



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: Hamilton County including the Cities/Towns of Collegedale, East Ridge, Lakesite, Lookout Mountain, Ridgeside, Red Bank, Soddy-Daisy, and Walden		MS4 Permit Number: TNS075566
Contact Person: Crystal Bishop		Email Address: CrystalB@HamiltonTN.gov
Telephone: (423) 209-7851		MS4 Program Web Address: hamiltontn.gov/waterquality/
Mailing Address: 1250 Market St, Suite 3044		
City: Chattanooga	State: TN	ZIP code: 37402

What is the current population of your MS4? 168,923 (according to 2014 Census Bureau Data - Hamilton County minus Chattanooga and Signal Mountain)

What is the reporting period for this annual report? July1 2018 to June 30 2019

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 (tdeconline.tn.gov/dwr/)? If yes, attach a list. ☒ Yes ☐ No
- 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. ☒ 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)? 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: Yes, additional protections as prescribed in the MS4 permit such as EPSC design criteria and greater water quality buffer widths. ☒ 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: NPS Pollution from urbanized and municipal areas; sediment discharge from construction activity; pathogens and household pollutants from illicit discharges; pollutants from municipal operations. ☒ Yes ☐ No
- C. Do you have a webpage dedicated to your stormwater program? If yes, provide a link/URL: <http://www.hamiltontn.gov/waterquality/> ☒ Yes ☐ No

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- D. Summarize how you advertise and publicize your public education, outreach, involvement and participation opportunities: Newspaper, website, and media releases from the County's Communications office.
- E. Summarize the public education, outreach, involvement and participation activities you completed during this reporting period: see attachment
- 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: We hosted several events that allowed citizen involvement; 24 participants were at our River Rescue location at Mountain Creek to remove litter from the creek. 29 educators at Project WET will have an exponential effect to teach youth about being good environmental stewards. We continue to supply pet waste bags (800 bags for this reporting period) for stations within county and municipal parks, which reduces pollution from pet wastes. WaterWays, Tennessee Aquarium, TNSA, the City of Chattanooga, the City of Cleveland and Bradley County were our biggest educational programming partners.

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? 945
- 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: This is outlined in the Hamilton County Water Quality Field Screening SOP, which is available upon request. ☒ Yes ☐ No
- F. How many illicit discharge related complaints were received this reporting period? 7
- G. How many illicit discharge investigations were performed this reporting period? 7
- H. Of those investigations performed, how many resulted in valid illicit discharges that were addressed and/or eliminated? 5

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? ☒ Yes ☐ No
- Construction site operators to control wastes such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste? ☒ Yes ☐ 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)? ☒ Yes ☐ No

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- 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
- 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? 55
- F. How many active priority and non-priority construction sites were inspected this reporting period? 55
- G. How many construction related complaints were received this reporting period? 20

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: As described in 2010 MS4 Permit (30 ft for drainage area under 1 square mile; 60 ft for drainage area equal to or greater than 1 square mile). ☒ 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.)? All projects within the Water Quality Program Boundary that disturb one acre or greater.
- D. How many development and redevelopment project plans were reviewed for this reporting period? 51
- E. How many development and redevelopment project plans were approved? 47
- 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. _____ ☐ 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

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- | | | |
|---|---|--|
| Fleet or maintenance shops with outdoor storage areas? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| Salt and storage locations? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| Snow disposal areas? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Waste disposal, storage, and transfer stations? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> 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? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| | | |
| If yes, are new applicable employees trained within six months, and existing applicable employees trained and/or retrained within the permit term? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> 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. No changes within the past year.
- Changes to the program as required by the division to satisfy permit requirements. None
- Information (e.g. additional acreage, outfalls, BMPs) on newly annexed areas and any resulting updates to your program. No changes since filing NOI.
- 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. No modification seem necessary at this time. A full review of the program was performed at that time the NOI was completed in 2017, and the permit has been appealed by 3rd parties since that time. Also, TDEC performed a Compliance Evaluation and Inspection (CEI) of the Construction Program in March 2017, and deemed the Program to be complaint with the Construction Requirements of the MS4 permit.
- ☒ 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. _____ ☒ 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	#11	#0	#0	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Written notices	#3	#0	#0	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Citations with administrative penalties	#2	#0	#0	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Stop work orders	#2	#0	#0	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Withholding of plan approvals or other authorizations	#0	#0	#0	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Additional Measures	#0	#0	#0	Describe: _____	

- 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?
Work began without permits; track out; lack of BMP maintenance; failure to stabilize site; stream buffer encroachments.

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. Water Quality parameters (DO, Sp. Conductivity, Temperature, pH, and Turbidity) were continuously monitored at two stations on South Chickamauga Creek throughout the reporting period; additionally, discrete samples were collected during low flow for quality assurance of station calibrations and cross-sectional position bias. Macroinvertebrates were collected at multiple sites.
- B. Summarize any non-analytical monitoring activities (e.g., planning, collection, evaluation of results) performed during this reporting period. Qualitative habitat assessments were conducted on all stream segments where macroinvertebrates were collected.
- C. If applicable, are monitoring records for activities performed during this reporting period submitted with this report. ☒ Yes ☐ No

11. Certification

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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."

Todd E. Leamon, Chairman,
Hamilton County Water
Quality Program Committee
Printed Name and Title


Signature

09/24/2019
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

2A. Waters with unavailable parameters into which HCWQP MS4 discharges:

WATERBODY ID# AND NAME OF WATERBODY	NATURE OF POLLUTANT (CAUSE) OR EXCEPTIONAL
TN06020001067_2010 Ninemile Branch	Siltation, E. coli; Low DO; Habitat Alteration
TN06020001426_1000 Mountain Creek	E. coli; Habitat Alteration
TN06010001426_0200 Stringers Branch	E. coli; Habitat Alteration; Nitrate/Nitrite
TN060200011244_0400 Gillespie Springs Branch	E. coli; Habitat Alteration; Nitrate/Nitrite; Ammonia
TN06020001007_0510 Spring Creek	Siltation; E. coli; Exceptional
TN06020001007_1000 South Chickamauga Creek	Habitat Alteration; Siltation; E. coli; Total Phosphorous; Exceptional
TN06020001889_1000 Wolftever Creek	E. coli
TN06020001889_0100 Little Wolftever Creek	E. coli
TN06020001880_1000 Rogers Branch	E. coli
TN06020001889_0400 Hunter Creek	Alteration in stream side or littoral vegetative cover; Habitat Alteration
TN06010001889_0300 Wilkerson Branch	E. coli
TN06020001087_1000 Shoal Creek	E. coli ; Exceptional
TN06020001067_0100 Unnamed tributary to North Chickamauga Creek	Siltation; Habitat Alteration; E.coli
TN06020001007_0300 Mackey Branch	Habitat Alteration; Siltation; E. coli; Exceptional

2B. List of TMDLs in HCWQP jurisdiction:

WATERBODY ID# AND NAME OF UNAVAILABLE WATERBODY	PARAMETERS OF CONCERN
TN06020001007_0510 Spring Creek	E.coli

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TN0602000106_0210 Ninemile Branch	Siltation/Habitat Alteration
TN06020001007_1000 South Chickamauga Creek	Siltation/Habitat Alteration; E.coli
TN06020001067_2000 North Chickamauga Creek	Siltation/Habitat Alteration
TN060200011244_0400 Gillespie Springs Branch	Siltation/Habitat Alteration; E.coli
TN06020001426_0100 Stringers Branch	Siltation/Habitat Alteration; E.coli
TN06020001426_1000 Mountain Creek	Siltation/Habitat Alteration; E.coli
TN06020001889_1000 Wolftever Creek	E.coli

2C. List of ETWs into which HCWQP MS4 discharges:

TN06020001087_1000 Shoal Creek	E. coli; Exceptional
TN06020001067_2000 North Chickamauga Creek	Exceptional
TN06020001067_0310 Little Falling Water Creek	Exceptional
TN06020001067_0300 Falling Water Creek	Exceptional
TN06020001007_0500 West Chickamauga Creek	Exceptional
TN06020001007_0410 Johnson Branch	Exceptional
TN06020001007_0400 Hurricane Branch	Exceptional
TN06020001007_0310 Ryall Springs Branch	Exceptional
TN06020001007_0300 Mackey Branch	Habitat Alteration; Siltation; E. coli; Exceptional
Unnamed Tributary to Friar Branch	Exceptional
Unnamed Tributary to Lookout Creek	Exceptional
Unnamed Tributary Pitts Branch	Exceptional
Unnamed Tributary to West Chickamauga Creek	Exceptional

3E. Summary of Public Education, Outreach, Involvement and Participation Activities:

Date	Activity	Partners	Level of Participation	# of Participants
Annual Contract	Social Media Ads	Tennessee Stormwater Association	Participate in statewide social media campaign.	Records available upon request.
7/1/18 to 6/30/19	Web views hamiltontn.gov/waterquality		Provide information to public	Available on request
7/9/18 – 7/20/18	Kids for Clean Water Camp	Audubon Acres, WaterWays, Greenway Farms, Outdoor Chattanooga	Teach Kids aged 8-13 about importance of local water quality. Sponsor Materials and Support Staff	55
7/10/18 & 7/24/18	Audubon Acres Camp	Audubon Acres	Macroinvertebrate samples and water quality education camp	25
8/6/18	Chattanooga Development Symposium	City of Chattanooga, ASCE, TNSA	Sponsored Event. Staff helped plan and organize event.	75
8/12 – 8/15/19	International LID Conference	ASCE, Metro Nashville, TNSA	Program Manager was co-chair and gave presentation.	400
9/21/18	Environmental Permitting Symposium	Circadian Consulting	Sponsored event. Program Manager gave presentation.	50
10/6/18	Tennessee River Rescue	TN Aquarium, Reflection Riding, TWRA, and many more	Sponsor materials, staff clean up zone, organize volunteers	24 Participants at Mountain Creek Zone
9/26/2018	Hixson High School	Hixson High School	Outreach to local High School Students	40

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9/29/18	I heart Mountain Creek Day	WaterWays, Red Bank Elementary	Water Quality Education. Macro Invertebrate Sampling	30
10/12/2019	Ivy Academy Fall Break Camp	Ivy Academy	Outreach to local High School Students	20
10/15 – 10/18/18	TNSA Conference	TNSA and many others	Manager and Project Designer organized	284
10/3 – 10/5/18	SESWA Conference	Staff Member is SESWA Past - President	Staff Members plan and attend. Program Manager gave presentation.	235
7/1/18 to 6/30/19	Pet Waste Stations for East Ridge and Soddy Daisy Parks	City of East Ridge, City of Soddy Daisy	Purchase waste bags	Supplied 800 bags
2/9/19	Save Water Drink Wine	WaterWays, TN Aquarium, South Chick Creek Greenway Alliance, Reflection Riding, others	Sponsor, Staff planned and participated in event	100
3/16/19	Wild Ones Symposium	Exhibited with WaterWays	Homeowner Education	100
5/17/19	Ivy Academy Macro Sampling Demonstration	Ivy Academy	Outreach to local High School Students	40
2018-19 School Year	Red Bank Elementary School STEAM Project Support	Red Bank Elementary, WaterWays, City of Chattanooga	Assist STEAM Educator with lesson plans, sponsor activities	100 5 th grade students reached
Monthly Meetings	South Chickamauga Creek Greenway Alliance Meetings	SCCGA	Attend Meetings	Average of 25/meeting
Quarterly Meetings	Friends of Red Bank Streams	WaterWays	Attend Meetings	Average of 10/meeting
Monthly Meeting	Hamilton County Local Emergency Planning	HC LEPC and many other agencies	Staff member sits on Executive Committee.	20-25/meeting

Participation	Committee		Group provides education and training for various hazmat related responses.	
Quarterly Meetings	Public Management Committee Meetings	Each participating jurisdiction	Public meetings of the Management Committee to discuss/update Program's policies & procedures	10-15/meeting
5/15/19	SeSWA Webinar	SeSWA	Program Manager gave webinar on Public Education and Outreach	30
5/21/19	Clean Water Professionals of KY & TN Webinar	CWP-KYTN	Program Manager developed webinar – Practical Stormwater Maintenance	45
6/6/19	Project Wet Workshop	USFS, TNACI, Cleveland, Bradley County	Plan, sponsor, staff workshop	29
6/3/19	Ivy Academy Macro Sampling Demonstration	Ivy Academy	Outreach to local High School Students – Summer Camp	20
6/20 to 6/26/19	Kids for Clean Water Camp	Audubon Acres, WaterWays, Greenway Farms	Teach Kids aged 8-13 about importance of local water quality. Sponsor Materials and Support Staff	35
July 2018 – June 2019	WaterWays Young Professional Board	WaterWays	3 staff members serve on advisory board	10
July 2018 – June 2019	My Tennessee Certification Program	WaterWays and City of Chattanooga	Homeowner education and creek friendly yard certification	16 certifications/ 26 applicants
July 2018 – June 2019	Subdivision Review Meetings	RPA	Monthly meetings with review staff, surveyors and engineers	10-15/meeting

Target Audience:

1. General Public
2. Educators
3. Municipal Employees
4. School Aged Children & Their Families
5. Professionals (Engineers, Consultants, etc.)

Summary of Hamilton County Water Quality Program Macroinvertebrate Monitoring During Fall 2018

Introduction

Collection and analysis of aquatic macroinvertebrates is an established method for measuring the ecological health of waterbodies. Numerous metrics exist to characterize macroinvertebrate assemblages and to gauge aquatic ecological health. Likewise, the impacts of point source pollution, as well as non-point source pollutants derived from watershed scale land uses, have been well documented. In Tennessee, the state has established a group of metrics to compare possibly impacted streams with least impacted reference streams (TDEC 2017; Arnwine & Denton 2001a; Arnwine & Denton 2001b). These metrics are collectively the Tennessee Macroinvertebrate Index (TMI).

The index includes two measures of species richness: total macroinvertebrate taxa richness and the taxa richness of species belonging to the Ephemeroptera, Plecoptera, and Trichoptera orders (EPT) of insects. Both metrics are measures of species diversity—taxa richness in the general and EPT richness in the specific with regard to intolerant species—and are both predicted to be inversely correlated with ecological perturbation (Barbour *et al.* 1999).

A further four measures of relative abundance are included in the TMI. First, the relative abundance of EPT taxa is included; *Cheumatopsyche* spp. are excluded from calculation of the metric, because they are considered more tolerant of impacted conditions while the remaining EPT taxa are considered intolerant and more likely to respond to deteriorating conditions and pollutants. Second, the relative abundance of clingers is included. This behavioral group includes taxa having fixed retreats or adaptations for attachment to surfaces in flowing water (Barbour *et al.* 1999). As a result they are less able to retreat during short term perturbations within the stream and potentially slower to recolonize afterward. These two relative abundance metrics (i.e. EPT and clingers) are generally expected to decrease with increasing ecological perturbation—as with the two species richness metrics.

The third relative abundance metric is the count of individuals with the Oligochaeta and Chironomidae taxa (%C+O); and the fourth metric is relative abundance of Tennessee nutrient tolerant taxa (%TNUTOL) (TDEC 2017). Both of these metrics are generally expected to be positively correlated with ecological perturbation and thus increase with deteriorating stream conditions. The final and seventh metric included in the TMI is a composite North Carolina Biotic Index (NCBI) (TDEC 2017) and is expected to increase with deteriorating conditions as with %C+O and %TNUTOL, (Barbour *et al.* 1999).

Methods

Macroinvertebrates were collected at 7 stations in the Hamilton County Water Quality Program area during calendar year 2018. Collections were made between August, 21st and September, 19th following Semi-quantitative Single Habitat (SQSH) riffle kick protocols (TDEC 2017). Field observations of temperature, specific conductance, dissolved oxygen and pH were made and recorded at the time of

collection; general watershed and stream conditions were recorded, and a habitat assessment was completed following TDEC (2017) procedures. Samples were preserved and shipped to the taxonomy laboratory where subsampling, identification and data reduction were completed.

Date Sampled	Watercourse	Station ID	Description	303d Status
8/21/18	Stringers Branch	STRIN000.6 HM	Exiting Red Bank MS4 area	Impaired
8/22/18	Falling Water Creek	FWATE002.7 HM	Pickett Gulf; entering County MS4 area	Fully Supporting
8/31/18	North Chickamauga Creek	NCHIC016.7 HM	Upstream from confluence with Poe Branch	Impaired
9/5/18	Little Falling Water Creek	LFWAT000.1 HM	Exiting Walden MS4 area	Impaired
9/7/18	Shoal Creek	SHOAL002.9 HM	Exiting Walden MS4 area	Impaired
9/11/18	Middle Creek	MIDDLE003.4 HM	Downstream from confluence with Freudenberg Creek; exiting Signal, County and Walden MS4 areas	Fully Supporting
9/19/18	Mountain Creek	MOUNT003.3 HM	Downstream from school bank stabilization; downstream from Red Bank and County MS4 areas	Impaired

Table 1 List of the 7 streams sampled for macroinvertebrates during 2018 calendar year.

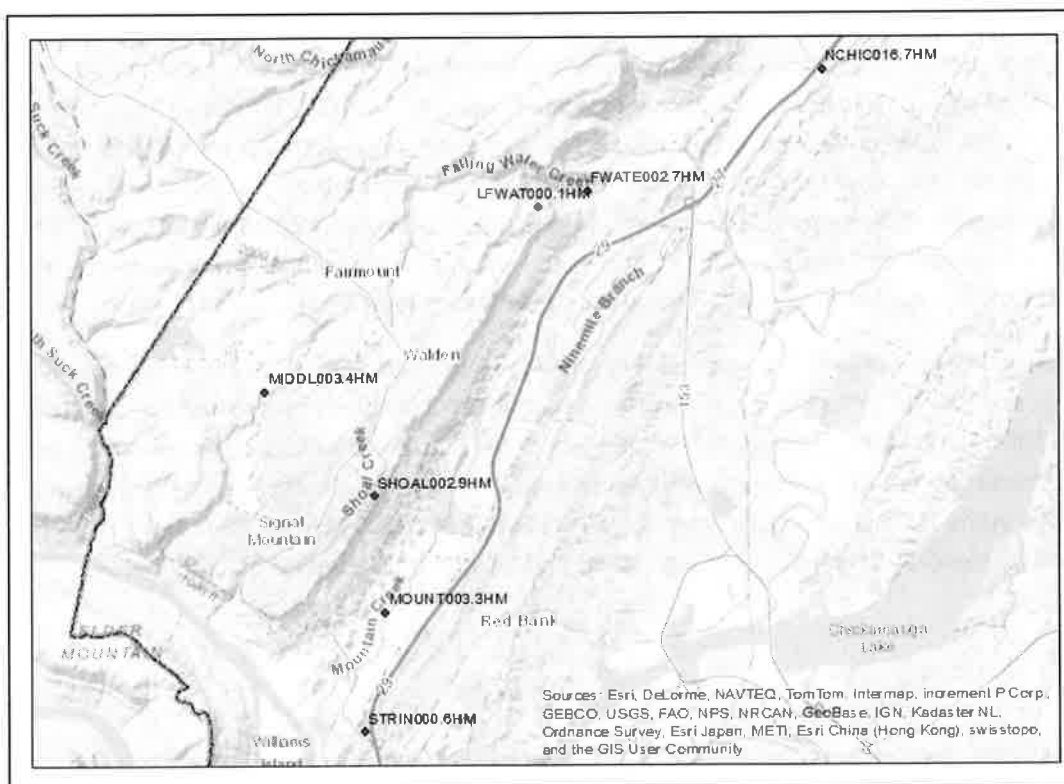


Figure 1 Macroinvertebrate monitoring stations labeled with station ID.

Individuals were identified to the genus taxa level when possible and to the lowest possible taxa level otherwise. Following identification, individuals were further grouped at the EPT family level as well as the Chironomidae family level and Oligochaeta class level for data reduction. Taxa were also categorized as nutrient tolerant, as behavioral clingers, and they were assigned a biological index score (NCBI) following TDEC (2017) procedures; Taxa Richness, EPT Richness, EPT Relative Abundance, Chironomidae + Oligochaeta Relative Abundance, Clinger Relative Abundance, and Nutrient Tolerant Relative Abundance were all calculated following TDEC (2017) and subsequently compared to least impacted streams by assigning ordinal scores for calculation of the Tennessee Macroinvertebrate Index (TMI).

Results

Taxa Richness ranged between 42 -18, with 42 taxa collected at the North Chickamauga Creek station and 18 collected at the Mountain Creek (Figure 2). EPT Richness ranged between 14-2 taxa; 14 were collected at the North Chickamauga station, and 2 taxa were collected at the Shoal Creek station. The average NCBI score for all taxa collected at each station ranged between 4.61 on North Chickamauga to 6.27 on Shoal Creek.

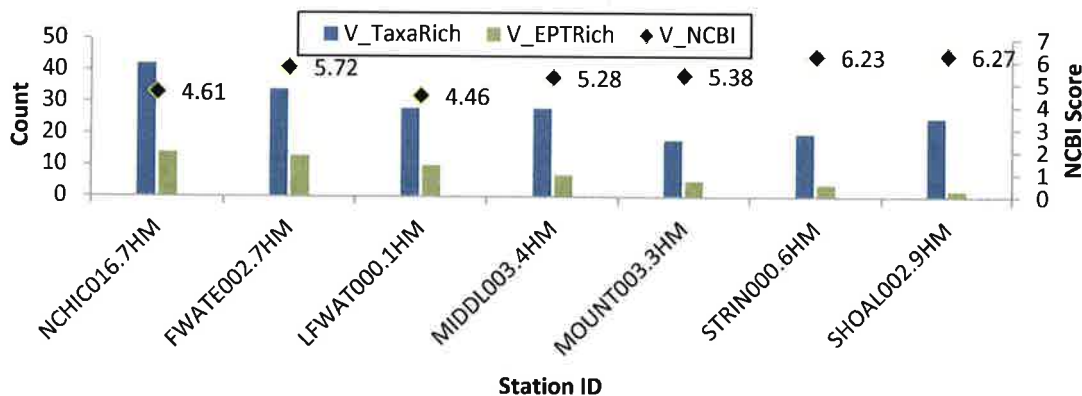


Figure 2 Richness and NCBI values for 7 macroinvertebrate samples collected in Hamilton County in 2018. Blue columns indicate the taxa richness sampled at each station; green columns representing EPT taxa. Station names appear along the horizontal axis and are ordered from left to right by highest TMI to lowest.

The relative abundance of EPT taxa was highest at the station on Falling Water Creek with 59.6% of collected individuals falling within those families (Figure 3). The lowest EPT relative abundance was observed on Shoal Creek with less than 1% of individuals belonging to EPT families. The highest abundance of clingers was observed at the Mountain Creek station with 45.9% and ranged to a low of 12.1% observed at Falling Water Creek. The relative abundance of chironomids and oligochaetes ranged from a high of 59.3% on Stringers Branch to a low of 16.7% at Falling Water. And nutrient tolerant taxa were most abundant at the Stringers Branch station at 55.2% and least abundant on North Chickamauga at 9.5%.

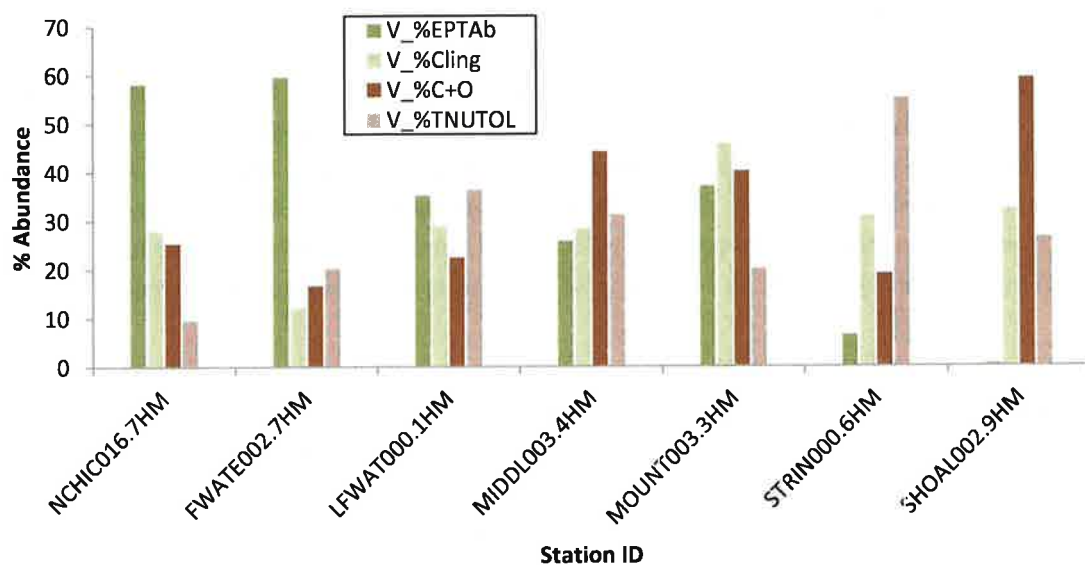


Figure 3 Relative abundance EPT (dark green bars), Clingers (light green), Chironomids and Oligochaetes (dark red), and nutrient tolerant taxa (light red). Station names appear along the horizontal axis and are ordered from left to right by highest TMI to lowest.

Scores for each metric are presented in Table 2 with the totaled score (TMI) in the far right column. TMI scores ranged between 38-22 with only the stations on North Chickamauga Creek and Falling Water Creek producing scores above 32.

Station ID	Taxa	EPT	% EPT	% Clinger	NCBI	% C+O	% TNUTOL	TMI
NCHIC016.7HM	6	6	6	2	6	6	6	38
FWATE002.7HM	6	6	6	0	4	6	6	34
LFWAT000.1HM	4	4	4	2	6	6	4	30
MIDDLE003.4HM	4	4	2	2	6	4	6	28
MOUNT003.3HM	4	2	4	4	4	4	6	28
STRIN000.6HM	4	2	0	2	4	6	4	22
SHOAL002.9HM	4	0	0	4	4	4	6	22

Table 2 biometric scores used to calculate TMI. Scores are 6, 4, 2, and 0 with the highest score indicating the greatest comparability to ecoregion reference streams and the lowest score being the greatest difference from reference streams. The 7 scores are totaled to calculate the TMI with 32 or higher considered to pass guidelines for comparability to least impacted reference streams.

Discussion

Of the 7 stations sampled, only 2 passed the TMI biocriteria guideline of 32. Considering that each of the sampled streams receive significant portions of stormwater runoff from urban areas, it was not surprising that most samples failed guidelines. The two stations that passed guidelines were on North Chickamauga Creek and Falling Water Creek; both streams are within the largest watersheds of the group of sampled streams, so it may have been that a relatively small contribution of urban runoff influenced the TMI scores. However, that analysis was not conducted.

All but one of the macroinvertebrate metrics appeared to follow the expected relationships to overall ecological perturbation; only relative abundance of clingers seemed to follow an unexpected relationship as it generally increased while total TMI score decreased. However, with only 7 stations sampled, no analysis of the statistical significance of correlation was conducted; and it may be that the apparent trend is an insignificant artifact of normal variation within data. As more samples are collected analyses of variance and correlation will become more applicable.

With the data collected from these seven stations it can be seen that there is preliminary indication that negative ecological perturbations are causing portions of the sampled streams (other than North Chickamauga and Falling Water creeks) to deviate from ecoregion reference conditions.

Conclusion

In conclusion, the Hamilton County Water Quality Program will continue to monitor the stations described in this report, as well as other stations not included currently, in accordance with the requirements of state of Tennessee issued permits pertaining to the discharge of stormwater runoff from municipal drainage systems.

Works Cited

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