



Tennessee Department of Environment and Conservation  
Division of Water Resources  
William R. Snodgrass Tennessee Tower,  
312 Rosa L. Parks Avenue, 11th Floor, Nashville, Tennessee 37243  
1-888-891-8332 (TDEC)

Phase II Small Municipal Separate Storm Sewer System (MS4) Annual Report

1. MS4 Information

Name of MS4: City of Morristown		MS4 Permit Number: TNS076031	
Contact Person: Jim Whitbeck, P.E.		Email Address: jwhitbeck@mymorristown.com	
Telephone: (423) 353-1055		MS4 Program Web Address: <a href="http://www.mymorristown.com/departments/public_works/stormwater/index.php">www.mymorristown.com/departments/public_works/stormwater/index.php</a>	
Mailing Address: PO Box 1499			
City: Morristown	State: TN	ZIP code: 37816-1499	

What is the current population of your MS4? 30,193

What is the reporting period for this annual report? July 1 2020 to June 30 2021

2. Discharges to Waterbodies with Unavailable Parameters or Exceptional Tennessee Waters (Section 3.1)

- A. Does your MS4 discharge into waters with unavailable parameters (previously referred to as impaired) for pathogens, nutrients, siltation or other parameters related to stormwater runoff from urbanized areas as listed on TN's most current 303(d) list and/or according to the on-line state GIS mapping tool ([tdec.state.tn.us/dwr/](http://tdec.state.tn.us/dwr/))? If yes, attach a list. ☒ Yes ☐ No
- B. Are there established and approved TMDLs (<http://www.tn.gov/environment/article/wr-wws-tennessees-total-maximum-daily-load-tmdl-program>) with waste load allocations for MS4 discharges in your jurisdiction? If yes, attach a list. ☒ Yes ☐ No
- C. Does your MS4 discharge to any Exceptional Tennessee Waters (ETWs - [http://environment-online.tn.gov:8080/pls/enf\\_reports/f?p=9034:34304:4880790061142](http://environment-online.tn.gov:8080/pls/enf_reports/f?p=9034:34304:4880790061142))? If yes, attach a list. ☐ Yes ☒ No
- D. Are you implementing specific Best Management Practices (BMPs) to control pollutant discharges to waterbodies with unavailable parameters or ETWs? If yes, describe the specific practices: Confirm appropriate measures are provided for construction sites which discharge to waterbodies with unavailable parameters as part of site plan review ☒ Yes ☐ No

3. Public Education/Outreach and Involvement/Participation (Sections 4.2.1 and 4.2.2)

- A. Have you developed a Public Information and Education plan (PIE)? ☒ Yes ☐ No
- B. Is your public education program targeting specific pollutants and sources, such as Hot Spots? If yes, describe the specific pollutants and/or sources targeted by your public education program: See Attached ☒ Yes ☐ No
- C. Do you have a webpage dedicated to your stormwater program? If yes, provide a link/URL: [http://www.mymorristown.com/departments/public\\_works/stormwater/index.php](http://www.mymorristown.com/departments/public_works/stormwater/index.php) ☒ Yes ☐ No
- D. Summarize how you advertise and publicize your public education, outreach, involvement and participation opportunities: See Attached

## Phase II Small Municipal Separate Storm Sewer System (MS4) Annual Report

- E. Summarize the public education, outreach, involvement and participation activities you completed during this reporting period: See Attached
- F. Summarize any specific successful outcome(s) (e.g., citizen involvement, pollutant reduction, water quality improvement, etc.) fully or partially attributable to your public education and participation program during this reporting period: See Attached

### 4. Illicit Discharge Detection and Elimination (Section 4.2.3)

- A. Have you developed and do you continue to update a storm sewer system map that shows the location of system outfalls where the municipal storm sewer system discharges into waters of the state or conveyances owned or operated by another MS4? ☒ Yes ☐ No
- B. If yes, does the map include inputs into the storm sewer collection system, such as the inlets, catch basins, drop structures or other defined contributing points to the sewershed of that outfall, and general direction of stormwater flow? ☒ Yes ☐ No
- C. How many outfalls have you identified in your storm sewer system? 504
- D. Do you have an ordinance, or other regulatory mechanism, that prohibits non-stormwater discharges into your storm sewer system? ☒ Yes ☐ No
- E. Have you implemented a plan to detect, identify and eliminate non-stormwater discharges, including illegal disposal, throughout the storm sewer system? If yes, provide a summary: Dry weather screening is performed on all outfalls once during the permit cycle. Any observed flows are investigated to determine if the flow is an illicit discharge. Results are tracked in GIS. More frequent targeting of hot spot areas will be performed in future years. Codes Enforcement investigated 220 cases involving junked cars, and 50 cases involving illegal dumping. ☒ Yes ☐ No
- F. How many illicit discharge related complaints were received this reporting period? 9
- G. How many illicit discharge investigations were performed this reporting period? 9
- H. Of those investigations performed, how many resulted in valid illicit discharges that were addressed and/or eliminated? 7

### 5. Construction Site Stormwater Runoff Pollutant Control (Section 4.2.4)

- A. Do you have an ordinance or other regulatory mechanism requiring:
- |   |   |                             |
|---|---|-----------------------------|
| Construction site operators to implement appropriate erosion prevention and sediment control BMPs consistent with those described in the TDEC EPSC Handbook?                                  | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| Construction site operators to control wastes such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste?  | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| Design storm and special conditions for unavailable parameters waters or Exceptional Tennessee Waters consistent with those of the current Tennessee Construction General Permit (TNR100000)? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
- B. Do you have specific procedures for construction site plan (including erosion prevention and sediment BMPs) review and approval? ☒ Yes ☐ No
- C. Do you have sanctions to enforce compliance? ☒ Yes ☐ No

## Phase II Small Municipal Separate Storm Sewer System (MS4) Annual Report

- D. Do you hold pre-construction meetings with operators of priority construction activities and inspect priority construction sites at least monthly? ☒ Yes ☐ No
- E. How many construction sites disturbing at least one acre or greater were active in your jurisdiction this reporting period? 15
- F. How many active priority and non-priority construction sites were inspected this reporting period? 15
- G. How many construction related complaints were received this reporting period? 10

### 6. Permanent Stormwater Management at New Development and Redevelopment Projects (Section 4.2.5)

- A. Do you have a regulatory mechanism (e.g. ordinance) requiring permanent stormwater pollutant removal for development and redevelopment projects? If no, have you submitted an Implementation Plan to the Division? ☒ Yes ☐ No  
☐ Yes ☐ No
- B. Do you have an ordinance or other regulatory mechanism requiring:
- Site plan review and approval of new and re-development projects? ☒ Yes ☐ No
- A process to ensure stormwater control measures (SCMs) are properly installed and maintained? ☒ Yes ☐ No
- Permanent water quality riparian buffers? If yes, specify requirements: See Attached ☒ Yes ☐ No
- C. What is the threshold for development and redevelopment project plans plan review (e.g., all projects, projects disturbing greater than one acre, etc.)? Disturbed area greater than or equal to 1 acre, net increased impervious area greater than or equal to 0.5 acre, permanent stormwater pollutant removal required, located within 100' of a water of the state, or as designated by the City Administrator
- D. How many development and redevelopment project plans were reviewed for this reporting period? 17
- E. How many development and redevelopment project plans were approved? 10
- F. How many permanent stormwater related complaints were received this reporting period? 0
- G. How many enforcement actions were taken to address improper installation or maintenance? 0
- H. Do you have a system to inventory and track the status of all public and private SCMs installed on development and redevelopment projects? ☒ Yes ☐ No
- I. Does your program include an off-site stormwater mitigation or payment into public stormwater fund? If yes, specify. N/A ☐ Yes ☒ No

### 7. Stormwater Management for Municipal Operations (Section 4.2.6)

- A. As applicable, have stormwater related operation and maintenance plans that include information related to maintenance activities, schedules and the proper disposal of waste from structural and non-structural stormwater controls been developed and implemented at the following municipal operations:
- Streets, roads, highways? ☒ Yes ☐ No
- Municipal parking lots? ☒ Yes ☐ No
- Maintenance and storage yards? ☒ Yes ☐ No
- Fleet or maintenance shops with outdoor storage areas? ☒ Yes ☐ No
- Salt and storage locations? ☒ Yes ☐ No
- Snow disposal areas? ☐ Yes ☒ No

## Phase II Small Municipal Separate Storm Sewer System (MS4) Annual Report

Waste disposal, storage, and transfer stations? ☐ Yes ☒ No

B. Do you have a training program for employees responsible for municipal operations at facilities within the jurisdiction that handle, generate and/or store materials which constitute a potential pollutant of concern for MS4s? ☒ Yes ☐ No

If yes, are new applicable employees trained within six months, and existing applicable employees trained and/or retrained within the permit term? ☒ Yes ☐ No

### 8. Reviewing and Updating Stormwater Management Programs (Section 4.4)

- A. Describe any revisions to your program implemented during this reporting period including but not limited to:  
 Modifications or replacement of an ineffective activity/control measure. N/A  
 Changes to the program as required by the division to satisfy permit requirements. N/A  
 Information (e.g. additional acreage, outfalls, BMPs) on newly annexed areas and any resulting updates to your program. 0.068 square miles annexed; no updates required
- B. In preparation for this annual report, have you performed an overall assessment of your stormwater management program effectiveness? If yes, summarize the assessment results, and any modifications and improvements scheduled to be implemented in the next reporting period. See Attached ☒ Yes ☐ No

### 9. Enforcement Response Plan (Section 4.5)

- A. Have you implemented an enforcement response plan that includes progressive enforcement actions to address non-compliance, and allows the maximum penalties specified in TCA 68-221-1106? If no, explain. N/A ☒ Yes ☐ No
- B. As applicable, identify which of the following types of enforcement actions (or their equivalent) were used during this reporting period; indicate the number of actions, the minimum measure (e.g., construction, illicit discharge, permanent stormwater management), and note those for which you do not have authority:

<u>Action</u>	<u>Construction</u>	<u>Permanent Stormwater</u>	<u>Illicit Discharge</u>	<u>In Your ERP?</u>	
Verbal warnings	<u>#5</u>	<u>#0</u>	<u>#5</u>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Written notices	<u>#2</u>	<u>#0</u>	<u>#0</u>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Citations with administrative penalties	<u>#0</u>	<u>#0</u>	<u>#0</u>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Stop work orders	<u>#0</u>	<u>#0</u>	<u>#0</u>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Withholding of plan approvals or other authorizations	<u>#0</u>	<u>#0</u>	<u>#0</u>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Additional Measures	<u>#0</u>	<u>#0</u>	<u>#0</u>	Describe: <u>N/A</u>	

C. Do you track instances of non-compliance and related enforcement documentation? ☒ Yes ☐ No

D. What were the most common types of non-compliance instances documented during this reporting period?  
mud in the road

## Phase II Small Municipal Separate Storm Sewer System (MS4) Annual Report

### 10. Monitoring, Recordkeeping and reporting (Section 5)

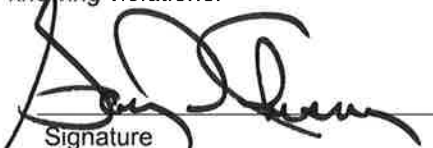
- A. Summarize any analytical monitoring activities (e.g., planning, collection, evaluation of results) performed during this reporting period. See Attached
- B. Summarize any non-analytical monitoring activities (e.g., planning, collection, evaluation of results) performed during this reporting period. N/A
- C. If applicable, are monitoring records for activities performed during this reporting period submitted with this report. ☒ Yes ☐ No

### 11. Certification

This report must be signed by a ranking elected official or by a duly authorized representative of that person. See signatory requirements in sub-part 6.7.2 of the permit.

*"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."*

**GARY D. CHESNEY, Mayor**  
Printed Name and Title

  
Signature

**9/30/21**  
Date

Annual reports must be submitted by September 30 of each calendar year (Section 5.4) to the appropriate Environmental Field Office (EFO), identified in the table below:

EFO	Street Address	City	Zip Code	Telephone
Chattanooga	1301 Riverfront Pkwy, Suite 206	Chattanooga	37402	(423) 634-5745
Columbia	1421 Hampshire Pike	Columbia	38401	(931) 380-3371
Cookeville	1221 South Willow Ave.	Cookeville	38506	(931) 520-6688
Jackson	1625 Hollywood Drive	Jackson	38305	(731) 512-1300
Johnson City	2305 Silverdale Road	Johnson City	37601	(423) 854-5400
Knoxville	3711 Middlebrook Pike	Knoxville	37921	(865) 594-6035
Memphis	8383 Wolf Lake Drive	Bartlett	38133	(901) 371-3000
Nashville	711 R S Gass Boulevard	Nashville	37216	(615) 687-7000

## City of Morristown

### Attachment to Small Municipal Separate Storm Sewer System (MS4) Annual Report 2020-2021 (Year 5) Reporting Period

- 2.A *Does your MS4 discharge into waters with unavailable parameters (previously referred to as impaired) for pathogens, nutrients, siltation or other parameters related to stormwater runoff from urbanized areas as listed on TN's most current 303(d) list and/or according to the on-line state GIS mapping tool ([tdeconline.tn.gov/dwr/](http://tdeconline.tn.gov/dwr/))? If yes, attach a list.*

<b>River Basin</b>	<b>Waterbody ID#</b>	<b>Cause</b>	<b>TMDL Approved?</b>	<b>TMDL Pollutant</b>
Holston	TN06010104004T-1900 Fall Creek	Alteration in stream-side or littoral vegetative covers; Sedimentation / Siltation; Nitrate / Nitrite (Nitrite + Nitrate as N); Phosphorus (Total); Escherichia coli	Yes	E. Coli
Holston	TN06010104004T-2220 Stubblefield Creek	Other anthropogenic substrate alterations	No	N/A
Holston	TN06010104004T-2300 Turkey Creek	Nitrate / Nitrite (Nitrite + Nitrate as N); Alteration in stream-side or littoral vegetative covers; Sedimentation / Siltation; Escherichia coli	Yes	E. Coli
Nolichucky	TN06010108001-0100 Flat Creek	Escherichia coli	Yes	E. Coli
Nolichucky	TN06010108043-0400 Cedar Creek	Alteration in stream-side or littoral vegetative covers; Sedimentation / Siltation	Yes	E. Coli; Siltation and Habitat Alteration

- 2.B *Are there established and approved TMDLs (<http://www.tn.gov/environment/article/wrws-tennessees-total-maximum-daily-load-tmdl-program>) with waste load allocations for MS4 discharges in your jurisdiction? If yes, attach a list.*

See table in 2.A.

- 3.B *Is your public education program targeting specific pollutants and sources, such as Hot Spots? If yes, describe the specific pollutants and/or sources targeted by your public education program:*

Specific pollutant sources which are targeted include: litter, household hazardous waste, BOPAE (Batteries, Oil, Paint, Antifreeze, and Electronics) waste, general water pollution, construction sites, and hot spots.

New developments classified as hot spots require a Special Pollution Abatement Plan, which requires the owner to conduct employee training on pollution prevention at the site. More details on how the other pollutants and sources are targeted are contained in Sections 3.D and 3.E.

*3.D Summarize how you advertise and publicize your public education, outreach, involvement and participation opportunities:*

The City maintains a website which includes:

- a link to the Keep Morristown-Hamblen Beautiful (KMHB) website for education and involvement opportunities
- a summary of each minimum control measure required by the TDEC permit
- requirements for plan submittal and review
- a copy of the City's stormwater ordinance
- targeted education on stormwater pollution prevention
- rates and other information for the stormwater utility

Keep Morristown Hamblen Beautiful (KMHB) coordinates and participates in events and education efforts in line with the mission and focus of Keep America Beautiful to encourage everyone to take action every day to improve and beautify the community. Targeted litter reduction and stormwater education efforts are provided to the public through local partnerships with the City of Morristown.

The KMHB website and social media are utilized to disseminate information based on the guidance of their Executive Director and Board of Directors. They utilize Facebook, Instagram, Twitter, and local media (newspaper, radio stations, and the local TV cable channel) to notify the public about upcoming events, how-to's, recycling and litter prevention tips, and other ways for the public to participate.

The draft Report was posted on the City's website. Public notice of the Annual Report with links to the draft was posted on the City's website, Facebook and Twitter accounts. Comments were accepted via e-mail and telephone.

*3.E Summarize the public education, outreach, involvement and participation activities you completed during this reporting period:*

Numerous annual events were canceled this year due to the COVID-19 pandemic. These included several of the largest events: Soil Conservation Field Days, where all fourth-grade students participate in the "Freddie the Fish" presentation (a hands-on demonstration on common water pollutants), Household Hazardous Waste collection, and Project Graduation, an all-night gathering for new high school graduates.

Restrictions and closures resulting from the COVID-19 pandemic significantly reduced activities. Despite this, many events were held which provided public education and outreach as listed below.

Completed by KMHB

- Two BOPAE (batteries, oil, paint, antifreeze, and electronics) collection events were held, one each in fall and spring. The first event collected nearly 43,000 pounds of those items from about 390 households. The second event, held during a Community Recycling Day, collected about 15,600 pounds from 350 households. Adult participants received education materials on general water quality and car litter bags. Smokers were provided with cigarette litter prevention information and ashtrays. Children received coloring pages and crosswords on general water quality. In addition, 75,520 pounds of tires were collected at the Spring event. Thirty-four volunteers contributed about 70 hours toward the two BOPAEs.
- KMHB staffed a booth at the Home Show at College Square, which had an estimated 600 attendees. They provided demonstrations with their watershed model, which represents how rainfall becomes stormwater which can pick up pollution as it flows through both rural and urban areas. The booth offered attendees t-shirts, brochures, litter bags, pens, tote bags, and ashtrays, with anti-litter and general water quality information. Eight volunteers worked 30 hours on this event.
- KMHB provided information at several other community events which had an estimated 1,500 attendees: Music on the Green, Live on the Lawn (2 events), Vintage Market, and MATS Family Fun Day. Education on littering and general stormwater quality was included in brochures, flyers, and puzzles for children. Handouts included car litter bags, pens, and tote bags. Nine volunteers provided 24 hours of effort.
- KMHB was able to make one in-person presentation at a school, to the East High School Earth Club. The KMHB director provided information on water quality via her presentation and brochures. She also made a presentation to Rotary club via zoom covering general stormwater topics and litter cleanups.
- KMHB routinely sets up and maintains recycling bins at community events to deter litter and encourage recycling. The number of events was down this year due to COVID-19. However, the bins were in place at the Rat Rod Roundup and the SkyMart Arts & Crafts Festival. Two volunteers spent 2 hours on the bins.
- Twelve articles ran in the local newspaper, the *Citizen Tribune*. Most of these provided information about upcoming events, such as dates and times. One of them provided additional information on pesticide and fertilizer use and car washing.
- Litter pickups were undertaken 26 times by KMHB. Forty-three volunteers devoted approximately 50 hours. These ranged from organized group events to individual roadside cleanups.
- KMHB uses social media extensively to provide education and involvement opportunities. 114 Facebook posts reached 32,300 users and had 2,700 engagements. 102 Twitter posts generated 4,100 impressions and nearly 200 engagements. Instagram yielded 80 posts and 200 likes. Topics included information about the BOPAE collections and other participation opportunities, litter, and general stormwater education.



Completed by the City

- Stormwater personnel gave a presentation on the City's stormwater permit and compliance program at a City Council workshop. Information included the basics of the City's stormwater permit, enforcement, and repair and maintenance work performed.
- The City hosted a Chamber of Commerce Open House at the Public Works Facility. Attendees browsed tables depicting the different departments. City stormwater personnel and the KMHB director staffed a table with brochures and flyers about illicit discharges, grass clippings, and general stormwater topics. KMHB's watershed model was on display, and staff engaged participants in conversations about stormwater.

3.F *Summarize any specific successful outcome(s) (e.g., citizen involvement, pollutant reduction, water quality improvement, etc.) fully or partially attributable to your public education and participation program during this reporting period:*

- The education efforts summarized in Sections 3.D and 3.E resulted in the following volunteer participation by members of the public. Note that the "volunteers" and "hours" columns in the table reflect active participation in organizing and conducting the activities. The "attendees" column is an estimate of attendees who were exposed to the education message or who participated in the event.

**Summary of Public Participation**

Category	Volunteers	Hours	Attendees
BOPAE Collection	34	70.0	750
Litter Cleanup	43	49.3	2
Misc Education	42	64.8	2,232
Recycling	2	2.5	300
<b>Total</b>	<b>121</b>	<b>186.5</b>	<b>3,284</b>

- BOPAE (batteries, oil, paint, antifreeze, electronics) waste collection attendees delivered approximately 58,500 pounds of those items to the two collections. In addition, about 75,500 pounds of tires were collected at the Spring BOPAE.

6.B *Do you have an ordinance or other regulatory mechanism requiring: Permanent water quality riparian buffers?*

A water quality buffer zone (WQBZ), measured from the top of bank, is required as follows:

- stream with drainage area less than 1 square mile: 30' wide

- stream with drainage area greater than or equal to 1 square mile, and/or water with unavailable parameters: 60' wide
- wetland: 30' wide around perimeter

Variances are permitted with approval from the Stormwater Violations Appeals Board.

7.A *As applicable, have stormwater related operation and maintenance plans that include information related to maintenance activities, schedules and the proper disposal of waste from structural and non-structural stormwater controls been developed and implemented at the following municipal operations: (Items Marked "No")*

The City does not operate snow disposal areas or waste disposal, storage, and transfer stations.

8.B *In preparation for this annual report, have you performed an overall assessment of your stormwater management program effectiveness? If yes, summarize the assessment results, and any modifications and improvements scheduled to be implemented in the next reporting period.*

Public participation dropped significantly again this year. Several large events which were held last year (Lakeway Hola Festival, Craft Beer Festival, Boo Fest, Heritage Park Salute) were either not held or were not attended by KMHB. In addition, the College Square Home Show had a large drop in recorded attendance.

The number of volunteers increased from 90 to 121 (34%), but the number of volunteer hours dropped from 277 to 187 (33%). This was likely a result of COVID-19 which prompted smaller gatherings.

The Household Hazardous Waste (HHW) collection was canceled by TDEC this year. An additional BOPAE event was held with the Community Recycling event to partially make up for the loss of this event, since BOPAE is typically also collected at the HHW.

BOPAE collections were up again this year. Total quantity increased 31% from last year (44,700 lbs) to 58,500 lbs this year, and the number of households increased 42% (524 to 743). Again this year, the total collected at the second event in the spring was considerably lower than the fall event, probably reflecting that many people took most or all of their waste to the first event.

The City's Litter Crew, composed of a City police officer supervising inmates from the county jail, did not operate this year due to COVID-19 restrictions and staffing issues.

Overall, progress was made on meeting the Program BMP's, with 87% fully met. Two of the four BMP's which were not met last year were met this year, and one was partially met. One of the three partially met BMP's last year was met this year.

Currently, three BMP's are partially met. Education has been provided to all but one of the targeted groups, dry weather screening procedures have not been updated, and some municipal operations procedures have not been implemented. One BMP, developing a program to ensure implementation of appropriate SCM maintenance procedures, has not been met.

Staff has shifted some duties to consultants so one staff member is dedicated solely to working on these Milestones for several months, with the goal of meeting most of them in the next permit year.

*10.A Summarize any analytical monitoring activities (e.g., planning, collection, evaluation of results) performed during this reporting period.*

A fish and benthic survey was performed in Turkey Creek at approximately the same location as the prior survey in 2015. The results were similar, but the recent survey showed a slightly lower biotic integrity score of 26, compared to 30 in 2015. This was primarily due to fewer fish species being identified. The full report is attached.

# **A Fish and Benthic Survey of Turkey Creek Hamblen County Tennessee April 2021**

**Tennessee Wildlife Resources Agency  
Region IV Stream Survey Unit  
3030 Wildlife Way  
Morristown, TN 37814**



**Turkey Creek just upstream of the bridge crossing on Fairview Road in Morristown.**

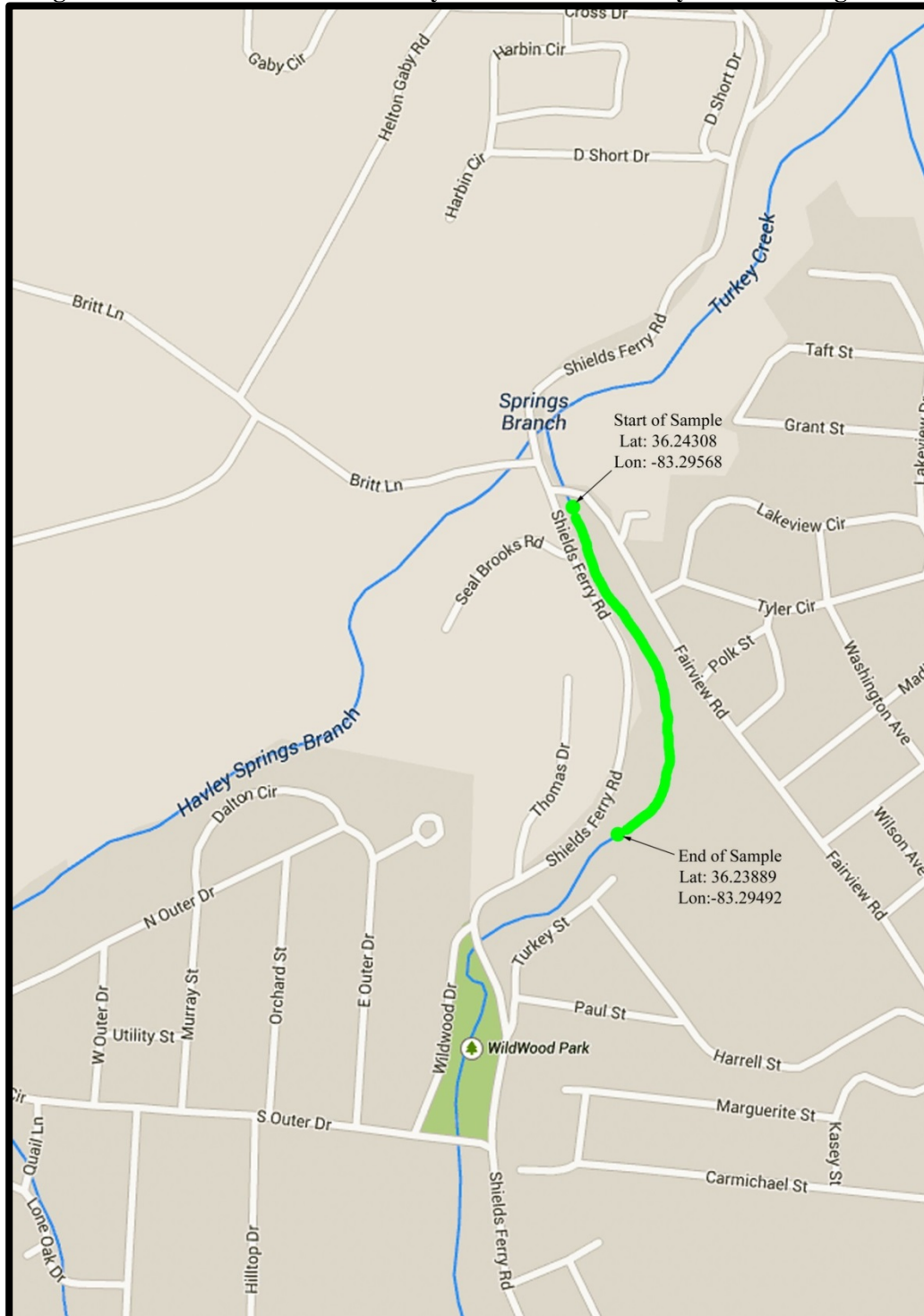
## **Introduction**

Located in the Ridge and Valley Province of eastern Tennessee, Turkey Creek originates on the south side of the City of Morristown and flows generally northward through the city proper where it courses through a largely urban environment, including industrial and municipal developments, as well as extensively developed residential communities before finally reaching the confluence with Cherokee Reservoir (Holston River). It is a small creek averaging three to five meters in width, has a significant spring (groundwater) influence, and exhibits relatively cool maximum summer temperatures. Our survey was initiated at the request of the City of Morristown for biological assessment of the fish and benthic communities. Three previous IBI fish surveys have been conducted on this stream: Tennessee Valley Authority in 1995 (TVA 1998), and Tennessee Wildlife Resources Agency (Carter et al. 2003, 2016).

## Study Area and Methods

On 26 April 2021, the Tennessee Wildlife Resources Agency (TWRA) Region IV Stream Survey Unit sampled the fish and benthic communities on a section of Turkey Creek beginning just upstream of the bridge crossing on Fairview Road and extending upstream. The 2021 sample approximated the same amount of stream reach surveyed in 2015.

**Figure 1. Site location for the survey conducted on Turkey Creek during 2021.**





Fish were sampled employing an Index of Biological Integrity (IBI) using standard electrofishing (backpack) and seining techniques. A 4 ft. X 15 ft. seine was used in conjunction with a backpack electrofisher operating at 125 volts AC to sample riffle, run, and pool habitats. Linear sections of shoreline habitat were sampled using the backpack electrofisher and a dip net. Benthic organisms were sampled qualitatively by conducting a three hour collection effort from all habitats types using aquatic insect nets and dissecting forceps. Analysis of the fish and benthic samples followed procedures developed by Karr et al. (1986) and Lenat (1993). Basic water quality data were taken: temperature 17.5 C, conductivity 341  $\mu\text{S}/\text{cm}$ , and pH 7.0.

## Results

Our survey produced a total of 356 fish comprising three species (six in 2015) (Table 1). The most abundant species collected were the Largescale Stoneroller (*Camptostoma oligolepis*) followed closely by Blacknose Dace (*Rhinichthys atratulus*). Together these two species comprised 98% of the total number of fish collected. The only other fish species collected during the survey was Creek Chub (*Semotilus atromaculatus*). No darter species were collected, although given the stream size, at least one darter species would be expected to occur. No sucker species were encountered during this survey but two were found in the 2015 survey (Northern Hog Sucker, White Sucker).

**Table 1. Fish species occurrence for Turkey Creek 2021**

Fish Species	Number
Blacknose Dace ( <i>Rhinichthys atratulus</i> )	172
Creek Chub ( <i>Semotilus atromaculatus</i> )	8
Largescale Stoneroller ( <i>Camptostoma oligolepis</i> )	176
<b>Total</b>	<b>356</b>



TWRA personnel collect fish from a seine effort during the Turkey Creek survey

Overall, the fish survey analysis indicates Turkey Creek is in very poor/poor condition with an IBI score of 26 (Table 2). This is a small decrease compared to the TWRA 2015 survey score of 30 (poor). The score was similar to the finding made by TVA in 1995 (26 very poor/poor). Low numbers of native and intolerant species, high numbers of omnivores, and the absence of darters, trophic specialist, and piscivores continue to ensure relatively low scores for this stream. Fluctuations in total numbers of the Largescale Stoneroller and Blacknose Dace account for slight variations in IBI scores among the three surveys.

**Table 2. Turkey Creek Index of Biotic Integrity analysis for the 2021 survey.**

Metric Description	Scoring Criteria 1 3 5	Observed	Score
Number of Native Species	<8 8-15 >15	3	1
Number of Darter Species	<2 2 >2	0	1
Number of Sunfish Species	<2 2 >2	0	1
Number of Sucker Species	<2 2 >2	0	1
Number of Intolerant Species	<2 2 >2	0	1
Percent of Individuals as Tolerant	>59 59-30 <30	0	5
Percent of Individuals as Omnivores	>45 45-22 <22	49	1
Percent of Individuals as Specialist	<16 11-32 >32	0	1
Percent of Individuals as Piscivores	<1 1-5 >5	0	1
Catch Rate	<16 16-32 >32	42.7	5
Percent of Individuals as Hybrids	>1 1-TR 0	0	5
Percent of Individuals with Anomalies	>5 5-2 <2	2.0	3
		<b>Total</b>	<b>26 (Very Poor–Poor)</b>

The number of species encountered during 2021 declined by 50% when compared to the 2015 survey. The only intolerant species encountered in 2015, Northern Hog Sucker was not collected during 2021. Historical surveys in (TVA 1995 and Carter et al. 2003) documented additional fish species for the stream: Bluegill (*Lepomis macrochirus*), Bluntnose Minnow (*Pimephales notatus*), Common Carp (*Cyprinus carpio*), Logperch (*Percina caprodes*), Redbreast Sunfish (*L. auritus*), Striped Shiner (*Luxilus chrysocephalus*), and Warmouth (*L. gulosus*). However, this is likely due to the localities of the 1995 and 2003 survey sites which were further downstream and contained habitat associated with those species.

Benthic macroinvertebrates collected within the sample site comprised eight families representing six identified genera (Table 3). The most abundant group in our collection was the mayflies comprising 65.7% of the total sample. Overall, a total of 10 taxa were identified from the sample of which four belonged to the Ephemeroptera, Plecoptera, and Trichoptera (EPT) group, which can represent important water quality indicators.

**Table 3. Taxa list and associated biotic statistics for benthic macroinvertebrates collected from Turkey Creek.**

ORDER/GROUP	FAMILY	SPECIES	NUMBER	PERCENT
<b>ANELLIDA</b>				1.5
	Oligochaeta		3	
<b>DIPTERA</b>				
	Chironomidae		17	10.9
	Simuliidae		2	
	Tipulidae	<i>Antocha larvae and pupa</i>	3	
<b>EPHEMEROPTERA</b>				65.7
	Baetidae	<i>Baetis</i>	132	
<b>ODONATA</b>				3.5
	Calopterygidae	<i>Calopteryx</i>	7	
<b>TRICHOPTERA</b>				17.9
	Hydropsychidae	<i>Cheumatopsyche</i>	3	
		<i>Hydropsyche betteni/depravata</i>	31	
	Hydroptilidae	<i>Hydroptila</i>	2	
<b>TURBELLARIA</b>			1	0.5
	<b>TOTAL</b>		<b>201</b>	

**TAXA RICHNESS = 10**

**EPT RICHNESS = 4**

**BIOCLASSIFICATION = 1.5 (POOR)**

Based on the EPT taxa richness and overall biotic index of all species collected, the relative health of the benthic community was classified as “poor” (1.5), and scored identical to the TWRA 2015 benthic survey. The 2021 survey did produce one additional caddisfly taxa that was not observed in 2015. Overall, taxa richness decreased by one and there was a low occurrence of intolerant taxa in the sample. These factors indicated a depressed benthic fauna similar to the one observed in 2015.



## **Literature Cited**

- Carter, B.D., C.E. Williams, R.D. Bivens, and J.W. Habera. 2015. Warmwater stream fisheries report: Region IV 2016. Fisheries Report 16-11. Tennessee Wildlife Resources Agency, Nashville.
- Carter, B.D., C.E. Williams, R.D. Bivens, and J.W. Habera. 2004. Warmwater stream fisheries report: Region IV 2003. Fisheries Report 04-03. Tennessee Wildlife Resources Agency, Nashville.
- Karr, J.R., K.D. Fausch, P.L. Angermier, P.R. Yant, and I.J. Schlosser. 1986. Assessing biological integrity in running waters, a method and its rationale. Illinois Natural History Survey, Special Publication 5.
- Lenat, D.R., 1993. A biotic index for the Southeastern United States: derivation and list of tolerance values, with criteria for assigning water quality ratings. *Journal of the North American Benthological Society* 12(3):279-290.
- Tennessee Valley Authority. 1998. Holston Watershed: Biological condition of streams. 1993-1997. Tennessee Valley Authority, Clean Water Initiative.