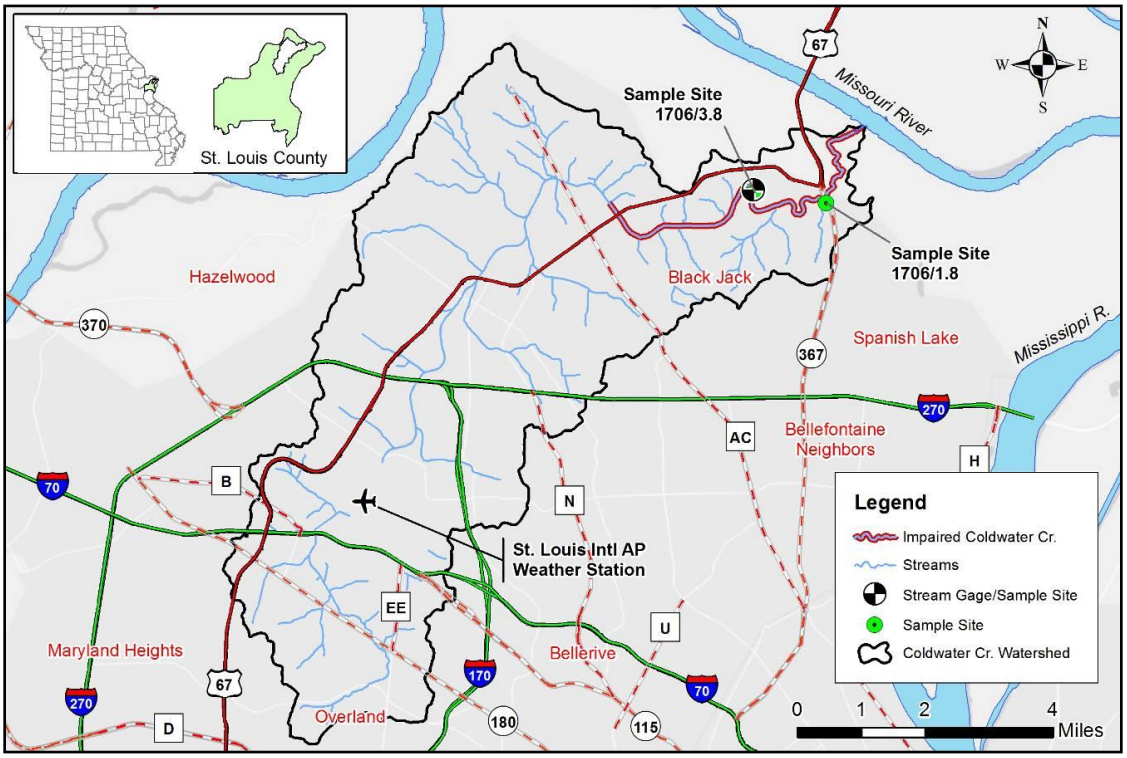

Figure 1. Location of the Coldwater Creek watershed in St. Louis County, Missouri

Coldwater Creek is an urban stream located in eastern Missouri in northeastern St. Louis County. The lowermost 6.9 miles of stream is identified in Missouri's Use Designation Dataset as water body identification number, or WBID, 1706. [7] The Coldwater Creek watershed drains approximately 44.5 square miles and includes the Lambert St. Louis International Airport and portions of 18 municipalities (Table 1). Annual rainfall in the watershed is estimated to be approximately 41 inches based upon 30-year averages from the St. Louis International Airport weather stations. Precipitation is an important factor related to stream flow and stormwater runoff events that can influence certain pollutant sources, such as bacteria.

Table 1. Municipalities in the Coldwater Creek watershed

Municipality	***Square Miles***	***Percent of Watershed***
Berkeley	3.3	7.4 %
Black Jack	2.0	4.5 %
Breckenridge Hills	0.8	1.8 %
Bridgeton	1.9	4.3 %
Calverton Park	0.2	0.4 %
Charlack	0.0	0.0 %
Edmundson	0.3	0.7 %
Ferguson	0.1	0.2 %
Florissant	11.4	25.6 %
Hazelwood	5.4	12.1 %
Kinloch	0.1	0.2 %
Overland	1.6	3.6 %
St. Ann	2.8	6.3 %
St. John	0.5	1.1 %
Sycamore Hills	0.0	0.0 %
Woodson Terrace	0.8	1.8 %
Spanish Lake	0.3	0.7 %
Old Jamestown	5.0	11.2 %

Soils in the watershed are varied, but can be grouped based on similar characteristics such as their runoff potential. The hydrologic soil groups developed by the Natural Resources Conservation Service provide information on the potential for runoff to occur on saturated soils. Stormwater runoff may carry contaminants, such as *E. coli*, to nearby streams, therefore identifying areas with a greater potential for producing runoff will aid TMDL implementation. Figure 2 shows the locations of various hydrologic soil groupings in the Coldwater Creek watershed and their runoff potential. In addition to these soil characteristics, the amount of impermeable surfaces associated with urbanized areas may also increase the potential for stormwater runoff by reducing the ability of rainwater to infiltrate the soil.

[7] The Missouri Use Designation Dataset documents the names and locations of the state's rivers, streams, lakes and reservoirs, which have been assigned designated uses. See 10 CSR 20.7031 (1)(P).

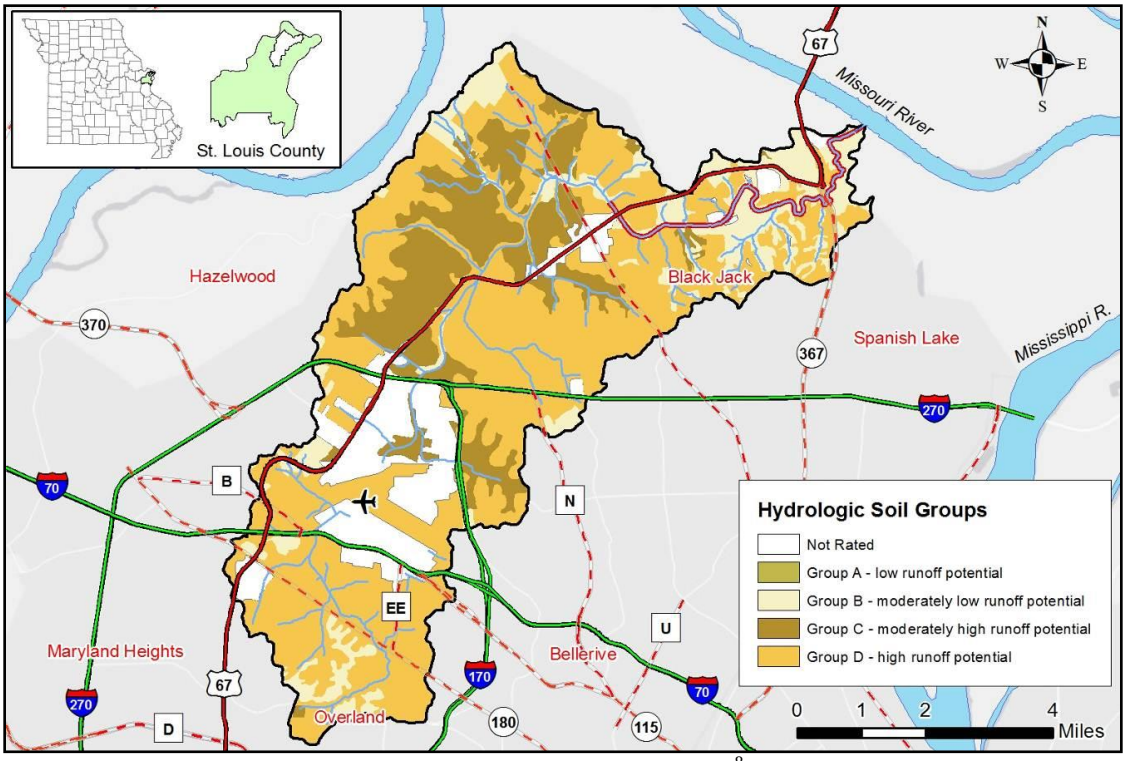

Figure 2. Hydrologic soil groups in the Coldwater Creek watershed[8]

Impervious areas within the Coldwater Creek watershed are common due to the watershed's urban nature. Land use in the Coldwater Creek watershed is primarily urban with approximately 78 percent of the area categorized as an urban or impervious land use type; the majority of this is classified as low-intensity urban, which is primarily residential (Figure 3). Approximately 62 percent, of the riparian corridor lies within areas categorized as urban and impervious. Although the land use dataset categorizes specific areas as being impervious, impervious areas exist in all urban land use categories due to the presence of roads, sidewalks, parking lots, driveways, and rooftops. The Metropolitan St. Louis Sewer District, which is a public agency responsible for management of wastewater and some stormwater in the watershed, estimates the total imperviousness of the watershed to be approximately 35 percent (Kristol Whatley, Metropolitan St. Louis Sewer District, email communication, Aug. 10, 2012). This amount of imperviousness in the watershed is significant, as stream degradation associated with imperviousness has been shown to first occur at about 10 percent imperviousness and to increase in severity as imperviousness increases (Arnold and Gibbons 1996; Schueler 1994).

[8] In the Coldwater Creek watershed, areas not rated in a hydrologic soil group are classified as being either water or as soils being comprised of 90 – 100 percent urban land (NRCS 2010).

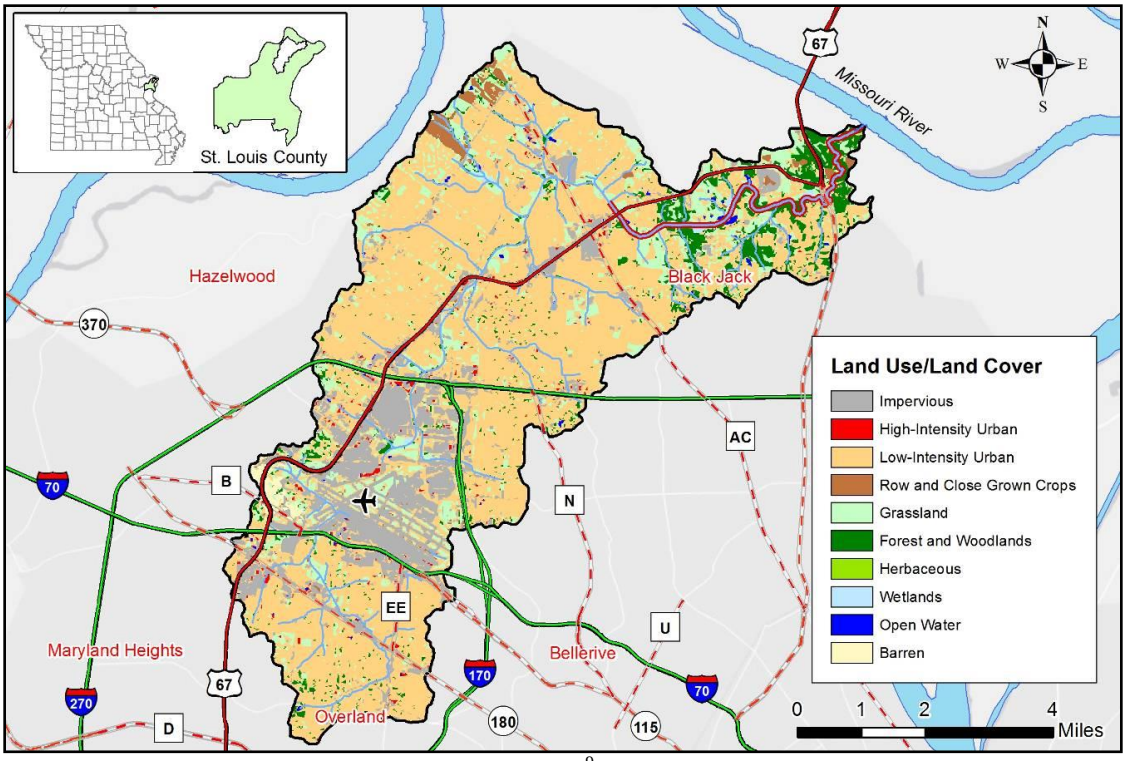

Figure 3. Land use in the Coldwater Creek watershed[9]

The population of the Coldwater Creek watershed, using 2010 census data, is estimated to be approximately 147,467 (U.S. Census Bureau 2010). The Coldwater Creek watershed is considered by EPA to be an Environmental Justice watershed (Steve Schaff, EPA, e-mail communication, June 30, 2011).[10] Environmental Justice communities may qualify for financial and strategic assistance for addressing environmental and public health issues (EPA 2011a). Funding opportunities are discussed in more detail in Section 12 of this document.

3. Designated Uses and Applicable Water Quality Criteria

Designated uses are the uses for a water body identified in the State's water quality standards that must be maintained in accordance with the federal Clean Water Act. The following designated uses have been assigned to Coldwater Creek:

- Livestock and wildlife protection (LWP)
- Irrigation (IRR)
- Protection of warm water habitat (WWH)
- Human health protection (HHP)
- Industrial water supply (IWS)
- Secondary contact recreation (SCR)
- Whole body contact recreation category B (WBC-B)

The use impaired by bacteria in this stream is the protection of whole body contact recreation category B. Whole body contact recreation includes activities in which there is direct human contact with surface

[9] Due to the urban nature of the watershed, areas categorized as grassland, which account for 14 percent of the watershed area, may include golf courses, cemeteries, parks, and school playgrounds.

[10] EPA defines Environmental Justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies.

water that results in complete body submergence, thereby allowing accidental ingestion of the water as well as direct contact to sensitive body organs, such as the eyes, ears and nose. Category A waters include those that have been established as public swimming areas and waters with documented existing whole body contact recreational uses by the public. Category B applies to waters designated for whole body contact recreation, but are not contained within category A.

In Missouri's Water Quality Standards at 10 CSR 20-7.031(5)(C) and Table A, specific numeric criteria are given for the protection of the whole body contact recreation use. Water quality criteria are limits on certain chemicals or conditions in a water body to protect particular designated uses. The state's Water Quality Standards dictate that for category B waters, *E. coli* counts, measured as a geometric mean, shall not exceed 206 counts per 100 milliliters of water (206/100mL) "during the recreational season".[11] Missouri's recreational season is defined in this section of the regulations as being from April 1 to October 31. Because the whole body contact category B criterion is a geometric mean, fluctuations in instantaneous bacteria concentrations are expected, and individual bacteria measurements greater than the TMDL target do not in and of themselves indicate a violation of water quality standards.

4. Review of TMDL Development

The public notice of the Coldwater Creek bacteria TMDL was issued on June 29, 2012 and comments from the public were accepted for 45 days ending on Aug. 13, 2012. Comments were received from 11 groups or individuals and the TMDL document was revised where necessary. A public meeting to discuss the TMDL was held on Sept. 12, 2012 at the Daniel Boone Branch of the St. Louis County Library. The revised TMDL document and the comments received are available online at dnr.mo.gov/env/wpp/tmdl/1706-coldwater-ck-record.htm.

For Coldwater Creek, the bacteria TMDL is expressed as *E. coli* counts per day using a load duration curve. A load duration curve is useful in identifying and differentiating between storm-driven and steady-input sources. The load duration approach can be used to provide a visual representation of stream flow conditions under which bacteria criteria exceedances have occurred, to assess critical conditions and to quantify the level of reduction necessary to meet the surface water quality targets for bacteria in the stream (Cleland 2002; Cleland 2003).

To develop the load duration curve, the targeted bacteria concentration of 206/100mL was multiplied by the average flow for a given day and a conversion factor to generate the allowable load over a range of flows. Figure 4 is the bacteria TMDL load duration curve calculated for Coldwater Creek. The y-axis describes bacteria loading as counts per day, which are plotted against flow duration intervals on the x-axis, which represent the frequency for which a particular flow is met or exceeded. Bacteria measurements collected from the impaired segment during the recreational season are plotted as blue points. Geometric means of these bacteria data are plotted as green triangles at the highest percentile flow exceedance for each flow condition. These geometric means represent the estimated existing bacteria loads to Coldwater Creek. Only the most recent 5 years of available bacteria data were used for TMDL development, as these data are the most likely to represent current conditions.

As can be seen in Figure 4, estimated existing loads exceed the TMDL load duration curve at the 50 and 10 percent flow exceedances, which correspond to high and mid-range flows. These observations indicate that the sources of bacteria in the Coldwater Creek watershed most likely to result in loading greater than the TMDL targets are those associated with precipitation events that vary in intensity as

[11] To assess a water body against the whole body contact bacteria criteria, Missouri's listing methodology document requires a minimum of five (5) samples (available online at dnr.mo.gov/env/wpp/waterquality/303d.htm).

opposed to a steady-input source, such as discharge from a wastewater treatment plant. Targeting sources under these various flow conditions will be critical to TMDL implementation addressing the impairment in this water body.

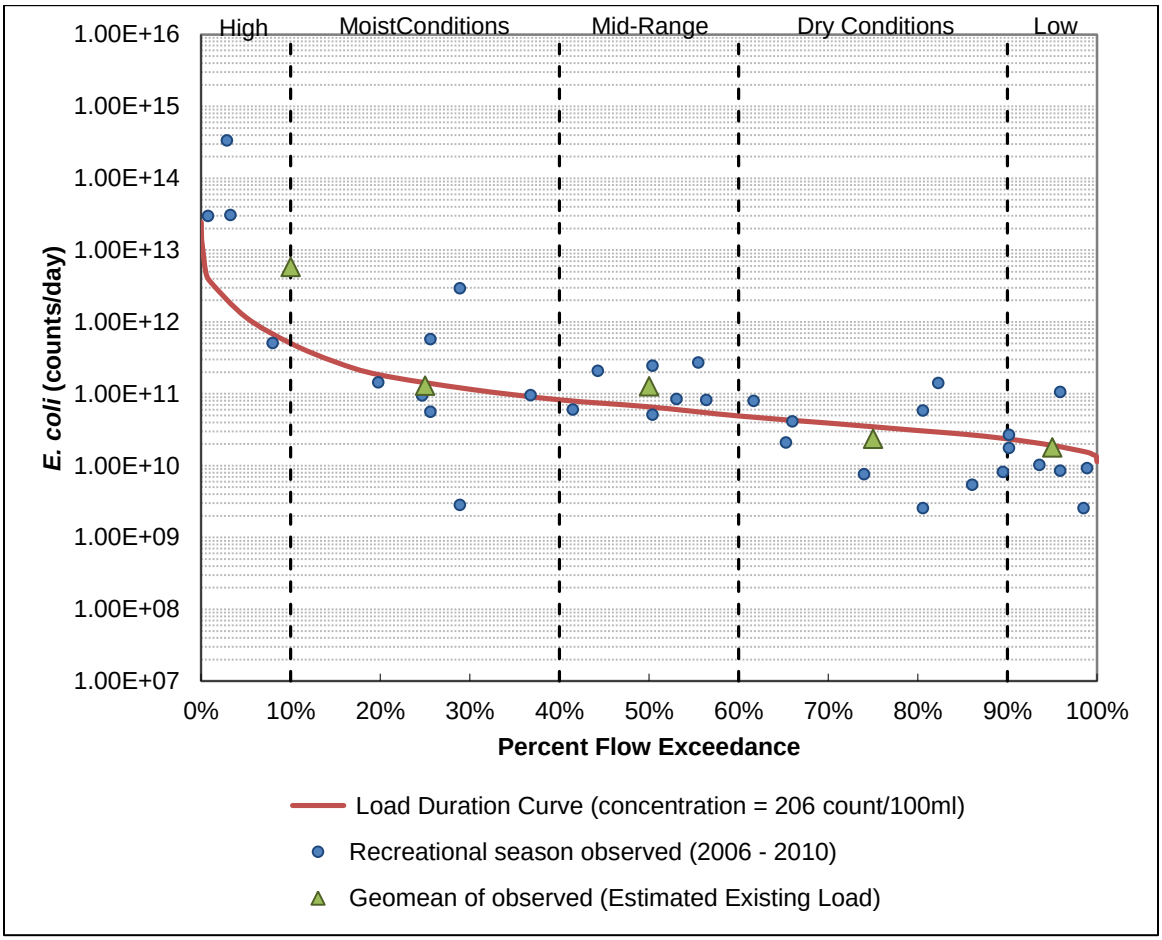

Figure 4. Coldwater Creek load duration curve

5. TMDL Source Assessment Summary

The Coldwater Creek bacteria TMDL provides a more comprehensive inventory and assessment of known or suspected sources of bacteria in the watershed than what is presented here. This document presents those sources identified by the TMDL as being likely contributors to the impaired condition and those sources where implementation activities should be focused in order to meet the goals established by the TMDL with the greatest efficiency. However, those employing BMPs in the watershed should not be discouraged from addressing additional pollutant sources not identified here. Sources of bacteria are categorized as being either regulated point sources or unregulated nonpoint sources. In the Coldwater Creek watershed, potential sources are those that are most likely to be contributing bacteria during runoff events as is evident by the estimates of existing loading presented in Figure 4.

5.1 Point Sources

Point sources are defined under Section 502(14) of the federal Clean Water Act and are typically regulated through the Missouri State Operating Permit program.[12] They include any discernible, confined and discrete conveyance, such as a pipe, ditch, channel, tunnel or conduit, by which pollutants are transported to a water body. Two significant point source contributors of bacteria were identified in the Coldwater Creek TMDL; sanitary sewer overflows and urban runoff regulated through Municipal Separate Storm Sewer System, or MS4, permitting.

5.1.1 Sanitary Sewer Overflows

Sanitary sewer systems are designed to carry household waste, which includes both greywater and sewage to a wastewater treatment facility. In the Coldwater Creek watershed, this system carries waste to the Coldwater Creek wastewater treatment facility, which discharges to the Missouri River and not any stream in the Coldwater Creek watershed. However, the presence of the sewerage system infrastructure within the Coldwater Creek watershed is still a potential source of bacteria due to possible overflows. Sanitary sewer overflows are untreated or partially treated sewage releases from a sanitary sewer system. Overflows can be caused by a variety of reasons including blockages, line breaks, sewer defects, lapses in sewer system operation and maintenance, inadequate sewer design and construction, power failures and vandalism. Sanitary sewer overflows can occur during either dry or wet weather and at any point in the collection system, and include overflows from manholes. Sanitary sewer overflows are unpermitted and are not authorized by the federal Clean Water Act. Occurrences of sanitary sewer overflows can result in periods of elevated bacteria concentrations. In addition to unintended overflows, 20 constructed sanitary sewer overflow outfalls, installed to relieve the sanitary sewers from excess flow caused by inflow and infiltration of stormwater during high rain events, are located within the watershed (Bruce Litzsinger, Metropolitan St. Louis Sewer District, email communication, Oct. 24, 2011).

5.1.2 MS4 Regulated Urban Runoff

In addition to sanitary sewer inputs, urban runoff has also been found to carry high levels of bacteria and can be expected to exceed water quality criteria for bacteria during and immediately after storm events in most streams throughout the country (EPA 1983). In the case of Coldwater Creek, MS4 permits regulate pollutant contributions from MS4 stormwater discharges for the entire urban area within the watershed, which accounts for approximately 95.7 percent of the entire watershed area. For this reason and for purposes of assigning TMDL allocations, urban runoff is considered a regulated point source. Entities regulated by MS4 permits in the Coldwater Creek watershed include the Missouri Department of Transportation and the Metropolitan St. Louis Sewer District and its co-permittees, which in the Coldwater Creek watershed include St. Louis County and the municipalities of Berkeley, Black Jack, Breckenridge Hills, Bridgeton, Charlack, Ferguson, Florissant, Hazelwood, Overland, St. Ann, St. John, and Woodson Terrace. Although the TMDL considers urban runoff in the Coldwater Creek watershed to be a regulated point source, due to the diffuse nature of urban runoff prior to entering a storm sewer system, implementation efforts should address urban runoff in a manner similar to nonpoint source runoff using BMPs to control or reduce stormwater runoff. Reductions in runoff should aid in reducing overall bacteria loading.

[12] The Missouri State Operating system is Missouri's program for administering the federal National Pollutant Discharge Elimination System (NPDES) program. The NPDES program requires all point sources that discharge pollutants to waters of the United States to obtain a permit.

5.2 Nonpoint Sources

Nonpoint source pollution refers to pollution coming from diffuse, nonpermitted sources that typically cannot be identified as entering a water body at a single location. They include all other categories of pollution not classified as being from a point source, and are exempt from department permit regulations as per state rules at 10 CSR 20-6.010(1)(B)1. In the Coldwater Creek watershed most stormwater runoff originates from urban areas and is considered a point source for the purposes of the TMDL. Other potential sources of bacteria identified in the TMDL as being nonpoint sources are onsite wastewater treatment systems.

5.2.1 Onsite Wastewater Treatment Systems

Failing onsite wastewater treatment systems are known sources of bacteria, which can reach nearby streams through surface runoff and groundwater flows, thereby contributing bacteria loads under either wet or dry weather conditions. They may contribute bacteria loads either directly or as a component of MS4-permitted stormwater. EPA's Spreadsheet Tool for Estimating Pollutant Load, or STEPL, website estimates the failure rate of onsite wastewater treatment systems in St. Louis County as being 39 percent based upon 1990s census data (EPA 2011b). A more recent study conducted by the Electric Power Research Institute suggests that up to 50 percent of onsite wastewater treatment systems in Missouri may be failing (EPA 2011c; EPRI 2000).

The exact number of onsite wastewater treatment systems in the Coldwater Creek watershed is unknown; however, such systems built prior to the sewerage systems serviced by the Metropolitan St. Louis Sewer District are known to exist in the older developed areas of St. Louis County (Jack Fischer, St. Louis County Public Works, personal communication, June 6, 2011). Although septic system installations and repairs within St. Louis County require a permit, the county database cannot distinguish between work pertaining to onsite wastewater treatment systems and work pertaining to sanitary sewers because they are classified the same (Jack Fischer, St. Louis County Public Works, personal communication, Jan. 31, 2011). The Metropolitan St. Louis Sewer District maintains parcel and billing information that can be used to estimate the number of parcels in the watershed without a sewer connection. The majority of parcels in the watershed, approximately 98 percent, do have a sewer connection. Nonsewered or suspected nonsewered parcels in the watershed may include parcels with houses or other structures on them, or may include, parcels comprised entirely of green space. These parcels may potentially have onsite wastewater systems on them. The Metropolitan St. Louis Sewer District confirms that about 1 percent of the parcels in the Coldwater Creek watershed, approximately 552 parcels, are not connected to a sewer. However, it is not known if any onsite systems exist on these parcels. An additional 146 parcels, are also suspected of not having a sewer connection (Kristol Whatley, Metropolitan St. Louis Sewer District, email communication, Aug. 10, 2012).

Much of the Coldwater Creek watershed is serviced by the Metropolitan St. Louis Sewer District's Coldwater Creek wastewater treatment plant, which discharges outside of the watershed. Due to the availability of this sewer system and a St. Louis County ordinance requiring that a sewer connection to a building be made when a sanitary sewer line is within 200 feet of the property, many septic system eliminations have been made. Despite a lack of specific data showing that onsite wastewater treatment systems are a significant problem in the Coldwater Creek watershed, the number of nonsewered or suspected nonsewered parcels in the watershed, combined with the available failure rate data, suggests that onsite wastewater treatment systems are present in the watershed and that these systems are potential contributors of bacteria to Coldwater Creek.

6. TMDL Allocations

A TMDL calculates a water body's loading capacity for a particular pollutant and allocates that load among the various pollutant sources. The loading capacity is the maximum pollutant load that a water body can assimilate and still attain water quality standards. It is equal to the sum of the wasteload allocation, load allocation and the margin of safety, and can be expressed as the equation:

$$TMDL = LC = \sum WLA + \sum LA + MOS$$

where LC is the loading capacity, ∑WLA is the sum of the wasteload allocations, ∑LA is the sum of the load allocations, and MOS is the margin of safety. The wasteload allocation is the fraction of the total pollutant load apportioned to point sources. The load allocation is the fraction of the total pollutant load apportioned to nonpoint sources. The margin of safety is a percentage of the TMDL that accounts for any uncertainty associated with the model assumptions as well as any data inadequacies.

The TMDL establishes pollutant allocations for the sources identified as contributing to the stream's impairment that, if met, will result in attainment of the state's water quality standards. Table 2 presents selected TMDL loading capacities and TMDL allocations for Coldwater Creek representing each flow condition along the load duration curve. The TMDL and flow values in the table correspond to the load duration curve presented in Figure 4. For this TMDL, an implicit margin of safety based on conservative modeling assumptions was used rather than an explicitly specified percentage.

Table 2. Selected *E. coli* TMDL and allocation values for Coldwater Creek*

Percentile Flow Exceedance	***Flow (cfs)***	***TMDL (counts/day)***	***MS4 WLA (counts/day)***	***SSO WLA (counts/day)***	***OWTS LA (counts/day)***	***LA (counts/day)***
95	3.80	1.91E+10	1.83E+10	0	0	8.23E+08
75	6.88	3.47E+10	3.32E+10	0	0	1.49E+09
50	13.05	6.58E+10	6.29E+10	0	0	2.83E+09
25	27.37	1.38E+11	1.32E+11	0	0	5.93E+09
10	99.85	5.03E+11	4.82E+11	0	0	2.16E+10

* cfs = cubic feet per second; SSO = sanitary sewer overflows; OWTS = Onsite wastewater treatment systems

In the Coldwater Creek watershed, there are no permitted point source facilities discharging municipal or domestic wastewater. For this reason, the most likely bacteria inputs into the stream are sanitary sewer overflows, onsite wastewater treatment systems, and stormwater runoff. Sanitary sewer overflows are not permitted by the department and are not authorized by the Clean Water Act. For this reason, this bacteria point source is given a wasteload allocation (SSO WLA) of zero at all flows. Properly functioning onsite systems should not be contributing bacteria loads to Coldwater Creek and discharges from these systems are not allowed by law. Therefore, this nonpoint source is given a load allocation (OWTS LA) of zero at all flows. Stormwater runoff from urban areas within the watershed is regulated by MS4 permits and is therefore considered a point source for TMDL purposes. The wasteload allocation assigned to the MS4 area (MS4 WLA) is based on the proportion of the area of the watershed that is regulated (95.7 percent). Stormwater runoff from the remaining 4 percent of the watershed that is unregulated is assigned the remainder of the TMDL loading capacity. As can be seen in the load duration curve in Figure 4, the allowable load, which is the TMDL, varies with flow. As such, the wasteload and load allocations associated with stormwater runoff also varies with flow, with the greatest allowances occurring at the highest flows.

7. Estimates of Existing Loads and Needed Reductions

The observed bacteria data in Figure 4 and estimates of existing bacteria loading calculated from this data represent overall bacterial inputs from various sources throughout the watershed and are insufficient for estimating specific reductions needed from each individual point and nonpoint source. TMDL targets are expected to be reached following collective reductions in bacteria loading from the various sources in the watershed. Future monitoring efforts may help estimate bacteria loads from individual sources, aid in identifying localized critical areas, and provide information to guide selection of BMPs. Reduction targets are expected to change over time as implementation activities occur, reductions are achieved, and newer data becomes available.

Figure 4 presents targeted loads over a range of flows using a load duration curve, as well as, estimates of existing loads calculated from bacteria monitoring data. The available bacteria data do not identify contributions from any specific source and represent the existing bacteria loading from all sources within the watershed. Table 3 presents estimated bacteria load reductions needed to achieve the allowable loading allocations for both point and nonpoint sources at various flow values. Estimated load reductions were calculated by subtracting the sum of the wasteload and load allocation values at the median flow value within a specific flow condition from the geometric mean of the observed data exceeding the TMDL curve within the same flow condition (Figure 4). Because the whole body contact recreation category B criterion is a geometric mean, reductions in the frequency of individually observed exceedances of the load duration curve (blue points in Figure 4) as well as overall reductions in existing loads (green triangles in Figure 4) will help to achieve water quality standards.

As can be seen from Table 3, to meet the TMDL targets the greatest pollutant reductions are needed at mid-range flows and greater. No reductions are necessary when the stream is at low flow. To achieve the needed reductions, the various contributing point and nonpoint sources mentioned in this document and the TMDL will need to be addressed. This includes the minimization of sanitary sewer overflows, including the complete elimination of constructed overflows; maintenance, repair and elimination of onsite wastewater treatment systems; and general stormwater runoff management from areas that contribute stormwater to MS4s. Over time, as implementation activities occur, additional monitoring data becomes available, and loading reductions are achieved, changes to the estimated reduction targets are expected.

Table 3. Estimated load reductions needed to achieve TMDL loading targets at various flows

Percent Flow Exceedance	***Flow (cfs)***	***Existing Load (counts/day)***	***TMDL (counts/day)***	***Load Reduction (counts/day)***	***Percent Reduction (%)***
95	3.80	1.79E+10	1.91E+10	None	0%
75	6.88	2.36E+10	3.47E+10	None	0%
50	13.05	1.27E+11	6.58E+10	6.10E+10	48%
25	27.37	1.29E+11	1.38E+11	None	0%
10	99.85	5.79E+12	5.03E+11	5.29E+12	91%

Data pertaining to specific bacteria load reductions that may be achieved by limiting the volume of stormwater runoff that flows into a water body is limited. It is expected that the use of stormwater BMPs in the watershed designed to reduce the volume and frequency of runoff entering the stream will also help to reduce bacteria loading and assist in meeting the reduction targets. Certain stormwater BMPs have been demonstrated to directly reduce bacteria loading, including bioretention (i.e., rain gardens),

media filters and retention ponds. Detention basins and grass swales, on the other hand, have been shown to potentially increase bacteria loading (BMP Database 2010). This implementation plan does not prescribe or prohibit any specific BMPs and BMP selection may be determined by various factors such as efficiency and cost. A summary of calculated BMP efficiencies and estimated costs for various BMPs can be found online from the International Stormwater BMP Database at www.bmpdatabase.org/BMPPerformance.htm.

8. Implementation of TMDL

TMDLs provide a basis for establishing water quality goals and determining the appropriate and necessary pollution controls for meeting these goals (EPA 2001). However, TMDLs are not self-implementing and are not in and of themselves regulatory documents. Therefore, TMDL implementation is carried out only in part through the department's permitting (point sources) and nonpoint source programs. Additional implementation is typically completed through actions taken by local governments or citizen's groups with an interest in improving water quality in their communities. For Coldwater Creek, progress toward meeting water quality standards is expected to be long-term, and TMDL implementation will primarily be a continuation of existing or planned activities, including activities legally required as part of the Metropolitan St. Louis Sewer District's consent decree.

The management practices and regulatory requirements outlined in this implementation plan will reflect the sources of bacteria identified in the TMDL, with the goal of meeting the whole body contact category B criterion. Any known management practices already in place or being planned in the watershed that may help to eliminate the bacteria impairment of Coldwater Creek will be discussed in this section. Revisions to the bacteria TMDL, or the development of future Coldwater Creek TMDLs, may require revisions to this implementation plan. Any group developing a watershed-based plan for the Coldwater Creek watershed is encouraged to address other pollutants and additional known pollutant sources, along with those already identified in the TMDL and this implementation plan. Future watershed based plans or any existing watershed based plans that were completed prior to development of the TMDL should be revised to incorporate the targets identified in the final TMDL, as well as the pollutant reductions identified in this plan.

8.1 Point Source Implementation

Point source reductions are typically implemented with discharge permits administered through the Missouri State Operating Permit program to meet the requirements of Missouri's water quality standards and the federal National Pollutant Discharge Elimination System (NPDES). Requirements for land disturbance, industrial and other stormwater permits include establishing BMPs developed in accordance with a department-accepted plan to manage stormwater. In the case of MS4 permits, this includes development and implementation of a stormwater management program plan that addresses the six required minimum control measures and other applicable requirements. For wastewater dischargers, permit terms and conditions established by the department are assumed to be protective of instream water quality. As part of any TMDL implementation plan where point source contributions are likely, the department will, during permit reissuance, conduct an analysis of facility compliance history, sampling results, permit effluent limitations and monitoring requirements. Should the department determine that more protective effluent limitations or permit conditions are necessary, these requirements will be included in the facility permit upon renewal. It is also possible for the permit to be reopened and adjusted between renewal periods.

8.1.1 Sanitary Sewer Overflows

Currently there are no permitted discharges of domestic wastewater in the Coldwater Creek watershed. However, constructed sanitary sewer overflows were identified as significant point source contributors of bacteria to Coldwater Creek. The Clean Water Act does not permit discharges from sanitary sewer overflows and occurrences of such discharges should be reduced as much as possible or eliminated altogether. The Metropolitan St. Louis Sewer District's consent decree requires the elimination of all constructed sanitary sewer overflows in the Metropolitan St. Louis Sewer District's service area. The complete elimination of constructed sanitary sewer overflows from the Coldwater Creek watershed is consistent with the TMDL wasteload allocation of zero to these discharges. This represents a 100 percent reduction of bacteria loading from these sources. Although specific bacteria reductions are unknown and cannot be estimated at this time, it is expected that the removal of constructed sanitary sewer overflows will result in reductions of bacteria loading.

Sanitary sewer overflows occurring due to malfunctions or stormwater inflows could occur in any area where sewer systems are present. Dry weather overflows can be reduced by regular sewer system maintenance including cleaning to eliminate blockages. Educating watershed residents about keeping fats, grease, and other potential blockage-producing materials out of the sewage system can also reduce dry weather overflows. Wet weather overflows can be reduced by repairing broken and leaking lines that may be allowing excess infiltration and inflow of stormwater. Enlarging or expanding the available sewer system and treatment plant may also be warranted. The consent decree between EPA, the Missouri Coalition for the Environment Foundation, and the Metropolitan St. Louis Sewer District includes the goal to eliminate these types of overflows and requires various repair and maintenance strategies to reduce occurrences of sanitary sewer overflows. Examples of such strategies mentioned in the consent decree include sewer-pipe lining and replacement, development of an operations and maintenance program, and continued implementation of a fats, oils, and grease program. These consent decree actions to reduce sanitary sewer overflows are consistent with the actions necessary for TMDL implementation and are expected to result in reductions of bacteria loading. It is estimated that over its entire service area, of which the Coldwater Creek watershed is a part, controls already implemented by the Metropolitan St. Louis Sewer District, as well as those completed as part of its consent decree obligations, will reduce overflows into nearby streams by almost 13 billion gallons per year (EPA 2011d).

8.1.2 MS4 Regulated Urban Runoff

Urban stormwater runoff is another potential contributor of bacteria to Coldwater Creek. Since two MS4 permits regulate stormwater in the watershed, urban runoff is considered a point source for TMDL purposes. One of these MS4 permits is held by the Missouri Department of Transportation and the other is held by the Metropolitan St. Louis Sewer District and several municipalities as co-permittees. For the Coldwater Creek bacteria TMDL, an aggregate wasteload allocation indicating the allowable bacteria load from the MS4 area was calculated. Although there are differences in how bacteria may originate in a highway system, as opposed to other urban locations where residential contributions associated with pet waste or onsite wastewater treatment systems are more likely, there is not sufficient data to adequately and appropriately disaggregate the MS4 wasteload allocation among permitted entities at this time.

To guide TMDL implementation through the MS4 permitting process, one approach may be to distribute the total wasteload allocation to each MS4 based on the percentage of their respective areas within the watershed. However, this approach assumes bacteria contributions from both MS4 areas are proportional to their areas, which may not be the case. Future bacteria monitoring may provide more specific

information regarding each MS4 area's actual contributions, including specific sources and mechanisms of transport, thereby allowing permits and implementation activities to be modified accordingly. In the Coldwater Creek watershed, the urban area associated with the Metropolitan St. Louis Sewer District and co-permittee's MS4 permit accounts for approximately 92 percent of the regulated watershed area. The area of the Missouri Department of Transportation's MS4 regulated area accounts for the remaining 4 percent of this area.

MS4 permits require implementation of a comprehensive stormwater management program to minimize negative impacts to water quality and the aquatic ecosystem, to monitor and eliminate illicit discharges, and to provide long-term water quality protection. As required by the MS4 permits, a stormwater management plan must address six minimum control measures, which include public education and outreach, public involvement and participation, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control, and pollution prevention and general housekeeping for municipal operations. The BMPs and programs developed by the Missouri Department of Transportation and the Metropolitan St. Louis Sewer District and its co-permittees to meet these permit requirements are expected to result in reductions of bacteria loading from the MS4 regulated area. Additional information on MS4 permit requirements can be found in Missouri's Stormwater Clearinghouse online at dnr.mo.gov/env/wpp/stormwater/sw-local-gov-programs.htm.

The Metropolitan St. Louis Sewer District has posted the MS4 stormwater management plan on their website at www.stlmsd.com. Summaries of BMPs for reducing urban stormwater and pollutants in stormwater are also presented on their website. Some examples of structural BMPs mentioned include rain gardens, rain barrels, and detention basins to capture stormwater, as well as overall reductions of impervious surfaces. Nonstructural BMPs, such as of picking up pet wastes and maintaining longer lawns are also mentioned. The purpose of these practices is to reduce the volume of stormwater runoff from the MS4 area that directly enters streams and, consequently, reduce the potential for erosion resulting from runoff conditions. This reduction in overall runoff and erosion is expected to result in reduced bacteria loading during flow conditions influenced by storm events. The Missouri Department of Transportation also makes their MS4 stormwater management plan available online at www.modot.org/stormwater/. In addition to stormwater runoff reductions, this plan provides information regarding BMPs associated with erosion control and sediment containment, which can reduce the likelihood of bacteria contaminated sediment from entering a stream via runoff. Additionally, the plan includes goals of restoring and revegetating riparian areas that the agency's activities may have disturbed. Although these activities do not target *E. coli* directly, reductions in runoff and sediment entering Coldwater Creek is also expected to result in reductions of bacteria loading.

Although MS4 permits regulate discharges of urban stormwater in the watershed, voluntary implementation of stormwater BMPs by private citizens living or operating businesses within the Coldwater Creek watershed will also aid in achieving TMDL goals and meeting calculated load reductions. For this reason, in addition to education efforts required as part of MS4 permitting, local governments may want to consider developing incentive programs for retrofitting existing development, encourage low-impact development for new construction projects, or possibly enact stormwater control regulations to successfully meet TMDL targets.

8.2 Nonpoint Sources Implementation

The department does not regulate nonpoint sources and nonpoint source loading is typically reduced using BMPs that may be implemented to address and improve land use practices that may contribute

bacteria to the impaired water bodies. One potential nonpoint source of bacteria identified in the Coldwater Creek bacteria TMDL is onsite wastewater treatment systems.

Failing onsite wastewater treatment systems may be sources of bacteria to nearby waterways. Therefore, educating homeowners about proper septic system maintenance, and repairing or replacing failing systems when necessary, may aid in reducing bacteria loading to Coldwater Creek. Education may be completed as part of the MS4 stormwater management plan, through the Metropolitan St. Louis Sewer District to meet consent decree obligations, by local governments, local watershed groups, or university extension offices. The EPA maintains various guidance documents and resources pertaining to onsite systems online at http://water.epa.gov/infrastructure/septic/homeowner-resources.cfm including a "Homeowner's Guide to Septic Systems." Similarly, the East-West Gateway Council of Governments has developed a septic system maintenance guide for the Lower Meramec Watershed. Although not developed specifically for the region where the Coldwater Creek watershed is located, the guide, available online at www.ewgateway.org/pdffiles/library/wrc/septictankbrochure.pdf, does provide useful septic system information that is relevant throughout St. Louis County.

Enforcement of local ordinances requiring a sewer connection if a sewer system is within 200 feet of a home will also aid in implementation of the Coldwater Creek bacteria TMDL (see Section 5.2.1). Further elimination of onsite systems and connection to the existing sewerage system should be explored by homeowners and local governments. Elimination of some onsite systems by the Metropolitan St. Louis Sewer District is a condition specified in their consent decree and is consistent with the implementation of the Coldwater Creek bacteria TMDL. Although this supplemental environmental project is limited in its scope and funding, any eliminations of onsite wastewater treatment systems in the Coldwater Creek watershed are expected to result in reductions of bacteria loading.[13]

9. Critical Areas and Recommended Actions

This implementation plan identifies critical areas using aerial imagery and geographic information system, or GIS, analyses to help target funding and work efforts. However, because these analyses are based on gross watershed characteristics, local government entities, watershed groups, and others using this implementation guidance should attempt to identify additional critical areas at a more refined scale. Local level identification of critical areas is crucial for proper selection and installation of BMPs.

Constructed sanitary sewer overflows are significant, potential contributors of bacteria to Coldwater Creek during periods of flow influenced by stormwater runoff. All areas directly impacted by constructed sanitary sewer overflows are critical areas needing targeted action to meet the TMDL goals. Elimination of these constructed overflows should provide water quality improvements immediately downstream from these points and should decrease the overall bacteria loading into Coldwater Creek during wet weather events. In the Coldwater Creek watershed, there are 20 constructed sanitary sewer overflows. Locations of these constructed overflows can be found in Figure 7 of the Coldwater Creek bacteria TMDL. Because sanitary sewer overflows are unauthorized and unpermitted, the TMDL wasteload allocation for these sources is zero, indicating the need for a 100 percent reduction in bacteria loading from these sources. Elimination of constructed sanitary sewer overflows within the Coldwater

[13] Any references to implementation of a supplemental environmental project shall include the following reference: "This project was undertaken in connection with the settlement of an enforcement action, *United States of America and the State of Missouri, and Missouri Coalition for the Environment Foundation v. Metropolitan St. Louis Sewer District*, No. 4:07-CV-1120-CEJ, taken on behalf of the U.S. Environmental Protection Agency, State, and the Coalition under the Clean Water Act" (John R. Lodderhose, Metropolitan St. Louis Sewer District, email communication, Oct. 24, 2012).

Creek watershed is addressed by the Metropolitan St. Louis Sewer District's consent decree, and should be conducted according to the schedule and requirements specified in that document.

In addition to constructed sanitary sewer overflows, the consent decree also addresses dry and wet weather overflows resulting from accidental discharges. These unauthorized discharges may occur at any point in the watershed serviced by a sewerage system, thereby making the entire service area the critical area for overall sanitary sewer overflow reduction. In general, dry weather sewer overflows can be reduced by regular sewer system maintenance, such as routine cleaning to eliminate blockages, and by sewer customers reducing their inputs of blockage-causing substances. The consent decree specifies various repair and maintenance strategies needed to reduce overflows and requires an educational component pertaining specifically to the reduction of inputs of fats, oils and grease from sewer system customers. Wet weather sewer overflows can be reduced by implementation of the Metropolitan St. Louis Sewer District's consent decree requirements.

Stormwater is another potential pathway for bacteria to enter a water body. Bacteria entering the stream network through urban stormwater runoff can be reduced through a number of practices, but these practices should be consistent with the requirements of MS4 permits and department-accepted stormwater management plans developed to meet those requirements. MS4 regulated entities are free to choose the appropriate BMPs that meet the individual local governments' budgets, timeframes, and needs, and the BMPs should be incorporated into the permittee's stormwater management plan. Critical areas for reducing stormwater runoff in the Coldwater Creek watershed are identified as being primarily impervious or urban (Figure 2). The riparian corridor of Coldwater Creek and its tributaries may need to be specifically targeted, especially in residential areas where wastes from pets or stabled animals could contaminate runoff flowing directly to the stream.

As noted earlier, onsite wastewater treatment systems have been identified as a nonpoint source identified in the watershed that may be contributing bacteria loading to Coldwater Creek. Critical areas for onsite wastewater treatment systems are likely to be found in the unincorporated portions of the county and other areas not serviced by a sewerage system. The St. Louis County assessor's office and the Metropolitan St. Louis Sewer District can provide additional information to help target the specific locations of unsewered properties. Surveying of residents in the watershed is another recommended tool to better estimate number, and identify the locations, of onsite systems. Education efforts related to proper septic system maintenance and repair can then be targeted to residents known to have onsite wastewater systems or who are living in unsewered areas. Since the department does not regulate nonpoint sources, a voluntary, site-specific approach to implementation may be used, as well as possible enforcement of any county or local ordinances pertaining to onsite wastewater systems. Additional information regarding specific regulations of onsite wastewater treatment systems in St. Louis County can be obtained from both the St. Louis County Public Works Department at 314-615-5184, and the St. Louis County Health Department, at 314-615-0600.

10. Measurable Goals, Timeline and Milestones

The ultimate goal of this TMDL implementation plan is to serve as a guide to local professionals, watershed managers, permitted entities, and citizens aiming to reduce bacteria concentrations in Coldwater Creek to a level that will support the whole body contact recreation category B designated use. Reaching this goal would require reductions in *E. coli* loading resulting in measurements at or below the recreational season geometric mean criterion of 206 counts/100mL. Additionally, the department's current 303(d) listing methodology document states that a water body is judged to be impaired by bacteria if *E. coli* counts exceed the geometric mean in any of the last three years for which

adequate data is available. In this case, adequate data is at least five samples per year taken during the recreational season. Assessment of Coldwater Creek for compliance with state water quality standards will be conducted by the department as required by the Clean Water Act Sections 305(b) and 303(d). Recent water quality data from the Coldwater Creek watershed was collected by the Metropolitan St. Louis Sewer District and the U.S. Geological Survey. In addition to data collected by these agencies, the department will also routinely examine water quality data collected by other local, state and federal entities in order to assess the effectiveness of TMDL implementation. These entities may include the EPA, the Missouri Department of Health and Senior Services, the Missouri Department of Conservation, and county health departments. In addition, certain quality-assured data collected by universities, municipalities, private companies and other volunteer groups may potentially be considered for monitoring water quality following TMDL implementation. Individuals or groups interested in developing monitoring plans are encouraged to contact the department for guidance. Department consultation may help identify current monitoring activities and potential collaborative opportunities as well as provide approved sampling and analytical methodologies.

Specific measurable goals for permitted facilities, local governments or watershed groups working to implement the Coldwater Creek bacteria TMDL should focus on maximizing BMP effectiveness and achieving pollutant reductions. In the case of bacteria, these goals will likely include overall stormwater runoff reduction and a reduction in the frequency of instantaneous *E. coli* measurements exceeding the TMDL loading capacity at mid-range flows or greater. Timelines and interim milestones may vary depending upon the means of implementation, as well as upon the strategies used to address individual point or nonpoint sources. As part of the iterative and adaptive approach used in TMDL implementation, these timelines may be adjusted as additional information becomes available and implementation strategies are refined. Many of the necessary implementation activities will be the result of projects completed to meet the Metropolitan St. Louis Sewer District's consent decree as well as those completed to meet MS4 permit requirements. The timelines established by these legal requirements will also act as the timelines for TMDL implementation.

10.1 Point Sources - Goals and Timeline

Point source implementation goals and timelines are typically dictated by conditions specified in permits issued under the department's Missouri State Operating Permit program to meet federal NPDES requirements. Any schedules or deadlines specified as conditions in the Missouri Department of Transportation and Metropolitan St. Louis Sewer District MS4 permits and their corresponding stormwater management plans, will serve as timelines to guide TMDL implementation for these sources. Current MS4 stormwater management plans were developed prior to the completion of the Coldwater Creek bacteria TMDL. Therefore, it is expected that subsequent revisions to these plans will specifically incorporate the goals of both the TMDL and this implementation plan. The current general small MS4 permit expired on June 12, 2013. Upon renewal, facilities will need to revise their stormwater management program plans. Examples of goals and timelines from the current Metropolitan St. Louis Sewer District's stormwater management plan are summarized in Table 4. A similar schedule does not appear in the Department of Transportation's plan.

In addition to the permits issued by the department, implementation efforts addressing the sanitary sewer system in the watershed will be conducted in accordance to the Metropolitan St. Louis Sewer District's consent decree. The consent decree requires the elimination of all constructed sanitary sewer overflows in the Metropolitan St. Louis Sewer District's service area, which includes the Coldwater Creek watershed, and provides a specific timeline for such eliminations. In accordance with the consent decree, constructed sanitary sewer overflows will be scheduled for elimination by no later than 2033 with 85

percent of the overflow outfalls to be eliminated by 2023. The order of the eliminations will be based on the potential for human health and environmental risks, frequency of overflow, estimated volumes, and technical engineering judgment. Eliminations of constructed overflows in the Coldwater Creek watershed are included in the Metropolitan St. Louis Sewer District's consent decree available online at www.epa.gov/region07/enforcement_compliance/MSD_consent_decree_cwa.htm.

Table 4. Summarized goals and timelines in the 2008 – 2013 Metropolitan St. Louis Sewer District's MS4 stormwater management plan

Permit Year	***Goal***
1	• Communication committees established; • Develop training for erosion control BMPs; • Develop post-construction BMP education materials; • Distribute post-construction BMP guidelines;
2	• Radio public service annoncement developed and distributed; • Provide BMP training; • Distribute post-construction BMP education materials; • Develop a list of solid waste problem areas; • Post pet waste signs in parks;
3	• Distribute educational materials; • Work group to develop septic system strategic plan; • List ordinances and BMPs frequently in noncompliance and target these areas for education; Develop post-construction BMP toolbox/reference library; • Implement actions to address solid waste;
4	• Distribute strategic plan for addressing septic systems; • Distribute educational information; • Ask municipalities to adopt stormwater ordinances and codes; • Implement actions to address solid waste;
5	• Distribute educational materials; • Conduct survey to evaluate public awareness and program effectiveness; • Publish citizen volunteer outcomes and recommendations report; • Training of municipal staff for land-disturbance stormwater pollution prevention plan compliance and land-disturbance compliance inspection; • Complete implementation actions to address solid waste

Source: www.stlmsd.com

10.2 Nonpoint Sources – Goals and Timeline

Although urban runoff is addressed as a point source for TMDL purposes, implementation activities to reduce stormwater runoff that are beyond the required elements of an MS4 permit may be considered nonpoint sources for funding purposes. Additionally, approximately 4 percent of the watershed area is not regulated by MS4 permits and runoff from these areas is considered to be a nonpoint source. Since much of the Coldwater Creek watershed is private land, voluntary implementation activities completed by watershed groups, home or business owners will work in concert with the implementation activities required by permitted entities in the watershed. The development of a citizen initiated watershed based plan, using this implementation plan as a guide, will help to direct and define the goals and milestones for addressing nonpoint sources in the watershed. For information about developing a watershed based

plan and Section 319 nonpoint source funding, please contact the Missouri Department of Natural Resources at 800-361-4827 or 573-751-1300 or by emailing nonpointsource@dnr.mo.gov.

11. Targeted Participants and Implementation Roles

Successful implementation of the Coldwater Creek TMDL will require the participation and cooperation of various organizations, with roles ranging from technical support to actual on-the-ground implementation of BMPs. Groups that may potentially be involved in the TMDL implementation process are listed below, along with descriptions of their possible roles. The TMDL implementation plan is not a regulatory document and this list is not intended to compel participation from any of these organizations, nor is it intended to exclude others not listed here who may be interested in participating.

- Metropolitan St. Louis Sewer District
    - Regulated through small MS4 permit; must meet applicable requirements of the permit, including the implementation of applicable strategies outlined in the MS4 stormwater management program plan.
    - Meet requirements outlined in consent decree (EPA 2011).
- MS4 co-permittees located in the Coldwater Creek watershed
    - Regulated through small MS4 permit; must meet applicable requirements of the permit, including the implementation of applicable strategies outlined in the stormwater management program plan.
    - Enforcement of any local ordinance concerning urban runoff, pet waste, low impact development, livestock, and onsite wastewater treatment systems.
- Missouri Department of Transportation
    - Regulated through small MS4 permit; must meet requirements of permit, including the implementation of strategies outlined in the stormwater management plan.
- Missouri Department of Natural Resources
    - Monitor compliance and enforce regulations associated with MS4 permit and Missouri clean water law.
    - Provide technical assistance and support to regulated entities and watershed groups where appropriate.
    - Responsible for water quality assessment for Clean Water Act sections 305(b) and 303(d) purposes.
    - Ensure that requirements of permits issued in watershed are consistent with the wasteload allocations and conditions specified in the TMDL.
    - Serve as a potential source of financial assistance for watershed plan development and BMP implementation through Section 319 or 604(b) grants.
- University of Missouri Extension
    - Technical assistance with nonpoint source and watershed management issues.
    - Assistance in organizing a locally led watershed group.
- Missouri Department of Conservation
    - Technical assistance with stream and watershed management issues.
- Missouri Department of Health and Senior Services
    - Technical assistance and regulatory authority regarding onsite wastewater treatment systems.
- St. Louis County Health Department
    - Technical assistance and regulatory authority regarding onsite wastewater treatment systems.
- St. Louis County Public Works

  - Technical assistance regarding onsite wastewater treatment systems.
- Locally led watershed group
  - Provide input for the development/revision of nine-element watershed based plan that incorporates TMDL goals and considers the guidance provided in this implementation plan.
  - Provide input for the identification of critical areas at a local level.
  - Install BMPs.
  - Public education.
  - Evaluate watershed plan's effectiveness.
- General public within the Coldwater Creek watershed
  - Voluntary lifestyle changes to meet implementation plan goals (e.g., pet waste cleanup, septic system maintenance, water conservation, etc.).
  - Voluntary installation of BMPs on private lands, residences and businesses.

12. Potential Funding Sources

A variety of grants and loans may be available to assist watershed stakeholders with developing and implementing watershed plans, controls, and practices to meet the load reductions identified in this implementation plan. The most commonly used sources of funding are state revolving fund low-interest loans and Section 319 grants. Low-interest loans from state revolving funds may be available to assist with expanding the available sewerage system to currently unsewered homes in the watershed, as well as upgrading or expanding the municipal wastewater treatment plant that receives municipal wastewater from the Coldwater Creek watershed. Grant money from the department's Section 319 Nonpoint Source Implementation Program may be available for implementing nonpoint source controls in the watershed. In some cases, nonpoint sources for Section 319 purposes may differ from those outlined in the TMDL. A TMDL may determine that no reductions of nonpoint sources are necessary; however, the water body could still be eligible for incremental 319 funding .For example, urban runoff regulated by an MS4 permit is considered a point source for TMDL purposes, but in some instances can be considered a nonpoint source for Section 319 purposes. Section 319 grant money can support a wide variety of activities including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and monitoring to assess BMP effectiveness.

In addition to the previously identified sources of funding, the EPA maintains the Catalog of Federal Funding Sources for Watershed Protection, which is a searchable database of financial assistance sources. The link to this online catalog as well as other federal funding sources is provided in Table 5.

Table 5. Online resources for potential funding sources

Name	***URL***	***Description***
Catalog of Federal Funding Sources for Watershed Protection	https://ofmpub.epa.gov/apex/watershedfunding/f?p=fedfund:1	Searchable data of financial assistant sources for watershed protection
Nonpoint Source – Related Funding Opportunities	http://water.epa.gov/polwaste/nps/funding.cfm	List of federal websites with information regarding funding opportunities

Water: Grants & Funding	http://water.epa.gov/grants_funding/	EPA website providing information on available grants.
Watershed Funding	http://water.epa.gov/aboutow/owow/funding.cfm	Funding resources and tools from EPA
Environmental Education Grants	http://www2.epa.gov/education/environmental-education-ee-grants	Financial support for environmental education projects
U.S. Army Corps of Engineers Planning Assistance to States	http://www2.mvn.usace.army.mil/pd/pppmd_assistance_states.asp	Financial support to states and local governments for developing plans to protect land and water resources
Targeted Watershed Grants Program	http://water.epa.gov/grants_funding/twg/initiative_index.cfm	EPA grant to increase citizen stewardship of urban waterways.
Environmental Justice Grants	http://www.epa.gov/Compliance/environmentaljustice/grants/index.html	Grant resources for Environmental Justice communities

13. Public Participation – Availability for Comment

The TMDL process works best when local people get together to understand and identify problems in their watershed. They can help develop the most effective solution for reducing water pollution. Without public understanding and support for TMDLs, implementation plans for impaired waters will not succeed.

A 90-day public notice and comment period for the Coldwater Creek TMDL implementation plan was held from May 23, 2014 to Aug. 21, 2014. This comment period was extended for an additional 60 days to Oct. 21, 2014. Groups that directly received the public notice announcement include the Missouri Clean Water Commission, the Missouri Water Quality Coordinating Committee, the Missouri Department of Conservation, the Missouri Department of Transportation, the St. Louis County Soil and Water Conservation District, St. Louis County Department of Health, St. Louis County Public Works, the University of Missouri Extension, the Greenway Network Inc., the Missouri Coalition for the Environment, the St. Louis County Council, the Metropolitan St. Louis Sewer District, Stream Team volunteers living in or near the watershed, the Missouri Stream Team Watershed Coalition, any affected permitted entities, the state legislators representing areas within the watershed and any other individual or group who submitted comments during the first public comment period of the TMDL in 2012. In addition, this implementation plan was made available on the department's website atdnr.mo.gov/env/wpp/tmdl/1706-coldwater-ck-record.htm, and is available to anyone with access to the Internet. Any comments received and the department's responses to those comments are maintained on file with the department and are to be posted on this webpage.

The department maintains an email distribution list via GovDelivery.com for notifying subscribers regarding significant TMDL updates or activities, including announcements for public notices and comment periods. Those interested in receiving these TMDL updates may do so by submitting their

email address to the GovDelivery website at
public.govdelivery.com/accounts/MODNR/subscriber/new?topic_id=MODNR_177.

14. Administrative Record and Supporting Documentation

An administrative record for the Coldwater Creek TMDL and this implementation plan has been assembled and is on file with the Missouri Department of Natural Resources. The administrative record includes this implementation plan, the Coldwater Creek bacteria TMDL, and any studies, data and calculations on which the TMDL is based. This information is available upon request to the department at dnr.mo.gov/sunshine-form.htm. Any request for information will be processed in accordance with Missouri's Sunshine Law (Chapter 610, RSMO) and the department's administrative policies and procedures governing Sunshine Law requests. For more information on open record/Sunshine requests, please consult the department's website at dnr.mo.gov/sunshinerequests.htm.

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APPENDIX A: Addressing the nine elements of a successful watershed plan

Additional detail may be necessary when developing a watershed based plan funded through grants from the department's Section 319 Nonpoint Source Implementation Program.

see http://water.epa.gov/polwaste/nps/handbook_index.cfm#contents for additional 319 requirements**.**

Element	Element Description	Location in Plan	Level of Detail Given in Plan
a	Identification of causes and sources	Section 5. TMDL Source Assessment Summary Section 5.2 for NPS	Stormwater discussed mainly as point source (MS4). Onsite systems as NPS. Failure rates given. Estimates of number of nonsewered parcels given.
b	Estimate of load reductions expected from described management measures	Section 7. Existing Loads and Needed Reductions	Gives bacteria reductions needed to meet TMDL targets for both point and NPS. Brief mention of BMPs shown to reduce bacteria. Reference to BMP efficiencies at bmpdatabase.org. No specific reductions per BMP or expected from groups of BMPs given.
c	Description of measures needed to achieve load reductions and description of critical areas.	Section 7 (see element b) Section 9. Critical Areas and Recommended Actions	For Section 7 see element b. Critical areas defined in a broad sense based on GIS and land use data. Recommended management measures discussed briefly and generally.
d	Estimate of technical/financial assistance, costs, and authorities	Section 7. Existing Loads and Needed Reductions Section 11. Targeted Participants Section 12. Potential Funding Sources	No specifics on BMPs to select, where to place, or number to install, so no costs calculated. Section 7 gives link to BMP Database for costs. Section 11 lists potential participants and their possible role in TMDL implementation. Section 12 lists potential funding sources.
e	Information/Education component	Section 8 Point Source Implementation Section 9. Critical areas and Recommended Actions Section 11 Targeted Participants	Section 8.1 discusses education as a required component of MS4 permits and 8.2 gives links to guidance documents. Section 9 does not give a specific education/information program, but identifies education as a necessary component. Section 11 lists participants who can aid in education.
f	Schedule for implementing management measures.	Section 10. Measurable Goals, Timeline and Milestones	Consent decree, permitting, and stormwater management plan schedules given.
g	Interim measurable milestones	Section 10. Measurable Goals, Timeline and Milestones	See elements f and h
h	Criteria to determine if loading reductions are being achieved or progress made. Criteria to determine if plan needs to be revised.	Section 10. Measurable Goals, Timeline and Milestones	Section 10 notes ultimate goal of Coldwater to meet WQS. Summarizes department assessment procedure.
i	Monitoring component to evaluate effectiveness of implementation efforts over time.	Section 10. Measurable Goals, Timeline and Milestones	No specific monitoring plan given. Summarizes department assessment procedure. Notes existing data collectors in watershed and potential data contributors.