

## CHAPTER 11: ELEMENT I. - MONITORING

The Deer Creek Watershed Management Plan reflects management measures that when implemented are intended to improve the water quality within the watershed. The following monitoring program has been designed to track the progress in meeting load reduction goals and attaining water quality standards.

To assist the Missouri Department of Natural Resources (**Department**), Water Protection Program (**WPP**) and the Missouri Botanical Garden, Deer Creek Watershed Alliance project; Randy Sarver of the Department's Environmental Services Program (**ESP**), Water Quality Monitoring Section (**WQMS**) initiated a Cooperative Stream Investigation (**CSI**) project to collect total nitrogen, total phosphorus, *E. coli* and chloride samples along with discharge measurements from Deer Creek, St. Louis County, Missouri. The project focus will be in the upper part of the Deer Creek watershed along a 0.9 mile Class C segment of the Water Body Identification (**WBID**) number 4078. In addition, two unnamed Class C reaches that currently have the WBID 3960 will also be monitored. The Missouri Use Designation Dataset (**MUDD**) Version 1.0 includes WBID 3960 as a temporary waterbody code that will be replaced with unique WBIDs in the future.

Designated recreational uses for Deer Creek WBID 4078 are listed as Whole Body Contact – Class B (**WBC-B**) and Secondary Contact Recreation (**SCR**). The Missouri Water Quality Standard (**WQS**) *E. coli* criterion for WBC-B is 206/100 ml Most Probable Number (**MPN**); and SCR is 1134/100 ml MPN. Although the upper segment of WBID 4078 is not designated as a losing stream, the segment downstream of I-64 is designated as a losing segment of WBID 4078. The *E. coli* criterion for a gaining stream reach is based on a geometric mean of at least five samples collected during the recreational season (April 1 – October 31).

WBID 4078 is not currently on the impaired waterbody list (**303d list**). However, the downstream WBID 3826 was placed on the United States Environmental Protection Agency (**USEPA**) approved Missouri 303(d) list of impaired waters for impairment by chloride in 2006 and for *E. coli* in 2012. The source of *E. coli* and chloride are listed as Urban Runoff/Storm Sewers.

A Total Maximum Daily Load (**TMDL**) for *E. coli* pollution of Deer Creek WBID 3826 was approved in 2019. A chloride TMDL will be completed in the future. TMDLs are developed by the Department in accordance with Section 303(d) of the federal Clean Water Act (**CWA**). Section 303(d) of the CWA and federal regulations in 40 Code of Federal Regulations (**CFR**) Part 131 require TMDL development for waters not meeting designated beneficial uses under technology-based controls for pollutants of concern. The purpose of a TMDL is to determine the maximum amount of a pollutant (the load) that a water body can assimilate without exceeding the Missouri WQS for that pollutant. The TMDL determines the pollutant loading capacity necessary to meet the Missouri WQS established for each water body based on the relationship between pollutant sources and in-stream water quality conditions. The goal of the TMDL program is to restore designated beneficial uses to water bodies. Therefore, identification of sources and implementation of Best Management Practices (**BMP**) to address the sources are critical to watershed restoration.

Historical monitoring results have documented high nutrients, *E. coli* and chloride concentrations in the Deer Creek watershed. Approximately 20% - 60% of the sources of *E. coli* in the watershed are from wildlife and other animals. The St. Louis Metropolitan Sewer District has progressed in reducing sanitary sewer overflows into area creeks and stormwater permits are addressing other human sources of *E. coli*. However, it is not feasible to remove wildlife and animal excrement as a source. Therefore an emphasis on voluntary, plant-based solutions to reduce stormwater runoff is the most effective way to address these additional non-point sources of nutrients and *E. coli* in the watershed and is key to reducing pollutant loads, including *E. coli*, is the reduction of stormwater runoff in the watershed. According to a 2010 USGS study of Metropolitan St. Louis streams, *E. coli* densities and loads typically were many times greater in storm events than at base flow, primarily because loading increased as a result of runoff that contain bacteria contributions from the numerous combined and sanitary sewer overflows within the study area, as well as contributions from nonpoint source runoff. [Occurrence and Sources of Escherichia in Metropolitan St. Louis Streams, October 2004 <https://pubs.usgs.gov/sir/2010/5150/pdf/sir2010-5150.pdf> ]

To assist in improving water quality, a project through the Missouri Botanical Garden's Deer Creek Watershed Initiative has been funded through the 319 Nonpoint Source Implementation Grant Program. The project was designed in four phases, which include: Phase I (subgrant #G09-NPS-13); Phase II (subgrant #G11-NPS-15); Phase III (subgrant G14-NPS-04); and Phase IV (subgrant G19-NPS-11). All phases implement BMPs that help address the stream bacteria impairment and improve the water quality of Deer Creek.

During the 319 project maps were developed to help identify high, medium, and low priority planting areas for implementation based on the six criteria of: proximity to floodplain; fragmentation; distance to impervious surface; slope; soil erosion potential; and soil permeability (see Figure 1 for a map of the four priority areas identified for the next three years). Approximately 70-75 stormwater BMPs will be installed through the Deer Creek Watershed Alliance Rainscaping Cost-Share Program during the three-year period 2019 - 2022. BMP implementation will include practices like rain gardens, bioswales, woodland and riparian corridor restoration, permeable pavers, rain barrels, etc. Pre-implementation water quality data will be collected over the next two years (2021 & 2022) in the priority implementation areas to satisfy the monitoring components of the Phase IV 319 Grant (Oct 1, 2019 through September 30, 2022).

For a detailed description of the monitoring plan, see Appendix 11-A.

Deer Creek Watershed Management Plan  
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