

## *Lytle Creek Pollution Reduction Plan*

---

Last updated: 7/1/2015 - Upham  
Re: MS4 Permit, **Section 3.1 Discharges to Water Quality Impaired Waters**  
(Including requirements in 5.1, 5.2)

Waterbody I.D. #: TN05130203022\_1000  
Subwatershed: Lytle Creek (water shed – 1,553 acres)

Purpose of this report is to document actions taken to fulfill requirements for the MS4 (City of Murfreesboro) related to impaired waters. These actions include: BMP implementation, monitoring and sampling schedules, and other actions related to these requirements.

- I. TMDL's
- II. Waste Load Allocations (WLA)
- III. BMP's
  - a. Existing
    - 1. Restoration
    - 2. Structural
    - 3. Non structural
    - 4. In stream
    - 5. Total imperviousness
  - b. Recommended
- IV. Monitoring
- V. Notes



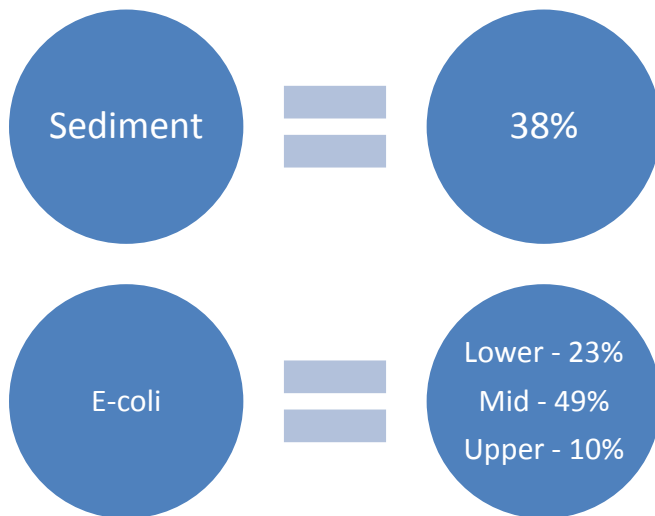
## I. TMDL's

Lytle Creek is listed on the 303d list for three impairments. Two impairments also have an EPA approved TMDL in which the MS4 is listed as the source.

Cause/ TMDL Priority	Is MS4 a source?	Approved?	MS4 assigned to WLA?
Alteration in stream-side or littoral vegetative cover	Yes	Yes	--
Escherichia coli	Yes	Yes	23% lower, 49% mid, 10% upper
Loss of biological integrity due to siltation	Yes	Yes	38%

## II. Waste Load Allocation

A Sediment TMDL with a reduction goal of 38% percent has been assigned to the MS4. An additional reduction of e-coli has also been assigned. The MS4 permit, section 3.1 requires that a MS4 discharging into such waters must implement BMP's which help achieve the assigned WLA. Furthermore, the MS4 must initiate sampling and monitoring component to assess the effective of such BMP's.



## III. Best Management Practices (BMP's)

### A. Existing BMP's

The Lytle Creek watershed has a diverse land use which contributes to water quality variability in its streams. Upper reaches of the watershed are primarily agricultural,

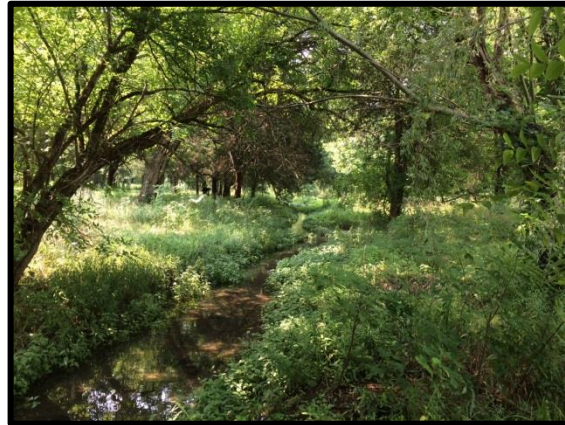
but becoming more residential, while lower portions of Lytle Creek are a mixture urban and suburban land use types. Extensive sampling and research has demonstrated that e-coli is being loaded into the stream by both groundwater discharges as well as stormwater runoff during first flush. Minor bank erosion is occurring throughout the stream. Proposed and existing controls which address these pollutants will be described below.

**1. Restoration**

- **Old Fort Park Restoration and Renovation (Restoration of Spring Branch)**

The City of Murfreesboro Parks and Recreation Department partnered with the Stormwater program to renovate Old Fort Park in 2010. The park now serves as a demonstration site for accepted stormwater controls where these controls treat stormwater before it enters Spring Branch and Lytle Creek. Prior to the renovation Spring Branch had little riparian buffer and some eroding bank. A wide buffer was established in the project in which native vegetation was featured. The Stormwater Program summoned a professional habitat assessment and biological analysis before and after the project and plans to continue to monitor habitat to gage the effectiveness of such BMP’s.

<b>Control/ Activity</b>	<b>Quantity</b>	<b>Monitoring</b>
Riparian buffer restoration	2,756 linear feet of riparian zone reestablished with natives grasses, trees, and shrubs	Benthic macro (before and after results ongoing and on file)
Porous Pavement/Pavers	3,971 square feet	--
SRNB Public Lands Day – invasive plant removal and clean – up	Bi-annually	Progress checks
Bio-retention	3,392 sq ft	
Education Brochure	--	--

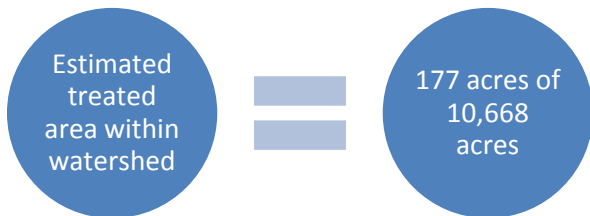


- **Hobgood Elementary**

The Hobgood Elementary School replaced approximately **55,327** square feet of parking with porous pavers in 2013.

## 2. Structural

Some properties within the lower segment of the Lytle Creek watershed have been redeveloped decreasing parking lot size and increasing infiltration rates. Large industrial commercial tracts in the mid to upper portions of the watershed are also being treated with various stormwater control facilities.



Control Type	Quantity	Directly connected	Annual change
Ponds	32/ 19 acres	0	--
Weirs	17	1	--
Filter Strip	1/51 ft	0	--
Infiltration trench	1/336 ft	0	--
Porous Pavement	59, 014 sq ft	0	--
Bioretention	5/12, 553 sq ft	No	--

### 3. Non structural

- **Water Quality Protection Area (WQPA)**

The City of Murfreesboro established a Water Quality Protection Area (WQPA) ordinance in 2007. The WQPA protects 35 to 50 of streamside buffer for any construction since 2007.

- **Education/Outreach**

The City of Murfreesboro in conjunction with Middle Tennessee State University actively targets the Lytle Creek Watershed with education/ outreach activities. These activities range from city TV programming to volunteer events.



- **Sediment line clearing**

A jet vacuum truck clears all lines directly connected to Lytle Creek with the exception of lines located on private property. Quantities of sediment removed are tracked in an operations and maintenance work order management system. Lines are coded in the GIS to correspond with sub watersheds.

- **Sewer TV and Rehab**

The Murfreesboro Water and Sewer Department has a sewer rehabilitation program in which sewer lines are televised and repaired if needed although services lines are not included. Active sampling and research is ongoing to determine whether wastewater systems such as service lines and septic tanks are contributing to the human source tracked bacteria loading found in Town creek.

<b>Activity</b>	<b>Target Impairment</b>	<b>Audience/ participants</b>	<b>Outcome</b>
Water Quality Protection Area	Alteration in stream-side or littoral vegetative cover	--	11,280 linear feet
2014 Lytle Creek Tree Day	Alteration in stream-side or littoral vegetative cover	Lytle Creek riparian property owners	1000 trees given/ 93 riparian education brochures sent
Line clearing	Sediment	--	tons removed
Sewer Rehab	e-coli	--	62,858 linear feet



#### 4. In Stream

- **Murfree Spring Wetlands**

The flow of Murfree Spring is controlled by a large weir that forms a wetland near the Discovery Center. After the weir box Town Creek flows through a large culvert and then to Lytle Creek. Repeated sampling indicates that the wetland is effective in removing a large percentage of bacteria.

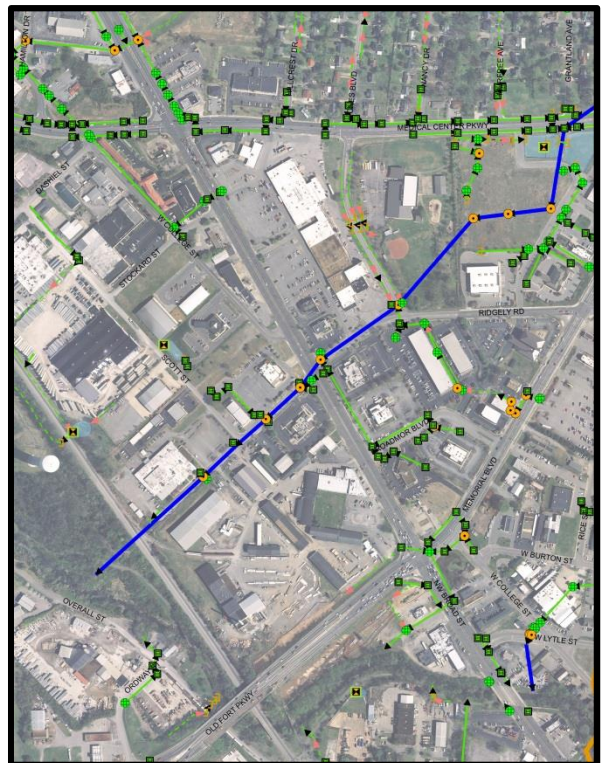
#### 5. Total Imperviousness

Much of the lower portion of Lytle Creek is built out with a large percentage of imperviousness. Many of the industrial lot remain gravel but some large lots near Middle Tennessee Blvd and Mercury Blvd could be retrofitted due to lack of use.

% impervious 2015	% impervious 2016
• 34 %	• --

#### B. Recommended BMP's

As mentioned previously, extensive sampling has indicated that much of the baseline bacteria loading is coming from Murfree Spring and other minor groundwater discharges along Lytle Creek in which dye tracing has narrowed to smaller recharge basins. Although this baseline loading accounts for much of the bacteria background stormwater sampling has also determined that two main outfalls contributing bacteria during storm events and the “first flush” therefore it is recommended that constructed wetlands be installed at these outfalls to treat their associated large basins. Furthermore it is recommended that LID retrofits be developed in the Ridgely Rd basins as well.



<b>BMP</b>	<b>location</b>	<b>Pollutant</b>	<b>Schedule</b>
Constructed wetland	Ridgely Rd outfall near greenway	e-coli	--
Constructed wetland	W. College St. outfall	Nutrients	2015 or 2016
Unused parking retrofit	Watershed	e-coli	ongoing
Channel structure	Main channel	Habitat	--

### **In-stream**

Trash and metals should be removed from the stream segment between S. Church Street and Old Salem Hwy.

## **IV. Sampling and Monitoring**

Permit language requires sampling and monitoring activities in order to gage the effectiveness of installed BMP's. Specific sampling is also required when certain pollutants are contributing to stream impairment. Furthermore, staff samples city wide to establish general water quality conditions. The SWMM model will also be ran to generate sediment removal numbers. *Sampling results are compiled in a GIS database which can be viewed online (sampling reports kept on file). Dr. Frank Bailey of MTSU and students are source tracking bacteria from springs and outfalls along Lytle Creek. Research findings will be added to this report upon completion.*

<http://mwsdmaps.murfreesborotn.gov/gisapps/Stormwater/>

<b>Parameter</b>	<b>Schedule/ frequency</b>	<b>Quality Trend</b> up/down	<b>Rule or BMP Effectiveness</b>
Outfall	Summer 2012	Many outfalls clear	3.1, BMP effectiveness
Biological SQSH	2013, Spring 2015/ bi-annually	TMI – 16	5.1
Biological Cursory	Spring 2013/ annually		3.1, BMP effectiveness
Bacteria	Spring/summer/ Fall 2015/annually		3.1, BMP effectiveness
Visual Stream Assessment	Summer 2013/ 5 yrs		5.2

## Model Runs

Model Type	TSS removal estimates	watershed

## V. Notes

- *A detailed sampling history is documented on file. Extensive sampling in the open karst system associated with the Murfree Spring recharge basin indicates that the source of the high bacteria found in the spring is fairly close by and is of a human source.*
- *Sampling two manholes up from the outfall in the Ridgely Rd stormwater basin show that the concentration of bacteria is during the first flush as the bacteria count lowered with the hydrograph.*
- *For the most part Lytle Creek has good vegetative cover and habitat although there are areas of altered and eroding bank especially between S. Church St and Old Salem Hwy. It is important to note that while SQSH biological sampling did not meet supporting criteria, the habitat assessment scored unimpaired.*