

2018 Stormwater Monitoring Plan
Unincorporated Shelby County, Tennessee
May 1, 2018

The Small Municipal Separate Storm Sewer System (MS4) encompassed by unincorporated Shelby County, Tennessee (Tracking No. TNS075663) includes portions of four (4) distinct HUC_8 Watersheds, as shown on Figure 1. These watersheds include the following:

1. The Loosahatchie River Watershed (HUC_8 08010209)
2. the Wolf River Watershed (HUC_8 08010210)
3. the Nonconnah Creek Watershed (HUC_8 08010211), and
4. the Mississippi River Watershed (HUC_8 08010100)

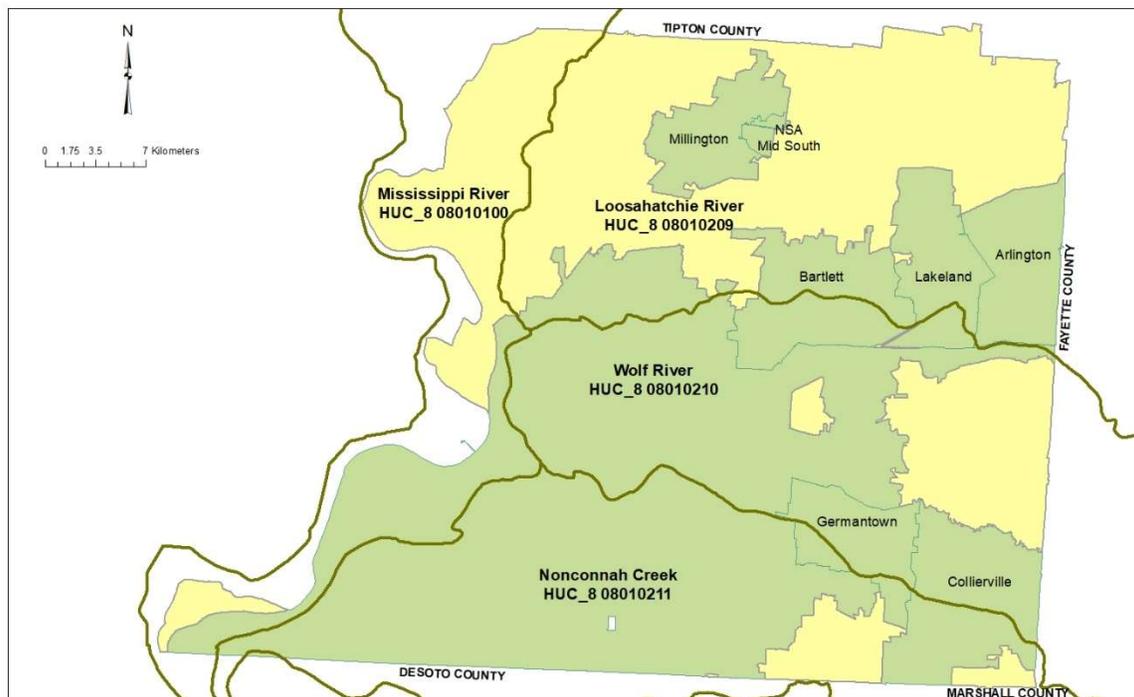


Figure 1
HUC_8 Watersheds
Shelby County, Tennessee

The land uses present in each of these watersheds are extremely diverse, including agricultural/pastures, woodlands, both low and high density residential, and commercial/industrial. In addition to the various land uses encountered within the Shelby County MS4, a large percentage of the runoff in the watersheds can be attributed to MS4's belonging to other government entities. The Loosahatchie River Watershed receives runoff from Fayette County and Tipton County in Tennessee, Naval Support Activities Mid South, and from the municipalities of Memphis, Arlington, Lakeland, Bartlett and Millington, TN. The Wolf River Watershed receives runoff from Fayette County, TN, northern Mississippi, and from the municipalities of Memphis, Bartlett, Lakeland, Germantown, and Collierville, TN. The Nonconnah Creek Watershed receives runoff from Fayette County, TN, from Marshall and Desoto

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Counties in Mississippi, from the municipalities of Germantown, and Collierville, TN. The Mississippi River Watershed receives runoff from the eastern floodplain of the Mississippi River from the southwest corner of Shelby County, TN to the confluence of the Ohio River at Cairo, IL.

Analytical Monitoring

The General Permit (Permit No. TNS000000) requires that the permittee, Shelby County Government, perform analytical monitoring in compliance with the requirements of Option 1, as described in the permit, but also allows the permittee to develop a jurisdiction-specific monitoring plan (Option 2) as an alternative to the minimum plan identified in Option 1. Regardless of the option chosen, the permittee shall perform monitoring as prescribed for stream segments subject to EPA approved TMDLs as applicable to the MS4. Due to the number of watersheds involved, and the diversity of the pollutants associated with the various land uses that exist within each of the watersheds, the County has decided to meet the requirements of Option 2 as listed in the permit. This will allow the County to selectively address the pollutants within each individual watershed and provide greater flexibility in the County's interface with the monitoring plans from the various adjacent jurisdictions. The analytical monitoring plan must be designed to meet, at a minimum, the following objectives:

- a. Measure the effectiveness of the Permittee's Stormwater Management Program;
- b. Evaluate stormwater impacts to receiving waters;
- c. Identify sources of specific pollutants, including nutrients, pathogens, siltation or other parameters related to stormwater runoff from urbanized areas;
- d. Gather data to inform program decisions and prioritization of future activities related to the protection of water quality;
- e. Utilize division protocols identified Option 1 for instream monitoring; and include any monitoring required by a TMDL that is applicable to MS4 jurisdictions.

Factors that were considered during the development of this monitoring plan include land use conditions, stream status/characteristics, and utilization of monitoring results. Analytical monitoring will not be performed on every stream with unavailable parameters. Instead, monitoring locations will be selected based on existing stream geometry and an analysis for each watershed of the reasons for the stream to be classified as non-supporting. Where possible, the monitoring plans for adjacent jurisdictions will be examined and the monitoring sites will be located so as to best complement the efforts of those adjoining jurisdictions. When necessary, due to excessive results observed in the analytical stream monitoring, addition upstream locations may be added in an attempt to localize the cause of the excessive results.

Bacteriological Sampling Biological sampling is required for all stream segments that have been identified with unavailable parameters for siltation or habitat alteration, or for pathogens where discharges from the MS4 have been identified as the source(s) for the unavailable parameter(s). Stream sampling is to be performed utilizing methods identified in the *TDEC Quality System Standard Operating Procedure for Macroinvertebrate Stream Surveys* (latest edition) and *TDEC Quality System Standard Operating Procedure for Chemical and Biological Sampling of Surface Water* (latest edition). These documents are included in Appendixes 8 and 9 in *Shelby County's Stormwater Management Plan, Book of Appendixes*. For the majority of the stream segments located within Shelby County's MS4 jurisdiction, the primary unavailable parameters listed are *Escherichia coli*, total phosphorus, dissolved oxygen and sedimentation/siltation. The primary goal of the County's analytical monitoring is to identify the sources for *Escherichia coli* and phosphorus. The pathogens in each stream segment will be source tracked to either locate the source of the pollution, or to prove that the MS4 is not the source, When the source has been shown to be within the jurisdiction of the Shelby County MS4, BMP's will be implemented that address the source of the pollution. Subsequent samples will either validate the effectiveness of the Stormwater Program, or indicate that new BMP's should be implemented to address the pollution. While obtaining

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water quality parameters is not a requirement, water samples will be tested for dissolved oxygen in stream segments where this has been reported as an unavailable parameter. A secondary goal of the County's analytical monitoring program is to assess the effectiveness of the County's stormwater program as it concerns addressing the pollutants listed as causes for unavailable parameters. Data collected will be compared to historical data and evaluated for trends and impacts to receiving waters. The final goal of the County's analytical monitoring is to provide data that can be utilized to identify and prioritize future activities related to the protection of water quality. Factors listed as contributing to the presence of sedimentation/siltation and habitat alteration in the streams includes non-irrigated crop production, channelization, and discharges from municipal MS4s. With the exception of the MS4 discharges, these are not factors that can be controlled or enforced by Shelby County Government. When sedimentation/siltation is the result of municipal MS4s discharges, other pollutants, such as *Escherichia coli* or total phosphorus, are typically also present in the stream. Since the impacted streams will be monitored for these pollutants, the source of the sedimentation/siltation can also be identified from these monitoring activities.

At least one sample a month for 12 months will be collected for each stream segment within a five-year period. A set of five samples will be obtained during one of the months of June through September for each stream segment in order to calculate a geometric mean. This set will replace to normal monthly sampling for that segment. Sampling locations will be at established TDEC monitoring sites whenever possible. When additional locations are needed for source identification or more effective land use monitoring, station identification numbers will be established using the procedures found in *TDEC Quality System Standard Operation Procedure for Chemical and Biological Sampling of Surface Water, Protocol B*. If any monthly sampling analysis for *Escherichia coli* results in an exceedance of 941 CFU/100 mL, another sample will be obtained upstream of the normal monitoring location at the first junction of any blue line branches. This sampling is intended to help isolate the source of the exceedance. Sample locations will continue upstream until the exceedance no longer occurs. At this point, the source should be between the point of exceedance and the point of non-exceedance. Additional sampling may be required to more accurately locate the source.

TMDL Monitoring Analytical monitoring for stream segments subject to TMDLs shall be performed as prescribed in the TMDL. TMDLs have been approved for *Escherichia coli*, chlordane, dioxins, and polychlorinated biphenyls in the Loosahatchie River Watershed, the Wolf River Watershed, and the Nonconnah Creek Watershed. In addition, a TMDL has been approved for metals the Wolf River Watershed and a TMDL for arsenic has been approved for the Nonconnah Creek Watershed. Although the *Escherichia coli* TMDL does not specifically list monitoring requirements, Bacteriological sampling as described above will be used. Stream sampling is performed utilizing methods identified in the *TDEC Quality System Standard Operating Procedure for Chemical and Biological Sampling of Surface Water* (latest edition). As of the publication date of this Monitoring Plan, there are no TMDLs that require analytical monitoring by Shelby County. Future TMDLs will be reviewed to assess their impact on this portion of the Monitoring Plan.

Loosahatchie River Watershed – HUC 8 08010209

As is shown in Figure 2, this watershed consists of the northern half of Shelby County, and extends into southern Tipton County and northern Fayette County. The City of Millington, and Naval Air Station Mid-South are contained within the watershed. Parts of the municipalities of Memphis, Bartlett, Lakeland and Arlington extend into the southern portion of this watershed. The municipalities of Munford and Atoka in Tipton County are located in the northern reaches of the watershed. There are seven (7) HUC-12 sub-watersheds located within the Loosahatchie River Watershed. The primary pollutants reported throughout the Loosahatchie River watershed are *Escherichia coli*, dissolved oxygen, and phosphorus. Chlordane, dioxin, mercury and polychlorinated biphenyls are also present within the watershed along the lower reaches of the Loosahatchie River. These contaminants are the result of past discharges, and are not on-going. Shelby County will not sample for chlordane, dioxin, mercury or polychlorinated biphenyls.

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TMDLs have been approved for *Escherichia coli*, chlordane, dioxins, and polychlorinated biphenyls in the Loosahatchie River Watershed. Many of the Unavailable Parameters identified on stream segments that result from causes that are outside of Shelby County's scope of influence. These include unavailable parameters that are caused by stream channelization, livestock, agricultural activities, discharges from MS4s located outside of the Shelby County MS4 jurisdiction, and past (non-ongoing) industrial activities. A detailed listing of the stream segments and identified Unavailable Parameters for the Loosahatchie River Watershed are provided in Appendix A.

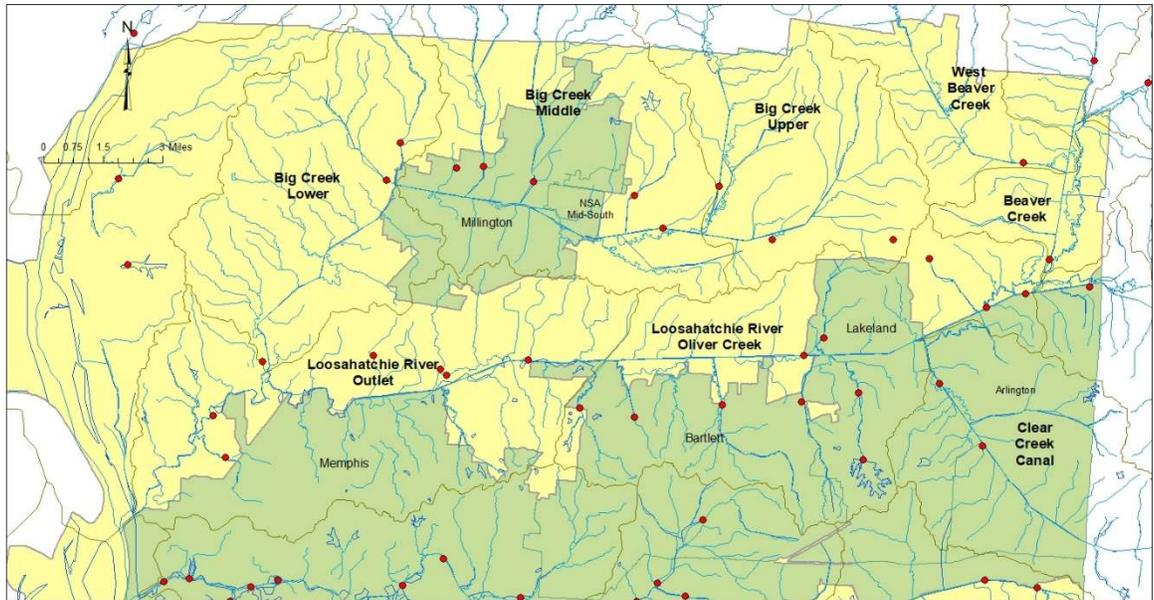


Figure 2
HUC_12 Sub Watersheds
Loosahatchie River Watershed
Shelby County, Tennessee

Monitoring Proposed by other MS4's

NSA Mid South proposes the collection of samples at outfalls of two miscellaneous tributaries to Big Creek, and in Big Creek just upstream of each of these outfalls. These outfalls mark the eastern and western boundaries of the NSA Mid South MS4. Samples collected at these locations will be analyzed for phosphate, CBOD₅, and *Escherichia coli*. These tributaries are not listed by TDEC as having unavailable parameters. The Town of Arlington does not propose any monitoring efforts on the Loosahatchie River. The City of Bartlett proposes the collection of samples on Howard Creek at Old Brownsville Road, on Buckhead Creek at Old Brownsville Road, on Oliver Creek at Old Brownsville Road, and on the Loosahatchie River at Austin Peay Highway. Samples collected by the City of Bartlett will be analyzed for arsenic, and *Escherichia coli*. The City of Lakeland proposes to obtain samples from two (2) locations on Oliver Creek. Samples collected by Lakeland will be analyzed for total phosphorus, and *Escherichia coli*.

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Shelby County Monitoring Locations

Where available, Shelby County's sampling locations for the Loosahatchie River Watershed will be at established TDEC monitoring sites. An enlarged view of each sub-watershed located within the Loosahatchie River Watershed, including the locations of the proposed monitoring stations, is included in Appendix A. Proposed monitoring stations to be used in the Loosahatchie River Watershed are as listed below:

ID305B/Water Name	Station ID Location Name	Location Description	Contaminants to be Sampled	Sample Year
TN08010209021_0610 Unnamed Trib to Crooked Creek Canal	<i>Name to be determined</i>	Millington-Arlington Road	Escherichia coli	2019
TN08010209021_0600 Crooked Creek Canal	CROOK1C1.3SH	Donnell Road	Escherichia coli Phosphorus	2019
TN08010209021_3000 Big Creek Canal	BIG1C15.8SH	Millington-Arlington Road	Escherichia coli	2019
TN08010209021_2000 Big Creek Canal	BIG1C13.6SH	U/S of Millington STP at Sledge Road	Escherichia coli Dissolved Oxygen Phosphate Sedimentation/Siltation	2019
TN08010209021_0100 Jakes Creek	JAKES000.3SH	Shake Rag Road	Escherichia coli	2019
TN08010209021_1000 Big Creek Canal	BIG1C1.0SH	Fite Road	Escherichia coli Nitrate/Nitrite (Nitrite + Nitrate as N) Dissolved Oxygen Phosphorus	2020
TN08010209002_0100 Unnamed Trib to Loosahatchie River	LOOSA10.8T1.3SH	Near Old Millington Road	Escherichia Coli	2020
TN08010209002_2000 Loosahatchie River	LOOSA1C22.7SH	Brunswick Road	Escherichia coli Phosphorus Sedimentation/Siltation	2020
TN08010209002_1000 Loosahatchie River	LOOSA008.2SH	Hwy 51	Escherichia coli Phosphorus Sedimentation/Siltation	2020
TN08010209001_0100 Todd Creek	TODD001.6SH	Millington Road	Escherichia coli Dissolved Oxygen Phosphorus	2020
TN08010209001_1000 Loosahatchie River	LOOSA001.5SH	Benjestown Road	Escherichia coli Phosphorus	2020

Stream Segments Not Monitored as a Part of This Plan

- **Beaver Creek (TN08010209016_1000)**

Unavailable parameters reported within this stream segment include dissolved oxygen, total phosphorus, physical substrate habitat alteration, and sedimentation/siltation. These unavailable parameters are believed to be the result of stream channelization and non-irrigated crop production.

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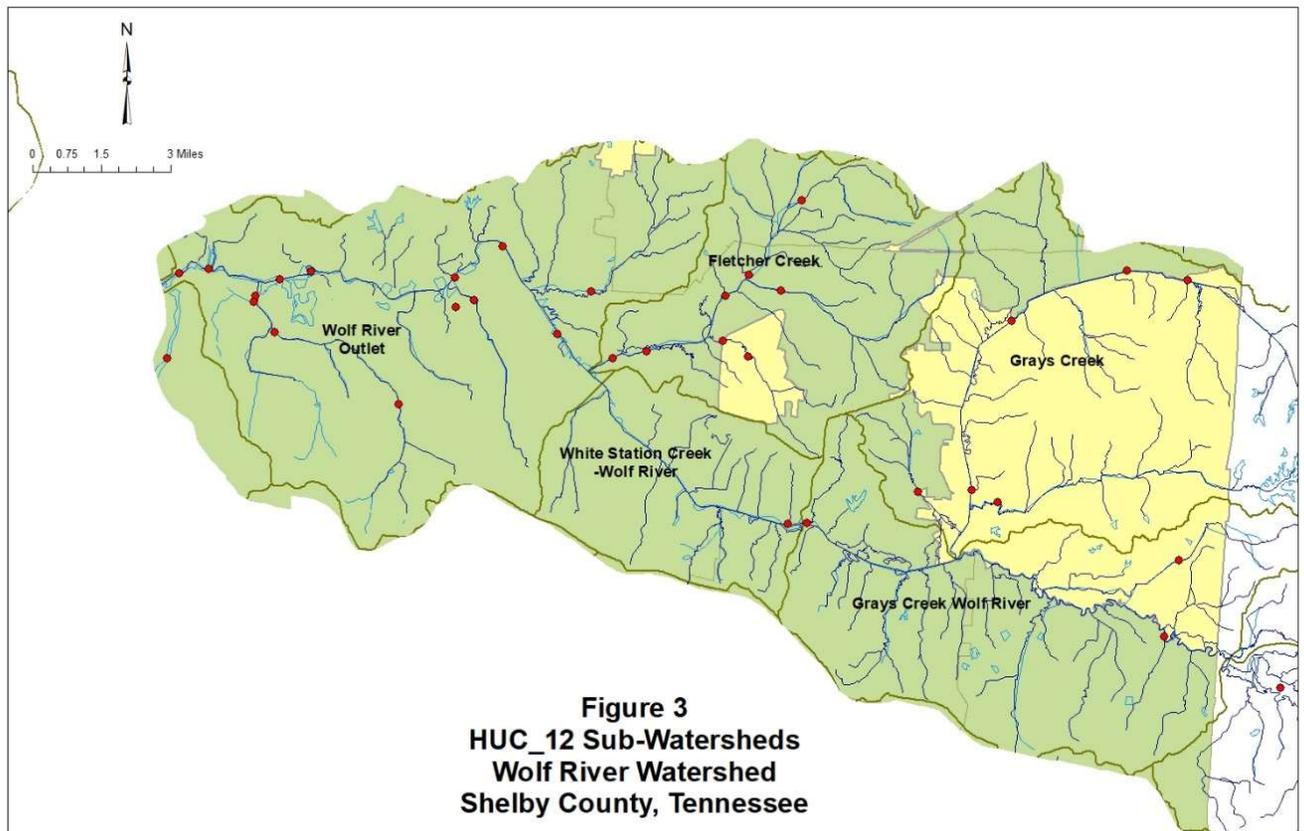
- **Middle Beaver Creek (TN08010209016_0200)**
Unavailable parameters reported within this stream segment include dissolved oxygen, total phosphorus, physical substrate habitat alteration, and sedimentation/siltation. These unavailable parameters are believed to be the result of stream channelization and non-irrigated crop production.
- **East Beaver Creek (TN08010209016_0300)**
Unavailable parameters reported within this stream segment include dissolved oxygen, total phosphorus, physical substrate habitat alteration, nitrite + nitrate as N, and sedimentation/siltation. These unavailable parameters are believed to be the result of stream channelization non-irrigated crop production, and municipal point source discharges. Only a small segment at the downstream end of this stream lies within the jurisdiction of the Shelby County MS4. The majority of the sub-watershed, including the municipalities of Braden and Mason, lie within Tipton and Fayette Counties.
- **West Beaver Creek (TN08010209016_0100)**
Unavailable parameters reported within this stream segment include dissolved oxygen, total phosphorus, physical substrate habitat alteration, and sedimentation/siltation. These unavailable parameters are believed to be the result of stream channelization and non-irrigated crop production.
- **North Fork Creek (TN08010209021_0300)**
Unavailable parameters reported within this stream segment include Escherichia coli, dissolved oxygen, total phosphorus, physical substrate habitat alteration, and sedimentation/siltation. These unavailable parameters are believed to be the result of stream channelization, grazing in riparian or shoreline zones, or non-irrigated crop production. One reported source of Escherichia coli is discharges from MS4s. The municipality of Atoka is located at the upstream end of this stream segment, while the City of Millington is located at the extreme southern end of the stream segment.
- **Royster Creek (TN08010209021_0200)**
Unavailable parameters reported within this stream segment include Escherichia coli, dissolved oxygen, total phosphorus, physical substrate habitat alteration, and sedimentation/siltation. These unavailable parameters are believed to be the result of stream channelization, grazing in riparian or shoreline zones, or non-irrigated crop production.
- **Bear Creek (TN08010209016_0110)**
Unavailable parameters reported within this stream segment include Escherichia coli, dissolved oxygen, and total phosphorus. These unavailable parameters are believed to be the result of grazing in riparian or shoreline zones, or non-irrigated crop production.
- **Rocky Branch (TN08010209002_0200)**
Unavailable parameter reported within this stream segment is Escherichia coli. Only a very small segment at the extreme upstream portion of this stream (0.31 miles) lies within the jurisdiction of the Shelby County MS4. The majority of the stream lies within the jurisdiction of the City of Lakeland.
- **Oliver Creek (TN08010209002_0400)**
Unavailable parameters reported within this stream segment include total phosphorus, Escherichia coli and sedimentation/siltation. Monitoring on this stream is being provided by the City of Bartlett.
- **Buckhead Creek (TN08010209002_0500)**
Unavailable parameters reported within this stream segment include total phosphorus, Escherichia coli, dissolved oxygen, and sedimentation/siltation. Monitoring on this stream is being provided by the City of Bartlett.

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- **Howard Creek (TN08010209002_0700)**
Unavailable parameters reported within this stream segment include total phosphorus, and Escherichia coli. Monitoring on this stream is being provided by the City of Bartlett.

Wolf River Watershed – HUC 8 08010210

As is shown in Figure 3, this watershed is located in central Shelby County and includes portions of Fayette County and extends into northern Mississippi. Parts of the municipalities of Memphis, Bartlett, Lakeland and Arlington are located within along the northern portion of this watershed. Parts of the municipalities of Germantown, Memphis, and Collierville are located within the southern portion of the watershed. In Fayette County, the municipalities of Williston, Piperton, Rossville, Moscow, and La Grange lie within the Wolf River Watershed. There are five (5) total HUC_12 sub-watersheds located in Shelby County within the Wolf River Watershed. Three (3) of these are located within the jurisdiction of the Shelby County MS4 area. The pollutants reported throughout the unincorporated Shelby County portion the Wolf River watershed are Escherichia coli, dissolved oxygen, and total phosphorus. TMDLs have been approved for Escherichia coli, metals, chlordane, dioxins, and polychlorinated biphenyls. A detailed listing of the Unavailable Parameters for the Wolf River Watershed is provided in Appendix B.



Monitoring Proposed by other MS4's

The City of Germantown focusing on sedimentation/siltation within the Wolf River Watershed. Only non-analytical monitoring of the Wolf River is provided in their Monitoring Plan. The City of Bartlett is monitoring Harrington Creek at Elmore Road, focusing on Escherichia coli and arsenic.

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Shelby County Monitoring Locations

Where available, sampling locations for the Wolf River Watershed will be at established TDEC monitoring sites. An enlarged view of each sub-watershed located within the Wolf River Watershed, including the locations of the monitoring stations, is included in Appendix B. Proposed monitoring stations to be used in the Wolf River Watershed are as listed below:

ID305B Water Name	Station ID Location Name	Location Description	Contaminants to be Sampled	Sample Year
TN08010210022_0300 Marys Creek	MARYS001.0SH	Raleigh-Lagrange Road	Escherichia coli Phosphorus Sedimentation/Siltation	2021
TN08010210022_1000 Grays Creek	GRAYS001.7SH	Raleigh-Lagrange Road	Escherichia coli Phosphorus Dissolved Oxygen Sedimentation/Siltation	2021
TN08010210023_0200 Unnamed Trib to Fletcher Creek	FLETC2.8T0.4SH	Whitten Road	Escherichia coli Phosphorus Dissolved Oxygen	2021

Stream Segments Not Monitored as a Part of This Plan

- **Johnson Creek (TN08010210003_0100)**
Unavailable parameter reported within this stream segment is alteration in stream-side or littoral vegetative covers. This unavailable parameter is believed to be the result of discharges from MS4s, and grazing in riparian or shoreline zones.
- **Marys Creek (TN08010210022_0350)**
Unavailable parameters reported within this stream segment include low flow alteration and Escherichia coli. These unavailable parameters are believed to be the result of upstream impoundments, and grazing in riparian or shoreline zones.
- **Unnamed tributary to Grays Creek (TN08010210022_0100)**
Unavailable parameters reported within this stream segment include Escherichia coli, dissolved oxygen, total phosphorus, physical substrate habitat alteration, and sedimentation/siltation. This stream segment lies primarily with the jurisdiction of the City of Memphis, with only the most downstream portion of the segment being within the Shelby County jurisdiction.
- **Wolf River (TN08010210002_2000)**
Unavailable parameter reported within this stream segment is sedimentation/siltation, which is believed to be the result of discharges from MS4s, and channelization. Only the upstream end of this segment (0.3 miles) is located within the jurisdiction of the Shelby County MS4, with the majority being located with the MS4 jurisdictions of the Cities of Memphis and Germantown.
- **Unnamed Tributary to Fletcher Creek (TN08010210023_0200)**
Unavailable parameter reported within this stream segment include alteration in stream-side or littoral vegetative covers, dissolved oxygen, total phosphorus, and Escherichia coli. These pollutants are believed to be the result of discharges from MS4s, grazing in riparian or shoreline areas, and livestock (grazing or feeding operations).
- **Fletcher Creek (TN08010210023_1000)**
Unavailable parameter reported within this stream segment include dissolved oxygen, total phosphorus, Escherichia coli and physical substrate habitat alteration. These pollutants are believed to be the result of discharges from MS4s, grazing in riparian or shoreline areas and channelization. Only a small segment (0.3 miles) of this watershed is

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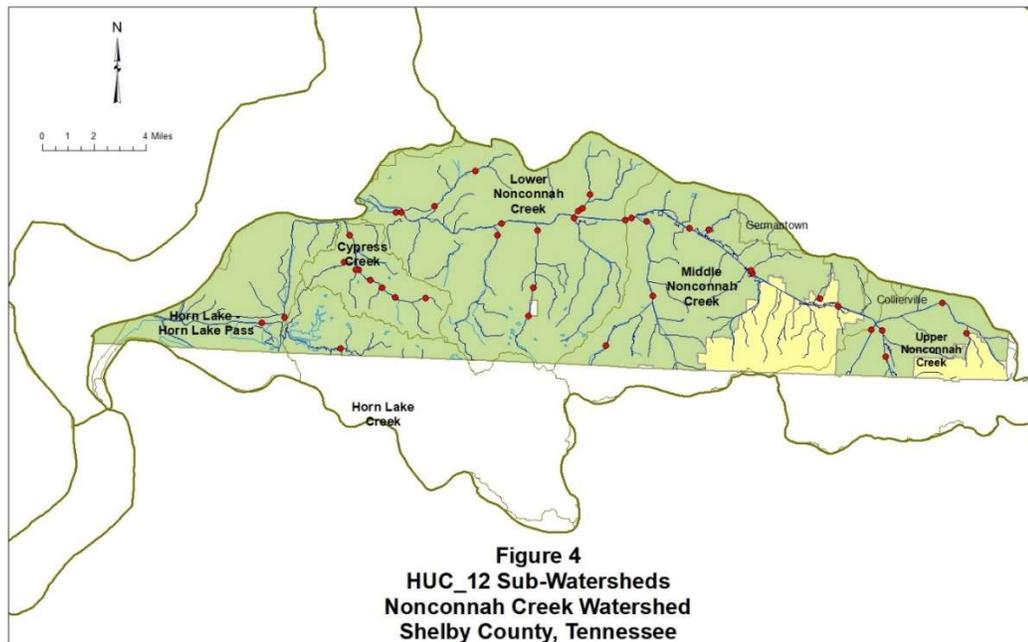
located within the jurisdiction of the Shelby County MS4, with the majority being located with the MS4 jurisdiction of the City of Memphis.

- **Harrington Creek (TN08010210001_0100)**

Unavailable parameter reported within this stream segment include arsenic, dissolved oxygen, total phosphorus, and Escherichia coli. These pollutants are believed to be the result of discharges from MS4s. Only a small segment (0.3 miles) of this watershed is located within the jurisdiction of the Shelby County MS4, with the majority being located with the MS4 jurisdictions of the City of Memphis and the City of Bartlett.

Nonconnah Creek Watershed – HUC 8 08010211

As is shown in Figure 4, this watershed is located in southern Shelby County and includes portions of Fayette County and northern Mississippi. Parts of the municipalities of Memphis, Germantown and Collierville are located within this Watershed. There are six (6) total HUC_12 sub-watersheds located within the Nonconnah Creek Watershed. A portion of two (2) of these are located within the jurisdiction of the Shelby County MS4. The pollutants reported throughout the unincorporated Shelby County portion the Nonconnah Creek watershed are Escherichia coli, dissolved oxygen, and total phosphorus. TMDLs have been approved for Escherichia coli, arsenic, chlordane, dioxins, and polychlorinated biphenyls in the Nonconnah Creek Watershed. A detailed listing of the Unavailable Parameters for the Nonconnah Creek Watershed are provided in Appendix C.



Monitoring Proposed by other MS4's

The Town of Collierville will be testing samples taken from segments of Nonconnah Creek for Escherichia coli. Their intent is to localize the sources of Escherichia coli contamination so they will test downstream of potential sources (specific sampling locations are not provided in their Monitoring Plan). The City of Germantown will be testing samples taken from Nonconnah Creek and from two unnamed tributaries for Nonconnah Creek for Escherichia coli. Specific sampling locations are not provided in their Monitoring Plan.

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Shelby County Monitoring Locations

Where available, sampling locations for the Nonconnah Creek Watershed will be at established TDEC monitoring sites. An enlarged view of each sub-watershed located within the Nonconnah Creek Watershed, including the locations of the monitoring stations, is included in Appendix C. Proposed monitoring stations to be used in the Nonconnah Creek Watershed are as listed below:

ID305 Water Name	Station ID Location Name	Location Description	Contaminants to be Sampled	Sample Year
TN0801021100720_0500 Unnamed Trib to Nonconnah Creek	NONCO018.3T0.9SH	Barnstable Road (Lowrance Road)	Oxygen, dissolved Phosphorus (Total) Escherichia coli	2021

Stream Segments Not Monitored as a Part of This Plan

- **Nonconnah Creek (TN0801021100720_3000)**
Unavailable parameters reported within this stream segment are physical substrate habitat alterations and total phosphorus. These unavailable parameters are believed to be the result of channelization, specialty crop production and discharges from MS4s. Only a very small segment of this stream is located within the Shelby County MS4 jurisdiction. The stream serves as the boundary separating the Shelby County and the Town of Collierville MS4s.
- **Unnamed tributary to Nonconnah Creek (TN0801021100720_0300)**
Unavailable parameters reported within this stream segment are sedimentation/siltation and total phosphorus. These unavailable parameters are believed to be the result of specialty crop production.
- **Unnamed tributary to Nonconnah Creek (TN0801021100720_0400)**
Unavailable parameters reported within this stream segment are Escherichia coli, sedimentation/siltation and total phosphorus. These unavailable parameters are believed to be the result of sources outside of State Jurisdiction Boundaries.
- **Nonconnah Creek (TN0801021100720_2000)**
Unavailable parameters reported within this stream segment are physical substrate habitat alterations, total phosphorus, dissolved oxygen sedimentation/siltation. And Escherichia coli. These unavailable parameters are believed to be the result of channelization, site clearance (land development or redevelopment) and discharges from MS4s. Only a very small segment of this stream is located within the Shelby County MS4 jurisdiction. The stream serves as the boundary separating the Shelby County and the City of Germantown MS4s.

Mississippi River Watershed – HUC 8 08010100

This watershed is located along the western limits of Shelby County and includes the Mississippi River floodplain from the southwest corner of Shelby County northerly to the confluence of the Ohio River. Within the Shelby County MS4 jurisdiction, all stream segments within this watershed are either fully supporting or not assessed. Shelby County does not propose to conduct any sampling or monitoring for the stream segments within this watershed.

Non-analytical Monitoring

Visual Stream Surveys and Unavailable Parameter Inventories must be performed on each stream segment within the MS4 jurisdiction with unavailable parameters for siltation, habitat alteration,

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pathogens, and nutrients to identify and prioritize sources of these pollutants of concern. If a stream segment is identified as having unavailable parameters of concern, it is recommended that visual stream surveys be performed throughout the entire HUC_12 sub-watershed including that stream segment. At a minimum, a visual stream survey must be performed immediately upstream and downstream of each MS4 outfall that discharges into that stream segment. Existing survey protocols similar to those developed by the [Maryland Department of Natural Resources](#) will be used for conducting the Visual Stream Surveys. All stream segments with unavailable parameters in the permitted jurisdiction will be surveyed in a five-year period.

Record Keeping

When the permittee conducts monitoring or stormwater Discharges, or of receiving waters, it must comply with the following:

- a. Representative monitoring. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity; and
- b. Test Procedures. Monitoring results must be conducted according to test procedures approved under [40 CFR § 136](#).

Records of monitoring information shall include:

- a. The date, exact place indicated by latitude and longitude, and time of sampling or measurements;
- b. The name(s) of the individual(s) who performed the sampling or measurements;
- c. The date(s) analyses were performed;
- d. The names of the individuals who performed the analyses;
- e. The analytical techniques or methods used; and
- f. The results of such analyses.

The monitoring plan must be included in the SWMP. The records and results of the analytical monitoring must be submitted to the division in the subsequent annual report. A summary of non-analytical activities and results must also be submitted in the subsequent annual report.

Reporting

The permittee must submit an annual report to the appropriate EFO by September 30 of each calendar year that covers the reporting year (July 1 to June 30). The permittee may fulfill this requirement by submitting the report via water.permits@tn.gov. Prior to submitting the annual report to the division, the permittee must present the annual report to the public for suggestions and comment. This may be done through any public communication method the permittee chooses such as a public hearing or by publishing a draft annual report on the permittee's website. The permittee should respond to any comments received.

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**Appendix A
Loosahatchie River Watershed**

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Appendix A

Unavailable Parameters - Loosahatchie River Watershed - HUC_8 08010209

ID305B/Water Name	Cause Name	Source Name
Beaver Creek - HUC_12 080102090203		
TN08010209016_1000 Beaver Creek	Oxygen, Dissolved	Non-Irrigated Crop Production
	Phosphorus (Total)	Non-Irrigated Crop Production
	Physical Substrate habitat alterations	Channelization
	Sedimentation/Siltation	Non-Irrigated Crop Production
TN08010209016_0200 Middle Beaver Creek	Oxygen, Dissolved	Non-Irrigated Crop Production
	Phosphorus (Total)	Non-Irrigated Crop Production
	Physical Substrate habitat alterations	Channelization
	Sedimentation/Siltation	Non-Irrigated Crop Production
East Beaver Creek - HUC_12 080102090201		
TN08010209013_0300 East Beaver Creek	Oxygen, Dissolved	Non-Irrigated Crop Production
	Physical Substrate habitat alterations	Non-Irrigated Crop Production
	Sedimentation/Siltation	Non-Irrigated Crop Production
	Nitrate/Nitrite (Nitrite + Nitrate as N)	Non-Irrigated Crop Production
	Phosphorus (Total)	Non-Irrigated Crop Production
	Nitrate/Nitrite (Nitrite + Nitrate as N)	Municipal Point Source Discharges
	Phosphorus (Total)	Municipal Point Source Discharges
West Beaver Creek - HUC_12 080102090202		
TN08010209016_0100 West Beaver Creek	Oxygen, Dissolved	Non-Irrigated Crop Production
	Phosphorus (Total)	Non-Irrigated Crop Production
	Physical Substrate habitat alterations	Channelization
	Sedimentation/Siltation	Non-Irrigated Crop Production
Big Creek Upper - HUC_12 080102090301		
TN08010209021_0610 Unnamed Trib to Crooked Creek Canal	Escherichia coli	On-Site Treatment Systems (Septic Systems)

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TN08010209021_0600 Crooked Creek Canal	Escherichia coli	On-Site Treatment Systems (Septic Systems)
	Oxygen, Dissolved	Non-Irrigated Crop Production
	Phosphorus (Total)	Municipal Point Source Discharges
	Phosphorus (Total)	Non-Irrigated Crop Production
	Physical Substrate habitat alterations	Channelization
TN08010209021_3000 Big Creek	Escherichia coli	Discharges from MS4s
	Phosphorus (Total)	Non-Irrigated Crop Production
	Physical substrate habitat alterations	Channelization
	Sedimentation/Siltation	Channelization
Big Creek Middle - HUC_12 080102090302		
TN08010209021_0300 North Fork Creek	Escherichia coli	Discharges from MS4s
	Escherichia coli	Grazing in Riparian or Shoreline Zones
	Oxygen, Dissolved	Non-Irrigated Crop Production
	Phosphorus (Total)	Non-Irrigated Crop Production
	Physical substrate habitat alterations	Channelization
	Sedimentation/Siltation	Channelization
TN08010209021_0200 Royster Creek	Escherichia coli	Grazing in Riparian or Shoreline Zones
	Oxygen, Dissolved	Non-Irrigated Crop Production
	Phosphorus (Total)	Non-Irrigated Crop Production
	Physical substrate habitat alterations	Channelization
	Sedimentation/Siltation	Non-Irrigated Crop Production
TN08010209021_2000 Big Creek	Escherichia coli	Discharges from MS4s
	Oxygen, Dissolved	Discharges from MS4s
	Phosphate	Discharges from MS4s
	Physical substrate habitat alterations	Channelization
	Sedimentation/Siltation	Channelization
	Sedimentation/Siltation	Discharges from MS4s

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Big Creek Lower - HUC_12 080102090303

TN08010209021_0110 Bear Creek	Escherichia coli	Grazing in Riparian or Shoreline Zones
	Oxygen, Dissolved	Non-Irrigated Crop Production
	Phosphorus (Total)	Grazing in Riparian or Shoreline Zones
TN08010209021_0100 Jakes Creek	Escherichia coli	Source Unknown
	Phosphorus (Total)	Non-Irrigated Crop Production
	Sedimentation/Siltation	Non-Irrigated Crop Production
TN08010209021_1000 Big Creek	Escherichia coli	Discharges from MS4s
	Nitrate/Nitrite (Nitrite + Nitrate as N)	Municipal Point Source Discharges
	Oxygen, Dissolved	Municipal Point Source Discharges
	Phosphorus (Total)	Municipal Point Source Discharges
	Physical Substrate habitat alterations	Channelization
	Sedimentation/Siltation	Channelization
Loosahatchie River-Oliver Creek - HUC_12 080102090405		
TN08010209004_1000 Loosahatchie River	Physical Substrate habitat alterations	Channelization
TN08010209002_2000 Loosahatchie River	Escherichia coli	Discharges from MS4s
	Phosphorus (Total)	Discharges from MS4s
	Phosphorus (Total)	Municipal Point Source Discharges
	Physical substrate habitat alterations	Channelization
	Sedimentation/Siltation	Channelization
	Sedimentation/Siltation	Site Clearance (Land Development or Redevelopment)
Loosahatchie River-Oliver Creek - HUC_12 080102090405		
TN08010209002_1000 Loosahatchie River	Chlordane	Contaminated Sediments
	Dioxin (Including 2,3,7,8-TCDD)	Contaminated Sediments

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	Escherichia coli	Discharges from MS4s
	Mercury	Atmospheric Depositions - Toxics
	Phosphorus (Total)	Discharges from MS4s
	Physical substrate habitat alterations	Channelization
	Polychlorinated biphenyls	Contaminated Sediments
	Sedimentation/Siltation	Channelization
	Sedimentation/Siltation	Site Clearance (Land Development or Redevelopment)
TN08010209002_0200 Rocky Branch	Escherichia coli	Discharges from MS4s
TN08010209002_0400 Oliver Creek	Phosphorus (Total)	Discharges from MS4s
	Escherichia coli	Discharges from MS4s
	Sedimentation/Siltation	Site Clearance (Land Development or Redevelopment)
	Sedimentation/Siltation	Discharges from MS4s
TN08010209002_0500 Buckhead Creek	Sedimentation/Siltation	Site Clearance (Land Development or Redevelopment)
	Oxygen, Dissolved	Discharges from MS4s
	Escherichia coli	Discharges from MS4s
	Sedimentation/Siltation	Discharges from MS4s
	Phosphorus (Total)	Discharges from MS4s
TN08010209002_0700 Howard Creek	Phosphorus (Total)	Discharges from MS4s
	Escherichia coli	Discharges from MS4s
TN08010209002_0100 Unnamed Trib to Loosahatchie River	Escherichia coli	Discharges from MS4s
TN08010209001_0100 Todd Creek	Escherichia coli	Discharges from MS4s
	Escherichia coli	Sanitary Sewer Overflows (Collection System Failure)
	Oxygen, Dissolved	Discharges from MS4s
	Phosphorus (Total)	Discharges from MS4s

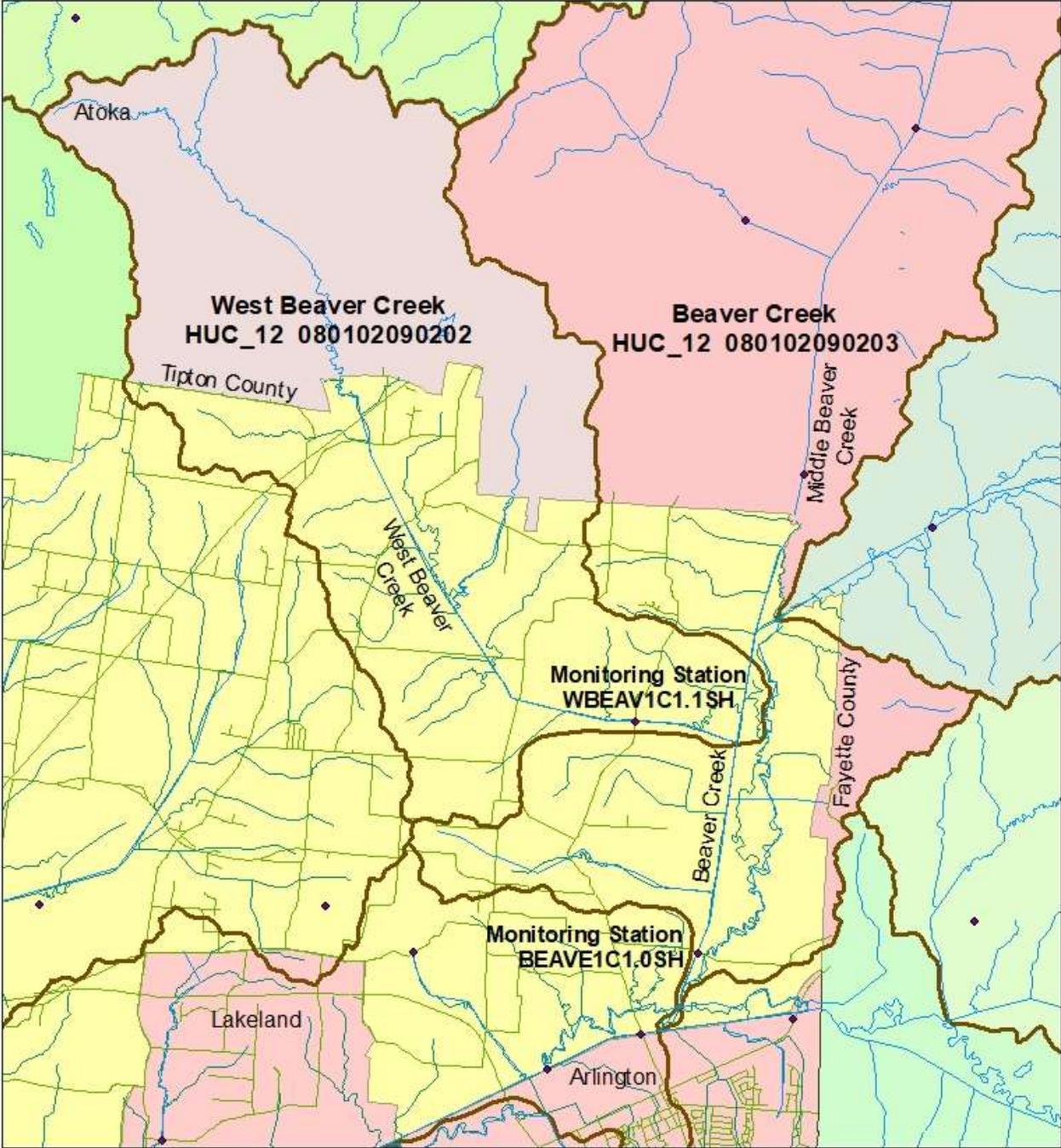
2018 Stormwater Monitoring Plan
Unincorporated Shelby County, Tennessee

TN08010209001_1000 Loosahatchie River	Physical substrate habitat alterations	Channelization
	Chlordane	Contaminated Sediments
	Dioxin (Including 2,3,7,8-TCDD)	Contaminated Sediments
	Escherichia coli	Discharges from MS4s
	Mercury	Atmospheric Depositions - Toxins
	Phosphorus (Total)	Discharges from MS4s
	Physical substrate habitat alterations	Channelization
	Polychlorinated biphenyls	Contaminated Sediments
	Sedimentation/Siltation	Channelization

Legend

	Caused by stream channelization	No monitoring proposed
	Caused by livestock	No monitoring proposed
	Caused by agricultural activities	No monitoring proposed
	Sedimentation/Siltation or habitat alteration not caused by MS4	No monitoring proposed
	Segment monitored by other MS4	No monitoring proposed
	MS4s outside of Shelby County	No monitoring proposed
	Caused by upstream impoundments	No monitoring proposed
	Caused by past industrial activities	No monitoring proposed
	Pollutants to be monitored by Shelby County	

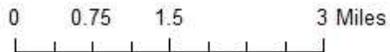
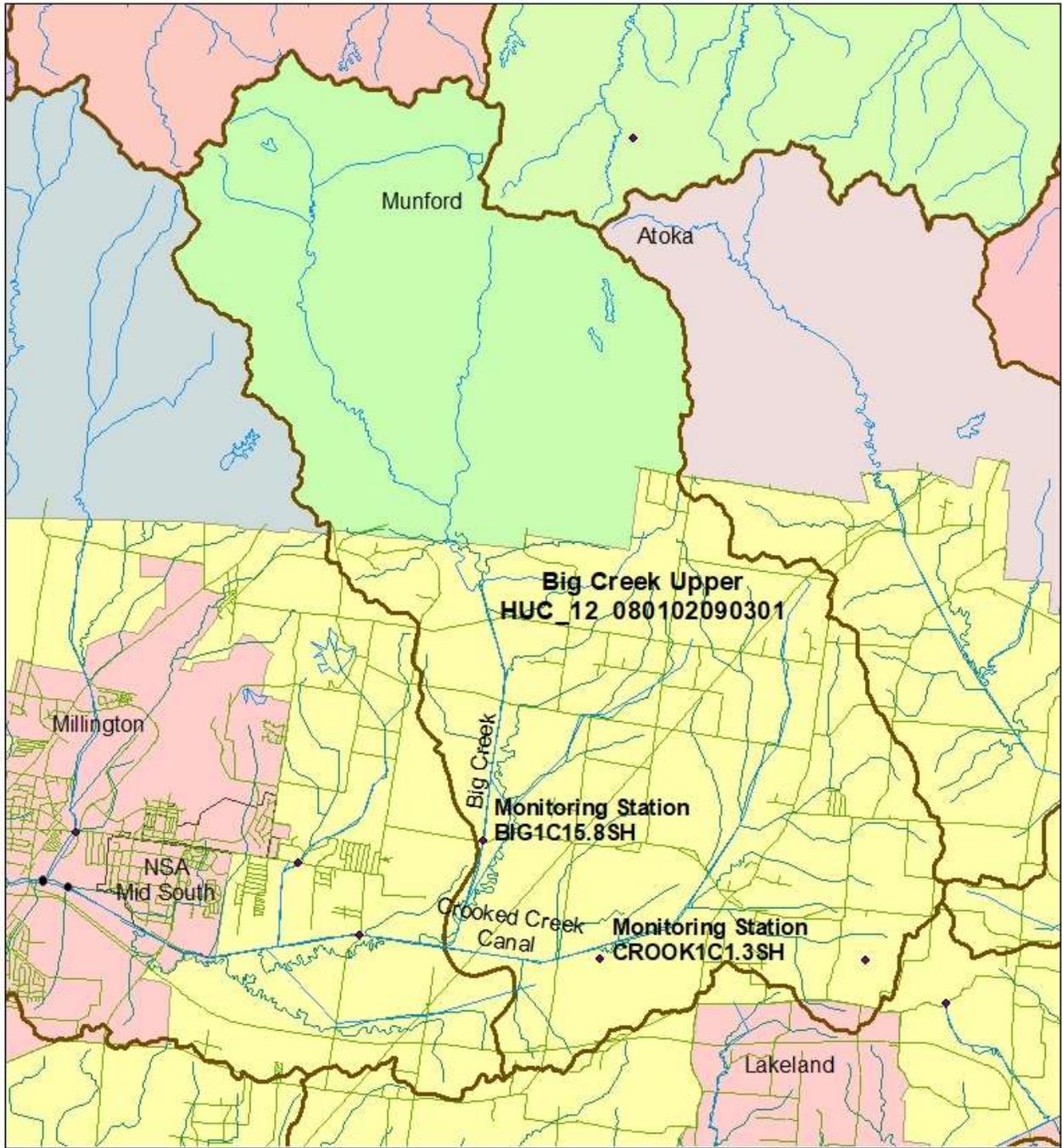
2018 Stormwater Monitoring Plan
Unincorporated Shelby County, Tennessee



0 0.75 1.5 3 Miles

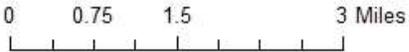
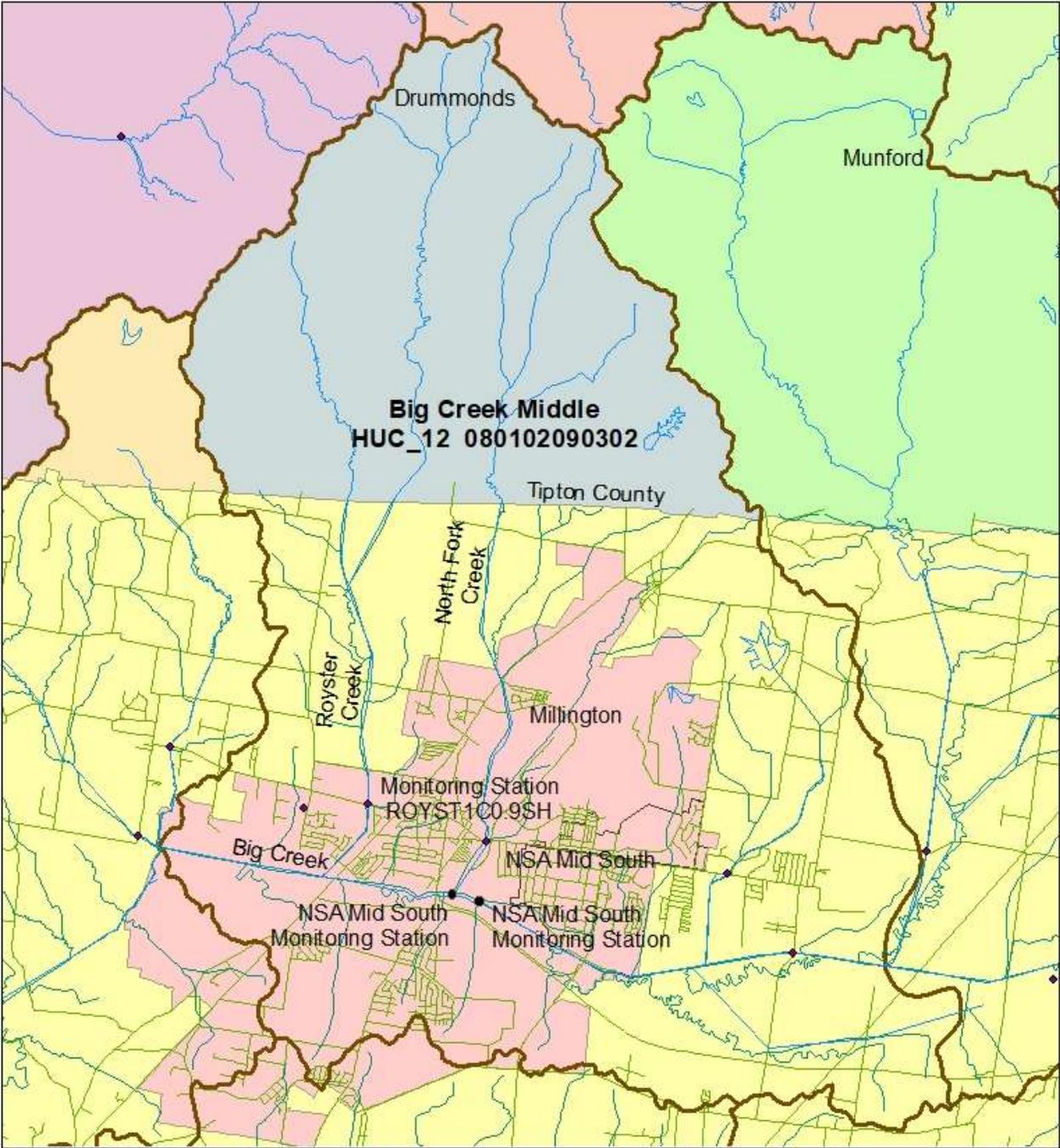
Appendix A
Figure 1
HUC_12 080102090202 - West Beaver Creek
HUC_12 080102090203 - Beaver Creek
Loosahatchie River Watershed
Shelby County, Tennessee

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Unincorporated Shelby County, Tennessee



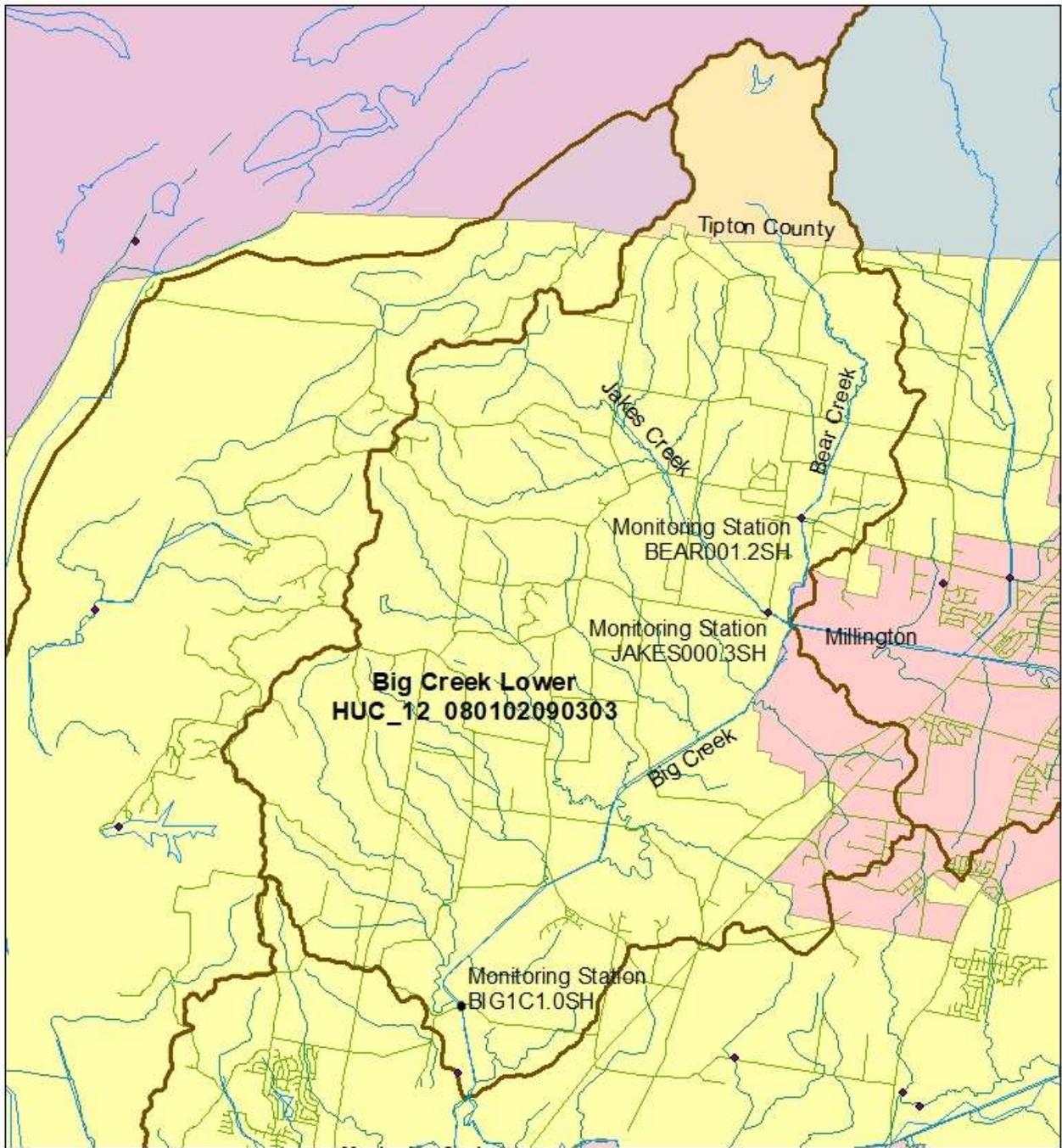
Appendix A
Figure 2
HUC_12 080102090301 - Big Creek Upper
Loosahatchie River Watershed
Shelby County, Tennessee

2018 Stormwater Monitoring Plan
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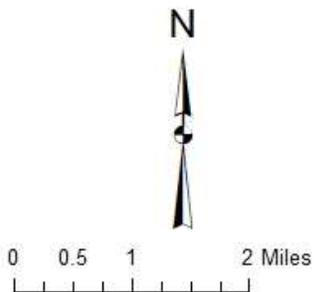


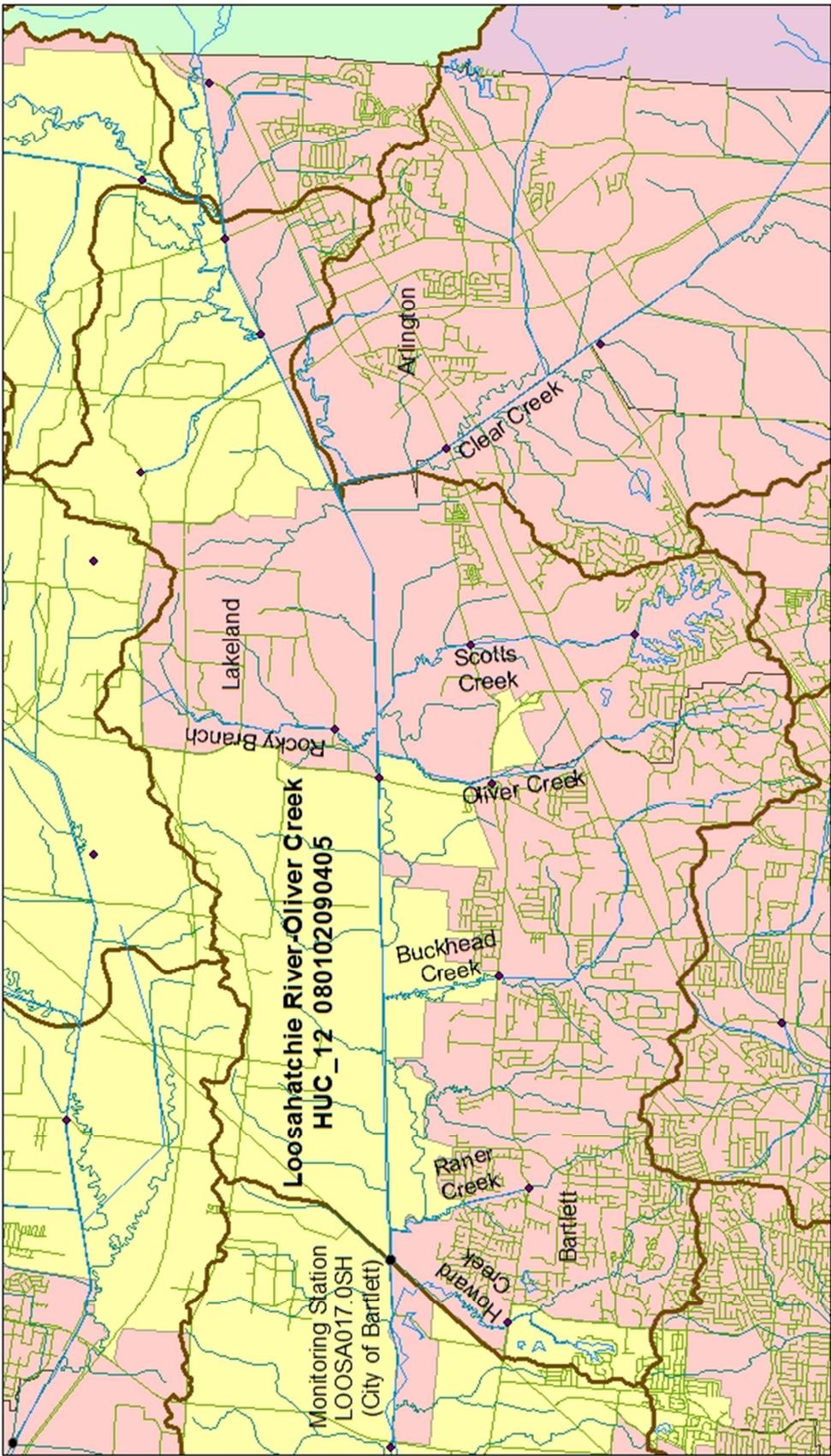
Appendix A
Figure 3
HUC_12 080102090302 - Big Creek Middle
Loosahatchie River Watershed
Shelby County, Tennessee

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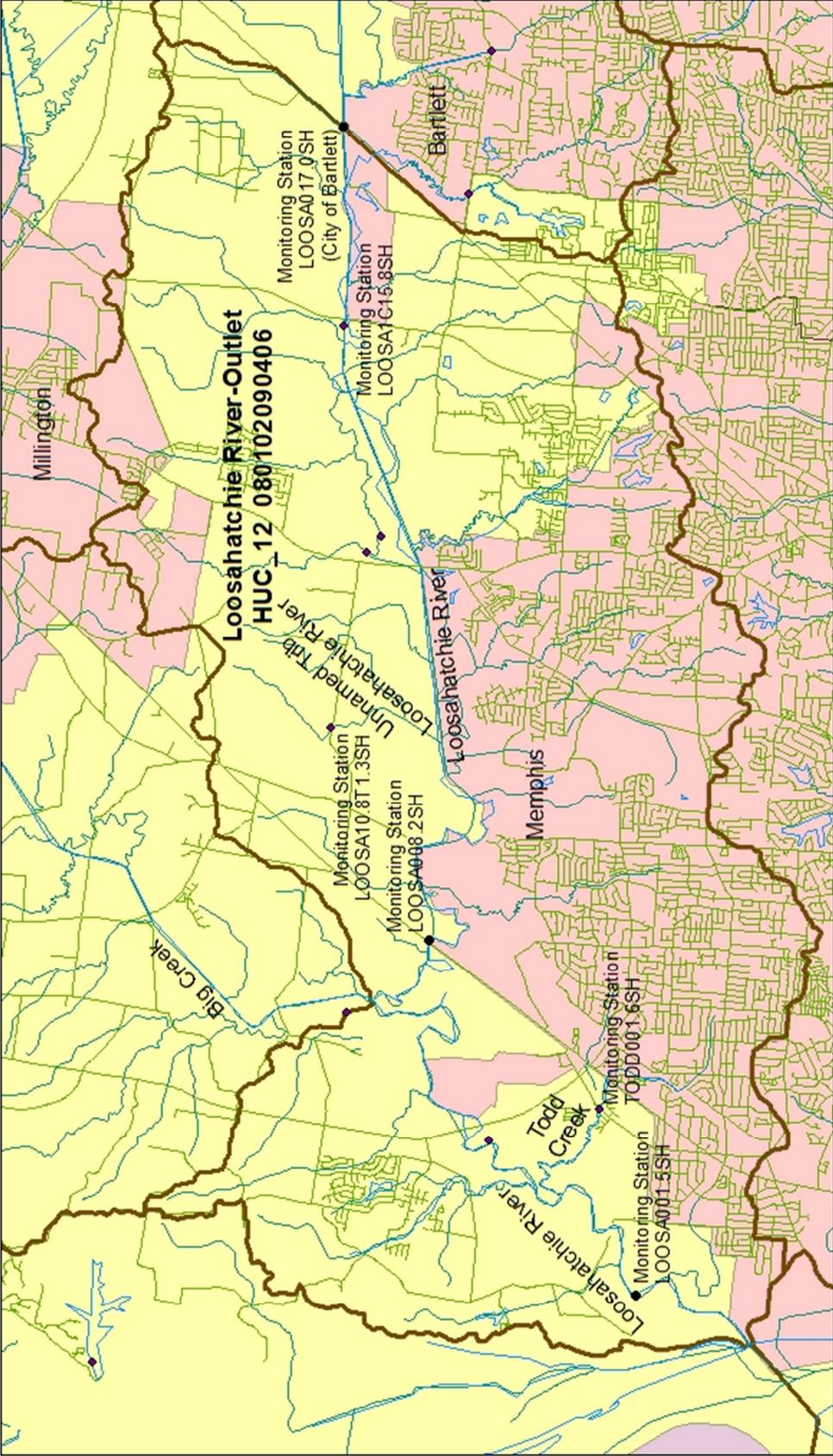


Appendix A
Figure 4
HUC_12 080102090303 - Big Creek Lower
Loosahatchie River Watershed
Shelby County, Tennessee





Appendix A
Figure 5
HUC_12 080102090405 - Loosahatchie River-Oliver Creek
Loosahatchie River Watershed
Shelby County, Tennessee



Appendix A
Figure 6
HUC_12 080102090406 - Loosahatchie River-Outlet
Loosahatchie River Watershed
Shelby County, Tennessee

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**Appendix B
Wolf River Watershed**

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Appendix B
Unavailable Parameters - Wolf River Watershed

ID305B/Water Name	Cause Name	Source Name
Grays Creek - Wolf River HUC_12 080102100305		
TN08010210003_0100 Johnson Creek	Alteration in stream-side or littoral vegetative covers	Discharges from MS4s
	Alteration in stream-side or littoral vegetative covers	Grazing in Riparian or Shoreline Areas
TN08010210002_2000 Wolf River	Sedimentation/Siltation	Discharges from MS4s
	Sedimentation/Siltation	Channelization
Grays Creek HUC_12 080102100304		
TN08010210022_0300 Marys Creek	Phosphorus (Total)	Discharges from MS4s
	Phosphorus (Total)	Grazing in Riparian or Shoreline Areas
	Dissolved Oxygen	Upstream Impoundments
	Sedimentation/Siltation	Discharges from MS4s
	Escherichia coli	Grazing in Riparian or Shoreline Areas
	Escherichia coli	Discharges from MS4s
Marys Creek TN08010210022_0350	Low flow alterations	Upstream Impoundments
	Escherichia coli	Grazing in Riparian or Shoreline Areas
TN08010210022_1000 Grays Creek	Physical substrate habitat Alterations	Channelization
	Sedimentation/Siltation	Non-irrigated Crop Production
	Sedimentation/Siltation	Channelization
	Sedimentation/Siltation	Discharges from MS4s
	Phosphorus (Total)	Discharges from MS4s
	Dissolved Oxygen	Discharges from MS4s
	Escherichia coli	Discharges from MS4s
TN08010210022_0100 Unnamed Trib to Grays Creek	Sedimentation/Siltation	Discharges from MS4s
	Phosphorus (Total)	Discharges from MS4s
	Physical substrate habitat Alterations	Discharges from MS4s
	Dissolved Oxygen	Discharges from MS4s
	Escherichia coli	Discharges from MS4s
Fletcher Creek HUC_12 080102100307		
TN08010210023_0200 Unnamed Trib to Fletcher Creek	Alteration in stream-side or littoral vegetative covers	Discharges from MS4s
	Dissolved Oxygen	Discharges from MS4s
	Phosphorus (Total)	Discharges from MS4s
	Phosphorus (Total)	Grazing in Riparian or Shoreline Areas
	Escherichia coli	Grazing in Riparian or Shoreline Areas
	Escherichia coli	Livestock (Grazing or Feeding Operations)

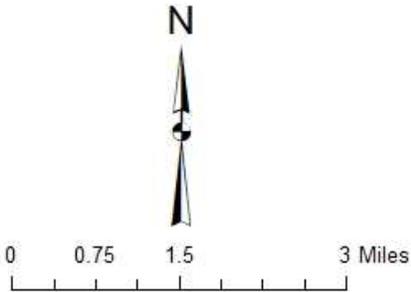
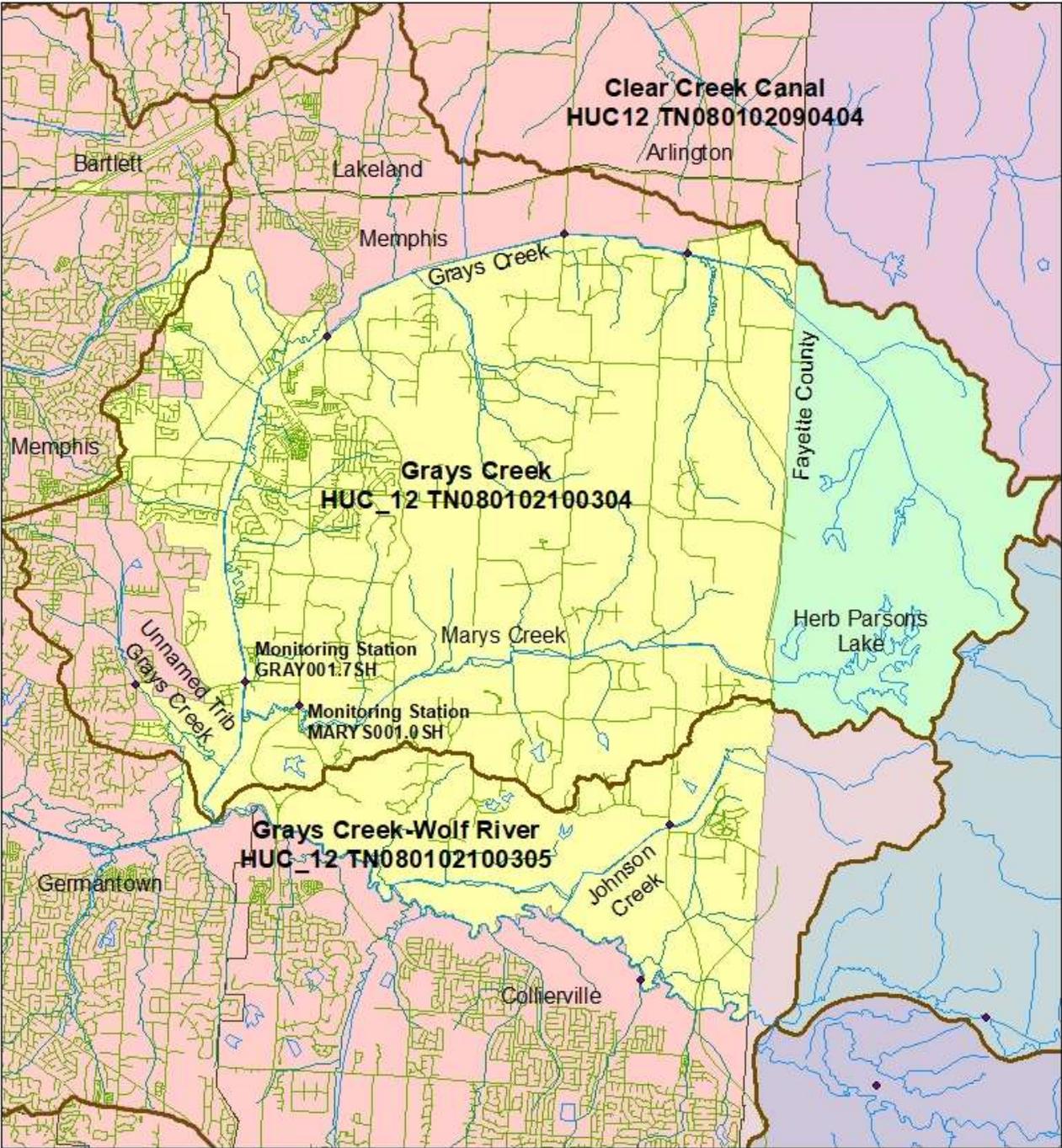
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Unincorporated Shelby County, Tennessee

	Escherichia coli	Discharges from MS4s
TN08010210023_1000 Fletcher Creek	Dissolved Oxygen	Discharges from MS4s
	Phosphorus (Total)	Discharges from MS4s
	Escherichia coli	Discharges from MS4s
	Escherichia coli	Grazing in Riparian or Shoreline Areas
	Physical substrate habitat Alterations	Channelization
Wolf River Outlet HUC_12 080102100308		
TN08010210001_0100 Harrington Creek	Arsenic	Discharges from MS4s
	Escherichia coli	Discharges from MS4s
	Phosphorus (Total)	Discharges from MS4s
	Dissolved Oxygen	Discharges from MS4s

Legend

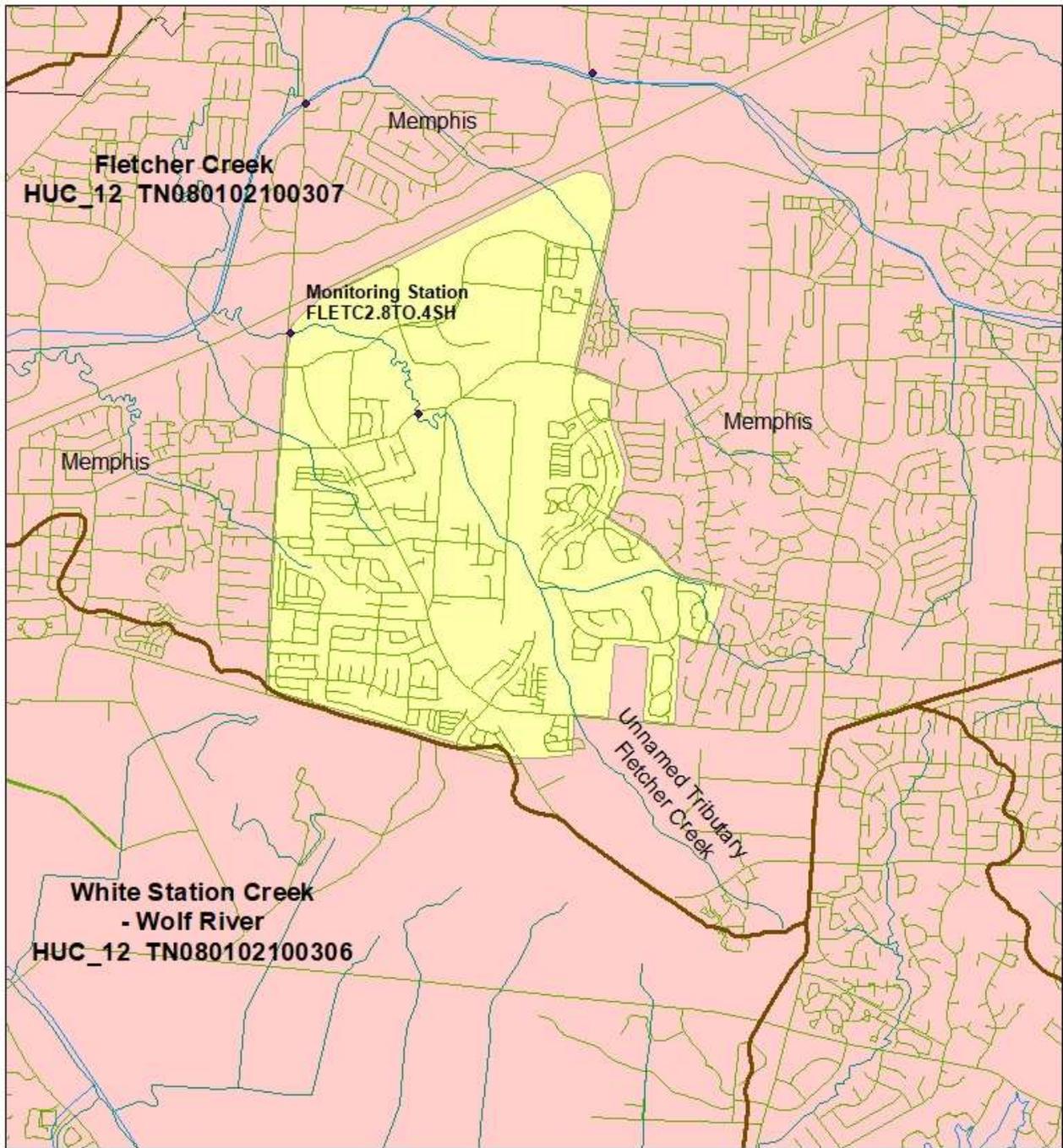
	Caused by stream channelization	No monitoring proposed
	Caused by livestock	No monitoring proposed
	Caused by agricultural activities	No monitoring proposed
	Sedimentation/Siltation or habitat alteration not caused by MS4	No monitoring proposed
	Segment monitored by other MS4	No monitoring proposed
	MS4s outside of Shelby County	No monitoring proposed
	Caused by upstream impoundments	No monitoring proposed
	Caused by past industrial activities	No monitoring proposed
	Pollutants to be monitored by Shelby County	

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Appendix B
Figure 1
HUC_12 TN080102100304 - Grays Creek
HUC_12 TN080102100305 - Grays Creek-Wolf River
Wolf River Watershed
Shelby County, Tennessee

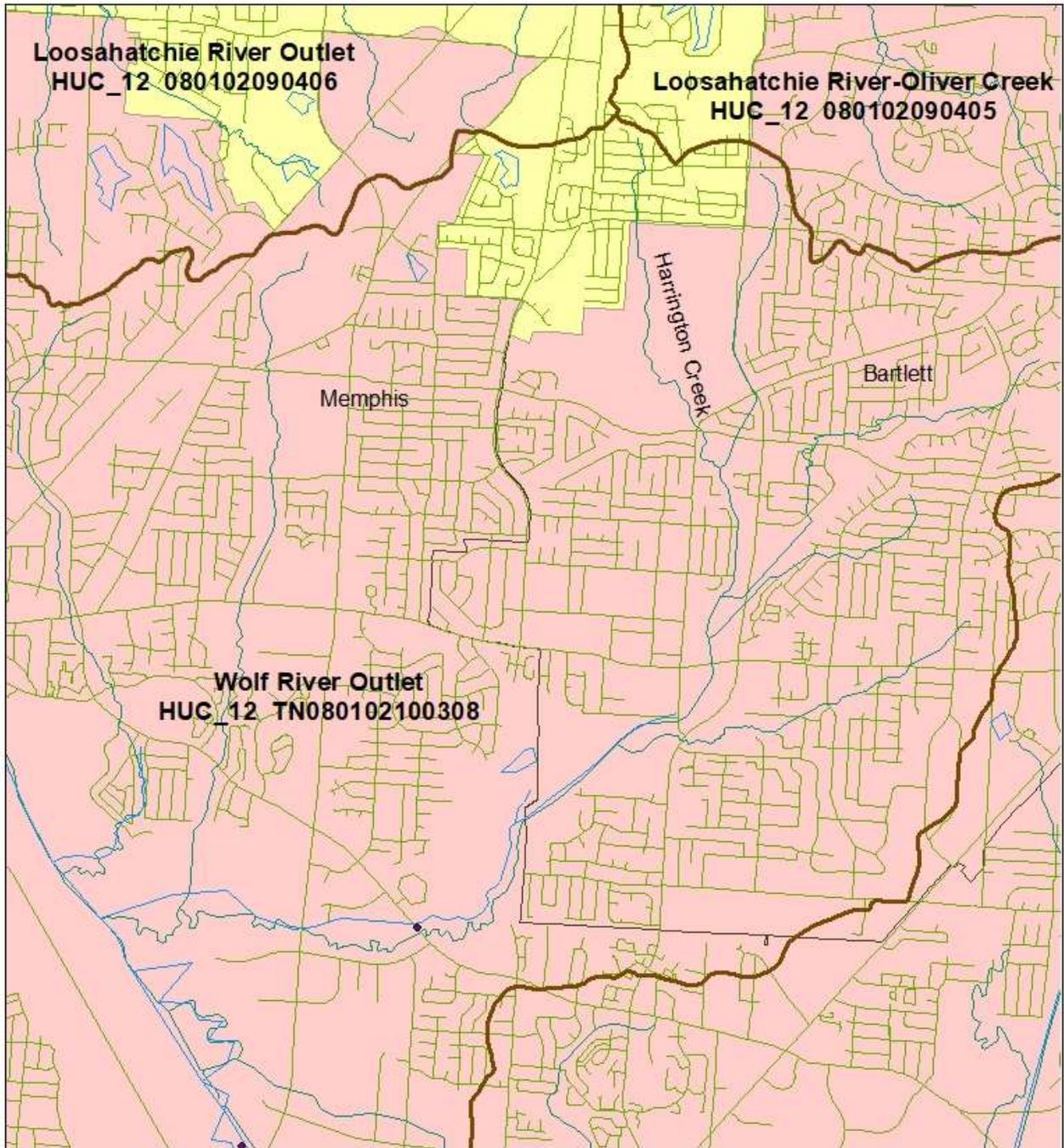
2018 Stormwater Monitoring Plan
Unincorporated Shelby County, Tennessee



0 0.275 0.55 1.1 Miles

Appendix B
Figure 2
HUC_12 080102100307 - Fletcher Creek
Wolf River Watershed
Shelby County, Tennessee

2018 Stormwater Monitoring Plan
Unincorporated Shelby County, Tennessee



0 0.275 0.55 1.1 Miles

Appendix B
Figure 3
HUC_12 080102100308 - Wolf River Outlet
Wolf River Watershed
Shelby County, Tennessee

2018 Stormwater Monitoring Plan
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Appendix C
Nonconnah Creek Watershed

2018 Stormwater Monitoring Plan
Unincorporated Shelby County, Tennessee

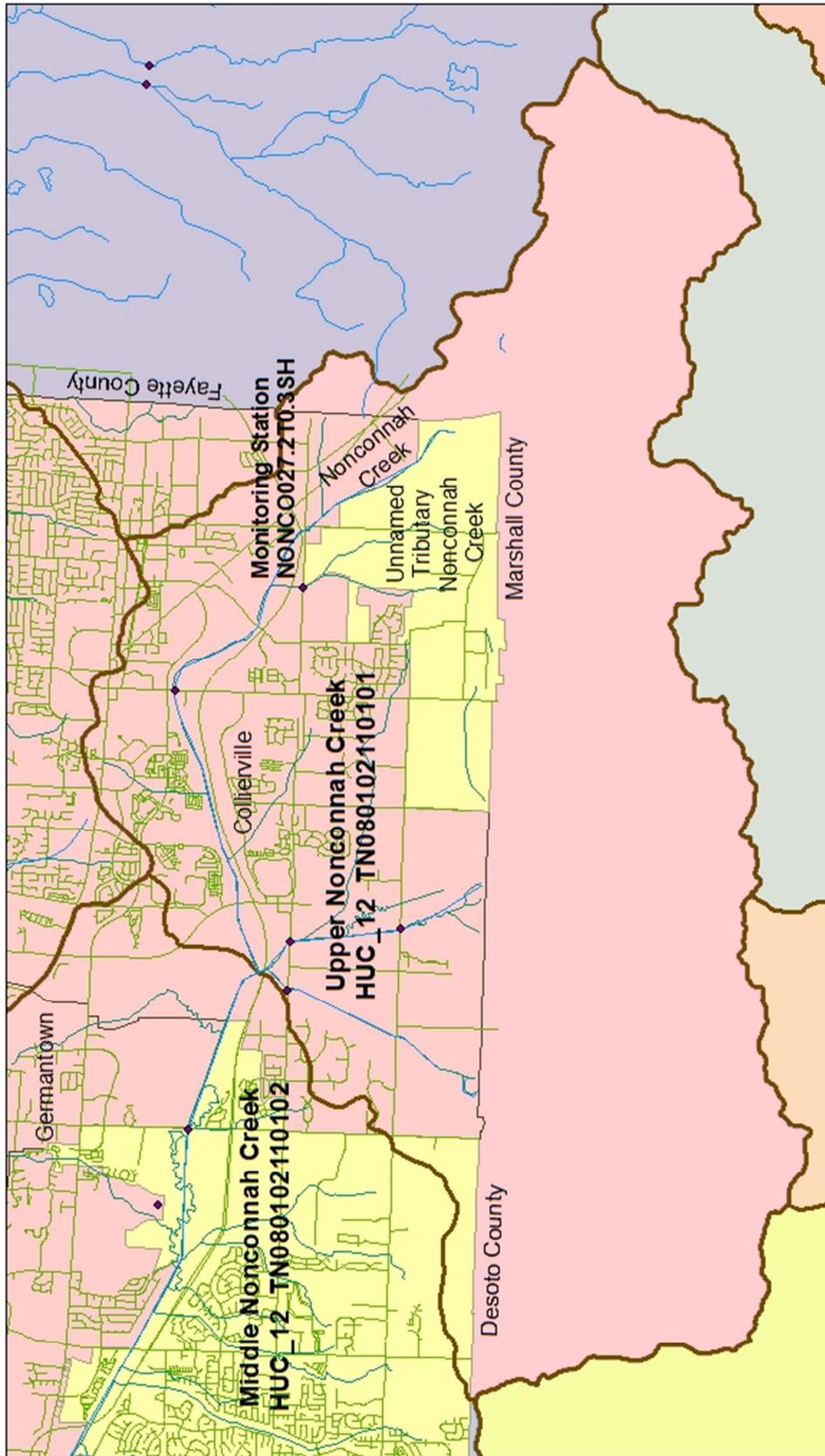
Appendix C

Unavailable Parameters - Nonconnah Creek Watershed

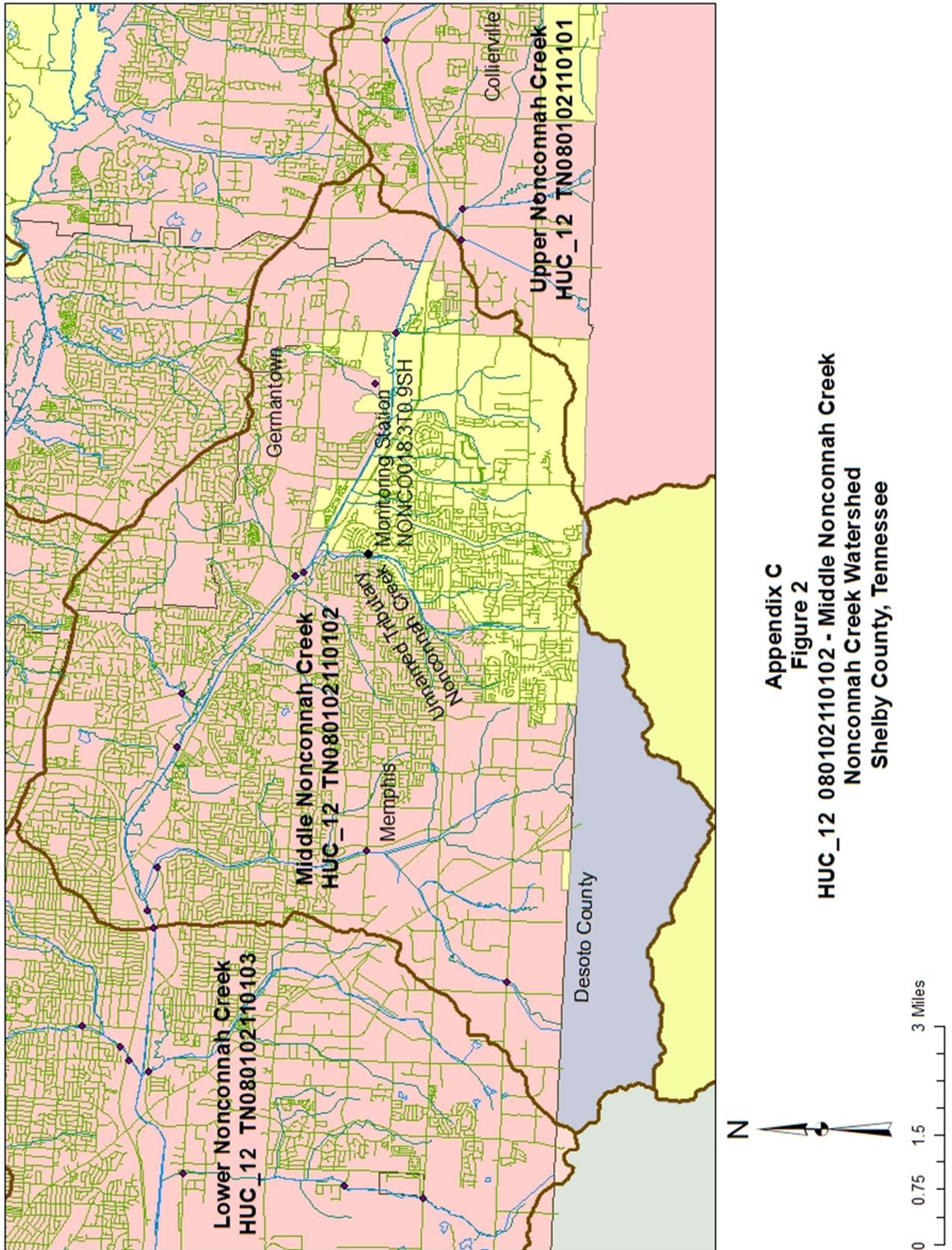
WaterName/ID305B	Cause Name	Source Name
Upper Nonconnah Creek HUC_12 080102110101		
TN0801021100720_3000 Nonconnah Creek	Physical substrate habitat alterations	Channelization
	Phosphorus (Total)	Discharges from MS4s
	Phosphorus (Total)	Non-irrigated Crop Production
TN0801021100720_0300 Unnamed Trib to Nonconnah Creek	Sedimentation/Siltation	Specialty Crop Production
	Phosphorus (Total)	Specialty Crop Production
TN0801021100720_0400 Unnamed Trib to Nonconnah Creek	Sedimentation/Siltation	Sources Outside State Jurisdiction or Borders
	Phosphorus (Total)	Sources Outside State Jurisdiction or Borders
	Escherichia coli	Sources Outside State Jurisdiction or Borders
Middle Nonconnah Creek HUC_12 080102110102		
TN0801021100720_0500 Unnamed Trib to Nonconnah Creek	Oxygen, Disolved	Discharges from MS4s
	Phosphorus (Total)	Discharges from MS4s
	Escherichia coli	Discharges from MS4s
TN0801021100720_2000 Nonconnah Creek	Oxygen, Disolved	Discharges from MS4s
	Physical substrate habitat alterations	Channelization
	Sedimentation/Siltation	Channelization
	Sedimentation/Siltation	Site Clearance (Land Development or Redevelopment)
	Phosphorus (Total)	Discharges from MS4s
	Escherichia coli	Discharges from MS4s

Legend

	Caused by stream channelization	No monitoring proposed
	Caused by livestock	No monitoring proposed
	Caused by agricultural activities	No monitoring proposed
	Sedimentation/Siltation or habitat alteration not caused by MS4	No monitoring proposed
	MS4s outside of Shelby County	No monitoring proposed
	Caused by upstream impoundments	No monitoring proposed
	Caused by past industrial activities	No monitoring proposed
	Pollutants to be monitored by Shelby County	



Appendix C
Figure 1
HUC_12 080102110101 - Upper Nonconnah Creek
Nonconnah Creek Watershed
Shelby County, Tennessee



Appendix C
Figure 2
HUC_12 080102110102 - Middle Nonconnah Creek
Nonconnah Creek Watershed
Shelby County, Tennessee