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: Carter County		MS4 Permit Number: TN5075124
Contact Person: Chris Schuettler		Email Address: schuettler11b@gmail.com
Telephone: (423) 542-1834		MS4 Program Web Address: N/A
Mailing Address: 801 E Elk Ave Box 14		
City: Elizabethton	State: TN	ZIP code: 37643

What is the current population of your MS4? 56,356

What is the reporting period for this annual report? July1 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 (tdeconline.tn.gov/dwr/)? If yes, attach a list. ☒ Yes ☐ No

B. Are there established and approved TMDLs (http://www.tn.gov/environment/article/wr-ws-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: Buffers and BMP's are listed in our stormwater ordinance ☒ 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: AUTO SHOPS, PUBLIC MAINTENANCE SHOPS, ETC ☒ Yes ☐ No

C. Do you have a webpage dedicated to your stormwater program? If yes, provide a link/URL: N/A ☐ Yes ☒ No

D. Summarize how you advertise and publicize your public education, outreach, involvement and participation opportunities: PUBLIC EVENTS, ANNUAL MS-4 REPORT AT PUBLIC MEETINGS, DISCUSS MS4 VIOLATIONS IF ANY ARE APPLICABLE DURING MONTHLY REGIONAL PLANNING COMMISSION MEETINGS

E. Summarize the public education, outreach, involvement and participation activities you completed during this reporting period: COMMUNITY CLEANUP EVENTS AND DISCUSSIONS WITHIN REGIONAL PLANNING COMMISSION OPEN MEETINGS AND COUNTY BOARD OF COMMISSIONER OPEN MEETINGS

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: N/A

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? 312		
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: STREAM INSPECTIONS, MONITORING, AND COMPLAINTS	☒ Yes	☐ No
F.	How many illicit discharge related complaints were received this reporting period? 0		
G.	How many illicit discharge investigations were performed this reporting period? 0		
H.	Of those investigations performed, how many resulted in valid illicit discharges that were addressed and/or eliminated? 0		

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
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? 38 "ACTIVE" PERMITS ARE LISTED ON TDEC SITE. THERE IS ONLY ONE TRULY ACTIVE

F. How many active priority and non-priority construction sites were inspected this reporting period? 1

G. How many construction related complaints were received this reporting period? 0

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 ☒ Yes	☐ No ☐ 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: _____	☐ 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

D. How many development and redevelopment project plans were reviewed for this reporting period? 0

E. How many development and redevelopment project plans were approved? 0

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
Fleet or maintenance shops with outdoor storage areas?	☒ Yes	☐ No
Salt and storage locations?	☒ Yes	☐ No
Snow disposal areas?	☐ Yes	☒ No
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. PLEASE SEE CALENDAR OF CORRECTIVE ACTION PLAN

Information (e.g. additional acreage, outfalls, BMPs) on newly annexed areas and any resulting updates to your program. N/A

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. AN EVALUATION OF ALL PROCESSES AND PROCEDURES HAS BEEN NOTED AND MANY ISSUES HAVE BEEN ADDRESSED (SEE CHART). WE HAVE ALSO MADE SIGNIFICANT IMPROVEMENTS OF DOCUMENTING COMPLAINTS AND OTHER ENFORCEMENT PROCEDURES. AGREEMENTS WITH OTHER COUNTY AGENCIES HAS BEEN AGREED UPON AND WILL OFFICE WILL BE NOTIFIED OF ANY CHANGES OR ISSUES PERTAINING TO IDDE. ☒ 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:

Action	Construction	Permanent Stormwater	Illicit Discharge	In Your ERP?	
Verbal warnings	#_____	#_____	#_____	☒ Yes	☐ No
Written notices	#_____	#_____	#_____	☒ Yes	☐ No
Citations with administrative penalties	#_____	#_____	#_____	☒ Yes	☐ No
Stop work orders	#_____	#_____	#_____	☒ Yes	☐ No
Withholding of plan approvals or other authorizations	#_____	#_____	#_____	☒ Yes	☐ No
Additional Measures	#_____	#_____	#_____	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? NONE AT THE REPORTING PERIOD

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. BRUSHY FORK HAS BEEN CONTRACTED AND HAS COMPLETED MONITORING OUR 303D STREAMS. WE HAVE ATTACHED A COPY FOR YOUR RECORDS.

B. Summarize any non-analytical monitoring activities (e.g., planning, collection, evaluation of results) performed during this reporting period. CODE ENFORCEMENT CHECKS

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."

Bobbie Gouge Dietz, Chairwoman CCPC	Bobbie Gouge-Dietz	9-30-21
Printed Name and Title	Signature	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

303D TMDL Listings

Waterbody ID	*Impacted Waterbody*	*County*	*Miles/Acres Impaired*	*Cause / TMDL Priority*	*Pollutant Source*
TN06010103 008-0400	Campbell Branch	Carter	3.0	Nitrate+Nitrate Loss of biological integrity due to siltation Alteration in stream-side or littoral vegetative cover Escherichia coli	Discharges from MS4
TN06010103 008-0400	Davis Branch	Carter	5.9	Habitat loss due to stream flow alteration Alteration in stream-side or littoral vegetative cover	Discharges from MS4 area Upstream impoundment
TN06010103 008-0800	Gap Branch	Carter	15.93	Nitrate+Nitrate Loss of biological integrity due to siltation Alteration in stream-side or littoral vegetative cover Escherichia coli	Discharges from MS4 area Streambank modification Septic tanks
TN06010103 011-1000	Buffalo Creek	Carter	6.08	Nitrate+Nitrite M Escherichia coli H	Pasture Grazing
TN06010103 013 – 0600	Roaring Creek	Carter	11.92	Iron	Upstream Impoundment
TN06010103 013 – 0811	Gouge Creek	Carter	1.36	Loss of biological integrity due to siltation	Land Development Pasture Grazing
TN06010103 020 – 1000	Watauga Lake	Carter/Johnson	6427 ac	Mercury	Atmospheric Deposition

Carter County MS-4 Maps

CARTER COUNTY, TENNESSEE

BASE MAP 1 AUGUST 2012
Updated Map of 10 September 2013
Outfall Mapping as of 01 May 2015

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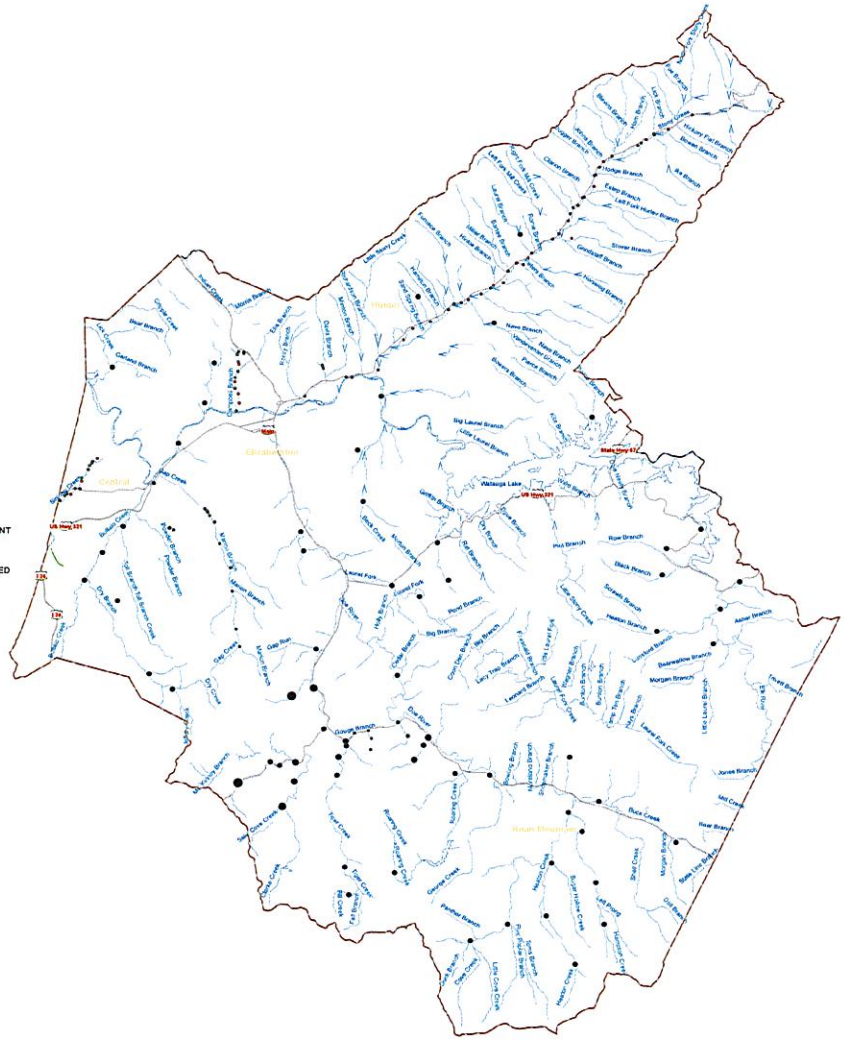
W E
S

NOTES:

DO TO THE CURRENT CONSTRUTION OF THE SOUTHERN BYPASS SOME AREAS IN THE MIDWESTERN SECTION OF THIS MAY CHANGE AND/OR NEW OUTFALLS WILL HAVE TO BE LOCATED AS BUILT AND COMPLETED

ANY NEW OUTFALLS WILL BE MAPPED AND RECORDED AS SUCH AS SHOWN ON INSERT ON RIGHT SIDE OF THIS DOCUMENT

THIS IS A WORKING DOCUMENT AND WILL BE UPDATED AS NEEDED



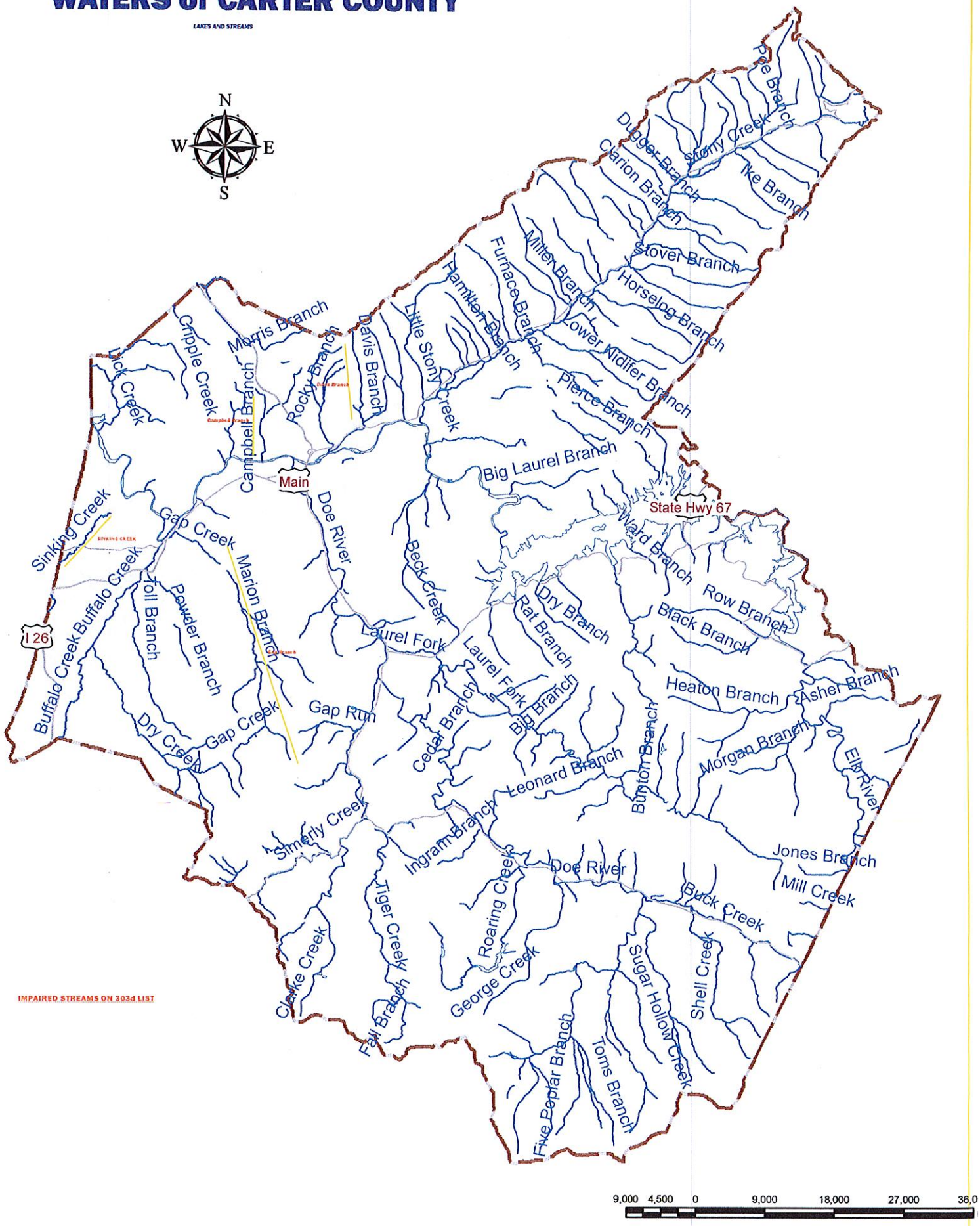
Legend
- ww_outfa
- ww_bridg
- ww_outf2
- ww_outf4
- ww_bridg
- Footer
- Kaye Moody
- ww_mains
- Highways
- Lakes
- Streams
- County Line
- City Limits

46,000 23,000 0 46,000 Feet

CARTER COUNTY TENNESSEE
EST. 1796

WATERS of CARTER COUNTY

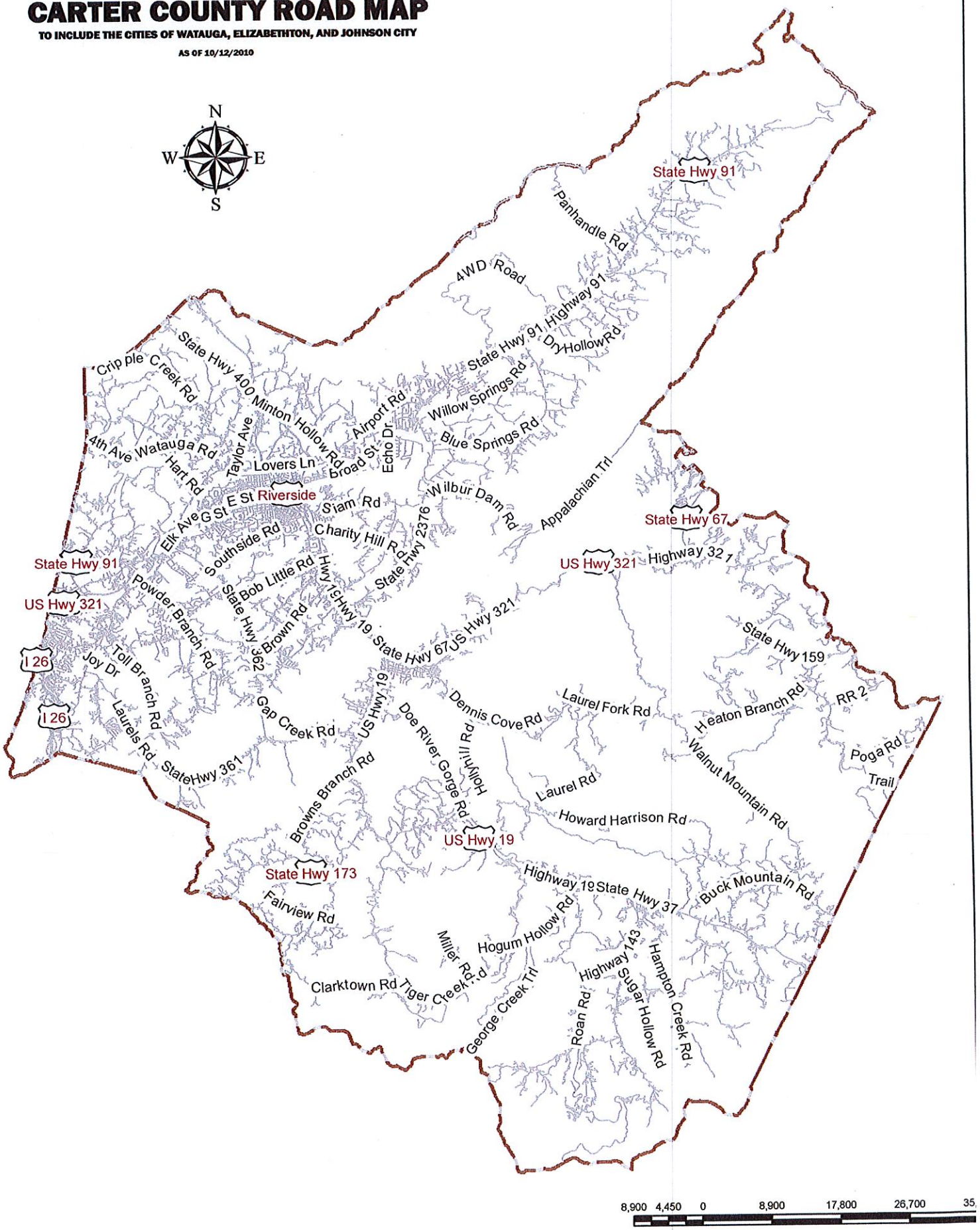
LAKES AND STREAMS



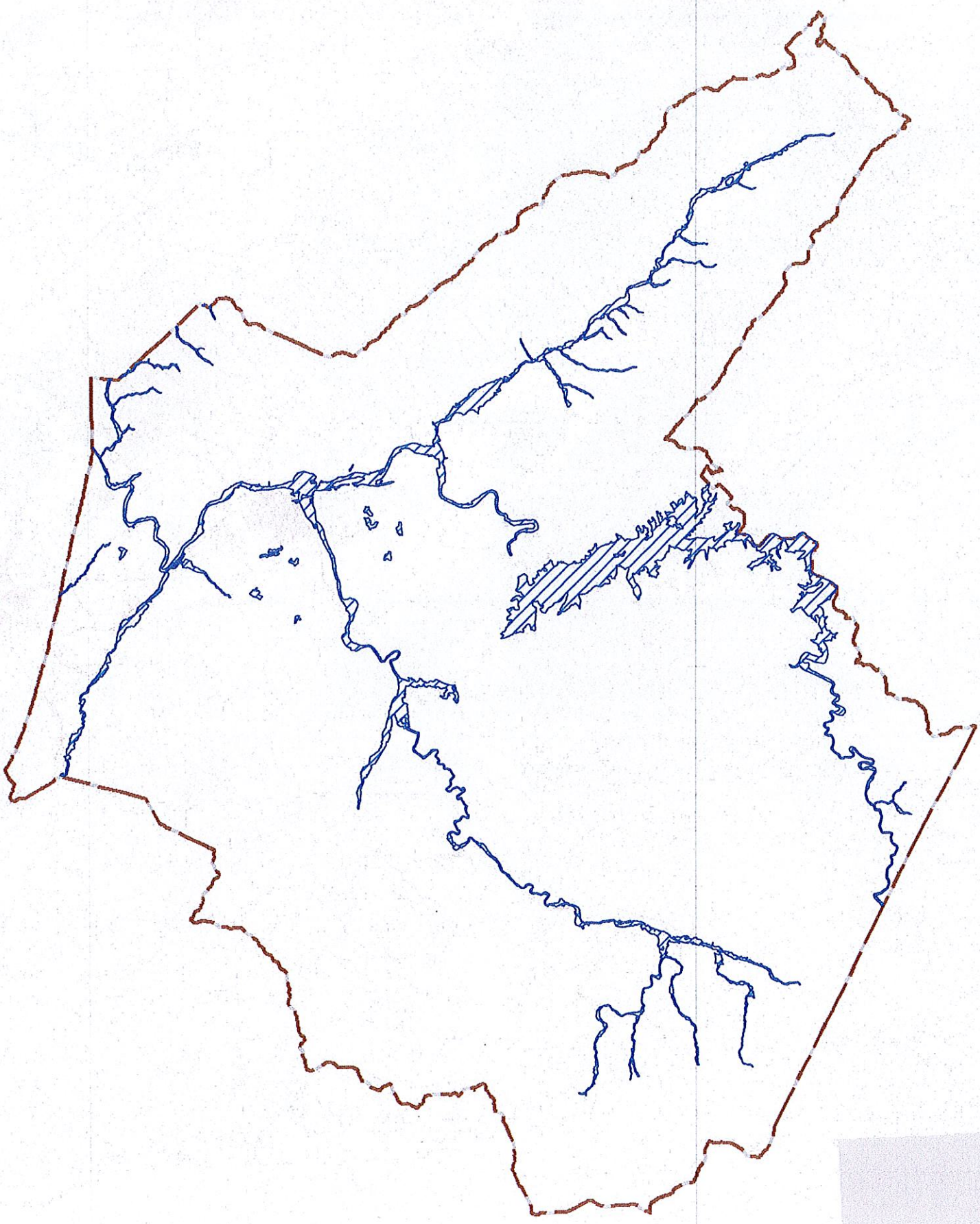
CARTER COUNTY ROAD MAP

TO INCLUDE THE CITIES OF WATAUGA, ELIZABETHTON, AND JOHNSON CITY

AS OF 10/12/2010



TOPOGRAPHY MAPPING of CARTER COUNTY and ADJIONING AREAS

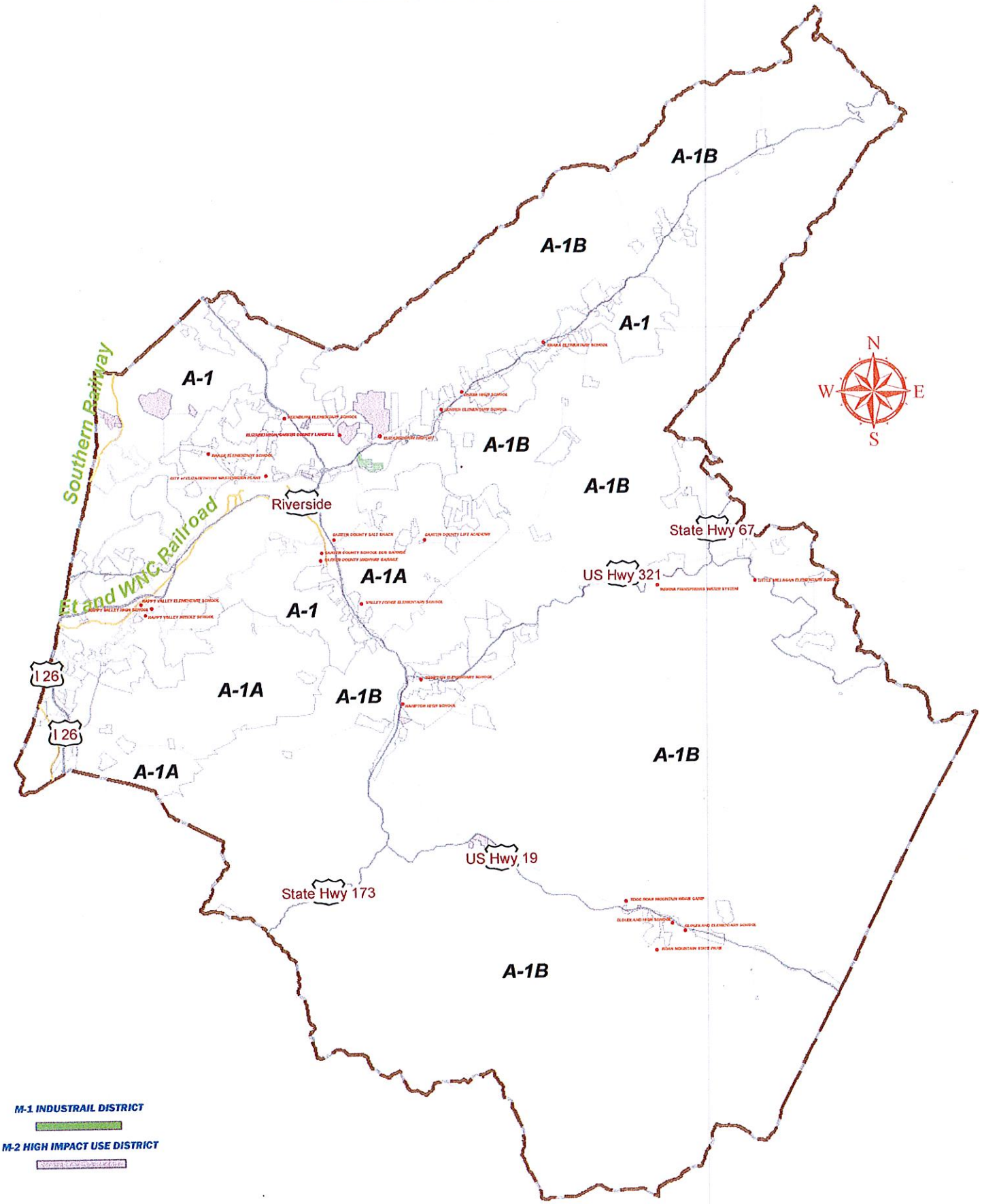


MAJOR WATERSHEDS and RECIEVERS HIGHLIGHTED HATCHED/BLUE

9,100 4,550 0 9,100 18,200 27,300 36,400
Feet

CARTER COUNTY

INDUSTRAIL ZONING and LOCATION MAPPING



Escherichia Coli Stream Monitoring

Brushy Fork Environmental Consulting, Inc.

Providing Sound Environmental Solutions

10565 Highway 421 S
Trade, TN 37691
ph/fax: 423.727.4476
Josselyn@bfec.org

August 13th 2021

c/o: Chris Scheuttler, Director
Carter County Planning & Zoning
824 E Second Street
Elizabethton, TN 37643
(423) 542-1834

RE: Carter County Stream Monitoring (E. Coli) - Carter County TN

Mr. Scheuttler:

Please find the enclosed report: *Escherichia coli* Stream Monitoring - Carter County, Tennessee. This water quality assessment was performed for reaches of Campbell Branch and Gap Creek during the month of July and into August 2021. The geometric mean for *Escherichia coli* (E. coli) levels at both streams were both above the water quality criteria given for E. Coli in the Watauga River TMDL (126 colony forming units per 100 ml (CFU/100ml)). All discrete measurements (five) were less than the standard sample maximum of 941 CFI/100ml. These data suggest neither stream is meeting its numeric criteria for E. coli relative to their recreation use classification.

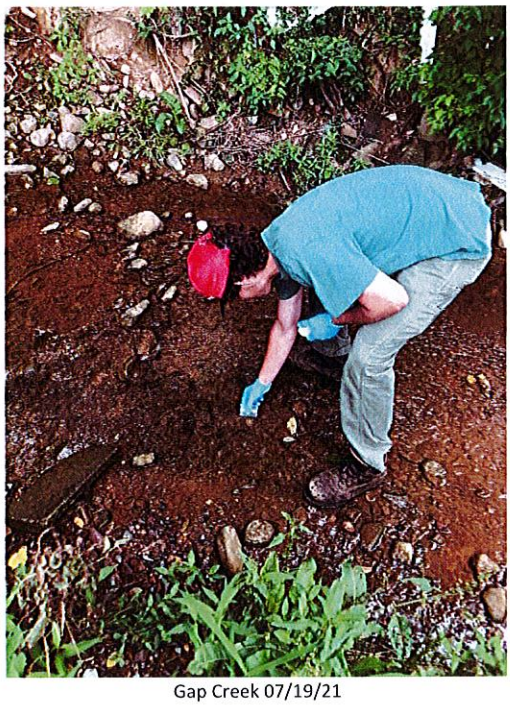
If you have any questions or need additional information, please be in touch.

Sincerely,

Josselyn K Lucas

Josselyn Lucas

Escherichia coli Stream Monitoring - Carter County, Tennessee
Assessment and Results – July 2021



Gap Creek 07/19/21

Prepared By:

Brushy Fork Environmental Consulting, Inc.
10565 Hwy 421 S
Trade, TN 37691

August 13, 2021

Prepared For:
Carter County Planning & Zoning
Chris Scheuttler, Director
824 E Second Street
Elizabethton, TN 37643

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Appendices

1. SCOPE OF SERVICES

Water sampling for *Escherichia coli* (E. coli) was performed for Campbell Branch (TN06010103008-0200) and Gap Creek (TN06010103008-0800) streams in Carter County, Tennessee. Brushy Fork Environmental Consulting, Inc. (BFEC) staff collected samples from one (1) monitoring location at each reach. Five (5) samples from each monitoring location were collected over a 5 day period in the month of July 2021 to determine the geometric mean for the water quality parameter of E. coli. Samples were analyzed by Oakwood Scientific Laboratory of Mechanicsville, VA. BFEC followed the E. coli sampling requirements outlined in the Tennessee Department of Environment and Conservation's (TDEC) "Quality System Standard Operating Procedure for Chemical and Bacteriological Sampling of Surface Water" (rev. 2018).

This project report presents sampling results with analysis and comments pertinent to specific stream pollutant sources and the Watauga River Watershed (HUC 06010103) TMDL for E. Coli (TDEC, 2015)

2. MATERIALS AND METHODS

Materials

Prior to beginning sampling efforts, BFEC staff acquired a sufficient number of 250 milliliter (ml) sterile polypropylene screw-cap sampling bottles pre-preserved with sodium thiosulfate and EDTA from Burgie Drug Store in Elizabethton, TN.

Methods

Following the Standard Operating Procedures outlined by TDEC, BFEC staff (Caleb Crowell and Sam Phillips) selected sample sites for the two creeks within 200 meters of previously sampled locations. These previous sampling locations were identified through the United States Environmental Protection Agency (US EPA) STORET database.

Table1: Sampling Locations

	Station ID	Station Name	Organization ID	EPA STORET Lat./Long.	Sampling Lat./Long.
Gap Creek	GAP000.4CT	Gap Creek	TDECWPC	36.3311 -82.2639	36.3319 -82.2649
Campbell Branch	CAMPB000.6CT	Campbell Branch	TDECWPC	36.3569 -82.2258	36.3568 -82.2264

Each sampling location was sampled five times. Four of the samples were taken within a 5 day period, 24 hours apart, and not directly following a significant rainfall event. The fifth sample was damaged en-route to the lab, so the fifth sample was re-done on 8/4/21. No significant rainfall event had occurred before this sample was taken. During each site visit, one 250 ml pre-preserved bottle was used to collect a single sample from each creek. Staff members were

careful not to displace the preservative or overfill the bottle. In order to avoid cross-contamination, staff members wore nitrile gloves throughout the sampling process. Tagged sample bottles were placed in zip-type bags and immediately stored on ice in a sealed cooler. A chain of custody and sample request form were taken to the lab along with the samples. All of the samples received by the lab were under the specified temperature threshold (10°C).

Gap Creek and Campbell Branch were each sampled on the following dates (M/D/Y): 7/19/21, 7/20/21, 7/21/21, 7/22/21, 8/4/21.

Laboratory Analysis

Oakwood Scientific Laboratories used Standard Methods, 22nd ed. 2012 Method 9223 B Colilert 18 for quantification of E. Coli presence. With this method, chromogenic substrates ortho-nitrophenyl-β-d-galactopyranoside (ONPG) and chlorophenol red-β-d-galactopyranoside (CPRG), respectively, are used to detect the enzyme β-d-galactosidase, which is produced by total coliform bacteria. The β-d-galactosidase enzyme hydrolyzes the chromogenic substrate that produces a color change, thereby indicating the presence of total coliforms. Through this methodology, a Most Probable Number (MPN) of bacteria was quantified for each water sample.

3. RESULTS

Results for E. Coli presence (MPN) for each sample, and the median and geometric mean of sample values at each location is presented below in Table 2.

Table 2 - Sampling Results

Sampling Date	Gap Creek (mpn/100ml)	Campbell Branch (mpn/100ml)
19-Jul	177	325
20-Jul	383	113
21-Jul	232	172
22-Jul	162	341
4-Aug	85.4	128
Median	**177.00**	**172.00**
Geometric Mean	**185.15**	**194.13**

4. DISCUSSION

Water quality criteria for E. coli in waters designated for recreational use were established by the "State of Tennessee Water Quality Standards, Chapter 0400-40-03, General Water Quality Criteria, 2019 Version" (TDEC 2019). The standard limits the geometric mean for E. coli to 126 colony forming units (cfu)/100ml and limits the sample maximum within a thirty-day period to

941 cfu/100ml. This standard is used as the water quality criteria for the E. coli TMDL target identified in the proposed TMDL document for the Watauga River Watershed (TDEC 2006). Upon instruction from TDEC staff, mpn and cfu are treated as approximate equal units. At the Gap Creek sampling location, the geometric mean (185.15 mpn) for E. coli exceeded the TMDL water quality criteria; however, none of the samples exceeded the sample maximum criteria. Likewise, at Campbell Branch, the geometric mean (194.13 mpn) none of the five samples exceeded the maximum criteria. E. Coli presence fluctuated over the sample period with a standard deviation being over 100 for both tributaries.

According to TDEC's, "Proposed Total Maximum Daily Load (TMDL) for E. Coli in the Watauga River Watershed (HUC 6010103)" (TDEC 2006) document, 3.0 miles of Campbell Branch was impaired for E. Coli. The source of this pollutant was attributed to direct discharge from the MS4 area. The majority of the 2.3 square mile drainage basin is comprised of open grasslands and mix forests. There are however, concentrations of residential homes and other facilities located within the drainage area. Highly developed concentrations of residential developments occur; one just north and west of the sampling location, and another approximately 0.5 miles to the north/northeast of the sampling location. Additionally, there is a mobile home development adjacent (east) to the sample location and new development directly to the west.

Gap Creek can be characterized in much the same way. However, it is a much larger basin encompassing 10.3 square miles. The watershed above the sampling location is primarily forested, followed by open grassland or pasture. According the TDEC's "Total Maximum Daily Load (TMDL) for E. Coli in the Watauga River Watershed (06010103), 15.93 miles of Gap Creek is impaired for E. Coli. Gap Creek has been cited for E. Coli contamination in City of Elizabethton's 2020 Annual Stormwater Report. Possible pollution sources identified are from discharge from MS4 area, stream bank modification, septic tanks, and pasture grazing.

5. REFERENCES

City of Elizabethton."City of Elizabethton MS4 Annual Permit Report," 2020.

Standard Methods."Standard Methods for the Examination of Water and Wastewater."*Standard Methods*, 2004.http://www.standardmethods.org/store/ProductView.cfm?ProductID=313.

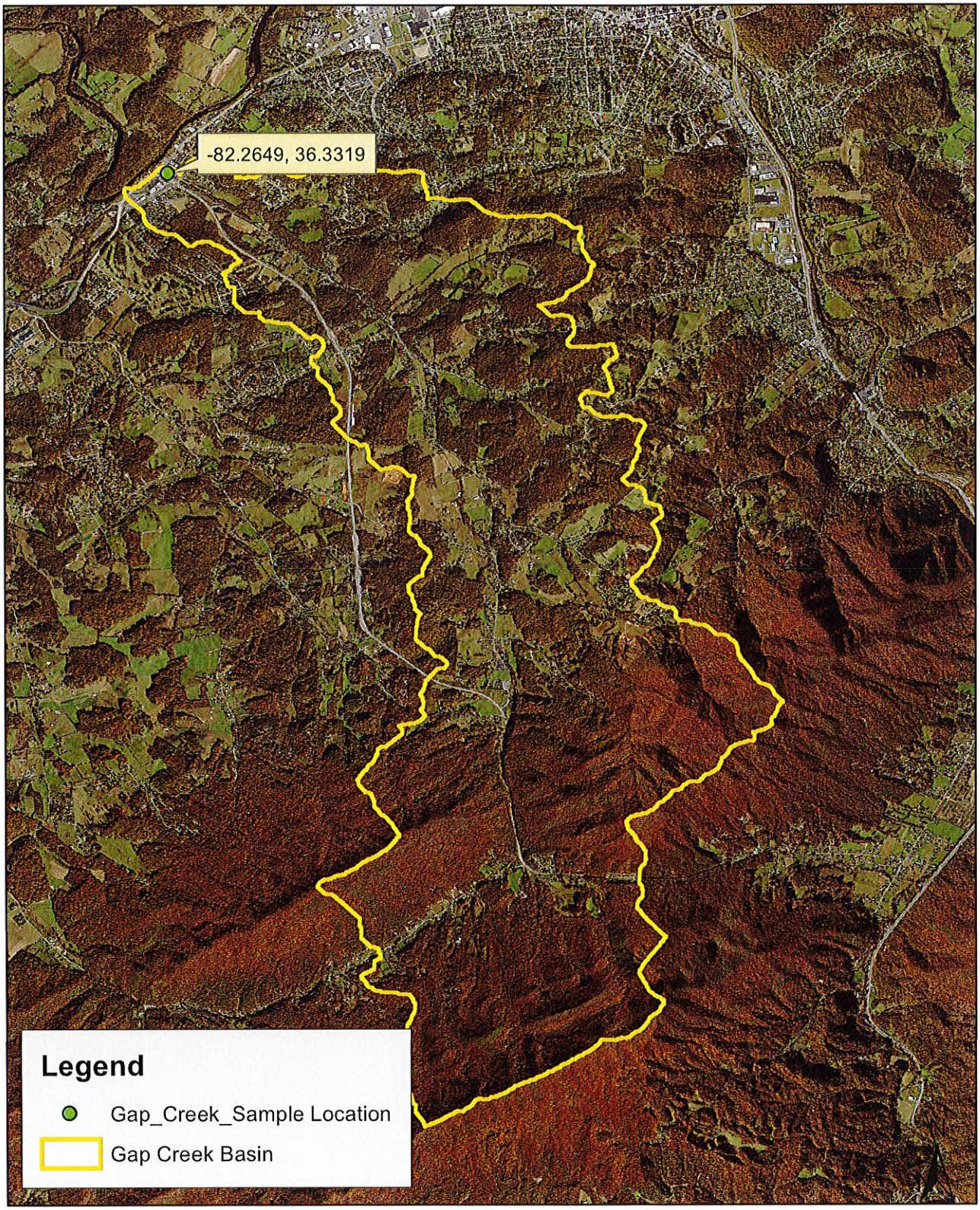
Tennessee Department of Environment and Conservation. "PROPOSED TOTAL MAXIMUM DAILY LOAD (TMDL) for E. Coli in the Watauga River Watershed (HUC 06010103) Carter, Johnson, Sullivan, Unicoi, and Washington Counties, Tennessee" pp. 8-54, 2015.

Tennessee Department of Environment and Conservation."State of Tennessee Department of Environment and Conservation Division of Water Pollution Control Quality System Standard Operating Procedure for Chemical and Bacteriological Sampling of Surface Water", 2018.

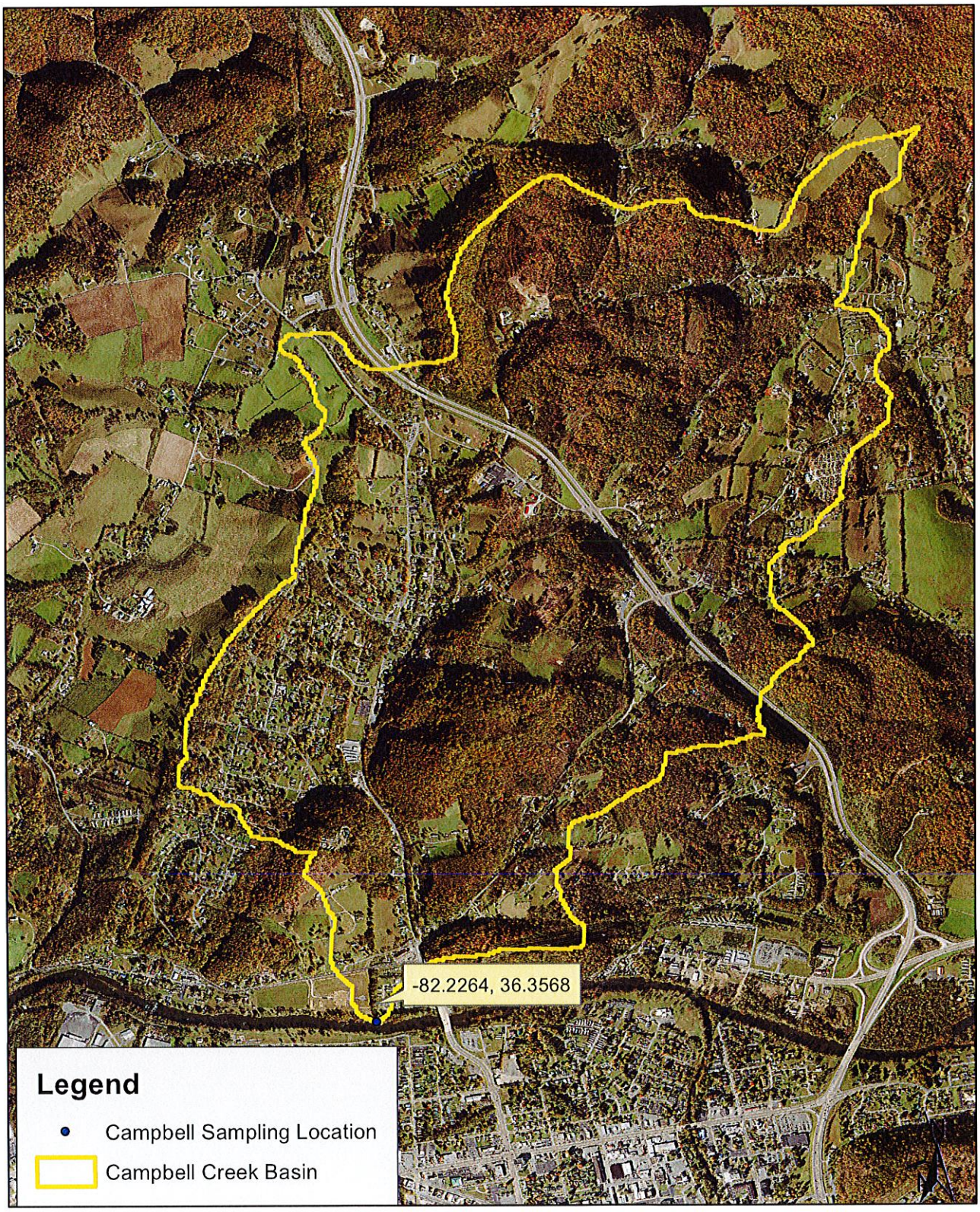
Tennessee Department of Environment and Conservation. "State of Tennessee Water Quality Standards, Chapter 0400-40-03, General Water Quality Criteria", v. 2019.

APPENDIX A - DRAINAGE BASIN MAPS

Gap Creek Basin



Campbell Creek Basin



APPENDIX B - LAB RESULTS AND CHAIN OF CUSTODY DOCUMENTATION

115.3 6.65 = 177.9 Total = 737226 MPN/100 ml 184750

Bryce's Drug (2)

E.coli 177 MPN/100 ml

OAKWOOD SCIENTIFIC LABORATORY
State Certified Bacteriological Water Testing

7102 Pole Green Road
Mechanicsville, VA 23116
oakwoodlab@verizon.net.

(804) 730-3263 Richmond
(804) 730-9379 Fax
1-800-582-5211 Toll Free

Please circle one

Bacteria (circled) Ecoli Enumeration

lead, nitrate/nitrite

chemistry
(includes lead, nitrate)

Rush/email results 48 hrs+$3: your email Caleo@bfec.org

NON-PUBLIC SUPPLY ☐

Jn 7/20/21 10:25 AM <5°C RRW

THIS BOTTLE CONTAINS THIOSULPHATE

DATE COLLECTED 7/19 TIME: 12:45 NAME OF CITY OR COUNTY Carter

ADDRESS OF SUPPLY Sample 2 Gap Creek

SUPPLY OWNED BY BFEC

SAMPLE COLLECTED BY Caleb Crowell

SAMPLE WAS TAKEN FROM Gap Creek (WELL, APPROVED TAP, ETC.)

IS SUPPLY CHLORINATED? YES ☐ NO ☒

WAS CHLORINE TEST MADE AT SAMPLING POINT YES ☐ NO ☒

RES. CL. ______ PPM.

- REPORT RESULTS TO -

PRINT

Brushy Fork Environmental

10565 US 421 Trade TN

Telephone 423 727 4476

See reverse side for collection information

REPORT ON BACTERIOLOGICAL EXAMINATION OF WATER

DO NOT WRITE IN SPACE BELOW.

Portion Of Sample Tested	Bact. of Coliform Group	Portion Of Sample Tested	Bact. of Coliform Group
.0001 ml.		20 ml.	
.001 ml.		20 ml.	
.01 ml.		20 ml.	
.1 ml.		20 ml.	
1 ml.		20 ml.	

SAMPLE NO 072021-5 BFEC

RECEIVED 7/20/21

COMPLETED

Results Based on Confirmed Tests Unless Otherwise Specified

Membrane Filter ______ Coliforms per 100 ml.

+ Opposite Portion Tested Means Bacteria Indicating Contamination WERE Present

— Means Bacteria Indicating Contamination WERE NOT Present

OAKWOOD SCIENTIFIC LABORATORY

State Certified Bacteriological Water Testing

Total > 2419.6 MPN/100ml (1841.80)
E.coli : 325.5 MPN/100ml

Please circle one: (bacteria) E.coli Enumerate

7102 Pole Green Road
Mechanicsville, VA 23116
oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 730-9379 Fax
1-800-582-5211 Toll Free

lead, nitrate/nitrite

chemistry (includes lead, nitrate)

Rush/email results 48 hrs+$3: your email Caleb@bfec.org

Jn 7/20/21 10:25AM 4.5°C KMW

NON-PUBLIC SUPPLY ☐

REPORT ON BACTERIOLOGICAL EXAMINATION OF WATER

DATE COLLECTED 7-19 TIME: 1:03 NAME OF CITY OR COUNTY Carter

ADDRESS OF SUPPLY Campbell Branch

SUPPLY OWNED BY BFec

SAMPLE COLLECTED BY Caleb Crowell

SAMPLE WAS TAKEN FROM Campbell Branch (WELL, APPROVED TAP, ETC.)

IS SUPPLY CHLORINATED? YES ☐ NO ☒

WAS CHLORINE TEST MADE AT SAMPLING POINT YES ☐ NO ☒

RES. CL ______ PPM.

- REPORT RESULTS TO -

Beaver Creek Environmental

10565 US 421 [illegible] TN

PRINT

Telephone 423 727 4476

See reverse side for collection information

DO NOT WRITE IN SPACE BELOW.

Portion Of Sample Tested	Bact. of Coliform Group	Portion Of Sample Tested	Bact. of Coliform Group
.0001 ml.		20 ml.	
.001 ml.		20 ml.	
.01 ml.		20 ml.	
.1 ml.		20 ml.	
1 ml.		20 ml.	

SAMPLE NO 072021-6 BFec

RECEIVED 7/20/21

COMPLETED 7/21/21

Membrane Filter ______ Coliforms per 100 ml.

\+ Opposite Portion Tested Means Bacteria Indicating Contamination WERE Present

— Means Bacteria Indicating Contamination WERE NOT Present

Results Based on Confirmed Tests Unless Otherwise Specified

THIS BOTTLE CONTAINS THIOSULPHATE

Total >2488 MPN/100ml 184324
E.coli 383 MPN/100ml

OAKWOOD SCIENTIFIC LABORATORY

State Certified Bacteriological Water Testing

7102 Pole Green Road
Mechanicsville, VA 23116
oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 730-9379 Fax
1-800-582-5211 Toll Free

Please circle one

bacteria

lead, nitrate/nitrite

chemistry (includes lead, nitrate)

Rush/email results 48 hrs+$3: your email Caleb@Bfcc.org

7/21/21 4:00 PM ~5°C RDW

NON-PUBLIC SUPPLY ☐

REPORT ON BACTERIOLOGICAL EXAMINATION OF WATER

DO NOT WRITE IN SPACE BELOW.

THIS BOTTLE CONTAINS THIOSULFATE

DATE COLLECTED 7-20 TIME 10:00 NAME OF CITY OR COUNTY Carroll

ADDRESS OF SUPPLY Gap Creek

SUPPLY OWNED BY Bfcc

SAMPLE COLLECTED BY Caleb Crowell

SAMPLE WAS TAKEN FROM Gap Creek (WELL, APPROVED TAP, ETC.)

IS SUPPLY CHLORINATED? YES ☐ NO ☒

WAS CHLORINE TEST MADE AT SAMPLING POINT YES ☐ NO ☒

RES. CL _____ PPM.

REPORT RESULTS TO -

PRINT

Brushy Fork Environmental
10565 US 421
Trade TN
Telephone 423 >27- 4476

See reverse side for collection information

Portion Of Sample Tested	Bact. of Coliform Group	Portion Of Sample Tested	Bact. of Coliform Group
.0001 ml.		20 ml.	
.001 ml.		20 ml.	
.01 ml.		20 ml.	
.1 ml.		20 ml.	
1 ml.		20 ml.	

SAMPLE NO 072121-33 Bfcc

RECEIVED 7/21/21

COMPLETED 7/28/21 V

Membrane Filter _____ Coliforms per 100 ml.

Results Based on Confirmed Test Unless Otherwise Specified

+ Opposite Portion Tested Means Bacteria Indicating Contamination WERE Present

— Means Bacteria Indicating Contamination WERE NOT Present

Total 72688 MPN/100 ml
E coli 113.1 MPN/100 ml

OAKWOOD SCIENTIFIC LABORATORY

State Certified Bacteriological Water Testing

Please circle one

bacteria

lead, nitrate/nitrite

chemistry
(includes lead, nitrate)

7102 Pole Green Road
Mechanicsville, VA 23116
oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 730-9379 Fax
1-800-582-5211 Toll Free

Rush/email results 48 hrs+$3: your email Caleb@Bfcc.org

On 7/21/21 4:00PM 450CRW

NON-PUBLIC SUPPLY ☐

REPORT ON BACTERIOLOGICAL EXAMINATION OF WATER

THIS BOTTLE CONTAINS THIOSULPHATE

DATE COLLECTED 7-20 TIME: 10:00 NAME OF CITY OR COUNTY Carter Co

ADDRESS OF SUPPLY Campbell Creek

SUPPLY OWNED BY BFcc

SAMPLE COLLECTED BY Caleb Powell

SAMPLE WAS TAKEN FROM Campbell Creek (Well, Spring, Tap, Etc.)

IS SUPPLY CHLORINATED? YES ☐ NO ☒

WAS CHLORINE TEST MADE AT SAMPLING POINT YES ☐ NO ☒

RES. CL _____ PPM.

REPORT RESULTS TO:

PRINT

Brush Fork Environmental
10565 US 421
Trade TN
Telephone 423 727 4476

See reverse side for collection information

DO NOT WRITE IN SPACE BELOW.

Portion Of Sample Tested	Bact. of Coliform Group	Portion Of Sample Tested	Bact. of Coliform Group
.0001 ml.		20 ml.	
.001 ml.		20 ml.	
.01 ml.		20 ml.	
.1 ml.		20 ml.	
1 ml.		20 ml.	

SAMPLE NO
072103 +
BFCC

RECEIVED
7/21/20

COMPLETED
7/22/21

Membrane Filter _____ Coliforms per 100 ml.

Results Based on Confirmed Tests Unless Otherwise Specified

+ Opposite Portion Tested Means Bacteria Indicating Contamination WERE Present

— Means Bacteria Indicating Contamination WERE NOT Present

Total 3024.5 MPN/100ml
E-coli 233.5 MPN

Please circle one

bacteria

lead, nitrate/nitrite

chemistry
(includes lead, nitrate)

OAKWOOD SCIENTIFIC LABORATORY

State Certified Bacteriological Water Testing

7102 Pole Green Road
Mechanicsville, VA 23116
oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 730-9379 Fax
1-800-582-5211 Toll Free

18339

Rush/email results 48 hrs+$3: your email Caleb@bfec.org

NON-PUBLIC SUPPLY ☐

On 7/22/21 10:45AM <5C KW

REPORT ON BACTERIOLOGICAL EXAMINATION OF WATER

DATE COLLECTED 7-21 TIME: 9:45am NAME OF CITY OR COUNTY Custer Co

ADDRESS OF SUPPLY Gap Creek

SUPPLY OWNED BY BFEC

SAMPLE COLLECTED BY Samuel Rhoads

SAMPLE WAS TAKEN FROM Gap Creek (Well, Approved Tap, etc.)

IS SUPPLY CHLORINATED? YES ☐ NO ☒

WAS CHLORINE TEST MADE AT SAMPLING POINT YES ☐ NO ☒

RES. CL. _____ PPM.

REPORT RESULTS TO:

PRINT

Brushy Fork Environmental
10565 US 421
Trade, TN
Telephone 423-727-4476

See reverse side for collection information

THIS BOTTLE CONTAINS THIOSULPHATE

DO NOT WRITE IN SPACE BELOW.

Portion Of Sample Tested	Bact. of Coliform Group	Portion Of Sample Tested	Bact. of Coliform Group	SAMPLE NO
.0001 ml.		20 ml.		072221-16
.001 ml.		20 ml.		BFEC
.01 ml.		20 ml.		RECEIVED 7/22/21
.1 ml.		20 ml.		
1 ml.		20 ml.		COMPLETED 7/23/21

Membrane Filter _____ Coliforms per 100 ml.

+ Opposite Portion Tested Means Bacteria Indicating Contamination WERE Present

— Means Bacteria Indicating Contamination WERE NOT Present

Results Based on Confirmed Tests Unless Otherwise Specified

Total 3024.5 MPN/100ml 184339
E. coli 172 MPN/100ml

OAKWOOD SCIENTIFIC LABORATORY

State Certified Bacteriological Water Testing

7102 Pole Green Road
Mechanicsville, VA 23116
oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 730-9379 Fax
1-800-582-5211 Toll Free

Please circle one

bacteria

lead, nitrate/nitrite

chemistry (includes lead, nitrate)

Rush/email results 48 hrs+$3: your email Caleb@BFEC.org

7/22/21 | 10:02 | NON-PUBLIC SUPPLY ☐

Rec 7/22/21 10:45 AM <5 deg C

REPORT ON BACTERIOLOGICAL EXAMINATION OF WATER

DATE COLLECTED 7/21 TIME 10:[illegible] NAME OF CITY OR COUNTY Carter County

ADDRESS OF SUPPLY [illegible] Creek

SUPPLY OWNED BY [illegible] EC

SAMPLE COLLECTED BY Samuel Phillips

SAMPLE WAS TAKEN FROM Cammack Creek
(Well, Approved Tap, Etc.)

IS SUPPLY CHLORINATED? YES ☐ NO ☒

WAS CHLORINE TEST MADE AT SAMPLING POINT YES ☐ NO ☒

RES. CL. _____ PPM.

REPORT RESULTS TO:

PRINT
Brushy Fork Environmental
10565 US 421
Trade TN
Telephone 423-727-4476

See reverse side for collection information

THIS BOTTLE CONTAINS THIOSULPHATE

DO NOT WRITE IN SPACE BELOW.

Portion Of Sample Tested	Bact. of Coliform Group	Portion Sample Used	Bact. of Coliform Gr...	SAMPLE NO
.0001 ml.		20 ml.		072221-17
.001 ml.		20 ml.		BFEC
.01 ml.		20 ml.		RECEIVED 7/22/21
.1 ml.		20 ml.		
1 ml.		20 ml.		COMPLETED 7/23/21

Membrane Filter _____ Coliforms per 100 ml.

\+ Opposite Portion Tested Means Bacteria Indicating Contamination WERE Present

— Means Bacteria Indicating Contamination WERE NOT Present

Results Based on Confirmed Tests Unless Otherwise Specified

Total > 2419.6 MPN/100 ml
Ecoli 10.2 MPN/100 ml

OAKWOOD SCIENTIFIC LABORATORY

State Certified Bacteriological Water Testing

7102 Pole Green Road
Mechanicsville, VA 23116
oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 730-9379 Fax
1-800-582-5211 Toll Free

Please circle one

bacteria

lead, nitrate/nitrite

chemistry
(includes lead, nitrate)

Rush/email results 48 hrs+$3: your email [redacted]

7/22/21 On 7/23/21 10:10AM ES C RKW

REPORT ON BACTERIOLOGICAL EXAMINATION OF WATER

NON-PUBLIC SUPPLY ☐

DATE COLLECTED [redacted] TIME: [redacted] NAME OF CITY OR COUNTY [redacted]

ADDRESS OF SUPPLY [redacted]

SUPPLY OWNED BY BFEC

SAMPLE COLLECTED BY [redacted]

SAMPLE WAS TAKEN FROM [redacted] (Well, Reservoir, Tap, Etc.)

IS SUPPLY CHLORINATED? YES ☐ NO ☒
WAS CHLORINE TEST MADE AT SAMPLING POINT [redacted]

RES. CL. _____ PPM.

REPORT RESULTS TO:

PRINT
BFEC
10565 12421
Trade TAP
Telephone 423 727 4476

See reverse side for collection information

THIS BOTTLE CONTAINS THIOSULPHATE

DO NOT WRITE IN SPACE BELOW.

Portion of Sample Used	Sort of Coliform Group	Portion of Sample Tested	Sort of Coliform Group
.0001 ml.		20 ml.	
.001 ml.		20 ml.	
.01 ml.		20 ml.	
[redacted]		20 ml.	
1 ml.		20 ml.	

SAMPLE NO 0723.21-5 BFEC

RECEIVED 7/23/21

COMPLETED 7/24/21

Membrane Filter _____ Coliforms per 100 ml.

+ Opposite Portion Tested Means Bacteria Indicating Contamination WERE Present

— Means Bacteria Indicating Contamination WERE NOT Present

Results Based on Confirmed Test Unless Otherwise Specified

Total > 2046 MPN/100ml
Ecoli 341 MPN/100ml

OAKWOOD SCIENTIFIC LABORATORY

State Certified Bacteriological Water Testing

7102 Pole Green Road
Mechanicsville, VA 23116
oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 730-9379 Fax
1-800-582-5211 Toll Free

Please circle one

bacteria

lead, nitrate/nitrite

chemistry
(includes lead, nitrate)

Rush/email results 48 hrs+$3: your email Caleb@bfec.org

On 7/23/21 10:10AM <5C KM

NON-PUBLIC SUPPLY ☐

REPORT ON BACTERIOLOGICAL EXAMINATION OF WATER

DATE COLLECTED 7-22 TIME 5PM NAME OF CITY OR COUNTY Carter

ADDRESS OF SUPPLY Campbell Branch

SUPPLY OWNED BY BFEC

SAMPLE COLLECTED BY Caleb Crowell

SAMPLE WAS TAKEN FROM Campbell Branch (WELL, APPROVED TAP, ETC.)

IS SUPPLY CHLORINATED? YES ☐ NO ☒
WAS CHLORINE TEST MADE AT SAMPLING POINT YES ☐ NO ☒

RES. CL. ______ PPM.

REPORT RESULTS TO:

PRINT
Brushy Fork Environmental
10565 US 421
Trade TN
Telephone 423 727 4476

See reverse side for collection information

DO NOT WRITE IN SPACE BELOW.

Portion Of Sample Tested	Bact. of Coliform Group	Portion Of Sample Tested	Bact. of Coliform Group
.0001 ml.		20 ml.	
.001 ml.		20 ml.	
.01 ml.		20 ml.	
.1 ml.		20 ml.	
1 ml.		20 ml.	

SAMPLE NO 072321-3 BFEC

RECEIVED 7/23/21

COMPLETED 7/24/21

Membrane Filter ______ Coliforms per 100 ml.

\+ Opposite Portion Tested Means Bacteria Indicating Contamination WERE Present

— Means Bacteria Indicating Contamination WERE NOT Present

Results Based on Confirmed Tests Unless Otherwise Specified

THIS BOTTLE CONTAINS THIOSULPHATE

OAKWOOD SCIENTIFIC LABORATORY
State Certified Bacteriological Water Testing

7102 Pole Green Road
Mechanicsville, VA 23116
email: oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 598-6462 Powhatan
1-800-582-5211 Toll Free
(804) 730-9379 Fax

Date: *7/21/2021*

Bacteriological Examination of Water

Sample Number: *072021-6 BFEC*

Sampled by: *Caleb Crowell (Campbell Branch)*

Sample Origin: *BFEC*
Cambell Branch
Carter County, TN

Identification of Coliform Group Bacteria

	Positive	Negative
Total coliforms	[X]	[ ]
E. coli	[X]	[ ]

Colilert-18 *MPN = 325* *E. coli coliforms per 100 ml.*

[ ] Test results indicate the sample is free of coliform group bacteria, thus is satisfactory for drinking water.Total coliforms,fecal coliforms and *E. coli* are absent and passes the potability test required by EPA.

[X] Test results indicate the sample contains coliform group bacteria, thus may not be satisfactory for drinking water supply.

The above services were performed and the report prepared in accordance with accepted laboratory practices, and makes no other warranties, either expressed or implied, as to the professional advice provided herein.

Respectfully,

Ronald R. Weik, Ph.D. Simonetta M. Weik

Dr. Ronald R. Weik, Ph.D.
Director, Microbiology

Simonetta M. Weik
Assistant Director

Standard Methods, 22nd ed. 2012 Method 9223 B Colilert 18. Virginia State Lab Certification #00242 Maximum contaminant level (mcl is 126 E. coli per 100 mL

OAKWOOD SCIENTIFIC LABORATORY
State Certified Bacteriological Water Testing

7102 Pole Green Road
Mechanicsville, VA 23116
email: oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 598-6462 Powhatan
1-800-582-5211 Toll Free
(804) 730-9379 Fax

Date: *7/21/2021*

Bacteriological Examination of Water

Sample Number: *072021-5 BFEC*

Sampled by: *Caleb Crowell (Gap Creek)*

Sample Origin: *BFEC*
Sample 2 Gap Creek
Carter County, TN

Identification of Coliform Group Bacteria

	Positive	Negative
Total coliforms	[X]	[ ]
E. coli	[X]	[ ]

Colilert-18 *MPN = 177* *E. coli coliforms per 100 ml.*

[ ] Test results indicate the sample is free of coliform group bacteria, thus is satisfactory for drinking water.Total coliforms,fecal coliforms and *E. coli* are absent and passes the potability test required by EPA.

[X] Test results indicate the sample contains coliform group bacteria, thus may not be satisfactory for drinking water supply.

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Respectfully,

Ronald R. Weik, Ph.D. Simonetta M. Weik

Dr. Ronald R. Weik, Ph.D.
Director, Microbiology

Simonetta M. Weik
Assistant Director

Standard Methods, 22nd ed. 2012 Method 9223 B Colilert 18. Virginia State Lab Certification #00242 Maximum contaminant level (mcl is 126 E. coli per 100 mL

OAKWOOD SCIENTIFIC LABORATORY
State Certified Bacteriological Water Testing

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Mechanicsville, VA 23116
email: oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 598-6462 Powhatan
1-800-582-5211 Toll Free
(804) 730-9379 Fax

Date: *7/24/2021*

Bacteriological Examination of Water

Sample Number: *072121-34 BFEC*

Sampled by: *Caleb Crowell (Campbell Branch)*

Sample Origin: *BFEC*
Campbell Branch
Carter County, TN

Identification of Coliform Group Bacteria

	Positive	Negative
Total coliforms	[X]	[ ]
E. coli	[X]	[ ]

Colilert-18 *MPN = 113* *E. coli coliforms per 100 ml.*

[ ] Test results indicate the sample is free of coliform group bacteria, thus is satisfactory for drinking water.Total coliforms,fecal coliforms and *E. coli* are absent and passes the potability test required by EPA.

[X] Test results indicate the sample contains coliform group bacteria, thus may not be satisfactory for drinking water supply.

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Respectfully,

Ronald R. Weik, Ph.D. Simonetta M. Weik

Dr. Ronald R. Weik, Ph.D.
Director, Microbiology

Simonetta M. Weik
Assistant Director

Standard Methods, 22nd ed. 2012 Method 9223 B Colilert 18. Virginia State Lab Certification #00242

OAKWOOD SCIENTIFIC LABORATORY
State Certified Bacteriological Water Testing

7102 Pole Green Road
Mechanicsville, VA 23116
email: oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 598-6462 Powhatan
1-800-582-5211 Toll Free
(804) 730-9379 Fax

Date: *7/24/2021*

Bacteriological Examination of Water

Sample Number: *072121-33 BFEC*

Sampled by: *Caleb Crowell (Gap Creek)*

Sample Origin: *BFEC*
Sample 2 Gap Creek
Carter County, TN

Identification of Coliform Group Bacteria

	Positive	Negative
Total coliforms	[X]	[ ]
E. coli	[X]	[ ]

Colilert-18 *MPN = 383* *E. coli coliforms per 100 ml.*

[ ] Test results indicate the sample is free of coliform group bacteria, thus is satisfactory for drinking water.Total coliforms,fecal coliforms and *E. coli* are absent and passes the potability test required by EPA.

[X] Test results indicate the sample contains coliform group bacteria, thus may not be satisfactory for drinking water supply.

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Respectfully,

Ronald R. Weik, Ph.D.

Dr. Ronald R. Weik, Ph.D.
Director, Microbiology

Simonetta M. Weik

Simonetta M. Weik
Assistant Director

Standard Methods, 22nd ed. 2012 Method 9223 B Colilert 18. Virginia State Lab Certification #00242

OAKWOOD SCIENTIFIC LABORATORY
State Certified Bacteriological Water Testing

7102 Pole Green Road
Mechanicsville, VA 23116
email: oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 598-6462 Powhatan
1-800-582-5211 Toll Free
(804) 730-9379 Fax

Date: *7/24/2021*

Bacteriological Examination of Water

Sample Number: *072221-17 BFEC*

Sampled by: *Sammuel Phillips*

Sample Origin: *BFEC*
Campbell Branch
Carter County, TN

Identification of Coliform Group Bacteria

	Positive	Negative
Total coliforms	[X]	[ ]
E. coli	[X]	[ ]

Colilert-18 *MPN =172* *E. coli coliforms per 100 ml.*

[ ] Test results indicate the sample is free of coliform group bacteria, thus is satisfactory for drinking water.Total coliforms,fecal coliforms and *E. coli* are absent and passes the potability test required by EPA.

[X] Test results indicate the sample contains coliform group bacteria, thus may not be satisfactory for drinking water supply.

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Respectfully,

Ronald R. Weik, Ph.D. Simonetta M. Weik

Dr. Ronald R. Weik, Ph.D.
Director, Microbiology

Simonetta M. Weik
Assistant Director

Standard Methods, 22nd ed. 2012 Method 9223 B Colilert 18. Virginia State Lab Certification #00242

OAKWOOD SCIENTIFIC LABORATORY
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7102 Pole Green Road
Mechanicsville, VA 23116
email: oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 598-6462 Powhatan
1-800-582-5211 Toll Free
(804) 730-9379 Fax

Date: *7/24/2021*

Bacteriological Examination of Water

Sample Number: *072221-16 BFEC*

Sampled by: *Sammuel Phillips*

Sample Origin: *BFEC*
Gap Creek
Carter County, TN

Identification of Coliform Group Bacteria

	Positive	Negative
Total coliforms	[X]	[ ]
E. coli	[X]	[ ]

Colilert-18 *MPN = 232* *E. coli coliforms per 100 ml.*

[ ] Test results indicate the sample is free of coliform group bacteria, thus is satisfactory for drinking water.Total coliforms,fecal coliforms and *E. coli* are absent and passes the potability test required by EPA.

[X] Test results indicate the sample contains coliform group bacteria, thus may not be satisfactory for drinking water supply.

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Respectfully,

Ronald R. Weik, Ph.D. Simonetta M. Weik

Dr. Ronald R. Weik, Ph.D.
Director, Microbiology

Simonetta M. Weik
Assistant Director

Standard Methods, 22nd ed. 2012 Method 9223 B Colilert 18. Virginia State Lab Certification #00242 Maximum contamination level is MPN = 126 E. coli per 100 mL for good quality water. Some Heath Departments use mcl of MPN = 326

OAKWOOD SCIENTIFIC LABORATORY
State Certified Bacteriological Water Testing

7102 Pole Green Road
Mechanicsville, VA 23116
email: oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 598-6462 Powhatan
1-800-582-5211 Toll Free
(804) 730-9379 Fax

Date: *7/27/2021*

Bacteriological Examination of Water

Sample Number: *072321-8 BFEC*

Sampled by: *Sammuel Phillips 7/22/21 10:20am*

Sample Origin: *BFEC*
Campbell Branch
Carter County, TN

Identification of Coliform Group Bacteria

	Positive	Negative
Total coliforms	[X]	[ ]
E. coli	[X]	[ ]

Colilert-18 *MPN = 341* *E. coli coliforms per 100 ml.*

[ ] Test results indicate the sample is free of coliform group bacteria, thus is satisfactory for drinking water.Total coliforms,fecal coliforms and *E. coli* are absent and passes the potability test required by EPA.

[X] Test results indicate the sample contains coliform group bacteria, thus may not be satisfactory for drinking water supply.

The above services were performed and the report prepared in accordance with accepted laboratory practices, and makes no other warranties, either expressed or implied, as to the professional advice provided herein.

Respectfully,

Ronald R. Weik, Ph.D. Simonetta M. Weik

Dr. Ronald R. Weik, Ph.D.
Director, Microbiology

Simonetta M. Weik
Assistant Director

Standard Methods, 22nd ed. 2012 Method 9223 B Colilert 18. Virginia State Lab Certification #00242 Maximum contaminant level (mcl) = MPN 126 though varies in some areas to 326.

OAKWOOD SCIENTIFIC LABORATORY
State Certified Bacteriological Water Testing

7102 Pole Green Road
Mechanicsville, VA 23116
email: oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 598-6462 Powhatan
1-800-582-5211 Toll Free
(804) 730-9379 Fax

Date: *7/27/2021*

Bacteriological Examination of Water

Sample Number: *072321-7 BFEC*

Sampled by: *Sammuel Phillips 7/22/21 10:49am*

Sample Origin: *BFEC*
Gap Creek
Carter County, TN

Identification of Coliform Group Bacteria

	Positive	Negative
Total coliforms	[X]	[ ]
E. coli	[X]	[ ]

Colilert-18 *MPN = 162* *E. coli coliforms per 100 ml.*

[ ] Test results indicate the sample is free of coliform group bacteria, thus is satisfactory for drinking water.Total coliforms,fecal coliforms and *E. coli* are absent and passes the potability test required by EPA.

[X] Test results indicate the sample contains coliform group bacteria, thus may not be satisfactory for drinking water supply.

The above services were performed and the report prepared in accordance with accepted laboratory practices, and makes no other warranties, either expressed or implied, as to the professional advice provided herein.

Respectfully,

Ronald R. Weik, Ph.D.

Dr. Ronald R. Weik, Ph.D.
Director, Microbiology

Simonetta M. Weik

Simonetta M. Weik
Assistant Director

Standard Methods, 22nd ed. 2012 Method 9223 B Colilert 18. Virginia State Lab Certification #00242 Maximum contaminant level (mcl) = MPN 126 though varies in some areas to 326.

OAKWOOD SCIENTIFIC LABORATORY
State Certified Bacteriological Water Testing

7102 Pole Green Road
Mechanicsville, VA 23116
email: oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 598-6462 Powhatan
1-800-582-5211 Toll Free
(804) 730-9379 Fax

Date: *8/7/2021*

Bacteriological Examination of Water

Sample Number: *080521-15 BFEC*

Sampled by: *Caleb Cromell 8/4/21 11:15am*

Sample Origin: *BFEC*
Campbell Branch
Carter County, TN

Identification of Coliform Group Bacteria

	Positive	Negative
Total coliforms	[X]	[ ]
E. coli	[X]	[ ]

Colilert-18 *MPN = 128* *E. coli coliforms per 100 ml.*

[ ] Test results indicate the sample is free of coliform group bacteria, thus is satisfactory for drinking water.Total coliforms,fecal coliforms and *E. coli* are absent and passes the potability test required by EPA.

[X] Test results indicate the sample contains coliform group bacteria, thus may not be satisfactory for drinking water supply.

The above services were performed and the report prepared in accordance with accepted laboratory practices, and makes no other warranties, either expressed or implied, as to the professional advice provided herein.

Respectfully,

Ronald R. Weik, Ph.D.

Dr. Ronald R. Weik, Ph.D.
Director, Microbiology

Simonetta M. Weik

Simonetta M. Weik
Assistant Director

Standard Methods, 22nd ed. 2012 Method 9223 B Colilert 18. Virginia State Lab Certification #00242

OAKWOOD SCIENTIFIC LABORATORY
State Certified Bacteriological Water Testing

7102 Pole Green Road
Mechanicsville, VA 23116
email: oakwoodlab@verizon.net

(804) 730-3263 Richmond
(804) 598-6462 Powhatan
1-800-582-5211 Toll Free
(804) 730-9379 Fax

Date: *8/7/2021*

Bacteriological Examination of Water

Sample Number: *080521-14 BFEC*

Sampled by: *Caleb Cromell 8/4/21 10:58am*

Sample Origin: *BFEC*
Gap Creek
Carter County, TN

Identification of Coliform Group Bacteria

	Positive	Negative
Total coliforms	[X]	[ ]
E. coli	[X]	[ ]

Colilert-18 *MPN = 85.4 E. coli coliforms per 100 ml.*

[ ] Test results indicate the sample is free of coliform group bacteria, thus is satisfactory for drinking water.Total coliforms,fecal coliforms and *E. coli* are absent and passes the potability test required by EPA.

[X] Test results indicate the sample contains coliform group bacteria, thus may not be satisfactory for drinking water supply.

The above services were performed and the report prepared in accordance with accepted laboratory practices, and makes no other warranties, either expressed or implied, as to the professional advice provided herein.

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Habitat and Siltation Monitoring

Brushy Fork Environmental Consulting, Inc.

Providing Sound Environmental Solutions

5902 Highway 421 South
Mountain City, TN 37683
ph/fax: 423.727.4476
adam@bfec.org

September 22, 2021

c/o: Chris Scheuttler, Director
Carter County Planning & Zoning
824 E Second Street
Elizabethton, TN 37643
(423) 542-1834

RE: Habitat and Siltation Monitoring - Carter County TN

Mr. Scheuttler:

Please find the enclosed report: Habitat and Siltation Assessment - Carter County, Tennessesee. This habitat assessment was performed for a reach of Davis Branch during the month of August 2021. Davis Branch scored a TMI of 10, which fails to meet the Target Macroinvertebrate Index for Bioregion 67fghi (TMI) of 32. Also, Davis Branch scored (93.5) under the Habitat Assessment Score threshold of 123 for Moderate to High Gradient Streams in Ecoregion 67f (TDEC 2017).

If you have any questions or need additional information, please be in touch.

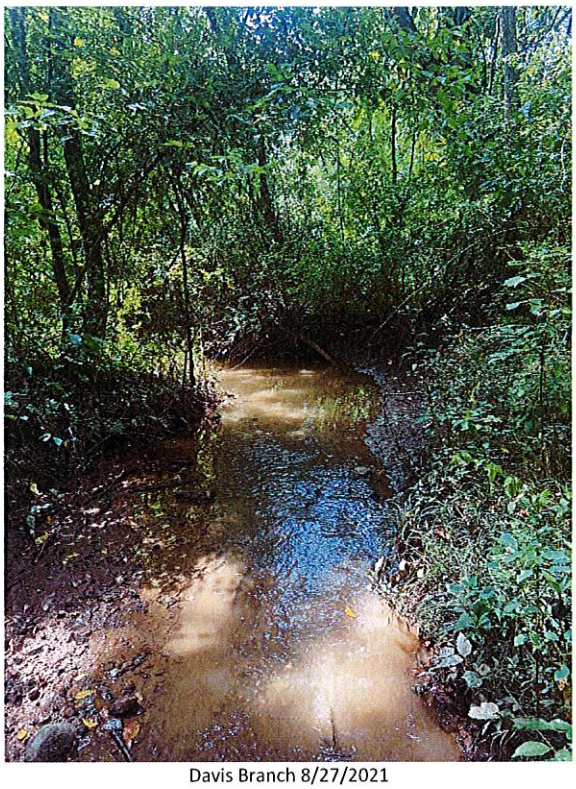
Sincerely,

Josselyn K. Lucas

Digitally signed by Josselyn Lucas
Date: 2021.09.24 09:49:19 -04'00'

Josselyn Lucas

Habitat and Siltation Stream Monitoring- Carter County, Tennessee
Assessment and Results – August 2021



Davis Branch 8/27/2021

Prepared By:

Brushy Fork Environmental Consulting, Inc.
10565 Highway 421 South
Trade, TN 37691

09/22/2021

Prepared For:
Carter County Planning & Zoning
Chris Scheuttler, Director
824 E Second Street
Elizabethton, TN 37643

Table of Contents

Tables

Appendices

1. SCOPE OF SERVICES

Brushy Fork Environmental Consulting, Inc. (BFEC) staff performed a habitat and siltation assessment, including macroinvertebrate sampling, for one (1) stream reach in Carter County, TN; Davis Branch (TN06010103008-0400). BFEC staff completed this assessment using the Semi-Quantitative Single Habitat (SQSH) method as defined by the Tennessee Department of Environment and Conservation's (TDEC) "Quality System Standard Operating Procedure for Macroinvertebrate Stream Survey (rev 2017)". BFEC staff collected the one (1) sample on August 27th, 2021, at the stream location.

This project report presents sampling results with analysis and comments pertinent to the Watauga River Watershed TMDL for Siltation and Habitat Alteration (TDEC 2006).

2. MATERIALS AND METHODS

2.1 Methods

Following the Standard Operating Procedure (SOP) outlined by TDEC for the SQSH method (TDEC 2017), BFEC staff selected a sample site for the streams reach within 200 meters (m) of previously sampled locations and the exact location of the previous year's sampling. This previous sampling location (2017) was identified through the United States Environmental Protection Agency (US EPA) STORET database. The sample taken in August of 2021 was within 200 meters of the TDEC sampling point provided in 2017. General information about the sampling site is given in Table 1. The sampling location within each stream's respective drainage basin is presented on Drainage Basin Maps given in Appendix A.

Table1: Sampling Locations

	Station ID	Station Name	Organization ID	Level IV Ecoregion	EPA STORET Lat./Long.	Sampling Lat./Long.
Davis Branch	DAVIS000.9CT	Davis Branch	TDECWR_WQX	67f	36.3666, -82.1849	36.36627475, -82.18460095

A Semi-Quantitative Riffle Kick (SQKICK) survey of benthic macroinvertebrates was conducted on August 27th, 2021. A one (1) meter, 500 micron mesh net was used for SQKICK sampling. The administered kicks took place at a slow and fast velocity location. One (1) riffle kick and one (1) pool kick was completed. After disturbing the substrate, sufficient time was allotted to allow for the organisms to float downstream into the net.

Following this, the staff member responsible for kicking proceeded to carefully extract the netted sample from the channel. The contents of the kick samples were sifted through a sampling tray with forceps. The organisms were directly transferred to a sealable container which contained a 95% ethyl-alcohol solution, as per the guidance of Pennington and Associates, Inc., who performed the taxonomic identification of the samples. Each sample was labeled with an internal tag with the following information: station ID, date, time, sampler's initials, and sample type. An external tag was also attached which contained the information previously

stated, with the addition of the location. The preserved samples were then packaged in an air-tight container, triple bagged, and placed into a temperature controlled styrofoam box provided by UPS. The samples were sent by ground to Pennington & Associates, Inc., in Cookeville, Tennessee.

A Habitat Assessment was performed concurrent with macroinvertebrate sampling using the Habitat Assessment Field Sheet and Protocol (TDEC 2017). This scoring metric was used to assess in-stream and riparian habitat and rate it's potential to support a healthy benthic ecosystem. Prior to the SQKICK survey, staff members completed the Habitat Assessment Field Sheet – Moderate to High Gradient Streams. Habitat Assessment Field Sheet and Macroinvertebrate Assessment Report for each sampling location is given in Appendix B.

Finally, the field crew described reach conditions at and near each sampling location using the DWR Stream Survey Sheet, as specified in TDEC 2017. An Aqua TROLL 500 Multiparameter Sonde was used to collect a discrete measurement of water chemistry attributes: pH, Conductivity (µ), Temperature (°C), and Dissolved Oxygen (ppm). Prior to taking discrete measurements, the instrument was calibrated for the previously stated parameters. Physical stream characteristics including riparian and in-stream attributes were described for approximately 200m -400 m of stream reach at each sampling location. These include riparian land use and canopy cover, stream size and substrate content, and additional qualitative descriptions of water quality pertinent to turbidity, sedimentation, and algal presence. DWR Stream Survey Sheet for the sampling location is given in Appendix C. Site photosheets documenting conditions at the sampling location are given in Appendix D.

2.2 Laboratory Analysis

Pennington & Associates, Inc. identified the collected organisms at the genus level, except for the families noted on TDEC's Standard Operating Procedure. BFEC was provided with taxonomic information which included order, family, and genus. Pennington & Associates, Inc. also calculated the following metrics: total number of organisms, total number of taxa, EPT, % EPT-CHEUM, % OC, NCBI, % clingers, percent TNUTOL (definitions are provided below); BFEC performed quality control calculations for all metrics. The lab has retained the samples and will hold them for the required length of time. The Tennessee Macroinvertebrate Index (TMI) was calculated by BFEC based on bioregion 67f reference information, which was verified in the 2017 TDEC QSSOP Macroinvertebrate Stream Surveys Report.

Definitions

The definitions and terminology used in this report are consistent with the definitions given in the TDEC "Quality System Standard Operating Procedure for Macroinvertebrate Stream Survey (rev 2017)".

Taxa Richness, TR
Total the number of distinct genera found in the subsample. Taxa that could only be identified to family are included only if it is probable that they are distinct from other taxa identified to genus within the family. (Document on taxa list if an unidentified organism is determined to be a distinct taxon.)

Ephemeroptera Plecoptera Trichoptera Richness, EPT
Total the number of genera within the orders Ephemeroptera, Plecoptera and Trichoptera. Taxa that could only be identified to family are included only if they are the only taxon found in that family or it is probable that they are distinct from other taxa identified to genus within the family. (Document on taxa list if an unidentified organism is determined to be a distinct taxon.)

EPT Abundance excluding *Cheumatopsyche* spp., % EPT-Cheum

$$\%\ EPT = \frac{\text{Total Ephemeroptera + Plecoptera + Trichoptera} - \text{Cheumatopsyche}}{\text{Total number of individuals in the subsample}} \times 100$$

Percent Oligochaetes and Chironomids, %OC

$$\%OC = \frac{\text{Total number of Oligochaeta + Chironomidae}}{\text{Total number of individuals in the subsample}} \times 100$$

North Carolina Biotic Index, NCBI
This index includes tolerance scores from other indices found in EPA Rapid Bioassessment Protocol for Streams when no value is available for NC.

Family value is to be assigned when there is no genus level tolerance value.

$$NCBI = \frac{\Sigma\, x_i\, t_i}{N \text{ (exclusive if no } t_i)}$$

where: x_i = number of individuals within a taxon
t_i = tolerance value of a taxon
N = total number of individuals in the subsample that have been assigned a tolerance value (exclude animals for which no tolerance value is assigned see following note).

% Clingers
Percent contribution of organisms (primary for genus) that build fixed retreats or have adaptations to attach to surfaces in flowing water.

$$\%\ Clingers = \frac{\text{Total number of clinger individuals}}{\text{Total individuals in the sample}} \times 100$$

Percent Nutrient Tolerant Organisms, % TNUTOL

$$\% \text{ TNUTOL} = 100 \times \frac{\text{Total of Cheumatopsyche, Stenelmis, Polypedilum, Cricotopus, Cricotopus/Orthocladius, Lirceus, Caenis, Elimia, Nais, Dero, Undetermined (immature) Tubificidae individuals}}{\text{Total individuals in the sample}}$$

Tennessee Macroinvertebrate Index, TMI

After calculating values for the seven biometrics, equalize the data by assigning a score of 0, 2, 4 or 6 based on comparison to the ecoregion reference database for the bioregion and stream size. Total the seven scores to calculate the TMI (Tennessee Macroinvertebrate Index). A score of 32 or higher is considered to pass biocriteria guidelines.

Bioregion 67f reference table (TDEC 2017) was used to assess the biometric calculations; it is presented below in Table 2.

Table 2: Bioregion Reference Values (taken from TDEC 2017)

Bioregion 67fghi Season: July-December Target TMI = 32 Scoring calibrated to 160-240 organism sample			Method = SQKICK Drainage > 2.5 sq miles Genus Level Identification	
Metric	6	4	2	0
Taxa Richness (TR)	> 26	18 – 26	9 – 17	< 9
EPT Richness (EPT)	> 10	7 – 10	4 – 6	< 4
% EPT-Cheum	> 43.5	29.1 – 43.5	14.5 – 29.0	< 14.5
% OC	< 27.0	27.0 – 51.3	51.4 – 75.6	> 75.6
NCBI	< 5.26	5.26 – 6.83	6.84 – 8.42	> 8.42
% Clingers-Cheum	> 53.5	35.7 – 53.5	17.9 – 35.6	< 17.9
% TNutol	< 33.2	33.2 – 55.4	55.5 – 77.7	> 77.7

3. RESULTS

Davis Branch

The stream reach at the sampling location was approximately 1.5m wide and ranged from approximately 0.1m to 0.6m deep, at riffles and runs/pools respectively. Stream gradient and flow conditions were described as moderate. Substrate in pools was dominated by Silt and Muck-Mud. These substrates constituted a relatively large portion of riffles and runs as well. Some cobbles and gravels occurred in riffles and run features. Deposits of Sludge and Muck-Mud were noted as excessive at the reach and turbidity was estimated as high. Water chemistry was characterized by a pH of 7.95, conductivity 210.68 µS/cm, water temperature 28.89°C, and dissolved oxygen was measured at 5.37ppm.

The riparian corridor lacks developed trees and shade in most areas of Davis Branch; mean canopy cover within the sampling reach, visually estimated, in the riparian corridor was 52%. The right descending bank of Davis Branch parallels TN-91 (New Stoney Creek Rd.) all the way to the confluence with the Watauga River. The left descending bank of Davis Branch parallels impervious surfaces including Elizabethton US Army National Guard Recruiting center, A-1 Auto

Car and Tire Center, Kimbo's American Restaurant, and the Elizabethton Corrugated Sheet Plant. Upstream land use is dominated by an impoundment and impervious surfaces/drainage from TN-91 and Elizabethton Municipal Airport. Human disturbances to the stream noted as "high" included urban uses, an upstream impoundment, road/hwy, and riparian loss. (Appendices A, D)

Epifaunal Substrate and Available Cover scored as sub-optimal since habitat is present, however, heavy siltation was observed along the sub-reach. Gravel is surrounded by mud and silt, resulting in a poor score for Embeddedness of Riffles. Channel Alteration scored optimally due to the presence of bends and some channelization, however there is an impoundment located upstream of the sampling reach which impacts flow and sedimentation. Sediment Deposition, and Frequency of Re-oxygenation Zones scored poor, along with Vegetative Protection on both banks. The Habitat Assessment of Davis Branch yielded a total score of **93.5** (below the guideline score of 123) for maintaining protective habitat in subregion 67f (TDEC 2017), see Appendix B).

BFEC staff noted the probable cause for relatively low scoring is caused by channel alteration, significant upstream impoundment, and siltation in the stream channel (Appendix B)

Biometric calculations and corresponding Bioregion 67fghi values for Davis Branch are given in Table 3. The total score for Davis Branch was 10, which is below the TMI target of 32 for the Bioregion. Biometric reference scoring was low except for %OC and total number of taxa. Lack of riparian cover, flow, and muck siltation seems to be excluding EPT taxa, clingers, and other intolerant taxa. Platyhelminthes, specifically *Girardia sp.*, accounted for 22% of the total number of organisms at the site. *Girardia sp.* are typically found in warm ponds, lakes, and rivers.

Table 3. Macroinvertebrate Metrics - Davis Branch

Biometrics		Bioregion Reference Value
TOTAL NO. OF ORGANISMS	238	
TOTAL NO. OF TAXA	19	4
EPT	2	0
% EPT-CHEUM	0.84%	0
%OC	49.58%	4
NCBI	8.43	0
% CLINGERS-CHEUM	6.30%	0
%TNUTOL	56.30%	2
TMI Bioregion 67fghi	Target TMI	32
TMI	TOTAL	10

4. DISCUSSION

Davis Branch failed to meet the Target Tennessee Macroinvertebrate Index (TMI) of 32, and

scored far below the TMI target and Habitat Assessment thresholds (Ecoregion 67f) set by TDEC (2017), indicating the stream reach is impaired and not fully supporting its designated use of "Fish, Shellfish, and Wildlife Protection and propagation".

Davis Creek (06010103008_0400) is experiencing habitat loss due to stream flow alteration and alteration in stream-side or littoral vegetation cover. The sources of pollution are attributed to discharge from MS4 area and upstream detention (TDEC 2006).

The low flow, heavy siltation, and habitat loss highlighted by the Habitat Assessment contribute to the low TMI score present at Davis Branch.

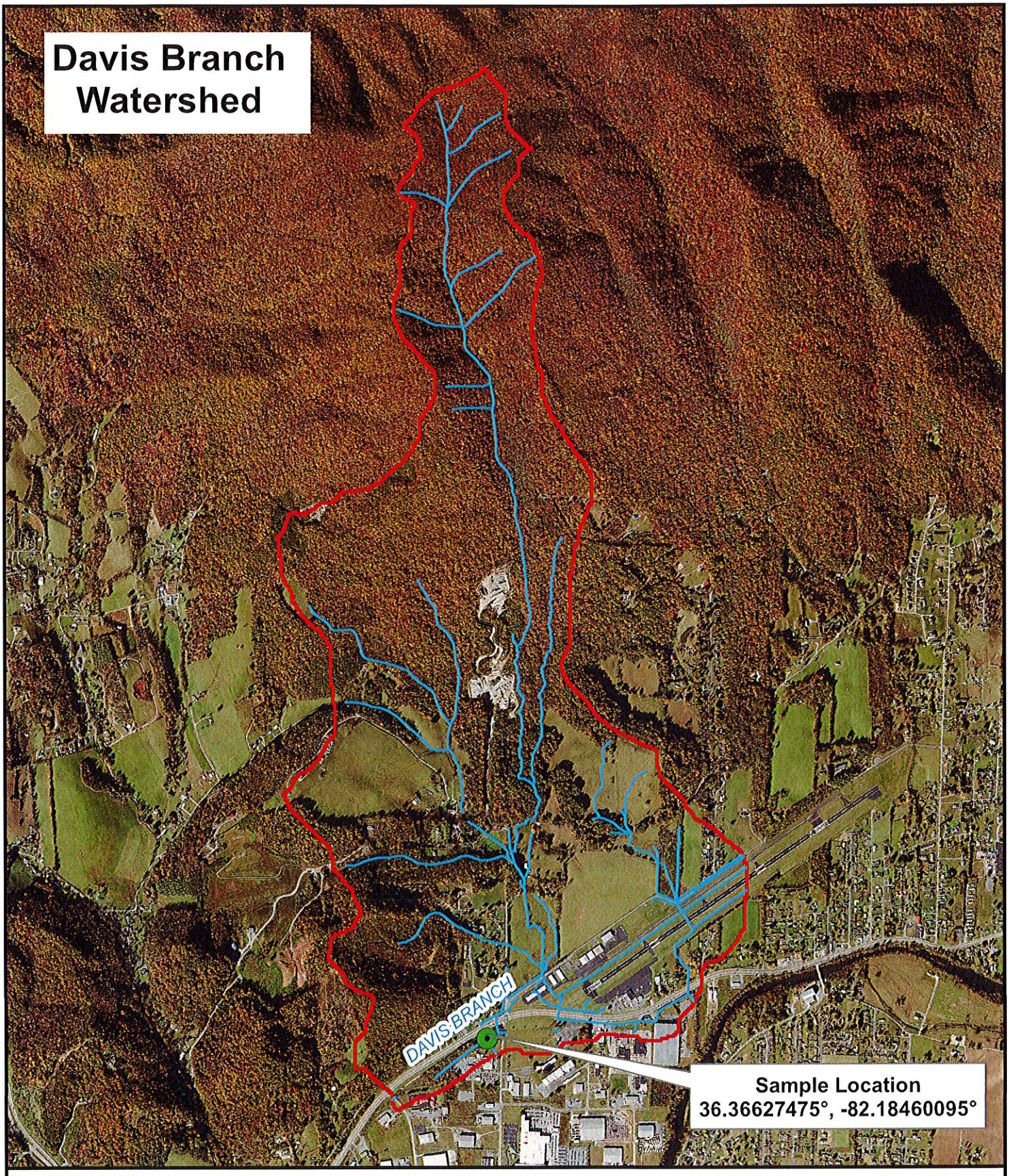
5. REFERENCES

Tennessee Department of Environment and Conservation. "Total Maximum Daily Load (TMDL) For Siltation and/or Habitat Alteration in the Watauga River Watershed (HUC 06010103) Carter, Johnson, Sullivan, Unicoi, and Washington Counties, Tennessee," 1-77, 2006.

Tennessee Department of Environment and Conservation. "State of Tennessee Department of Environment and Conservation Division of Water Pollution Control Quality System Standard Operating Procedure for Macroinvertebrate Stream Surveys," 2017.

United States Environmental Protection Agency. "Caddis Volume 2", https://www.epa.gov/caddis-vol2/caddis-volume-2-sources-stressors-responses-ph. Accessed 9 Sept. 2021.

APPENDIX A - DRAINAGE BASIN MAPS



Map is not to be construed as surveyed data. All boundaries are approximate GIS data taken from public data sources. BFEC 2019.

APPENDIX B - HABITAT ASSESSMENT FIELD SHEETS

HABITAT ASSESSMENT FIELD SHEET- MODERATE TO HIGH GRADIENT STREAMS (FRONT)
(See Protocol E for detailed descriptions and rank information)

DWR Station ID: Davis 000.9CT		**Habitat Assessment By:** Josselyn Lucas & Sarah Kilby	
Monitoring Location Name: Davis Branch		**Date:** 08/27/2021	**Time:** 12:50pm
Monitoring Location: SR 91		**Field Log Number:**	
HUC: 06010103008	WS Group: #1	Ecoregion: 67f	QC: ☐ Duplicate ☐ Consensus

	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Over 70% of stream reach has natural stable habitat suitable for colonization by fish and/or macroinvertebrates. Four or more productive habitats are present.	Natural stable habitat covers 40-70% of stream reach. Three or more productive habitats present. (If near 70% and more than 3 go to optimal.)	Natural stable habitat covers 20 -40% of stream reach or only 1-2 productive habitats present. (If near 40% and more than 2 go to suboptimal.)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 **11**	10 9 8 7 6	5 4 3 2 1
Comments	Habitat is present but not optimal, as there is heavy siltation on the sub-reach			
2.Embeddedness of Riffles	Gravel, cobble, and boulders 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. If near 25% drop to suboptimal if riffle not layered cobble.	Gravel, cobble and boulders 25-50% surrounded by fine sediment. Niches in bottom layers of cobble compromised. If near 50% & riffles not layered cobble drop to marginal.	Gravel, cobble, and boulder s are 50-75% surrounded by fine sediment. Niche space in middle layers of cobble is starting to fill with fine sediment.	Gravel, cobble, and boulders are more than 75% surrounded by fine sediment. Niche space is reduced to a single layer or is absent.
SCORE	20 19 18 17 16 15.5	15 14 13 12 11	10 9 8 7 6	**5** 4 3 2 1
Comments	Gravel is present but so is mud and silt. No submerged vegetation or root mats.			
3. Velocity/ Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow).	Only 3 of the 4 regimes present (if fast-shallow is missing score lower). If slow-deep missing score 15.	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime. Others regimes too small or infrequent to support aquatic populations.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1
Comments	Only fast-shallow and slow-deep were observed			
4. Sediment Deposition	Sediment deposition affects less than 5% of stream bottom in quiet areas. New deposition on islands and point bars is absent or minimal.	Sediment deposition affects 5-30% of stream bottom. Slight deposition in pool or slow areas. Some new deposition on islands and point bars. Move to marginal if build-up approaches 30%.	Sediment deposition affects 30-50% of stream bottom. Sediment deposits at obstruction, constrictions and bends. Moderate pool deposition.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6 5.5	5 4 **3** 2 1
Comments	Moderate to heavy deposits on some areas of bottom. More clear of fines, difficult to see due to turbidity.			
5. Channel Flow Status. .	Water reaches base of both lower banks and streambed is covered by water throughout reach. Minimal productive habitat is exposed.	Water covers > 75% of streambed or 25% of productive habitat is exposed.	Water covers 25-75% of streambed and/or productive habitat is mostly exposed.	Very little water in channel and mostly present as standing pools. Little or no productive habitat due to lack of water.
SCORE	20 19 18 17 16	15 14 **13** 12 11	10 9 8 7 6	5 4 3 2 1
Comments				

HABITAT ASSESSMENT FIELD SHEET- MODERATE TO HIGH GRADIENT STREAMS (BACK)

DWR Station ID Davis 000.9CT Date 8/27/2021 Assessors JKL/SDK

	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization, dredging rock removal or 4-wheel activity (past or present) absent or minimal; natural meander pattern. NO artificial structures in reach. Upstream or downstream structures do not affect reach.	Channelization, dredging or 4-wheel activity up to 40%. Channel has stabilized. If larger reach, channelization is historic and stable. Artificial structures in or out of reach do not affect natural flow patterns.	Channelization, dredging or 4-wheel activity 40-80% (or less that has not stabilized.) Artificial structures in or out of reach may have slight affect.	Over 80% of reach channelized, dredged or affected by 4-wheelers. Instream habitat greatly altered or removed. Artificial structures have greatly affected flow pattern.
SCORE	20 19 18 17 16 **15.5**	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments	Some areas are straight, and some bends and channelization. Impoundment is located upstream of the reach.			
7. Frequency of re-oxygenation zones. Use frequency of riffle or bends for category. Rank by quality.	Occurrence of re-oxygenation zones relatively frequent; ratio of distance between areas divided by average stream width <7:1.	Occurrence of re-oxygenation zones infrequent; distance between areas divided by average stream width is 7 - 15.	Occasional re-oxygenation area. The distance between areas divided by average stream width is over 15 and up to 25.	Generally all flat water or flat bedrock; little opportunity for re-oxygenation. Distance between areas divided by average stream width >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	**5** 4 3 2 1
Comments	1 or 2 reoxygenation zones were observed within the reach.			
8. Bank Stability (score each bank) Determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion. If approaching 30% score marginal if banks steep.	Moderately unstable; 30-60 % of bank in reach has areas of erosion; high erosion potential during floods, If approaching 60% score poor if banks steep.	Unstable; many eroded area; raw areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	Left Bank 10 9	8 **7** 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 **7** 6	5 4 3	2 1 0
Comments	Minimal erosion and lower areas without vegetation have formed a floodplain bench.			
9. Vegetative Protective (score each bank) includes vegetation from top of bank to base of bank. Determine left or right side by facing downstream	More than 90% of the bank covered by undisturbed vegetation. All 4 classes (mature trees, understory trees, shrubs, groundcover) are represented and allowed to grow naturally. All plants are native.	70-90% of the bank covered by undisturbed vegetation. One class may not be well represented. Disruption evident but not effecting full plant growth. Non-natives are rare (< 30%)	50-70% of the bank covered by undisturbed vegetation. Two classes of vegetation may not be well represented. Non-native vegetation may be common (30-50%).	Less than 50% of the bank covered by undisturbed vegetation or more than 2 classes are not well represented or most vegetation has been cropped. Non-native vegetation may dominate (> 50%)
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	**2** 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	**2** 1 0
Comments	Classes well			
10. Riparian Vegetative Zone Width (score each bank.) Zone begins at top of bank.	Average width of riparian zone > 18 meters. Unpaved footpaths may score 9 if run-off potential is negligible.	Average width of riparian zone 12-18 meters. Score high if areas < 18 meters are small or are minimally disturbed.	Average width of riparian zone 6-11 meters. Score high if areas less than 12 meters are small or are minimally disturbed.	Average width of riparian zone <6 meters. Score high if areas less than 6 meters are small or are minimally disturbed.
SCORE (LB)	Left Bank 10 **9**	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 **6**	5 4 3	2 1 0
Comments	Riparian zone is wide in some forested areas, but there are large sections of 0m riparian widths withing the reach. TN Hwy 91 at right bank.			

Total Score 93.5 Comparison to Ecoregion Guidelines (circle): ABOVE or **BELOW**
If score is below guidelines , result of (circle): Natural Conditions or **Human Disturbance**
Describe: Significant impoundment upstream causing sedimentation, high temperature, and lack of biodiversity.

APPENDIX C - DWR STREAM SURVEY FIELD SHEETS

STREAM SURVEY INFORMATION

DWR Station ID: Davis000.9CT	**Samplers:** JOSSELYN LUCAS, SARAH KILBY	
Monitoring Location Name: DAVIS BRANCH	**Date:** 8.27.21	**Time:** 1:22 PM
Monitoring Location: SR 91	**Organization:** BFEC	Drainage Area:
County: CARTER	Ecoregion: 66e	u/s ECO:
Latitude: 36.366380	HUC: 06010103008	WS Grp: #1
Longitude: -82.184524	WBID: TN06010103008-0400	Field Log #:

Project Name: ☐ **Watershed** ■ **303(d)** ☐ **Antideg** ☐ **ECO** ☐ **FECO** **Other:**

Project ID: TNPR

Activity Type: ☐ Sample ☐ QC Sample ■ Habitat ☐ QC habitat ☐ QC ID

Sample Status: ■Collected ☐Seasonally Dry ☐Frequently Dry ☐No Channel
☐Too Deep (Not Wadeable) ☐Too Deep (Temporary) ☐Permanent Barrier ☐Fenced
☐Landowner Denial: ☐Temporary Barrier ☐Posted Plan to revisit? ☐Yes ☐No

Flow Conditions: ☐Dry ☐Isolated Pools ☐Stagnant ☐Low ■Moderate ☐High ☐Bankful ☐Flooding

Sample	Collected?	Comment	Sample	Collected?	Comment
Biorecon	No		Periphyton		
SQKICK	Yes		Other		
SQBANK	No		Describe Other Sample:		

Chemicals/Bacteria: ☐None ☐Routine ☐Nutrient ☐Metals ☐*E. coli* ☐Organics ☐Other_____

Field Parameters: Meter(s) Used: Aqua TROLL 500 Multi-parameter Sonde

pH (su)	7.96		Dissolved Oxygen %		
Conductivity (umhos)	210.69		Turbidity (NTU)		
Temperature (C°)	28.89		TDS (mg/L)		
Dissolved Oxygen (ppm = mg/L)	5.38		Flow (cfs)		

Meter Problems? None. Meter was calibrated prior to use on 8/27/2021.

Photos Taken? ☐ No ■Yes: Description: Downstream, upstream, left riparian cover, and right bank riparian cover.

Previous 48 hours precipitation: ☐Unknown ■None ☐Slight ☐Moderate ☐Heavy ☐Flooding

Air Temperature (°F) 90

Physical Characteristics & Light Penetration:

Gradient (sample reach): ☐Flat ■Low ☐Moderate ☐High ☐Cascades

Average Stream Width: ☐Very Small (<1.5yd) ☐Small (1.5-3yd) ■Med. (3-10yd) ☐Large (10-25yd) ☐Very Large (>25yd)

Maximum Stream Depth: ☐Shallow (<0.3yd) ☐Medium (0.3-0.6yd) ■Deep (0.6 – 1yd) ☐Very Deep(>1yd)

% Canopy Cover Estimated for Reach: _____%

% Canopy Cover Measured (mid-reach): _____u/s + _____d/s + _____LDB + _____RDB = Total/384*100 ___

Channel Characteristics: 6 inches to 2 foot average

Bank Height: 0.17-0.67 (yd.) High Water Mark: 1 yard (yd.)

Bank Slope LDB: ☐Deeply incised ☐Bluff/Wall ☐Undercut ☐Sloughing ☐Steep terrain ■Gentle Slope

Bank Slope RDB: ☐Deeply incised ☐Bluff/Wall ☐Undercut ☐Sloughing ☐Steep terrain ■Gentle Slope

Manmade Modification: ■None ☐Rip-Rap ☐Cement ☐Gabions ☐Channelized ☐Dam ☐Dredging ☐Bridge ☐ATV

Stream Characteristics:

Sediment Deposits: ☐None ☐Slight ■Moderate ☐Excessive ☐Blanket

Sediment Type: ☐None ☐Sand ■Silt ■Mud ☐Clay ☐Sludge ☐Mn Precipitant ☐Orange Flocculent

Turbidity: ☐Clear ☐Slightly Turbid ☐Muddy ■Milky ☐Tannic ☐Planktonic Algae ☐Dyed

Foam/Surface Sheen: ■None ☐Nutrient ☐Surfactant ☐Bacteria

Algae: ☐None ☐Slight ■Moderate ☐High ☐Choking **Type:** ☐Diatoms ☐Green ■Filamentous ☐Blue-green

TDEC-DWR Stream Survey Field Sheet (Back)

DWR Station ID: Date: Assessors:

Dominate Substrate: (More than 25%) Check all that apply

Riffle	Run	Pool
☐ Boulders (>10")	☐ Boulders (>10")	☐ Boulders (>10")
☐ Cobble (2.5-10")	☐ Cobble (2.5-10")	☐ Cobble (2.5-10")
☐ Gravel (0.1-2.5")	☐ Gravel (0.1-2.5")	☐ Gravel (0.1-2.5")
☐ Bedrock	☐ Bedrock	☐ Bedrock
☐ Sand	☐ Sand	☐ Sand
☐ Silt (not gritty)	☐ Silt (not gritty)	☐ Silt (not gritty)
☐ Clay (Slick)	☐ Clay (Slick)	☐ Clay (Slick)

Surrounding Land Uses (list additional land uses under comments)

☐ Forest	☐ Grazing	☐ Stormwater	☐ STP/WWTP	☐ Construction
☐ Wetland	☐ Row Crops	☐ Urban	☐ Industry	☐ Impoundment
☐ Park	☐ CAFO/Dairy	☐ Commercial	☐ Mining/Dredging	☐ ATV/OHV
☐ Hay/Fields	☐ Logging	☐ Residential	☐ Road/Hwy/RR	☐ Golf Course

Observed Human Disturbance to Stream: Blank (not observed) S (Slight) M (Moderate) H (High)

Riparian Loss	H	**Logging**		**Industry**	M	**ATV/OHV**	
Channelization	M	Urban		Mining/ Dredging		Golf Course	
Active Grazing		Commercial		Road/Hwy/RR	H	Garbage/Trash	
Row Crops		Residential		Construction		Landfill	
CAFO/Dairy		STP/WWTP		Impoundment	H	Water Withdrawal	

Other Stream Information and Stressors:

Stream Sketch: (include road name or landmark, flow direction, reach distance, distance from bridge or road, sampling points, tributaries, outfalls, livestock access, riparian, potential impacts, north arrow, immediate land use, buildings, etc.) Use additional sheet if necessary.

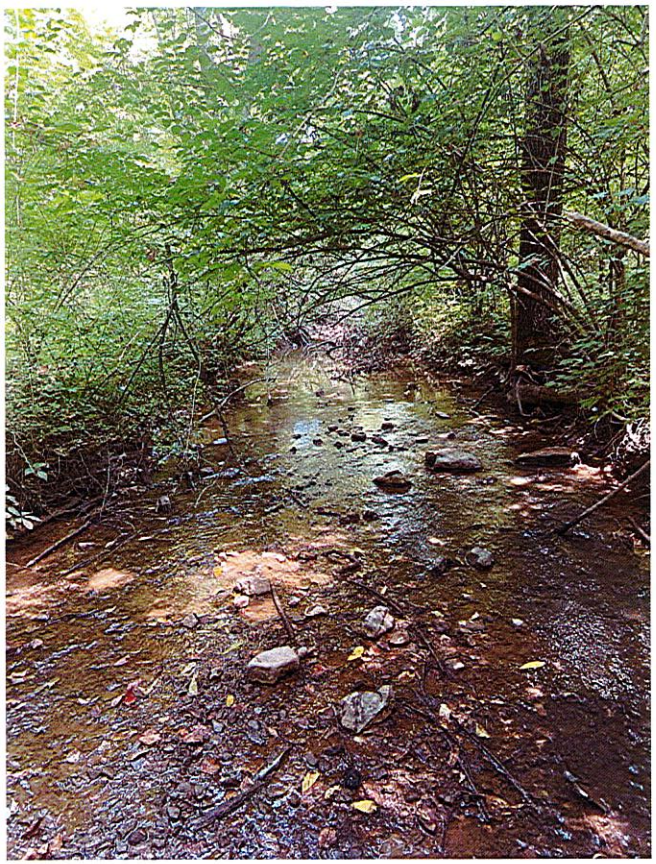
See attached maps and photographs

APPENDIX D - SITE PHOTOSHEETS

Davis Branch

08/27/2021

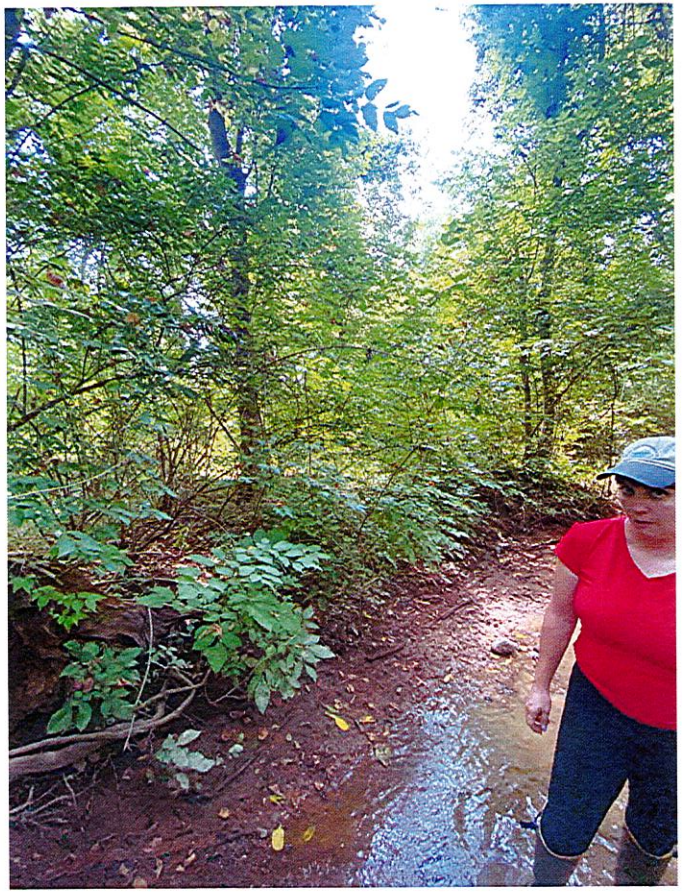
Davis Branch



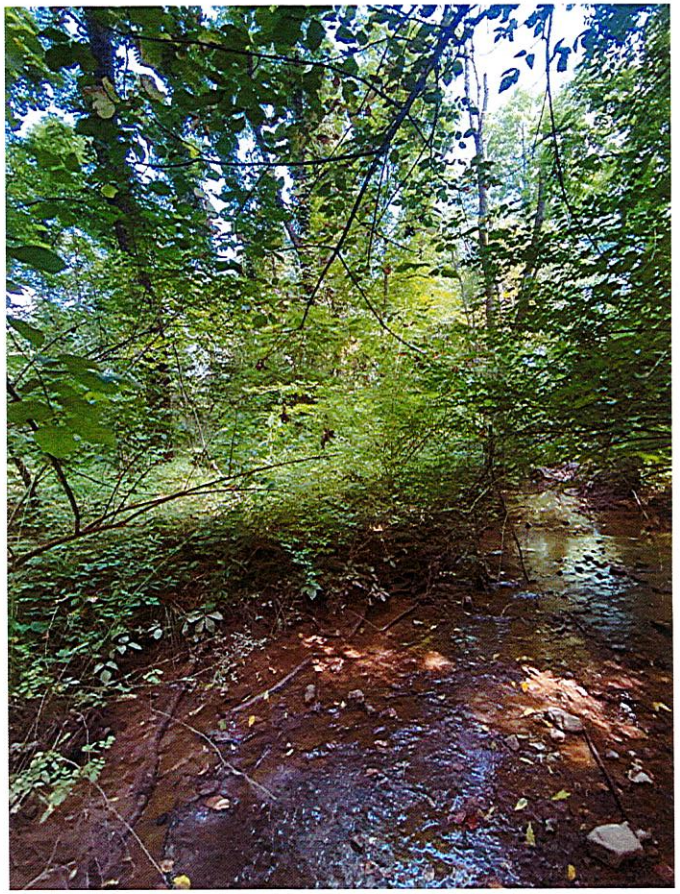
Upstream Davis Branch

Downstream Davis Branch

Davis Branch

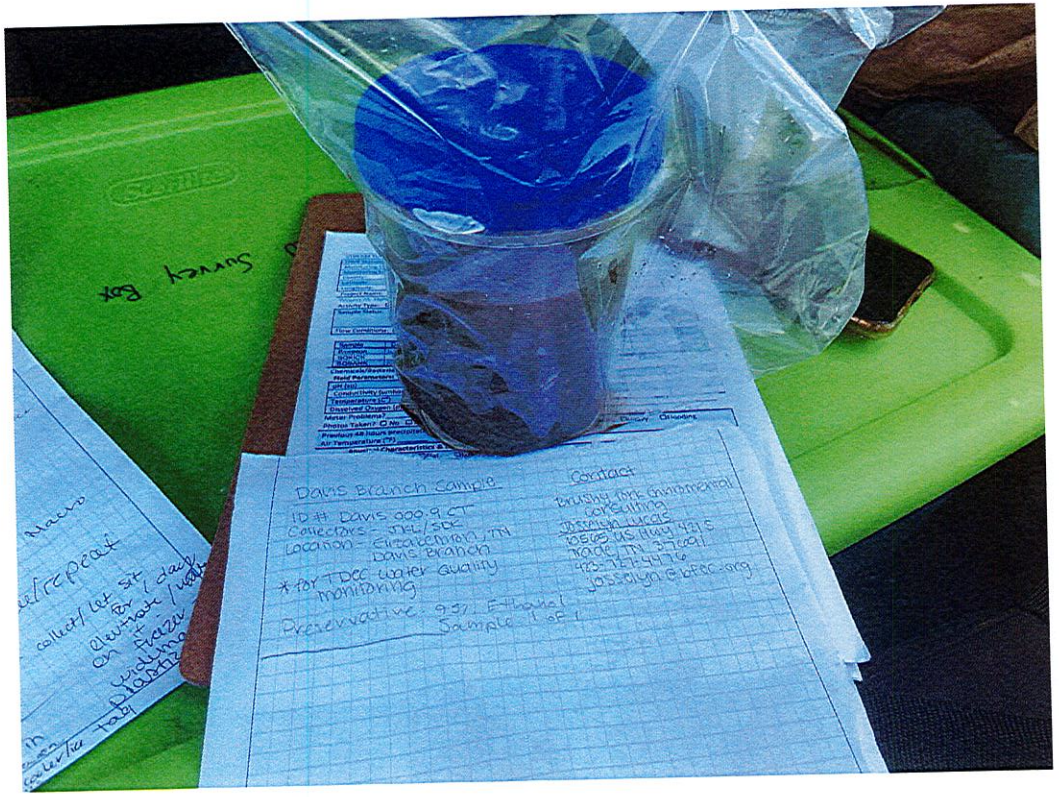


Left bank and riparian zone

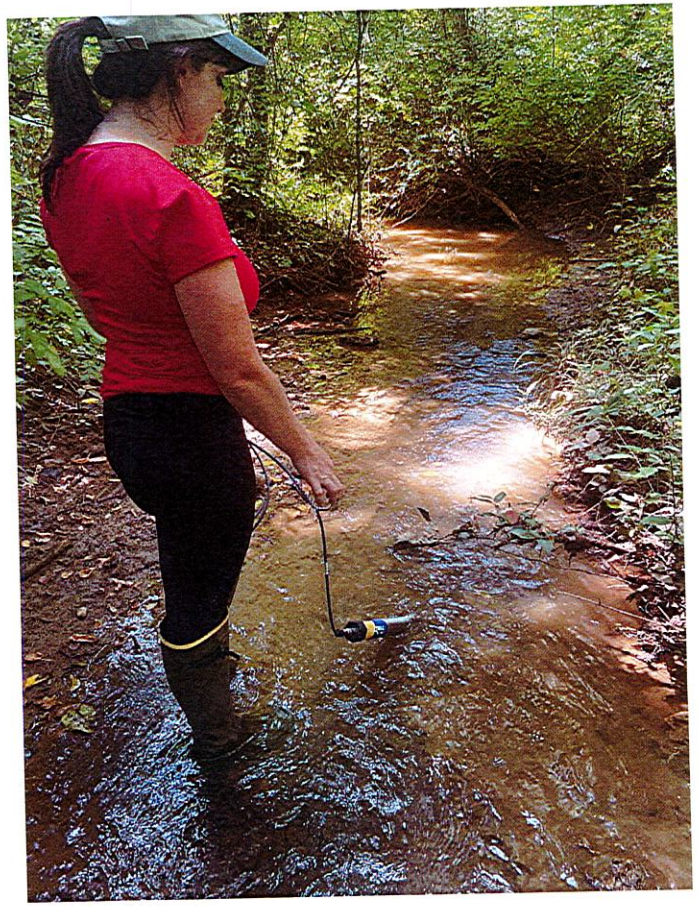


Right bank and riparian zone

Davis Branch



Macro sample sent to Pennington & Associates



Water quality sampling with Aqua TROLL 500 Sonde