



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

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

1. MS4 Information

|                                     |           |   |
|-------------------------------------|-----------|---|
| Name of MS4: City of Springfield    |           | MS4 Permit Number: TNS077640  |
| Contact Person: Kenny Morris        |           | Email Address: kenny.morris@springfieldtn.gov   |
| Telephone: (615) 469-4336           |           | MS4 Program Web Address:<br><a href="https://www.springfieldtn.gov/338/Public-Works-Storm-Water-Management">https://www.springfieldtn.gov/338/Public-Works-Storm-Water-Management</a> |
| Mailing Address: 2809 Clinard Drive |           |   |
| City: Springfield                   | State: TN | ZIP code: 37172   |

What is the current population of your MS4? 18,782 (US Census Bureau 2020 Decennial Census)

What is the reporting period for this annual report? July1 2021 to June 30 2022

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/](http://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](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: Construction plans are reviewed to ensure TDEC approved Best Management Practices are incorporated into the planning process. All priority and non-priority construction sites are monitored and inspected monthly until final stabilization is achieved.  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: Information on the City's website targets prevention of illicit discharges with tips for homeowners. Pamphlets are distributed to targeted audiences including homeowners, agriculture and the construction industry.  Yes  No
- C. Do you have a webpage dedicated to your stormwater program? If yes, provide a link/ URL: <https://www.springfieldtn.gov/338/Public-Works-Storm-Water-Management>  Yes  No

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- D. Summarize how you advertise and publicize your public education, outreach, involvement and participation opportunities: City website and social media.
- E. Summarize the public education, outreach, involvement and participation activities you completed during this reporting period: The City completed one highly successful city-wide clean-up event involving nearly 200 participants and resulting in more than 5,000 pounds of litter and debris collected. The City also participates in the Tennessee Stormwater Association's social media campaign.
- 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: Increased participation in the annual cleanup event. Additionally, the City has an Adopt-a-Street program. Program participants are highlighted on social media postings and the City website. Collectively this has enhanced the general awareness of pollution prevention.

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? 75
- D. Do you have an ordinance, or other regulatory mechanism, that prohibits non-stormwater discharges into your storm sewer system?  Yes  No
- E. Have you implemented a plan to detect, identify and eliminate non-stormwater discharges, including illegal disposal, throughout the storm sewer system? If yes, provide a summary: Dry weather outfall screening and Hot Spot inspections.  Yes  No
- F. How many illicit discharge related complaints were received this reporting period? 14
- G. How many illicit discharge investigations were performed this reporting period? 14
- H. Of those investigations performed, how many resulted in valid illicit discharges that were addressed and/or eliminated? 14

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

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- 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? 25
- F. How many active priority and non-priority construction sites were inspected this reporting period? 25
- G. How many construction related complaints were received this reporting period? 5

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: Attachment 2 is an extract from the City's Stormwater Management Ordinance. In the case that the provisions set forth in the City Ordinance are overlapping or contradictory with the Construction General Permit, the provision which imposes a higher or more restrictive standard shall be followed.  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.)? Projects disturbing equal to or greater than 10,000 square feet and/or projects excavating or filling greater than 500 cubic yards.
- D. How many development and redevelopment project plans were reviewed for this reporting period? 23
- E. How many development and redevelopment project plans were approved? 14
- 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? 2
- 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?  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. None.
- 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. None
- 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. Update PIE plan to include additional educational outreach opportunities such as general water quality awareness campaigns at local events and schools.  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                                       | # <u>3</u>          | # <u>0</u>                  | # <u>1</u>               | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| Written notices                                       | # <u>6</u>          | # <u>12</u>                 | # <u>3</u>               | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| Citations with administrative penalties               | # <u>2</u>          | # <u>0</u>                  | # <u>0</u>               | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| Stop work orders                                      | # <u>2</u>          | # <u>0</u>                  | # <u>1</u>               | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| Withholding of plan approvals or other authorizations | # <u>0</u>          | # <u>0</u>                  | # <u>0</u>               | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| Additional Measures                                   | # <u>0</u>          | # <u>0</u>                  | # <u>0</u>               | Describe: _____                         |                             |

- 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? Failing to implement and/or maintain erosion controls and siltation prevention measures. Failing to submit required reports to the City in accordance with stormwater management agreements.

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. Benthic-macroinvertebrate survey from previous reporting period attached. The final report was not received by the City until after the submission deadline for the 2020-2021 report had passed, although the survey was completed before the end of the reporting period.
- B. Summarize any non-analytical monitoring activities (e.g., planning, collection, evaluation of results) performed during this reporting period. None
- 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."*

Ryan Martin, J.D.,  
City Manager  
\_\_\_\_\_  
Printed Name and Title

  
\_\_\_\_\_  
Signature

9/26/22  
\_\_\_\_\_  
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 |

| ID 305B   Waterbody ID | Waterbody Name | Water Type | Water Size | Impairment Cause Name                                   | TMDL Priority | Potential Impairment Source Name                      |
|------------------------|----------------|------------|------------|---|---------------|---|
| TN05130206002_0400     | Buzzard Creek  | River      | 11         | ESCHERICHIA COLI (E. COLI)                              | NA            | GRAZING IN RIPARIAN OR SHORELINE ZONES                |
| TN05130206003_0300     | Peppers Branch | River      | 4.2        | ALTERATION IN STREAM-SIDE OR LITTORAL VEGETATIVE COVERS | Low           | GRAZING IN RIPARIAN OR SHORELINE ZONES                |
|                        |                |            |            | SEDIMENTATION/SILTATION                                 |               |   |
| TN05130206003_1100     | Wartrace Creek | River      | 0.72       | FLOW REGIME MODIFICATION                                | NA            | DAM OR IMPOUNDMENT                                    |
|                        |                |            |            | TEMPERATURE   | Low           |   |
| TN05130206003_1150     | Wartrace Creek | River      | 6.32       | ALTERATION IN STREAM-SIDE OR LITTORAL VEGETATIVE COVERS | Low           | MUNICIPAL (URBANIZED HIGH DENSITY AREA)               |
|                        |                |            |            | SEDIMENTATION/SILTATION                                 |               |   |
| TN05130206003_1200     | Black Branch   | River      | 1.87       | OTHER ANTHROPOGENIC SUBSTRATE ALTERATIONS               | Low           | MUNICIPAL (URBANIZED HIGH DENSITY AREA)               |
| TN05130206003_1300     | Carr Creek     | River      | 2.9        | ESCHERICHIA COLI (E. COLI)                              | NA            | SANITARY SEWER OVERFLOWS (COLLECTION SYSTEM FAILURES) |
| TN05130206003_1350     | Carr Creek     | River      | 7.8        | ESCHERICHIA COLI (E. COLI)                              | High          | SANITARY SEWER OVERFLOWS (COLLECTION SYSTEM FAILURES) |
| TN05130206003_1355     | Carr Creek     | River      | 11.3       | ESCHERICHIA COLI (E. COLI)                              | NA            | SANITARY SEWER OVERFLOWS (COLLECTION SYSTEM FAILURES) |
|                        |                |            |            | NITRATE/NITRITE (NITRITE + NITRATE AS N)                | Low           |   |
|                        |                |            |            | PHOSPHORUS, TOTAL                                       |               |   |
| TN05130206003_3000     | Sulphur Fork   | River      | 1.9        | DISSOLVED OXYGEN  | Low           | MUNICIPAL POINT SOURCE DISCHARGES                     |
|                        |                |            |            | ESCHERICHIA COLI (E. COLI)                              | High          | MUNICIPAL (URBANIZED HIGH DENSITY AREA)               |
|                        |                |            |            | PHOSPHORUS, TOTAL                                       | Low           | SANITARY SEWER OVERFLOWS (COLLECTION SYSTEM FAILURES) |
|                        |                |            |            | SEDIMENTATION/SILTATION                                 | Low           | MUNICIPAL POINT SOURCE DISCHARGES                     |
| TN05130206003_4000     | Sulphur Fork   | River      | 8.6        | ESCHERICHIA COLI (E. COLI)                              | High          | MUNICIPAL (URBANIZED HIGH DENSITY AREA)               |
|                        |                |            |            |   |               | SANITARY SEWER OVERFLOWS (COLLECTION SYSTEM FAILURES) |

## **6.5 Waterway Buffer**

New development and significant redevelopment adjacent to the floodplain or floodway of storm water conveyance (waterways), with a drainage area greater than 40 acres, shall include waterway buffers (buffers) on proposed plans. The buffer along waterways shall be an area where the surface is left in a natural state and not disturbed by construction or post-construction activity.

- 6.5.1 In areas where a floodplain and floodway have been determined and accepted by the Department of Public Works the buffer shall be the width of the floodway plus at least 50 feet perpendicular from the floodway on each side of the waterway.
- 6.5.2 In areas where a floodplain and floodway have not been determined and accepted by the Department of Public Works and if the waterway on the United States Geological Quadrangle map is a “blue line” or intermittent “blue line” stream with a drainage area less than one square mile, the buffer shall be at least 30 feet perpendicular from each side of the stream bank of the waterway under “bank full” conditions. For drainage areas greater than or equal to one square mile and less than or equal to two square miles the buffer shall be 45 feet perpendicular from each side of the stream of the waterway under “bank full” conditions. For drainage areas greater than two square miles the buffer shall be 60 feet perpendicular from each side of the stream of the waterway under “bank full” conditions. Ponds connected to community waters shall have a 25 foot buffer from the elevation of normal pool. Wetlands shall have a 25 foot buffer from the delineation line.

| <b>TNSA 2021-2022 Social Media Campaign Final Numbers</b> |  |                    |                           |                    |                       |  |  |
|---|--|--------------------|---------------------------|--------------------|-----------------------|--|--|
|   |  | <b>Impressions</b> | <b>Post Interactions*</b> | <b>Link Clicks</b> | <b>Total Clicks**</b> |  |  |
| June FB   | A clean car is a happy car, but do you know if your car wash disposes of contaminated water properly? Know before you go!  | 39,447             | 2                         | 36                 | 72                    |  |  |
| June Instagram  | A clean car is a happy car, but do you know if your car wash disposes of contaminated water properly? Know before you go!  | 37,757             | 0                         | 67                 | 72                    |  |  |
| June FB   | Everyone knows dogs are man's best friends, but did you know that 40% of people do not pick up their best friend's poop? Doggie doo is 57% more toxic than human waste and can harbor bacteria and parasites that cause illness when it seeps into waterways. Do your part and pick it up. | 30,651             | 7                         | 19                 | 53                    |  |  |
| June Instagram  | Everyone knows dogs are man's best friends, but did you know that 40% of people do not pick up their best friend's poop? Doggie doo is 57% more toxic than human waste and can harbor bacteria and parasites that cause illness when it seeps into waterways. Do your part and pick it up. | 27,308             | 5                         | 27                 | 53                    |  |  |

|                |   |        |     |       |       |  |  |
|----------------|---|--------|-----|-------|-------|--|--|
| July FB        | Use less fertilizer on your lawn! It will grow just as green, but you'll reduce toxic runoff that pollutes waterways.   | 40,769 | 4   | 68    |       |  |  |
| July Instagram | Use less fertilizer on your lawn! It will grow just as green, but you'll reduce toxic runoff that pollutes waterways.   | 41,352 | 1   | 60    |       |  |  |
| September      | Still using polystyrene? Wind and rain can transport foam to storm drains and water bodies, where it breaks into small pieces that are nearly impossible to remove. What steps are you taking in order to reduce polystyrene use? | 7,025  | 8   | 153   | 523   |  |  |
| October Ad 1   | Did you know that over-applied lawn care products can wash into our storm drains and pollute our waterways? If you fertilize often or use too much, pump the brakes and help preserve our water quality!                          | 19,920 | 27  | 328   | 823   |  |  |
| October Ad 2   | Do you have an area in your yard that receives a lot of rain or has standing water? Try planting a native plant rain garden. Rain gardens attract birds and butterflies, plus they remove pollutants from the water.              | 32,590 | 128 | 1,030 | 3,333 |  |  |

|               |   |        |     |     |       |  |  |
|---------------|---|--------|-----|-----|-------|--|--|
| November Ad 2 | Whipping up a delicious meal for Thanksgiving? When you are finished, don't pour out the grease where it can enter storm drains. It can be washed into stormwater runoff systems and end up in lakes, ponds and rivers. Cease the Grease!   | 25,641 | 66  | 469 | 1,608 |  |  |
| December Ad 1 | Everyone enjoys a nice 6-pack of their favorite beverage, but what do you do with the plastic it comes in? Plastic rings and can toppers can be washed into storm drains and end up in waterways. These are a danger to aquatic life, birds and more. Don't throw these on the street. Put them in the trash! | 30,178 | 161 | 531 | 1,787 |  |  |
| December Ad 2 | Most people ignore storm drains because they don't understand their importance. Kingsport designed a storm drain art contest to help bring awareness to the importance of protecting our rivers, stream habitats and aquatic wildlife. What has your city done?   | 43,791 | 163 | 655 | 2,152 |  |  |

|               |   |         |     |       |       |  |  |
|---------------|---|---------|-----|-------|-------|--|--|
| January Ad 1  | Did you know that polystyrene is non-biodegradable and can take over 500 years to decompose? Choose reusable or compostable containers to protect our waterways and ease the strain on our landfills.   | 18,583  | 48  | 344   | 1,362 |  |  |
| February Ad 1 | So, you just finished your favorite fast food meal. What now? Help us protect our waterways and wildlife by making sure your wrappers are thrown into the trash. Stray wrappers and containers can get washed into storm drains.                                | 185,551 | 289 | 2,176 | 5,240 |  |  |
| February Ad 2 | Contractors who manage the sediment, debris, trash, and chemicals on their construction site are great stewards for clean stormwater. This helps keep our waterways clean for future generations.   | 9,031   | 3   | 129   | 202   |  |  |
| March Ad 1    | Clean water is a necessity for our communities. That's why it's important to maintain your septic system. Overflow from improperly maintained operating systems can flow into local streams and bring unhealthy bacteria and excess nutrients to our waterways. | 197,383 | 160 | 2,732 | 3,684 |  |  |

|            |   |         |       |       |       |  |  |
|------------|---|---------|-------|-------|-------|--|--|
| March Ad 2 | Reducing litter can protect our clean waterways and beautify our local communities. Keep our roadways looking nice and free of litter by placing your trash in the garbage.   | 261,307 | 1,002 | 1,945 | 3,206 |  |  |
| April Ad 1 | Motor oil is critical to keep your vehicle running, but not everyone knows how to properly discard it. Learn more about how to properly dispose of your motor oil by clicking the link.   | 155,092 | 166   | 1,544 | 2,013 |  |  |
| April Ad 2 | Education programs for the youth can bring awareness to the importance of protecting local waterways. Stream teams are comprised of environmentally-minded students who meet regularly during the school year and explore their local waterway while creating solutions for | 137,742 | 40    | 1,185 | 1,489 |  |  |
| May Ad 1   | Green grass is healthy grass. When using fertilizer to beautify your lawn, use it sparingly to keep excess fertilizer out of storm drains.  | 191,139 | 61    | 1,416 | 2,582 |  |  |

|                          |  |                  |                              |                              |                   |                                   |  |
|--------------------------|--|------------------|------------------------------|------------------------------|-------------------|-----------------------------------|--|
| May Ad 2                 | Compostable, biodegradable products offer an eco-friendly alternative to traditional single-use plastics as they can disintegrate into non-toxic, natural elements. These products are great options to help reduce litter and protect our waterways.                              | 134,591          | 153                          | 2,160                        | 3,609             |                                   |  |
| June Ad 1                | Many enjoy washing their car in the driveway on a nice summer day, but did you know that car washes have specialized drainage systems that prevent chemicals from reaching our waterways? If given the option, choose a car wash.  | 126,907          | 108                          | 1,650                        | 5,883             |                                   |  |
| June Ad 2                | Did you know the things we do around the house every day can affect our rivers and streams? Many cleaning products found in homes shouldn't be flushed down the drain. Environmentally-friendly products that are free of chlorine or phosphate can be better alternatives to help | 116,296          | 127                          | 2,077                        | 4,234             |                                   |  |
|                          |  | <b>1,910,051</b> | <b>2,729</b>                 | <b>20,801</b>                | <b>43,980</b>     |                                   |  |
| <b>Reach in Top DMAs</b> |  | <b>Middle</b>    | <b>West &amp; North West</b> | <b>East &amp; North East</b> | <b>South East</b> | <b>Total Reach Among Top DMAs</b> | <b>Percentage of Reach in Top DMAs</b> |
| June Facebook            | A clean car is a happy car, but do you know if your car wash disposes of contaminated water properly? Know before you go!  | 6,763            | 9,629                        | 7,091                        | 2,553             | 26,036                            | 66%                                    |
| June Instagram           | A clean car is a happy car, but do you know if your car wash disposes of contaminated water properly? Know before you go!  | 4,922            | 3,959                        | 2,673                        | 1,225             | 12,779                            | 34%                                    |

|                |  |       |       |        |       |        |     |
|----------------|--|-------|-------|--------|-------|--------|-----|
| June Facebook  | Everyone knows dogs are man's best friends, but did you know that 40% of people do not pick up their best friend's poop? Doggie doo is 57% more toxic than human waste and can harbor bacteria and parasites that cause illness when it seeps into waterways. Do your part and pick it up. | 7,000 | 5,832 | 6,808  | 2,304 | 21,944 | 72% |
| June Instagram | Everyone knows dogs are man's best friends, but did you know that 40% of people do not pick up their best friend's poop? Doggie doo is 57% more toxic than human waste and can harbor bacteria and parasites that cause illness when it seeps into waterways. Do your part and pick it up. | 2,488 | 1,346 | 1,328  | 656   | 5,818  | 21% |
| July FB        | Use less fertilizer on your lawn! It will grow just as green, but you'll reduce toxic runoff that pollutes waterways.  | 9,744 | 8,867 | 10,742 | 3,280 | 32,633 | 80% |
| September      | Still using polystyrene? Wind and rain can transport foam to storm drains and water bodies, where it breaks into small pieces that are nearly impossible to remove. What steps are you taking in order to reduce polystyrene use?  | 1,615 | 1,001 | 1,687  | 513   | 4,816  | 69% |

|               |   |       |       |       |       |        |     |
|---------------|---|-------|-------|-------|-------|--------|-----|
| October Ad 1  | Did you know that over-applied lawn care products can wash into our storm drains and pollute our waterways? If you fertilize often or use too much, pump the brakes and help preserve our water quality!  | 4,216 | 2,592 | 4,484 | 1,496 | 12,788 | 97% |
| October Ad 2  | Do you have an area in your yard that receives a lot of rain or has standing water? Try planting a native plant rain garden. Rain gardens attract birds and butterflies, plus they remove pollutants from the water.  | 7,331 | 3,564 | 6,975 | 2,180 | 20,050 | 98% |
| November Ad 2 | Whipping up a delicious meal for Thanksgiving? When you are finished, don't pour out the grease where it can enter storm drains. It can be washed into stormwater runoff systems and end up in lakes, ponds and rivers. Cease the Grease!   | 8,479 | 5,066 | 8,753 | 2,625 | 24,923 | 97% |
| December Ad 1 | Everyone enjoys a nice 6-pack of their favorite beverage, but what do you do with the plastic it comes in? Plastic rings and can toppers can be washed into storm drains and end up in waterways. These are a danger to aquatic life, birds and more. Don't throw these on the street. Put them in the trash! | 7,387 | 3,950 | 6,881 | 2,301 | 20,519 | 97% |

|               |   |        |        |        |       |        |     |
|---------------|---|--------|--------|--------|-------|--------|-----|
| December Ad 2 | Most people ignore storm drains because they don't understand their importance. Kingsport designed a storm drain art contest to help bring awareness to the importance of protecting our rivers, stream habitats and aquatic wildlife. What has your city done? | 10,080 | 5,208  | 8,808  | 3,008 | 27,104 | 97% |
| January Ad 1  | Did you know that polystyrene is non-biodegradable and can take over 500 years to decompose? Choose reusable or compostable containers to protect our waterways and ease the strain on our landfills.   | 4,653  | 2,522  | 4,805  | 1,499 | 13,479 | 97% |
| February Ad 1 | So, you just finished your favorite fast food meal. What now? Help us protect our waterways and wildlife by making sure your wrappers are thrown into the trash. Stray wrappers and containers can get washed into storm drains.                                | 26,779 | 19,292 | 26,570 | 8,750 | 81,391 | 97% |
| February Ad 2 | Contractors who manage the sediment, debris, trash, and chemicals on their construction site are great stewards for clean stormwater. This helps keep our waterways clean for future generations.   | 2,648  | 2,168  | 2,256  | 902   | 7,974  | 98% |

|            |   |        |        |        |        |         |     |
|------------|---|--------|--------|--------|--------|---------|-----|
| March Ad 1 | Clean water is a necessity for our communities. That's why it's important to maintain your septic system. Overflow from improperly maintained operating systems can flow into local streams and bring unhealthy bacteria and excess nutrients to our waterways.   | 38,208 | 20,352 | 36,352 | 12,384 | 107,296 | 98% |
| March Ad 2 | Reducing litter can protect our clean waterways and beautify our local communities. Keep our roadways looking nice and free of litter by placing your trash in the garbage.   | 36,384 | 20,192 | 40,096 | 12,352 | 109,024 | 98% |
| April Ad 1 | Motor oil is critical to keep your vehicle running, but not everyone knows how to properly discard it. Learn more about how to properly dispose of your motor oil by clicking the link.   | 20,847 | 12,394 | 21,520 | 7,040  | 61,801  | 98% |
| April Ad 2 | Education programs for the youth can bring awareness to the importance of protecting local waterways. Stream teams are comprised of environmentally-minded students who meet regularly during the school year and explore their local waterway while creating solutions for improving the health of their stream. | 20,512 | 14,992 | 21,856 | 6,528  | 63,888  | 98% |

|              |   |                |                |                |                |                |     |
|--------------|---|----------------|----------------|----------------|----------------|----------------|-----|
| May Ad 1     | Green grass is healthy grass. When using fertilizer to beautify your lawn, use it sparingly to keep excess fertilizer out of storm drains.  | 25,088         | 15,072         | 25,600         | 8,752          | 74,512         | 98% |
| May Ad 2     | Compostable, biodegradable products offer an eco-friendly alternative to traditional single-use plastics as they can disintegrate into non-toxic, natural elements. These products are great options to help reduce litter and protect our waterways.   | 19,267         | 11,122         | 22,628         | 7,153          | 60,170         | 98% |
| June Ad 1    | Many enjoy washing their car in the driveway on a nice summer day, but did you know that car washes have specialized drainage systems that prevent chemicals from reaching our waterways? If given the option, choose a car wash.   | 21,360         | 16,464         | 23,360         | 8,096          | 69,280         | 98% |
| June Ad 2    | Did you know the things we do around the house every day can affect our rivers and streams? Many cleaning products found in homes shouldn't be flushed down the drain. Environmentally-friendly products that are free of chlorine or phosphate can be better alternatives to help protect our waterways. | 20,272         | 13,184         | 20,128         | 6,832          | 60,416         | 98% |
| <b>Total</b> |   | <b>306,043</b> | <b>198,768</b> | <b>311,401</b> | <b>102,429</b> | <b>918,641</b> |     |

\* Post Interactions include: Reactions (likes, loves, laughs, etc.), comments, shares and page likes

\*\* Total clicks include clicks on any part of the ad

**BENTHIC MACROINVERTEBRATE SURVEYS  
CITY OF SPRINGFIELD  
ROBERTSON COUNTY, TENNESSEE**

**PREPARED FOR:  
CITY OF SPRINGFIELD  
2809 CLINARD DRIVE  
SPRINGFIELD, TN 37172**

**PREPARED BY:  
CIVIL & ENVIRONMENTAL CONSULTANTS, INC.  
FRANKLIN, TENNESSEE**

**CEC PROJECT 312-080.0003**

**OCTOBER 2021**



**Civil & Environmental Consultants, Inc.**

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## 1.0 INTRODUCTION

Civil & Environmental Consultants, Inc. (CEC) conducted biological surveys as part of the City of Springfield's Municipal Separate Storm Sewer System (MS4) Phase II NPDES permit – TNS077640 (Permit), issued by the Tennessee Department of Environment and Conservation (TDEC). According to the permit, the City is required to perform benthic macroinvertebrate surveys in streams identified by TDEC as waters with unavailable parameters for siltation, habitat alteration, nutrients, and/or pathogens within a five-year permit cycle. Seven biomonitoring sites were sampled for benthic macroinvertebrate community composition, physical and chemical composition (pH, temperature, conductivity, turbidity and dissolved oxygen) as well as habitat characterization. The seven stream sampling locations are identified as: Sulpher Fork (3000) (SULPH023.3RN), Sulpher Fork (4000) (SULPH023.2RN), Wartrace Creek (1100) (WARTR000.3RN), Wartrace Creek (1150) (WARTR000.7RN), Peppers Branch, Black Branch (BLACK000.4RN), and Carr Creek (CARR005.2RN). Sampling locations are identified on Figure 1. All streams and sampling locations are located in the Red River watershed (HUC-8 – 05130206) and the Level III Ecoregion 71e – Western Pennyroyal Karst.

## 2.0 METHODS

### 2.1 FIELD

Seven benthic macroinvertebrate samples were collected on June 21, 2021 and June 22, 2021 in accordance with the TDEC Standard Operating Procedure (SOP 2017) for macroinvertebrates. In each sampling reach (site), a square meter net (500- $\mu$ m mesh) was used to collect approximately one square meter of material from two different locations in riffle habitat (SQKICK). The two samples were then composited. The combined material collected at each site was emptied into a labeled heavy-duty plastic bag, and fixed with 80 percent ethanol. Appendix A contains photos of upstream and downstream views of each site.

In conjunction with the benthic macroinvertebrate sampling, habitat assessments were performed at each site, following the procedures outlined in the SOP. Parameters such as substratum, embeddedness, velocity, depth, bank characteristics, and land use were assessed and rated to determine if, and to what extent, the habitat is capable of supporting a diverse benthic community. Other site characteristics such as sketches of the site, important features, weather, sampling personnel, methods, and other aquatic life were recorded on TDEC's field data sheets. *In-situ* water quality measurements were taken for dissolved oxygen, pH, conductivity, and temperature using a YSI Professional Plus portable meter. Water velocity and depth at each specific sampling site were measured using a Marsh-McBirney flow meter. All meters were calibrated prior to field use. All data, including habitat assessments and sketches of each site, can be found in Appendix B.

### 2.2 LABORATORY

Each sample was washed using a US Series No. 35 (500  $\mu$ m mesh) sieve to remove ethanol and excess detritus. The samples contained a large amount of material (detritus and organisms) and were subsampled using the Caton (1991) method recommended by the SOP. This procedure consists of dividing the sample into 30 equal portions (grids) using a specified subsampling device, then sorting at least four of these grids (which have been randomly selected) to obtain 200 $\pm$ 20 percent (160-240) organisms. If sorting a grid had been started, it was finished in its entirety. The benthic organisms removed from the sample were placed by major groupings (e.g., mayflies, worms, snails) into glass vials containing 70 percent ethanol. Each vial was labeled with information such as date of collection, location, specific sample identification, name of taxonomic group and number of organisms. The residue from the sorted portion of a sample was preserved separately from the portion that was not sorted. Organisms were identified using either a dissecting or compound microscope. The compound microscope was used for identifying chironomids (midgefly larvae) and oligochaetes (aquatic segmented worms) after these organisms were mounted on microscope slides using CMCP mounting medium. Most organisms were identified to the generic level, unless the specimens were too small or damaged to allow identification to this level. Identifications were recorded on laboratory bench sheets. The benthic laboratory data can be found in Appendix C.

## 2.3 DATA ANALYSIS

When identifications were complete, the raw benthic data were used to calculate values for seven individual metrics. The following metrics are required by the SOP and are all based on generic level identifications:

1. **TR** (Taxa Richness) – total number of distinct taxa identified.
2. **EPT** (Ephemeroptera Plecoptera Trichoptera) **Richness** – total number of genera of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera).
3. **%EPT-Cheum** (EPT abundance excluding *Cheumatopsyche spp.*) – total number of individuals of EPT taxa minus number of *Cheumatopsyche*, divided by the total number of individuals in the sample.
4. **%OC** (Percent Oligochaeta and Chironomidae) – total number of individuals in these two groups, divided by total number of individuals in the sample.
5. **NCBI** (North Carolina Biotic Index) – calculated as  $NCBI = \sum \frac{x_i t_i}{N}$  where:  
  
     $x_i$  = number of individuals in a taxon  
     $t_i$  = tolerance value of a taxon  
     $N$  = total number of individuals in sample that have an assigned tolerance value
6. **%Clingers** (Percent Clingers) – total number of individuals that build fixed retreats (or have adaptations to attach to surfaces in flowing water), divided by the total number of individuals in the sample.
7. **%TNUTOL** (Percent TN Nutrient Tolerant Organisms) – total number of Tennessee nutrient tolerant organisms divided by the total number of organisms in the sample. The Tennessee nutrient tolerant organisms include *Cheumatopsyche*, *Stenelmis*, *Polypedilum*, *Cricotopus*, *Cricotopus/Orthocladius*, *Lirceus*, *Caenis*, *Elimia*, *Nais*, *Dero*, and undetermined (immature) Tubificidae.

Upon completion of the individual metric calculations, each metric is assigned a score of 0, 2, 4, or 6 based on comparison to the ecoregion reference database, which is separated based on ecoregion, sampling period, and drainage area. The resulting total of all metric scores is the Tennessee Macroinvertebrate Index (TMI) score (TDEC 2017). The drainage area for Sulpher Fork (3000), Sulpher Fork (4000), Wartrace Creek (1100), Wartrace Creek (1150), Peppers Branch, and Carr Creek at the sampling locations is >2.5 square miles while the drainage area for Black Branch at the sampling locations is <2.5 square miles. All samples are located in Ecoregion 71e – Western Pennyroyal Karst, and the sampling period is between January and June.

### 3.0 RESULTS

Measurements of *in-situ* water quality parameters, water velocity, and habitat assessment are presented in Table 1 below.

| <b>Table 1. <i>In-situ</i> Water Quality Monitoring and Habitat Assessment<br/>City of Springfield, TN</b> |                        |                        |                          |                          |                |              |                      |
|--|------------------------|------------------------|--------------------------|--------------------------|----------------|--------------|----------------------|
| Site   | Sulpher Fork<br>(3000) | Sulpher Fork<br>(4000) | Wartrace Creek<br>(1100) | Wartrace Creek<br>(1150) | Peppers Branch | Black Branch | Carr Creek<br>(1350) |
| pH (su)  | 7.89                   | 8.08                   | 7.79                     | 7.97                     | 8.02           | 7.85         | 7.97                 |
| Conductivity<br>(uS/cm)  | 440.2                  | 362.1                  | 276.1                    | 439.8                    | 1284           | 612          | 350.5                |
| Temperature<br>(C°)  | 24.8                   | 24.7                   | 26.9                     | 26.06                    | 21.4           | 18.7         | 22.9                 |
| Dissolved<br>Oxygen<br>(mg/L)  | 8.5                    | 9.06                   | 8.14                     | 9.28                     | 9.79           | 12.8         | 8.92                 |
| Dissolved<br>Oxygen (%)  | 102.5                  | 108.6                  | 102.1                    | 109.7                    | 110.6          | 141.5        | 103.0                |
| Flow (cfs)   | 78.9                   | 54.4                   | 4.3                      | 2.9                      | 6.7            | 2.7          | 6.5                  |
| Habitat<br>Assessment  | 140                    | 151                    | 164                      | 143                      | 151            | 129          | 170                  |

*In-situ* water quality parameters give a general sense of water quality at each of the benthic sampling locations. The pH ranged from 7.79 to 8.08 with Sulpher Fork (4000) and Peppers Branch having the highest pH of 8.08 and 8.02, respectively. The normal range for pH in freshwater streams is 6.5 to 8.5. Conductivity is the ability of water to carry an electric current and indicates the physical presence of dissolved minerals in the water. The conductivity readings ranged from 276.1 to 1284 with Peppers Branch having the highest conductivity reading of 1284. Dissolved oxygen refers to the level of free oxygen in the stream. Aquatic life depends on dissolved oxygen to survive. The dissolved oxygen (mg/L) levels in the sampled streams ranged from 8.14 to 12.8 with Black Branch and Peppers Branch having the highest readings of 12.8 and 9.79, respectively. Wartrace Creek (1100) and Sulpher Fork (3000) had the lowest dissolved oxygen readings of 8.14 and 8.5, respectively. Dissolved oxygen is produced primarily by agitation (riffles) and plant photosynthesis. There are three main factors that can be attributed to varying dissolved oxygen numbers: lower water temperature, excessive algae, and the time of day in which the samples were taken. Dissolved oxygen fluctuates daily and seasonally based on water temperature and photosynthetic activity of aquatic plants. Samples taken later in the day in streams with excessive algae can have higher dissolved oxygen than samples taken early in the day. Colder water temperatures also increases the water's capacity for oxygen.

Results from the calculations of the biological measures are presented in Table 2, with the corresponding TMI scores shown in Table 3.

| <b>Table 2. Values for Biological Measures<br/>City of Springfield, TN</b> |                        |                        |                          |                          |                |              |                      |
|--|------------------------|------------------------|--------------------------|--------------------------|----------------|--------------|----------------------|
| Site   | Sulpher Fork<br>(3000) | Sulpher Fork<br>(4000) | Wartrace Creek<br>(1100) | Wartrace Creek<br>(1150) | Peppers Branch | Black Branch | Carr Creek<br>(1350) |
| Total # of individuals   | 232                    | 208                    | 180                      | 169                      | 189            | 175          | 222                  |
| Taxa Richness  | 29                     | 20                     | 12                       | 20                       | 17             | 14           | 25                   |
| EPT Richness   | 8                      | 6                      | 4                        | 8                        | 3              | 3            | 8                    |
| Percent Oligochaeta/<br>Chironomidae                                       | 22.84                  | 15.87                  | 44.44                    | 11.24                    | 25.93          | 18.29        | 21.17                |
| Percent EPT-<br><i>Cheumatopsyche</i>                                      | 40.95                  | 53.37                  | 5.00                     | 42.01                    | 13.76          | 64.57        | 40.54                |
| NC Biotic Index  | 5.94                   | 5.93                   | 6.35                     | 4.96                     | 4.63           | 5.19         | 5.86                 |
| Percent Nutrient Tolerant  | 42.24                  | 40.87                  | 85.56                    | 30.18                    | 59.26          | 20.57        | 44.59                |
| Percent Clingers-<br><i>Cheumatopsyche</i>                                 | 23.28                  | 16.35                  | 16.67                    | 41.42                    | 24.34          | 81.14        | 22.52                |

The total number of individuals identified ranged from 169 to 232 organisms. A total of 52 taxa were identified from the samples with a range of 12 to 29 taxa per sample. Twenty taxa were categorized as intolerant (tolerance values < 4.51) and six taxa were categorized as tolerant (tolerance values  $\geq$  7.50); those between these two values are considered facultative. Tolerance values ranged from 1.5 (*Leuctra sp.*) to 9.64 (*Psychoda sp.*), and there were seventeen (17) taxa classified as clingers. A phylogenetic list of taxa identified from the benthic samples is provided in Appendix C.

| <b>Table 3. Biological Measure Scores (TMI scores)</b> |                     |                     |                       |                       |                |              |                   |
|--|---------------------|---------------------|-----------------------|-----------------------|----------------|--------------|-------------------|
| <b>City of Springfield, Tennessee</b>                  |                     |                     |                       |                       |                |              |                   |
| Site   | Sulpher Fork (3000) | Sulpher Fork (4000) | Wartrace Creek (1100) | Wartrace Creek (1150) | Peppers Branch | Black Branch | Carr Creek (1350) |
| Drainage Area at Sampling Site (square miles)          | 87.24               | 87.19               | 7.76                  | 5.63                  | 3.5            | 0.94         | 18.77             |
| Bioregion  | 71e                 | 71e                 | 71e                   | 71e                   | 71e            | 71e          | 71e               |
| Taxa Richness  | 6                   | 4                   | 2                     | 4                     | 2              | 2            | 4                 |
| EPT Richness   | 4                   | 2                   | 2                     | 4                     | 0              | 2            | 4                 |
| Percent Oligochaeta/Chironomidae                       | 6                   | 6                   | 4                     | 6                     | 6              | 6            | 6                 |
| Percent EPT- <i>Cheumatopsyche</i>                     | 6                   | 6                   | 0                     | 6                     | 2              | 6            | 6                 |
| NC Biotic Index  | 4                   | 4                   | 4                     | 6                     | 6              | 6            | 4                 |
| Percent Nutrient Tolerant                              | 4                   | 4                   | 0                     | 6                     | 2              | 6            | 4                 |
| Percent Clingers- <i>Cheumatopsyche</i>                | 2                   | 2                   | 2                     | 4                     | 2              | 6            | 2                 |
| <b>Total (TMI)</b>                                     | <b>32</b>           | <b>30</b>           | <b>14</b>             | <b>36</b>             | <b>20</b>      | <b>34</b>    | <b>30</b>         |

The values for Taxa Richness ranged from 12 to 29, resulting in TMI individual metric scores ranging from 2 to 6, with Sulpher Fork (3000) and Carr Creek having the highest number of taxa (29 and 25). EPT Richness values ranged from 3 to 8, resulting in TMI individual metric scores ranging from 0 to 4, with Peppers Branch having the lowest values for this metric (0). Percent EPT-*Cheumatopsyche* values were highest at Black Branch, Sulpher Fork (4000), Wartrace Creek (1150), Sulpher Fork (3000), and Carr Creek resulting in a TMI score of 6 for these streams. Wartrace Creek (1100) had the lowest percent EPT-*Cheum* resulting in a metric score of 0 with a value of 5.0%. Wartrace Creek (1100) had the highest percentage of *Oligochaeta + Chironomidae* resulting in a TMI score of 4 for this metric with value of 44.44. The remaining six streams had a lower percentage of *Oligochaeta + Chironomidae* resulting in a metric score of 6. Sulpher Fork (3000), Sulpher Fork (4000), Wartrace Creek (1100), and Carr Creek had the lowest NC Biotic Index metric score of 4 while Wartrace Creek (1150), Peppers Branch, and Black Branch had a metric score of 6. Percent of Clingers values ranged from 16.35 to 81.14, resulting in TMI individual metric scores ranging from 2 to 6, with Sulpher Fork (4000) having the lowest value of 16.35 and lowest metric score of 2. Percent nutrient tolerant values ranged from 20.57 to 85.56,

resulting in TMI individual metric scores ranging from 2 to 6, with Wartrace Creek (1100) having the highest value of 85.56 and lowest metric score of 2.

A determination of biological condition is determined from the TMI bio-criteria scores as follows:

- >32 – Non-impaired (Supporting)
- 21-31 – Slightly impaired (Partially Supporting)
- 10-20 – Moderately impaired (Partially Supporting)
- <10 – Severely impaired (Non-supporting)

The target TMI score for bioregion 71e is 32, which indicates no impairment. Wartrace Creek (1150), at the sampling location, had the highest TMI score of 36 (no impairment/supporting), with a habitat assessment score of 143 indicating suboptimal habitat. Black Branch and Sulpher Fork (3000) are also considered non-impaired (supporting) with a TMI scores of 34 and 32, respectively. Black Branch and Sulpher Fork (3000) had habitat assessment scores of 129 and 140 indicating suboptimal habitats. The data indicate that Wartrace Creek (1150), Black Branch, and Sulpher Fork (3000) are healthy streams with a diverse benthic community. Sulpher Fork (4000) and Carr Creek had a TMI scores of 30 which are considered slightly impaired (partially supporting). The habitat assessment scores for these streams were 140 for Sulpher Fork (4000) and 170 for Carr Creek indicating suboptimal habitats. These three streams are on the higher end of the spectrum of slightly impaired and could be recovering from historic impairment in their watersheds. Peppers Branch and Wartrace Branch (1100) had the lowest TMI scores of 20 and 14 which is still considered moderately impaired (partially supporting) and habitat assessment scores of 151 and 164, indicating suboptimal habitats. The low TMI scores with higher habitat assessment scores may indicate that the riparian habitat is recovering from any urbanization impacts faster than the stream. The low TMI scores could also be the result of a currently unknown non-point source input. The habitat assessment reference score for Ecoregion 71e in watersheds greater than 2.5 square miles is 113 or greater, and the reference score in watersheds less than or equal to 2.5 square miles is 145 or greater.

In conclusion, the benthic community of the streams that were sampled are either non-impaired (supporting) or slightly impaired (partially supporting). The only exceptions being Wartrace Creek (1100) and Peppers Branch which had the lowest TMI scores of 14 and 20 (moderately impaired) and higher habitat assessment scores primarily due to the surrounding land use and lack of available substrate to sample near the TDEC preferred sampling location. Habitat assessment scores were higher than the ecoregion reference score for streams with >2.5 sq. mile drainages. Black Branch a headwater stream had the only habitat assessment score lower than the ecoregion reference score, which is typical in urbanized areas.

#### **4.0 LITERATURE CITED**

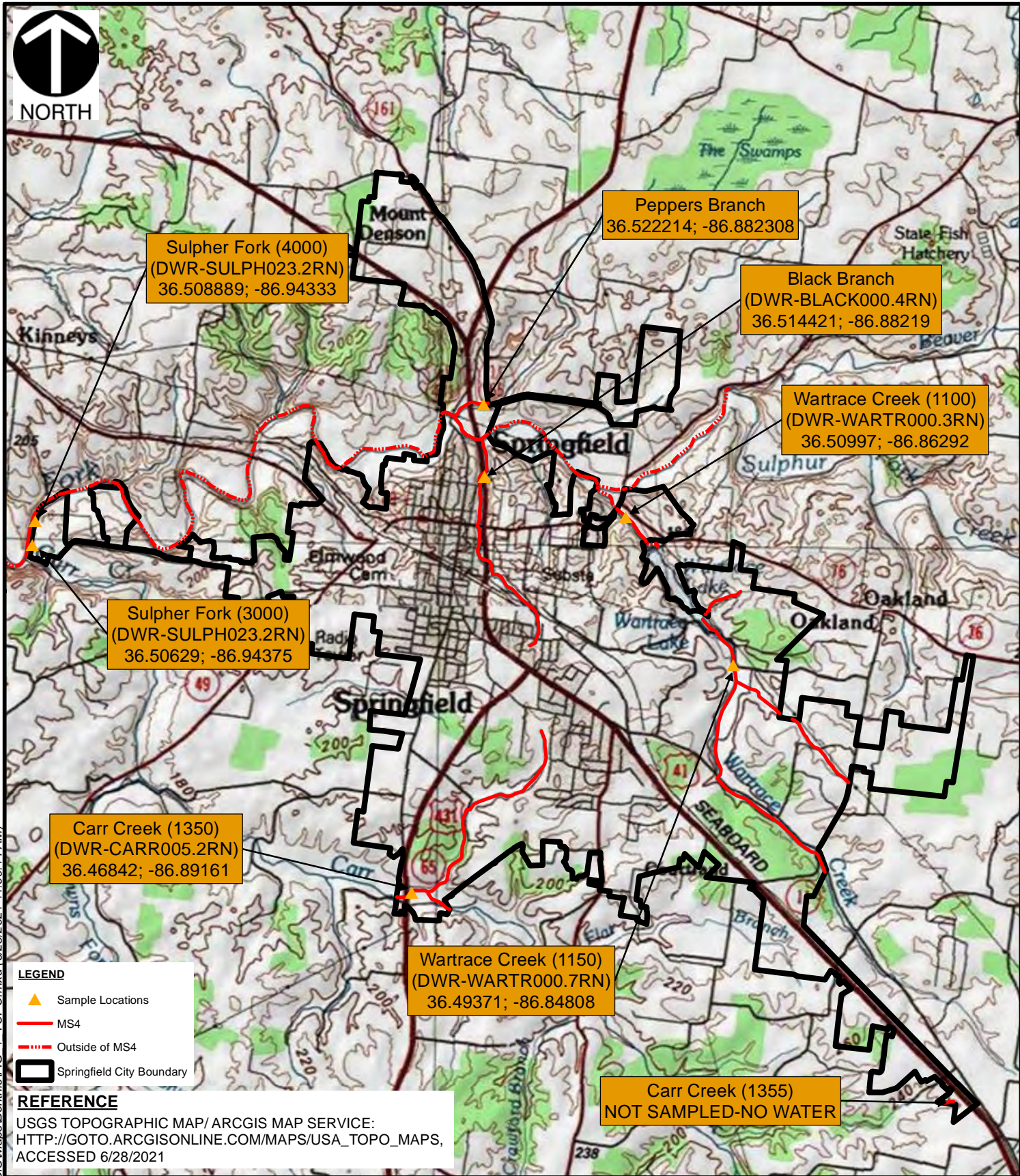
Tennessee Department of Environment and Conservation. 2017. Quality System Standard Operating Procedure for Macroinvertebrate Stream Surveys, Nashville. 3 sections + appendices.

Caton, L.W. 1991. Improved subsampling methods for the EPA “Rapid Bioassessment” benthic protocols. Bull. N. Am. Benthol. Soc. 8:317-319.

---

## **FIGURES**

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ISVR-NASHI.P:\310-000\312-080-GIS\Maps\Benthic\FIG 1\_TOPO.mxd (6/28/2021 11:00:14 AM)



**Civil & Environmental Consultants, Inc.**

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**CITY OF SPRINGFIELD  
 MS4 STREAM MONITORING PLAN  
 BENTHIC SURVEY LOCATIONS**

**BENTHIC TOPO MAP**

|                 |                    |   |              |
|-----------------|--------------------|---|--------------|
| DRAWN BY: CAD   | CHECKED BY: BCL    | APPROVED BY: <sup>*Hand signature</sup> on file TJN | FIGURE NO: 1 |
| DATE: 6/28/2021 | SCALE: 1" = 5,250' | PROJECT NO: 312-080                                 |              |

---

**APPENDIX A**  
**PHOTOGRAPHS OF SAMPLING SITES**

---



Photo 1: View of Sulphur Fork Creek (4000) looking downstream.



Photo 2: View of Sulphur Fork Creek (4000) looking upstream.



Photo 3: View of Sulphur Fork Creek (3000) looking downstream.



Photo 4: View of Sulphur Fork Creek (3000) looking upstream.



Photo 5: View of Wartrace Creek (1100) looking downstream.

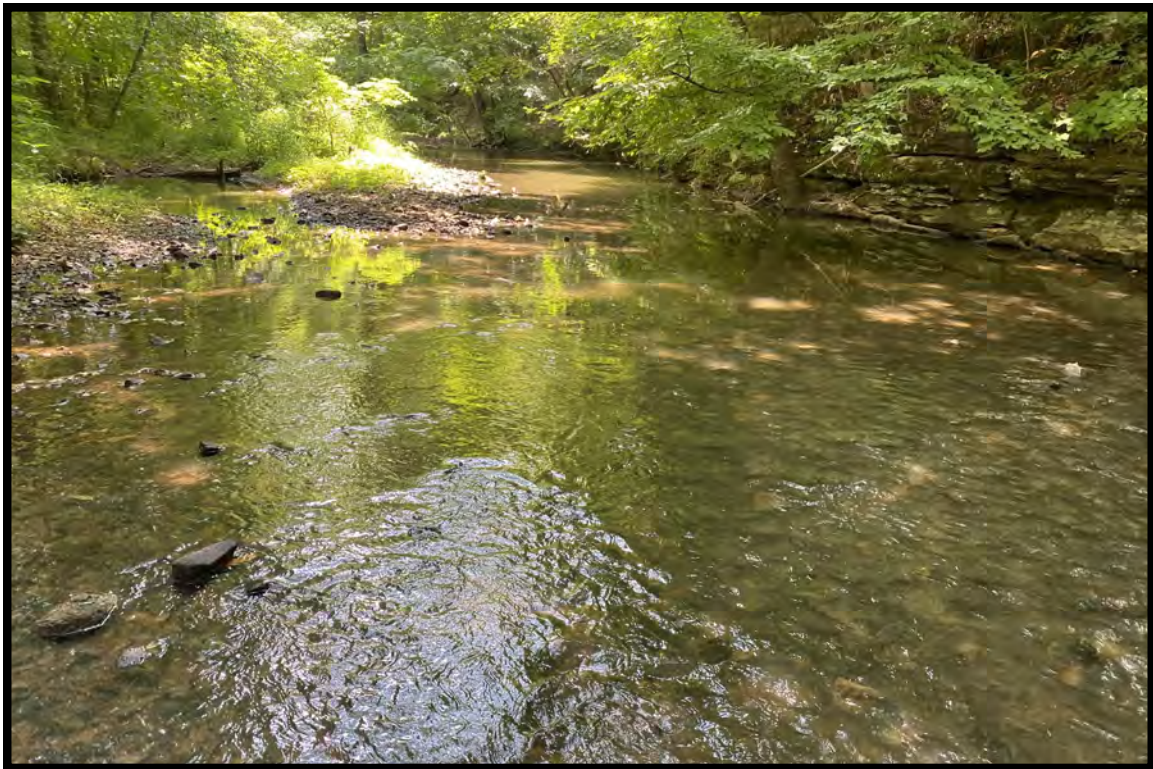


Photo 6: View of Wartrace Creek (1100) looking upstream.



Photo 7: View of Wartrace Creek (1150) looking downstream.



Photo 8: View of Wartrace Creek (1150) looking upstream.



Photo 9: View of Peppers Branch looking downstream.



Photo 10: View of Peppers Branch looking upstream.



Photo 11: View of Black Branch looking downstream.



Photo 12: View of Black Branch looking upstream.



Photo 13: View of Carr Creek (1355) looking downstream.



Photo 14: View of Carr Creek (1355) looking upstream.



Photo 15: View of Carr Creek (1350) looking downstream.



Photo 16: View of Carr Creek (1350) looking upstream.

---

**APPENDIX B**  
**FIELD DATA SHEETS AND HABITAT ASSESSMENTS**

---

**STREAM SURVEY INFORMATION**

|  |                                      |                             |
|--|--------------------------------------|-----------------------------|
| DWR Station ID: <u>Sculpho23.3RN</u>   | Samplers: <u>L. Duce, J. Willard</u> |                             |
| Monitoring Location Name: <u>Sulphur Fork (4000)</u>   | Date: <u>6/21/21</u>                 | Time: <u>9:40</u>           |
| Monitoring Location: <u>Springfield</u>  | Organization: <u>CEC</u>             | Drainage Area: <u>87.17</u> |
| County: <u>Robertson</u>   | Ecoregion: <u>71c</u>                | u/s ECO:                    |
| Latitude: <u>36.508889</u>   | HUC: <u>05130206</u>                 | WS Grp:                     |
| Longitude: <u>-86.94333</u>  | WBID:                                | Field Log #:                |
| Project Name: <input type="checkbox"/> Watershed <input type="checkbox"/> 303(d) <input type="checkbox"/> Antideg <input type="checkbox"/> ECO <input type="checkbox"/> FECO Other: <u>MS4</u> |                                      |                             |

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 |                                     |               | Periphyton             |            |         |
| SQKICK   | <input checked="" type="checkbox"/> | <u>SQKICK</u> | Other                  |            |         |
| SQBANK   |                                     |               | Describe Other Sample: |            |         |

Chemicals/Bacteria:  None  Routine  Nutrient  Metals  E. coli  Organics  Other \_\_\_\_\_

Field Parameters: Meter(s) Used: VSE PRO

|                               |              |                    |              |
|-------------------------------|--------------|--------------------|--------------|
| pH (su)                       | <u>8.08</u>  | Dissolved Oxygen % | <u>108.6</u> |
| Conductivity (umhos)          | <u>382.1</u> | Turbidity (NTU)    |              |
| Temperature (C°)              | <u>24.7°</u> | TDS (mg/L)         |              |
| Dissolved Oxygen (ppm = mg/L) | <u>9.06</u>  | Flow (cfs)         |              |

Meter Problems? NO

Photos Taken?  No  Yes: Description: US + DS

Previous 48 hours precipitation:  Unknown  None  Slight  Moderate  Heavy  Flooding

Air Temperature (°F) 70

**Physical Characteristics & Light Penetration:**

|  |
|--|
| Gradient (sample reach): <input type="checkbox"/> Flat <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High <input type="checkbox"/> Cascades  |
| Average Stream Width: <input type="checkbox"/> Very Small (<1.5yd) <input type="checkbox"/> Small (1.5-3yd) <input type="checkbox"/> Med. (3-10yd) <input checked="" type="checkbox"/> Large (10-25yd) <input type="checkbox"/> Very Large (>25yd) |
| Maximum Stream Depth: <input type="checkbox"/> Shallow (<0.3yd) <input type="checkbox"/> Medium (0.3-0.6yd) <input checked="" type="checkbox"/> Deep (0.6 - 1yd) <input type="checkbox"/> Very Deep (>1yd)   |
| % Canopy Cover Estimated for Reach: <u>50</u> %  |
| % Canopy Cover Measured (mid-reach): <u>25</u> u/s + <u>25</u> d/s + <u>25</u> LDB + <u>25</u> RDB = Total/384*100   |

**Channel Characteristics:**

|   |
|---|
| Bank Height: <u>3-5</u> (yd.) High Water Mark: <u>3</u> (yd.)   |
| Bank Slope LDB: <input type="checkbox"/> Deeply incised <input type="checkbox"/> Bluff/Wall <input type="checkbox"/> Undercut <input checked="" type="checkbox"/> Sloughing <input type="checkbox"/> Steep terrain <input checked="" type="checkbox"/> Gentle Slope   |
| Bank Slope RDB: <input type="checkbox"/> Deeply incised <input type="checkbox"/> Bluff/Wall <input type="checkbox"/> Undercut <input checked="" type="checkbox"/> Sloughing <input type="checkbox"/> Steep terrain <input type="checkbox"/> Gentle Slope  |
| Manmade Modification: <input checked="" type="checkbox"/> None <input type="checkbox"/> Rip-Rap <input type="checkbox"/> Cement <input type="checkbox"/> Gabions <input type="checkbox"/> Channelized <input type="checkbox"/> Dam <input type="checkbox"/> Dredging <input type="checkbox"/> Bridge <input type="checkbox"/> ATV |

**Stream Characteristics:**

|   |
|---|
| Sediment Deposits: <input type="checkbox"/> None <input checked="" type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Excessive <input type="checkbox"/> Blanket   |
| Sediment Type: <input type="checkbox"/> None <input type="checkbox"/> Sand <input checked="" type="checkbox"/> Silt <input type="checkbox"/> Mud <input type="checkbox"/> Clay <input type="checkbox"/> Sludge <input type="checkbox"/> Mn Precipitant <input type="checkbox"/> Orange Flocculent                               |
| Turbidity: <input type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly Turbid <input type="checkbox"/> Muddy <input type="checkbox"/> Milky <input type="checkbox"/> Tannic <input type="checkbox"/> Planktonic Algae <input type="checkbox"/> Dyed   |
| Foam/Surface Sheen: <input type="checkbox"/> None <input type="checkbox"/> Nutrient <input type="checkbox"/> Surfactant <input type="checkbox"/> Bacteria   |
| Algae: <input checked="" type="checkbox"/> None <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> High <input type="checkbox"/> Choking Type: <input type="checkbox"/> Diatoms <input type="checkbox"/> Green <input type="checkbox"/> Filamentous <input type="checkbox"/> Blue-green |

**TDEC-DWR Stream Survey Field Sheet (Back)**

DWR Station ID: Sculph023.3RN Date: 6/21/21 Assessors: CD, JW

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

- | Riffle  | Run   | Pool  |
|---|---|---|
| <input type="checkbox"/> Boulders (>10")              | <input type="checkbox"/> Boulders (>10")              | <input type="checkbox"/> Boulders (>10")              |
| <input checked="" type="checkbox"/> Cobble (2.5-10")  | <input checked="" type="checkbox"/> Cobble (2.5-10")  | <input type="checkbox"/> Cobble (2.5-10")             |
| <input checked="" type="checkbox"/> Gravel (0.1-2.5") | <input checked="" type="checkbox"/> Gravel (0.1-2.5") | <input checked="" type="checkbox"/> Gravel (0.1-2.5") |
| <input type="checkbox"/> Bedrock                      | <input checked="" type="checkbox"/> Bedrock           | <input checked="" type="checkbox"/> Bedrock           |
| <input type="checkbox"/> Sand                         | <input type="checkbox"/> Sand                         | <input type="checkbox"/> Sand                         |
| <input type="checkbox"/> Silt (not gritty)            | <input type="checkbox"/> Silt (not gritty)            | <input type="checkbox"/> Silt (not gritty)            |
| <input type="checkbox"/> Clay (Slick)                 | <input type="checkbox"/> Clay (Slick)                 | <input type="checkbox"/> Clay (Slick)                 |

**Surrounding Land Uses** (list additional land uses under comments)

- |  |                                     |                                      |  |                                       |
|--|-------------------------------------|--------------------------------------|--|---------------------------------------|
| <input checked="" type="checkbox"/> Forest     | <input type="checkbox"/> Grazing    | <input type="checkbox"/> Stormwater  | <input checked="" type="checkbox"/> STP/WWTP | <input type="checkbox"/> Construction |
| <input type="checkbox"/> Wetland               | <input type="checkbox"/> Row Crops  | <input type="checkbox"/> Urban       | <input type="checkbox"/> Industry            | <input type="checkbox"/> Impoundment  |
| <input type="checkbox"/> Park                  | <input type="checkbox"/> CAFO/Dairy | <input type="checkbox"/> Commercial  | <input type="checkbox"/> Mining/Dredging     | <input type="checkbox"/> ATV/OHV      |
| <input checked="" type="checkbox"/> Hay/Fields | <input type="checkbox"/> Logging    | <input type="checkbox"/> Residential | <input type="checkbox"/> Road/Hwy/RR         | <input type="checkbox"/> Golf Course  |

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

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

**Other Stream Information and Stressors:**

WWTP UpHill From Site, No Real  
Impacts over all

**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.



## HABITAT ASSESSMENT FIELD DATA SHEET – MODERATE TO HIGH GRADIENT STREAM (FRONT)

(Refer to Protocol E for detailed descriptions and rank information)

|   |  |  |    |    |    |    |   |    |    |    |                   |  |                 |   |   |   |   |   |             |   |  |  |  |  |
|---|--|--|----|----|----|----|---|----|----|----|-------------------|--|-----------------|---|---|---|---|---|-------------|---|--|--|--|--|
| <b>PROJECT:</b> Springs Field Reaches 154       |  | <b>HABITAT ASSESSED BY:</b> G. OLIVE   |    |    |    |    |   |    |    |    |                   |  |                 |   |   |   |   |   |             |   |  |  |  |  |
| <b>STA:</b> SLIPHO 23.3RN                       |  | <b>DATE:</b> 6/21/21   |    |    |    |    |   |    |    |    | <b>TIME:</b> 9:40 |  |                 |   |   |   |   |   |             |   |  |  |  |  |
| <b>STREAM NAME:</b> Slipho Run                  |  | <b>ECOREGION:</b> 71e  |    |    |    |    |   |    |    |    |                   |  |                 |   |   |   |   |   |             |   |  |  |  |  |
| <b>MAP LABEL:</b> Slipho Run (4000)             |  | <b>QC:</b> Consensus / Duplicate   |    |    |    |    |   |    |    |    |                   |  |                 |   |   |   |   |   |             |   |  |  |  |  |
| <b>HUC:</b> 05130206                            |  |  |    |    |    |    |   |    |    |    |                   |  |                 |   |   |   |   |   |             |   |  |  |  |  |
| <b>1. Epifaunal Substrate / Available Cover</b> | <b>OPTIMAL</b>   |  |    |    |    |    | <b>SUBOPTIMAL</b>   |    |    |    |                   |  | <b>MARGINAL</b> |   |   |   |   |   | <b>POOR</b> |   |  |  |  |  |
|   | 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.   |                 |   |   |   |   |   |             |   |  |  |  |  |
| <b>SCORE</b> 15                                 | 20   | 19   | 18 | 17 | 16 | 15 | 14  | 13 | 12 | 11 | 10                | 9  | 8               | 7 | 6 | 5 | 4 | 3 | 2           | 1 |  |  |  |  |
| Comments:                                       |  |  |    |    |    |    |   |    |    |    |                   |  |                 |   |   |   |   |   |             |   |  |  |  |  |
| <b>2. Embeddedness of Riffles</b>               | <b>OPTIMAL</b>   |  |    |    |    |    | <b>SUBOPTIMAL</b>   |    |    |    |                   |  | <b>MARGINAL</b> |   |   |   |   |   | <b>POOR</b> |   |  |  |  |  |
|   | 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 boulders 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.                                       |                 |   |   |   |   |   |             |   |  |  |  |  |
| <b>SCORE</b> 15                                 | 20   | 19   | 18 | 17 | 16 | 15 | 14  | 13 | 12 | 11 | 10                | 9  | 8               | 7 | 6 | 5 | 4 | 3 | 2           | 1 |  |  |  |  |
| Comments:                                       |  |  |    |    |    |    |   |    |    |    |                   |  |                 |   |   |   |   |   |             |   |  |  |  |  |
| <b>3. Velocity/ Depth Regime</b>                | <b>OPTIMAL</b>   |  |    |    |    |    | <b>SUBOPTIMAL</b>   |    |    |    |                   |  | <b>MARGINAL</b> |   |   |   |   |   | <b>POOR</b> |   |  |  |  |  |
|   | 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.   |                 |   |   |   |   |   |             |   |  |  |  |  |
| <b>SCORE</b> 18                                 | 20   | 19   | 18 | 17 | 16 | 15 | 14  | 13 | 12 | 11 | 10                | 9  | 8               | 7 | 6 | 5 | 4 | 3 | 2           | 1 |  |  |  |  |
| Comments:                                       |  |  |    |    |    |    |   |    |    |    |                   |  |                 |   |   |   |   |   |             |   |  |  |  |  |
| <b>4. Sediment Deposition</b>                   | <b>OPTIMAL</b>   |  |    |    |    |    | <b>SUBOPTIMAL</b>   |    |    |    |                   |  | <b>MARGINAL</b> |   |   |   |   |   | <b>POOR</b> |   |  |  |  |  |
|   | 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. |                 |   |   |   |   |   |             |   |  |  |  |  |
| <b>SCORE</b> 16                                 | 20   | 19   | 18 | 17 | 16 | 15 | 14  | 13 | 12 | 11 | 10                | 9  | 8               | 7 | 6 | 5 | 4 | 3 | 2           | 1 |  |  |  |  |
| Comments:                                       |  |  |    |    |    |    |   |    |    |    |                   |  |                 |   |   |   |   |   |             |   |  |  |  |  |
| <b>5. Channel Flow Status</b>                   | <b>OPTIMAL</b>   |  |    |    |    |    | <b>SUBOPTIMAL</b>   |    |    |    |                   |  | <b>MARGINAL</b> |   |   |   |   |   | <b>POOR</b> |   |  |  |  |  |
|   | 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.   |                 |   |   |   |   |   |             |   |  |  |  |  |
| <b>SCORE</b> 20                                 | 20   | 19   | 18 | 17 | 16 | 15 | 14  | 13 | 12 | 11 | 10                | 9  | 8               | 7 | 6 | 5 | 4 | 3 | 2           | 1 |  |  |  |  |
| Comments:                                       |  |  |    |    |    |    |   |    |    |    |                   |  |                 |   |   |   |   |   |             |   |  |  |  |  |

### HABITAT ASSESSMENT FIELD DATA SHEET – MODERATE TO HIGH GRADIENT STREAM (BACK)

| MAP LABEL:  |   | DATE:   |    |    |    |    |   |    |    |                    |    | ASSESSOR INITIALS: |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
|---|---|---|----|----|----|----|---|----|----|--------------------|----|--------------------|---|---|---|---|-------------|---|---|-------------------|--|--|--|--|--|--|--|--|--|
| <b>6. Channel Alteration</b>  | <b>OPTIMAL</b>  | 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. |    |    |    |    | <b>SUBOPTIMAL</b>   |    |    |                    |    | <b>MARGINAL</b>    |   |   |   |   | <b>POOR</b> |   |   |                   |  |  |  |  |  |  |  |  |  |
|   | 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. In-stream habitat greatly altered or removed. Artificial structures have greatly affected flow pattern.                     |    |    |                    |    |                    |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| <b>SCORE</b> 16   | 20  | 19  | 18 | 17 | 16 | 15 | 14  | 13 | 12 | 11                 | 10 | 9                  | 8 | 7 | 6 | 5 | 4           | 3 | 2 | 1                 |  |  |  |  |  |  |  |  |  |
| Comments:   |   |   |    |    |    |    |   |    |    |                    |    |                    |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| <b>7. Frequency of re-oxygenation zones.</b><br>Use frequency of riffles or bends for category. Rank by quality.  | <b>OPTIMAL</b>  | Occurrence of re-oxygenation zones relatively frequent: ratio of distance between areas divided by average stream width <7:1.   |    |    |    |    | <b>SUBOPTIMAL</b>   |    |    |                    |    | <b>MARGINAL</b>    |   |   |   |   | <b>POOR</b> |   |   |                   |  |  |  |  |  |  |  |  |  |
|   | 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.  |    |    |                    |    |                    |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| <b>SCORE</b> 11   | 20  | 19  | 18 | 17 | 16 | 15 | 14  | 13 | 12 | 11                 | 10 | 9                  | 8 | 7 | 6 | 5 | 4           | 3 | 2 | 1                 |  |  |  |  |  |  |  |  |  |
| Comments:   |   |   |    |    |    |    |   |    |    |                    |    |                    |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| <b>8. Bank Stability (score each bank)</b><br>Determine left or right side by facing downstream.  | <b>OPTIMAL</b>  | Banks stable: evidence of erosion or bank failure absent or minimal: little potential for future problems <5% of bank affected.   |    |    |    |    | <b>SUBOPTIMAL</b>   |    |    |                    |    | <b>MARGINAL</b>    |   |   |   |   | <b>POOR</b> |   |   |                   |  |  |  |  |  |  |  |  |  |
|   | 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.  |    |    |                    |    |                    |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| <b>SCORE (LDB)</b> 5  | LEFT  | 10  | 9  | 8  | 7  | 6  | 5   | 4  | 3  | 2                  | 1  | 0                  |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| <b>SCORE (RDB)</b> 7  | RIGHT   | 10  | 9  | 8  | 7  | 6  | 5   | 4  | 3  | 2                  | 1  | 0                  |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| Comments:   |   |   |    |    |    |    |   |    |    |                    |    |                    |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| <b>9. Bank Vegetative Protection</b> (score each bank) include vegetation from top of bank to base of bank. Determine left or right side by facing downstream | <b>OPTIMAL</b>  | 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.            |    |    |    |    | <b>SUBOPTIMAL</b>   |    |    |                    |    | <b>MARGINAL</b>    |   |   |   |   | <b>POOR</b> |   |   |                   |  |  |  |  |  |  |  |  |  |
|   | 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 banks 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%). |    |    |                    |    |                    |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| <b>SCORE (LDB)</b> 4  | LEFT  | 10  | 9  | 8  | 7  | 6  | 5   | 4  | 3  | 2                  | 1  | 0                  |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| <b>SCORE (RDB)</b> 9  | RIGHT   | 10  | 9  | 8  | 7  | 6  | 5   | 4  | 3  | 2                  | 1  | 0                  |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| Comments:   |   |   |    |    |    |    |   |    |    |                    |    |                    |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| <b>10. Riparian Vegetative Zone Width</b> (score each bank.) Zone begins at top of bank   | <b>OPTIMAL</b>  | Average width of riparian zone > 18 meters. Unpaved footpaths may score 9 if runoff potential is negligible.  |    |    |    |    | <b>SUBOPTIMAL</b>   |    |    |                    |    | <b>MARGINAL</b>    |   |   |   |   | <b>POOR</b> |   |   |                   |  |  |  |  |  |  |  |  |  |
|   | 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.  |    |    |                    |    |                    |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| <b>SCORE (LDB)</b> 5  | LEFT  | 10  | 9  | 8  | 7  | 6  | 5   | 4  | 3  | 2                  | 1  | 0                  |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| <b>SCORE (RDB)</b> 10   | RIGHT   | 10  | 9  | 8  | 7  | 6  | 5   | 4  | 3  | 2                  | 1  | 0                  |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| Comments:   |   |   |    |    |    |    |   |    |    |                    |    |                    |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| <b>TOTAL SCORE</b> 0 131  |   | Comparison to Ecoregion Guidelines (circle): ABOVE or BELOW   |    |    |    |    |   |    |    |                    |    |                    |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |
| If score is below guidelines, result of (circle)  |   |   |    |    |    |    |   |    |    | Natural Conditions |    |                    |   |   |   |   |             |   |   | Human Disturbance |  |  |  |  |  |  |  |  |  |
| Comments:   |   |   |    |    |    |    |   |    |    |                    |    |                    |   |   |   |   |             |   |   |                   |  |  |  |  |  |  |  |  |  |

**STREAM SURVEY INFORMATION**

|  |                                      |                             |
|--|--------------------------------------|-----------------------------|
| DWR Station ID: <u>50161023ZEN</u>           | Samplers: <u>Boone, J. Williford</u> |                             |
| Monitoring Location Name: <u>Springfield</u> | Date: <u>6/21/21</u>                 | Time: <u>10:45</u>          |
| Monitoring Location: <u>Springfield</u>      | Organization: <u>CEC</u>             | Drainage Area: <u>87.23</u> |
| County: <u>Robertson</u>                     | Ecoregion: <u>71c</u>                | u/s ECO: <u>-</u>           |
| Latitude: <u>36.50629</u>                    | HUC: <u>05130206</u>                 | WS Grp: <u>-</u>            |
| Longitude: <u>-86.94375</u>                  | WBID: <u>-</u>                       | Field Log #: <u>-</u>       |

Project Name:  Watershed  303(d)  Antideg  ECO  FECO Other: US4

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 |                                     |               | Periphyton             |            |         |
| SQKICK   | <input checked="" type="checkbox"/> | <u>SQKICK</u> | Other                  |            |         |
| SQBANK   |                                     |               | Describe Other Sample: |            |         |

Chemicals/Bacteria:  None  Routine  Nutrient  Metals  E. coli  Organics  Other \_\_\_\_\_

Field Parameters: Meter(s) Used: YSI

|                               |              |                    |              |
|-------------------------------|--------------|--------------------|--------------|
| pH (su)                       | <u>7.89</u>  | Dissolved Oxygen % | <u>102.5</u> |
| Conductivity (umhos)          | <u>940.2</u> | Turbidity (NTU)    | <u>-</u>     |
| Temperature (C°)              | <u>24.8</u>  | TDS (mg/L)         | <u>-</u>     |
| Dissolved Oxygen (ppm = mg/L) | <u>8.5</u>   | Flow (cfs)         |              |

Meter Problems? None

Photos Taken?  No  Yes: Description: DS LUS

Previous 48 hours precipitation:  Unknown  None  Slight  Moderate  Heavy  Flooding

Air Temperature (°F) 80

**Physical Characteristics & Light Penetration:**

|  |
|--|
| Gradient (sample reach): <input type="checkbox"/> Flat <input type="checkbox"/> Low <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> High <input type="checkbox"/> Cascades   |
| Average Stream Width: <input type="checkbox"/> Very Small (<1.5yd) <input type="checkbox"/> Small (1.5-3yd) <input type="checkbox"/> Med. (3-10yd) <input checked="" type="checkbox"/> Large (10-25yd) <input type="checkbox"/> Very Large (>25yd) |
| Maximum Stream Depth: <input type="checkbox"/> Shallow (<0.3yd) <input type="checkbox"/> Medium (0.3-0.6yd) <input checked="" type="checkbox"/> Deep (0.6 - 1yd) <input type="checkbox"/> Very Deep(>1yd)  |
| % Canopy Cover Estimated for Reach: <u>10</u> %  |
| % Canopy Cover Measured (mid-reach): <u>10</u> u/s + <u>0</u> d/s + <u>10</u> LDB + <u>10</u> RDB = Total/384*100  |

**Channel Characteristics:**

|   |
|---|
| Bank Height: <u>3</u> (yd.) High Water Mark: <u>3</u> (yd.)   |
| Bank Slope LDB: <input type="checkbox"/> Deeply incised <input checked="" type="checkbox"/> Bluff/Wall <input type="checkbox"/> Undercut <input type="checkbox"/> Sloughing <input type="checkbox"/> Steep terrain <input type="checkbox"/> Gentle Slope  |
| Bank Slope RDB: <input type="checkbox"/> Deeply incised <input type="checkbox"/> Bluff/Wall <input type="checkbox"/> Undercut <input type="checkbox"/> Sloughing <input type="checkbox"/> Steep terrain <input checked="" type="checkbox"/> Gentle Slope  |
| Manmade Modification: <input checked="" type="checkbox"/> None <input type="checkbox"/> Rip-Rap <input type="checkbox"/> Cement <input type="checkbox"/> Gabions <input type="checkbox"/> Channelized <input type="checkbox"/> Dam <input type="checkbox"/> Dredging <input type="checkbox"/> Bridge <input type="checkbox"/> ATV |

**Stream Characteristics:**

|   |
|---|
| Sediment Deposits: <input type="checkbox"/> None <input checked="" type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Excessive <input type="checkbox"/> Blanket   |
| Sediment Type: <input type="checkbox"/> None <input type="checkbox"/> Sand <input checked="" type="checkbox"/> Silt <input type="checkbox"/> Mud <input type="checkbox"/> Clay <input type="checkbox"/> Sludge <input type="checkbox"/> Mn Precipitant <input type="checkbox"/> Orange Flocculent                               |
| Turbidity: <input type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly Turbid <input type="checkbox"/> Muddy <input type="checkbox"/> Milky <input type="checkbox"/> Tannic <input type="checkbox"/> Planktonic Algae <input type="checkbox"/> Dyed   |
| Foam/Surface Sheen: <input type="checkbox"/> None <input type="checkbox"/> Nutrient <input type="checkbox"/> Surfactant <input type="checkbox"/> Bacteria   |
| Algae: <input checked="" type="checkbox"/> None <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> High <input type="checkbox"/> Choking Type: <input type="checkbox"/> Diatoms <input type="checkbox"/> Green <input type="checkbox"/> Filamentous <input type="checkbox"/> Blue-green |

**TDEC-DWR Stream Survey Field Sheet (Back)**

DWR Station ID: SULPH023-2RN Date: 6/21/21 Assessors: C. Dute

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

- | Riffle  | Run   | Pool  |
|---|---|---|
| <input type="checkbox"/> Boulders (>10")              | <input type="checkbox"/> Boulders (>10")              | <input type="checkbox"/> Boulders (>10")              |
| <input checked="" type="checkbox"/> Cobble (2.5-10")  | <input checked="" type="checkbox"/> Cobble (2.5-10")  | <input type="checkbox"/> Cobble (2.5-10")             |
| <input checked="" type="checkbox"/> Gravel (0.1-2.5") | <input checked="" type="checkbox"/> Gravel (0.1-2.5") | <input checked="" type="checkbox"/> Gravel (0.1-2.5") |
| <input type="checkbox"/> Bedrock                      | <input checked="" type="checkbox"/> Bedrock           | <input checked="" type="checkbox"/> Bedrock           |
| <input type="checkbox"/> Sand                         | <input type="checkbox"/> Sand                         | <input type="checkbox"/> Sand                         |
| <input type="checkbox"/> Silt (not gritty)            | <input type="checkbox"/> Silt (not gritty)            | <input type="checkbox"/> Silt (not gritty)            |
| <input type="checkbox"/> Clay (Slick)                 | <input type="checkbox"/> Clay (Slick)                 | <input type="checkbox"/> Clay (Slick)                 |

**Surrounding Land Uses** (list additional land uses under comments)

- |  |                                     |                                      |  |                                       |
|--|-------------------------------------|--------------------------------------|--|---------------------------------------|
| <input checked="" type="checkbox"/> Forest     | <input type="checkbox"/> Grazing    | <input type="checkbox"/> Stormwater  | <input checked="" type="checkbox"/> STP/WWTP | <input type="checkbox"/> Construction |
| <input type="checkbox"/> Wetland               | <input type="checkbox"/> Row Crops  | <input type="checkbox"/> Urban       | <input type="checkbox"/> Industry            | <input type="checkbox"/> Impoundment  |
| <input type="checkbox"/> Park                  | <input type="checkbox"/> CAFO/Dairy | <input type="checkbox"/> Commercial  | <input type="checkbox"/> Mining/Dredging     | <input type="checkbox"/> ATV/OHV      |
| <input checked="" type="checkbox"/> Hay/Fields | <input type="checkbox"/> Logging    | <input type="checkbox"/> Residential | <input type="checkbox"/> Road/Hwy/RR         | <input type="checkbox"/> Golf Course  |

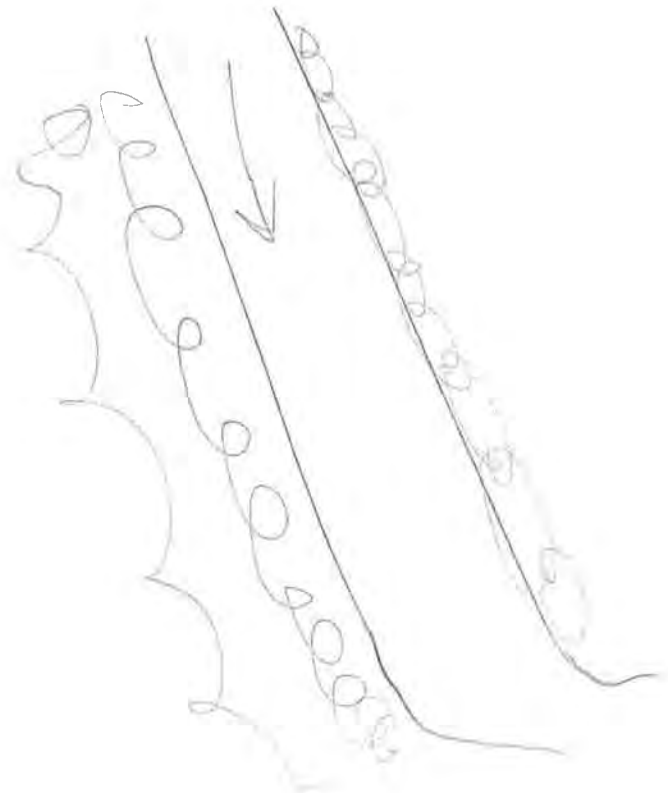
**Observed Human Disturbance to Stream:** Blank (not observed) S (Slight) M (Moderate) H (High)

|                |   |             |   |                  |  |                  |  |
|----------------|---|-------------|---|------------------|--|------------------|--|
| Riparian Loss  | S | Logging     |   | Industry         |  | ATV/OHV          |  |
| Channelization |   | Urban       |   | Mining/ Dredging |  | Golf Course      |  |
| Active Grazing |   | Commercial  |   | Road/Hwy/RR      |  | Garbage/Trash    |  |
| Row Crops      |   | Residential |   | Construction     |  | Landfill         |  |
| CAFO/Dairy     |   | STP/WWTP    | S | Impoundment      |  | 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.

| STN  | dist | flow |
|------|------|------|
| 0.0  | 0.0  | 0.0  |
| 3.0  | 0.25 | 0.0  |
| 6.0  | 1.0  | 0.1  |
| 10.0 | 1.05 | 0.07 |
| 13.0 | .95  | 1.35 |
| 16.0 | .65  | 2.59 |
| 20.0 | .60  | 3.52 |
| 24.0 | .70  | 3.22 |
| 28.0 | .70  | 4.13 |
| 32.0 | .80  | 4.30 |
| 36.0 | .85  | 4.15 |
| 40.0 | .75  | 3.41 |
| 44.0 | .25  | 1.40 |
| 48.0 | .1   | .05  |
| 50.0 | 0.0  | 0.0  |



# HABITAT ASSESSMENT FIELD DATA SHEET – MODERATE TO HIGH GRADIENT STREAM (FRONT)

(Refer to Protocol E for detailed descriptions and rank information)

|   |  |  |    |    |    |    |  |    |    |   |    |   |   |   |                    |   |  |   |   |   |   |
|---|--|--|----|----|----|----|--|----|----|---|----|---|---|---|--------------------|---|--|---|---|---|---|
| <b>PROJECT:</b> Springford Branch MSU           |  |  |    |    |    |    |  |    |    |   |    |   |   |   |                    |   |  |   |   |   |   |
| <b>STA:</b> S11023.27V                          |  |  |    |    |    |    |  |    |    | <b>HABITAT ASSESSED BY:</b> C. D. M. U. |    |   |   |   |                    |   |  |   |   |   |   |
| <b>STREAM NAME:</b> Springford                  |  |  |    |    |    |    |  |    |    | <b>DATE:</b> 7/21/21                    |    |   |   |   | <b>TIME:</b> 10:25 |   |  |   |   |   |   |
| <b>MAP LABEL:</b> S11023.27V                    |  |  |    |    |    |    |  |    |    | <b>ECOREGION:</b> 71e                   |    |   |   |   |                    |   |  |   |   |   |   |
| <b>HUC:</b> 08130206                            |  |  |    |    |    |    |  |    |    | <b>QC: Consensus / Duplicate</b>        |    |   |   |   |                    |   |  |   |   |   |   |
|   |  | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |   |    | <b>MARGINAL</b>   |   |   |                    |   | <b>POOR</b>  |   |   |   |   |
| <b>1. Epifaunal Substrate / Available Cover</b> |  | 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.   |   |   |   |   |
| <b>SCORE</b> 11                                 |  | 20   | 19 | 18 | 17 | 16 | 15   | 14 | 13 | 12                                      | 11 | 10  | 9 | 8 | 7                  | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |  |    |    |   |    |   |   |   |                    |   |  |   |   |   |   |
|   |  | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |   |    | <b>MARGINAL</b>   |   |   |                    |   | <b>POOR</b>  |   |   |   |   |
| <b>2. Embeddedness of Riffles</b>               |  | 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 boulders 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.                                       |   |   |   |   |
| <b>SCORE</b> 10                                 |  | 20   | 19 | 18 | 17 | 16 | 15   | 14 | 13 | 12                                      | 11 | 10  | 9 | 8 | 7                  | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |  |    |    |   |    |   |   |   |                    |   |  |   |   |   |   |
|   |  | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |   |    | <b>MARGINAL</b>   |   |   |                    |   | <b>POOR</b>  |   |   |   |   |
| <b>3. Velocity/ Depth Regime</b>                |  | 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.   |   |   |   |   |
| <b>SCORE</b> 17                                 |  | 20   | 19 | 18 | 17 | 16 | 15   | 14 | 13 | 12                                      | 11 | 10  | 9 | 8 | 7                  | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |  |    |    |   |    |   |   |   |                    |   |  |   |   |   |   |
|   |  | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |   |    | <b>MARGINAL</b>   |   |   |                    |   | <b>POOR</b>  |   |   |   |   |
| <b>4. Sediment Deposition</b>                   |  | 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. |   |   |   |   |
| <b>SCORE</b> 16                                 |  | 20   | 19 | 18 | 17 | 16 | 15   | 14 | 13 | 12                                      | 11 | 10  | 9 | 8 | 7                  | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |  |    |    |   |    |   |   |   |                    |   |  |   |   |   |   |
|   |  | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |   |    | <b>MARGINAL</b>   |   |   |                    |   | <b>POOR</b>  |   |   |   |   |
| <b>5. Channel Flow Status</b>                   |  | 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.   |   |   |   |   |
| <b>SCORE</b> 20                                 |  | 20   | 19 | 18 | 17 | 16 | 15   | 14 | 13 | 12                                      | 11 | 10  | 9 | 8 | 7                  | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |  |    |    |   |    |   |   |   |                    |   |  |   |   |   |   |

**HABITAT ASSESSMENT FIELD DATA SHEET – MODERATE TO HIGH GRADIENT STREAM (BACK)**

|   |   |    |    |   |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |  |
|---|---|----|----|---|---|----|----|----|---------------------------|--|----|-------------------|---|---|---|---|---|---|---|---|--|
| <b>MAP LABEL:</b>   |   |    |    | <b>DATE:</b>  |   |    |    |    | <b>ASSESSOR INITIALS:</b> |  |    |                   |   |   |   |   |   |   |   |   |  |
|   | <b>OPTIMAL</b>  |    |    |   | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |                   |   |   | <b>POOR</b>   |   |   |   |   |   |  |
| <b>6. Channel Alteration</b>  | 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. In-stream habitat greatly altered or removed. Artificial structures have greatly affected flow pattern.                     |   |   |   |   |   |  |
| <b>SCORE</b> 16   | 20  | 19 | 18 | 17  | 16  | 15 | 14 | 13 | 12                        | 11   | 10 | 9                 | 8 | 7 | 6   | 5 | 4 | 3 | 2 | 1 |  |
| Comments:   |   |    |    |   |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |  |
|   | <b>OPTIMAL</b>  |    |    |   | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |                   |   |   | <b>POOR</b>   |   |   |   |   |   |  |
| <b>7. Frequency of re-oxygenation zones.</b><br>Use frequency of riffles 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.  |   |   |   |   |   |  |
| <b>SCORE</b> 16   | 20  | 19 | 18 | 17  | 16  | 15 | 14 | 13 | 12                        | 11   | 10 | 9                 | 8 | 7 | 6   | 5 | 4 | 3 | 2 | 1 |  |
| Comments:   |   |    |    |   |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |  |
|   | <b>OPTIMAL</b>  |    |    |   | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |                   |   |   | <b>POOR</b>   |   |   |   |   |   |  |
| <b>8. Bank Stability (score each bank)</b><br>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.  |   |   |   |   |   |  |
| <b>SCORE (LDB)</b> 2  | LEFT  | 10 | 9  |   | 8   | 7  | 6  |    |                           |  | 5  | 4                 | 3 |   |   |   | 2 | 1 | 0 |   |  |
| <b>SCORE (RDB)</b> 9  | RIGHT   | 10 | 9  |   | 8   | 7  | 6  |    |                           |  | 5  | 4                 | 3 |   |   |   | 2 | 1 | 0 |   |  |
| Comments:   |   |    |    |   |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |  |
|   | <b>OPTIMAL</b>  |    |    |   | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |                   |   |   | <b>POOR</b>   |   |   |   |   |   |  |
| <b>9. Bank Vegetative Protection</b> (score each bank) include 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 banks 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%). |   |   |   |   |   |  |
| <b>SCORE (LDB)</b> 4  | LEFT  | 10 | 9  |   | 8   | 7  | 6  |    |                           |  | 5  | 4                 | 3 |   |   |   | 2 | 1 | 0 |   |  |
| <b>SCORE (RDB)</b> 9  | RIGHT   | 10 | 9  |   | 8   | 7  | 6  |    |                           |  | 5  | 4                 | 3 |   |   |   | 2 | 1 | 0 |   |  |
| Comments:   |   |    |    |   |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |  |
|   | <b>OPTIMAL</b>  |    |    |   | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |                   |   |   | <b>POOR</b>   |   |   |   |   |   |  |
| <b>10. Riparian Vegetative Zone Width</b> (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.  |   |   |   |   |   |  |
| <b>SCORE (LDB)</b> 1  | LEFT  | 10 | 9  |   | 8   | 7  | 6  |    |                           |  | 5  | 4                 | 3 |   |   |   | 2 | 1 | 0 |   |  |
| <b>SCORE (RDB)</b> 9  | RIGHT   | 10 | 9  |   | 8   | 7  | 6  |    |                           |  | 5  | 4                 | 3 |   |   |   | 2 | 1 | 0 |   |  |
| Comments:   |   |    |    |   |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |  |
| <b>TOTAL SCORE</b> 0 140  |   |    |    | Comparison to Ecoregion Guidelines (circle): ABOVE or BELOW |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |  |
| If score is below guidelines, result of (circle)  |   |    |    | Natural Conditions  |   |    |    |    |                           |  |    | Human Disturbance |   |   |   |   |   |   |   |   |  |
| Comments:   |   |    |    |   |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |  |

**STREAM SURVEY INFORMATION**

|  |                                    |                             |
|--|------------------------------------|-----------------------------|
| DWR Station ID: <u>CARR ODS, 2RN</u>   | Samplers: <u>C. Deke, J. White</u> |                             |
| Monitoring Location Name: <u>Carr Creek 1350</u>   | Date: <u>6/22/12</u>               | Time: <u>11:40</u>          |
| Monitoring Location: <u>Springfield</u>  | Organization: <u>CEC</u>           | Drainage Area: <u>18.77</u> |
| County: <u>Polk</u>  | Ecoregion: <u>71c</u>              | u/s ECO: <u>-</u>           |
| Latitude: <u>36.46842</u>  | HUC: <u>05130206</u>               | WS Grp: <u>-</u>            |
| Longitude: <u>-86.89161</u>  | WBID: <u>-</u>                     | Field Log #: <u>-</u>       |
| Project Name: <input type="checkbox"/> Watershed <input type="checkbox"/> 303(d) <input type="checkbox"/> Antideg <input type="checkbox"/> ECO <input type="checkbox"/> FECO Other: <u>M54</u> |                                    |                             |

Project ID: TNPR

Activity Type:  Sample  QC Sample  Habitat  QC habitat  QC ID

|   |
|---|
| Sample Status: <input checked="" type="checkbox"/> Collected <input type="checkbox"/> Seasonally Dry <input type="checkbox"/> Frequently Dry <input type="checkbox"/> No Channel  |
| <input type="checkbox"/> Too Deep (Not Wadeable) <input type="checkbox"/> Too Deep (Temporary) <input type="checkbox"/> Permanent Barrier <input type="checkbox"/> Fenced   |
| <input type="checkbox"/> Landowner Denial: <input type="checkbox"/> Temporary Barrier <input type="checkbox"/> Posted Plan to revisit? <input type="checkbox"/> Yes <input type="checkbox"/> No   |
| Flow Conditions: <input type="checkbox"/> Dry <input type="checkbox"/> Isolated Pools <input type="checkbox"/> Stagnant <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High <input type="checkbox"/> Bankful <input type="checkbox"/> Flooding |

| Sample   | Collected? | Comment          | Sample                 | Collected? | Comment |
|----------|------------|------------------|------------------------|------------|---------|
| Biorecon |            |                  | Periphyton             |            |         |
| SQKICK   | <u>✓</u>   | <u>Collected</u> | Other                  |            |         |
| SQBANK   |            |                  | Describe Other Sample: |            |         |

Chemicals/Bacteria:  None  Routine  Nutrient  Metals  E. coli  Organics  Other \_\_\_\_\_

Field Parameters: Meter(s) Used: YES

|                               |              |                    |              |
|-------------------------------|--------------|--------------------|--------------|
| pH (su)                       | <u>7.97</u>  | Dissolved Oxygen % | <u>103.6</u> |
| Conductivity (umhos)          | <u>350.5</u> | Turbidity (NTU)    |              |
| Temperature (C°)              | <u>22.9</u>  | TDS (mg/L)         |              |
| Dissolved Oxygen (ppm = mg/L) | <u>8.92</u>  | Flow (cfs)         |              |

Meter Problems? No

Photos Taken?  No  Yes: Description: DS 145

Previous 48 hours precipitation:  Unknown  None  Slight  Moderate  Heavy  Flooding

Air Temperature (°F) 70

**Physical Characteristics & Light Penetration:**

|  |
|--|
| Gradient (sample reach): <input type="checkbox"/> Flat <input type="checkbox"/> Low <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> High <input type="checkbox"/> Cascades   |
| Average Stream Width: <input type="checkbox"/> Very Small (<1.5yd) <input type="checkbox"/> Small (1.5-3yd) <input type="checkbox"/> Med. (3-10yd) <input checked="" type="checkbox"/> Large (10-25yd) <input type="checkbox"/> Very Large (>25yd) |
| Maximum Stream Depth: <input type="checkbox"/> Shallow (<0.3yd) <input type="checkbox"/> Medium (0.3-0.6yd) <input checked="" type="checkbox"/> Deep (0.6 - 1yd) <input type="checkbox"/> Very Deep (>1yd)   |
| % Canopy Cover Estimated for Reach: <u>80</u> %  |
| % Canopy Cover Measured (mid-reach): <u>85</u> u/s + <u>15</u> d/s + <u>85</u> LDB + <u>90</u> RDB = Total/384*100   |

**Channel Characteristics:**

|   |
|---|
| Bank Height: <u>3.4</u> (yd.) High Water Mark: <u>2.5</u> (yd.)   |
| Bank Slope LDB: <input type="checkbox"/> Deeply incised <input type="checkbox"/> Bluff/Wall <input type="checkbox"/> Undercut <input type="checkbox"/> Sloughing <input type="checkbox"/> Steep terrain <input checked="" type="checkbox"/> Gentle Slope  |
| Bank Slope RDB: <input type="checkbox"/> Deeply incised <input type="checkbox"/> Bluff/Wall <input type="checkbox"/> Undercut <input type="checkbox"/> Sloughing <input type="checkbox"/> Steep terrain <input checked="" type="checkbox"/> Gentle Slope  |
| Manmade Modification: <input type="checkbox"/> None <input type="checkbox"/> Rip-Rap <input type="checkbox"/> Cement <input type="checkbox"/> Gabions <input type="checkbox"/> Channelized <input type="checkbox"/> Dam <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Bridge <input type="checkbox"/> ATV |

**Stream Characteristics:**

|  |
|--|
| Sediment Deposits: <input type="checkbox"/> None <input checked="" type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Excessive <input type="checkbox"/> Blanket  |
| Sediment Type: <input type="checkbox"/> None <input type="checkbox"/> Sand <input checked="" type="checkbox"/> Silt <input type="checkbox"/> Mud <input type="checkbox"/> Clay <input type="checkbox"/> Sludge <input type="checkbox"/> Mn Precipitant <input type="checkbox"/> Orange Flocculent                    |
| Turbidity: <input type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly Turbid <input type="checkbox"/> Muddy <input type="checkbox"/> Milky <input type="checkbox"/> Tannic <input type="checkbox"/> Planktonic Algae <input type="checkbox"/> Dyed  |
| Foam/Surface Sheen: <input checked="" type="checkbox"/> None <input type="checkbox"/> Nutrient <input type="checkbox"/> Surfactant <input type="checkbox"/> Bacteria   |
| Algae: <input type="checkbox"/> None <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> High <input type="checkbox"/> Choking Type: <input type="checkbox"/> Diatoms <input type="checkbox"/> Green <input type="checkbox"/> Filamentous <input type="checkbox"/> Blue-green |

**TDEC-DWR Stream Survey Field Sheet (Back)**

DWR Station ID: CARPOOVS-2RW Date: 8/22/21 Assessors: C. Dume

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

- | Riffle  | Run   | Pool  |
|---|---|---|
| <input type="checkbox"/> Boulders (>10")              | <input type="checkbox"/> Boulders (>10")              | <input type="checkbox"/> Boulders (>10")              |
| <input checked="" type="checkbox"/> Cobble (2.5-10")  | <input type="checkbox"/> Cobble (2.5-10")             | <input type="checkbox"/> Cobble (2.5-10")             |
| <input checked="" type="checkbox"/> Gravel (0.1-2.5") | <input checked="" type="checkbox"/> Gravel (0.1-2.5") | <input checked="" type="checkbox"/> Gravel (0.1-2.5") |
| <input type="checkbox"/> Bedrock                      | <input checked="" type="checkbox"/> Bedrock           | <input checked="" type="checkbox"/> Bedrock           |
| <input type="checkbox"/> Sand                         | <input type="checkbox"/> Sand                         | <input type="checkbox"/> Sand                         |
| <input checked="" type="checkbox"/> Silt (not gritty) | <input checked="" type="checkbox"/> Silt (not gritty) | <input type="checkbox"/> Silt (not gritty)            |
| <input type="checkbox"/> Clay (Slick)                 | <input type="checkbox"/> Clay (Slick)                 | <input type="checkbox"/> Clay (Slick)                 |

**Surrounding Land Uses** (list additional land uses under comments)

- |  |                                     |                                      |   |                                       |
|--|-------------------------------------|--------------------------------------|---|---------------------------------------|
| <input checked="" type="checkbox"/> Forest | <input type="checkbox"/> Grazing    | <input type="checkbox"/> Stormwater  | <input type="checkbox"/> STP/WWTP               | <input type="checkbox"/> Construction |
| <input type="checkbox"/> Wetland           | <input type="checkbox"/> Row Crops  | <input type="checkbox"/> Urban       | <input type="checkbox"/> Industry               | <input type="checkbox"/> Impoundment  |
| <input type="checkbox"/> Park              | <input type="checkbox"/> CAFO/Dairy | <input type="checkbox"/> Commercial  | <input type="checkbox"/> Mining/Dredging        | <input type="checkbox"/> ATV/OHV      |
| <input type="checkbox"/> Hay/Fields        | <input type="checkbox"/> Logging    | <input type="checkbox"/> Residential | <input checked="" type="checkbox"/> Road/Hwy/RR | <input type="checkbox"/> Golf Course  |

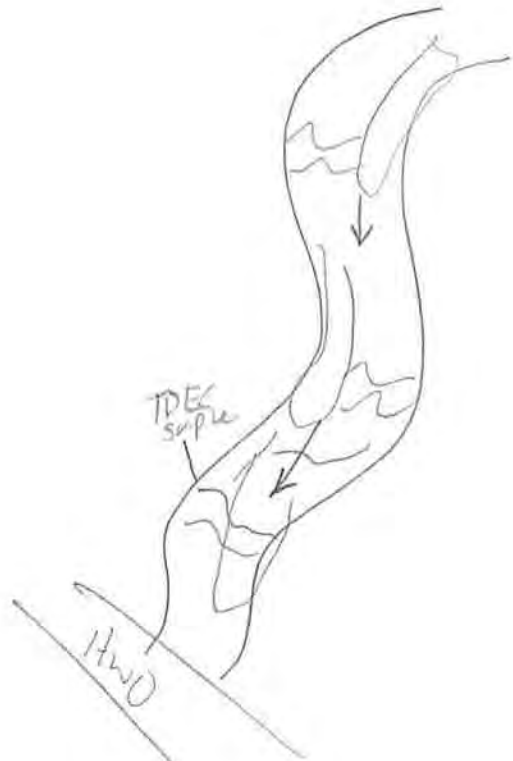
**Observed Human Disturbance to Stream:** Blank (not observed) S (Slight) M (Moderate) H (High)

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

**Other Stream Information and Stressors:** forested thicket most part

**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.

| Station | depth | flow |
|---------|-------|------|
| 0.0     | 0.0   | 0.0  |
| 1.5     | .10   | 0.0  |
| 3.0     | .20   | .05  |
| 6.0     | .25   | .10  |
| 10.0    | .26   | .10  |
| 14.0    | .23   | .05  |
| 16.0    | .40   | .49  |
| 19.0    | .30   | .81  |
| 20.5    | .55   | 1.32 |
| 22.0    | .60   | 1.39 |
| 25.0    | .25   | 1.46 |
| 28.0    | .45   | .29  |
| 31.0    | .30   | .80  |
| 34.0    | .25   | .32  |
| 36.0    | .05   | 0.0  |
| 44.0    | 0.0   | 0.0  |



## HABITAT ASSESSMENT FIELD DATA SHEET – MODERATE TO HIGH GRADIENT STREAM (FRONT)

(Refer to Protocol E for detailed descriptions and rank information)

|   |                 |  |    |    |    |    |                   |  |    |    |                    |    |                 |   |   |   |   |   |             |  |   |  |  |  |
|---|-----------------|--|----|----|----|----|-------------------|--|----|----|--------------------|----|-----------------|---|---|---|---|---|-------------|--|---|--|--|--|
| <b>PROJECT:</b> Springfield MS4 Benthic         |                 | <b>HABITAT ASSESSED BY:</b> C. Duke  |    |    |    |    |                   |  |    |    |                    |    |                 |   |   |   |   |   |             |  |   |  |  |  |
| <b>STA:</b>                                     |                 | <b>DATE:</b> 6/27/21   |    |    |    |    |                   |  |    |    | <b>TIME:</b> 11:40 |    |                 |   |   |   |   |   |             |  |   |  |  |  |
| <b>STREAM NAME:</b> Carr Creek                  |                 | <b>ECOREGION:</b> 71e  |    |    |    |    |                   |  |    |    |                    |    |                 |   |   |   |   |   |             |  |   |  |  |  |
| <b>MAP LABEL:</b> Carr Creek 1150               |                 | <b>QC:</b> Consensus / Duplicate   |    |    |    |    |                   |  |    |    |                    |    |                 |   |   |   |   |   |             |  |   |  |  |  |
| <b>HUC:</b> 05130206                            |                 |  |    |    |    |    |                   |  |    |    |                    |    |                 |   |   |   |   |   |             |  |   |  |  |  |
| <b>1. Epifaunal Substrate / Available Cover</b> | <b>OPTIMAL</b>  | Over 70% of stream reach has natural stable habitat suitable for colonization by fish and/or macroinvertebrates. Four or more productive habitats are present.                     |    |    |    |    | <b>SUBOPTIMAL</b> | 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.)  |    |    |                    |    | <b>MARGINAL</b> | 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.)      |   |   |   |   | <b>POOR</b> | Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.   |   |  |  |  |
|   | <b>SCORE</b> 18 | 20   | 19 | 18 | 17 | 16 | 15                | 14   | 13 | 12 | 11                 | 10 | 9               | 8   | 7 | 6 | 5 | 4 | 3           | 2  | 1 |  |  |  |
| Comments:                                       |                 |  |    |    |    |    |                   |  |    |    |                    |    |                 |   |   |   |   |   |             |  |   |  |  |  |
| <b>2. Embeddedness of Riffles</b>               | <b>OPTIMAL</b>  | 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. |    |    |    |    | <b>SUBOPTIMAL</b> | 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.                |    |    |                    |    | <b>MARGINAL</b> | Gravel, cobble, and boulders are 50-75% surrounded by fine sediment. Niche space in middle layers of cobble is starting to fill with fine sediment. |   |   |   |   | <b>POOR</b> | Gravel, cobble, and boulders are more than 75% surrounded by fine sediment. Niche space is reduced to a single layer or is absent.                                       |   |  |  |  |
|   | <b>SCORE</b> 16 | 20   | 19 | 18 | 17 | 16 | 15                | 14   | 13 | 12 | 11                 | 10 | 9               | 8   | 7 | 6 | 5 | 4 | 3           | 2  | 1 |  |  |  |
| Comments:                                       |                 |  |    |    |    |    |                   |  |    |    |                    |    |                 |   |   |   |   |   |             |  |   |  |  |  |
| <b>3. Velocity/ Depth Regime</b>                | <b>OPTIMAL</b>  | All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow).  |    |    |    |    | <b>SUBOPTIMAL</b> | Only 3 of the 4 regimes present (if fast-shallow is missing score lower). If slow-deep missing score 15.   |    |    |                    |    | <b>MARGINAL</b> | Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).   |   |   |   |   | <b>POOR</b> | Dominated by 1 velocity/depth regime. Others regimes too small or infrequent to support aquatic populations.   |   |  |  |  |
|   | <b>SCORE</b> 18 | 20   | 19 | 18 | 17 | 16 | 15                | 14   | 13 | 12 | 11                 | 10 | 9               | 8   | 7 | 6 | 5 | 4 | 3           | 2  | 1 |  |  |  |
| Comments:                                       |                 |  |    |    |    |    |                   |  |    |    |                    |    |                 |   |   |   |   |   |             |  |   |  |  |  |
| <b>4. Sediment Deposition</b>                   | <b>OPTIMAL</b>  | Sediment deposition affects less than 5% of stream bottom in quiet areas. New deposition on islands and point bars is absent or minimal.   |    |    |    |    | <b>SUBOPTIMAL</b> | 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%. |    |    |                    |    | <b>MARGINAL</b> | Sediment deposition affects 30-50% of stream bottom. Sediment deposits at obstruction, constrictions and bends. Moderate pool deposition.           |   |   |   |   | <b>POOR</b> | Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition. |   |  |  |  |
|   | <b>SCORE</b> 12 | 20   | 19 | 18 | 17 | 16 | 15                | 14   | 13 | 12 | 11                 | 10 | 9               | 8   | 7 | 6 | 5 | 4 | 3           | 2  | 1 |  |  |  |
| Comments: S-H                                   |                 |  |    |    |    |    |                   |  |    |    |                    |    |                 |   |   |   |   |   |             |  |   |  |  |  |
| <b>5. Channel Flow Status</b>                   | <b>OPTIMAL</b>  | Water reaches base of both lower banks and streambed is covered by water throughout reach. Minimal productive habitat is exposed.  |    |    |    |    | <b>SUBOPTIMAL</b> | Water covers > 75% of streambed or 25% of productive habitat is exposed.   |    |    |                    |    | <b>MARGINAL</b> | Water covers 25-75% of streambed and/or productive habitat is mostly exposed.   |   |   |   |   | <b>POOR</b> | Very little water in channel and mostly present as standing pools. Little or no productive habitat due to lack of water.   |   |  |  |  |
|   | <b>SCORE</b> 20 | 20   | 19 | 18 | 17 | 16 | 15                | 14   | 13 | 12 | 11                 | 10 | 9               | 8   | 7 | 6 | 5 | 4 | 3           | 2  | 1 |  |  |  |
| Comments:                                       |                 |  |    |    |    |    |                   |  |    |    |                    |    |                 |   |   |   |   |   |             |  |   |  |  |  |

### HABITAT ASSESSMENT FIELD DATA SHEET – MODERATE TO HIGH GRADIENT STREAM (BACK)

| MAP LABEL:  |                      |   | DATE:   |   |                 |  |             | ASSESSOR INITIALS:  |    |    |    |                   |   |   |   |   |   |   |   |   |
|---|----------------------|---|---|---|-----------------|--|-------------|---|----|----|----|-------------------|---|---|---|---|---|---|---|---|
| <b>6. Channel Alteration</b>  | <b>OPTIMAL</b>       | 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. | <b>SUBOPTIMAL</b>   | 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. | <b>MARGINAL</b> | 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.    | <b>POOR</b> | Over 80% of reach channelized, dredged or affected by 4-wheelers. In-stream habitat greatly altered or removed. Artificial structures have greatly affected flow pattern.                     |    |    |    |                   |   |   |   |   |   |   |   |   |
|   | <b>SCORE</b> 18      | 20  | 19  | 18  | 17              | 16   | 15          | 14  | 13 | 12 | 11 | 10                | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 |
| Comments:   |                      |   |   |   |                 |  |             |   |    |    |    |                   |   |   |   |   |   |   |   |   |
| <b>7. Frequency of re-oxygenation zones.</b><br>Use frequency of riffles or bends for category Rank by quality.   | <b>OPTIMAL</b>       | Occurrence of re-oxygenation zones relatively frequent; ratio of distance between areas divided by average stream width <7:1.   | <b>SUBOPTIMAL</b>   | Occurrence of re-oxygenation zones infrequent; distance between areas divided by average stream width is 7 - 15.  | <b>MARGINAL</b> | Occasional re-oxygenation area. The distance between areas divided by average stream width is over 15 and up to 25.  | <b>POOR</b> | Generally all flat water or flat bedrock; little opportunity for re-oxygenation. Distance between areas divided by average stream width >25.  |    |    |    |                   |   |   |   |   |   |   |   |   |
|   | <b>SCORE</b> 18      | 20  | 19  | 18  | 17              | 16   | 15          | 14  | 13 | 12 | 11 | 10                | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 |
| Comments:   |                      |   |   |   |                 |  |             |   |    |    |    |                   |   |   |   |   |   |   |   |   |
| <b>8. Bank Stability (score each bank)</b><br>Determine left or right side by facing downstream.  | <b>OPTIMAL</b>       | Banks stable: evidence of erosion or bank failure absent or minimal; little potential for future problems <5% of bank affected.   | <b>SUBOPTIMAL</b>   | 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.  | <b>MARGINAL</b> | 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.    | <b>POOR</b> | Unstable; many eroded area; raw areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.  |    |    |    |                   |   |   |   |   |   |   |   |   |
|   | <b>SCORE (LDB)</b> 8 | LEFT  | 10  | 9   | 8               | 7  | 6           | 5   | 4  | 3  | 2  | 1                 | 0 |   |   |   |   |   |   |   |
| <b>SCORE (RDB)</b> 8  | RIGHT                | 10  | 9   | 8   | 7               | 6  | 5           | 4   | 3  | 2  | 1  | 0                 |   |   |   |   |   |   |   |   |
| Comments:   |                      |   |   |   |                 |  |             |   |    |    |    |                   |   |   |   |   |   |   |   |   |
| <b>9. Bank Vegetative Protection (score each bank) include vegetation from top of bank to base of bank. Determine left or right side by facing downstream</b> | <b>OPTIMAL</b>       | 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.            | <b>SUBOPTIMAL</b>   | 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%).                                    | <b>MARGINAL</b> | 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%). | <b>POOR</b> | Less than 50% of the banks 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%). |    |    |    |                   |   |   |   |   |   |   |   |   |
|   | <b>SCORE (LDB)</b> 8 | LEFT  | 10  | 9   | 8               | 7  | 6           | 5   | 4  | 3  | 2  | 1                 | 0 |   |   |   |   |   |   |   |
| <b>SCORE (RDB)</b> 8  | RIGHT                | 10  | 9   | 8   | 7               | 6  | 5           | 4   | 3  | 2  | 1  | 0                 |   |   |   |   |   |   |   |   |
| Comments:   |                      |   |   |   |                 |  |             |   |    |    |    |                   |   |   |   |   |   |   |   |   |
| <b>10. Riparian Vegetative Zone Width (score each bank ) Zone begins at top of bank</b>   | <b>OPTIMAL</b>       | Average width of riparian zone > 18 meters. Unpaved footpaths may score 9 if run-off potential is negligible.   | <b>SUBOPTIMAL</b>   | Average width of riparian zone 12-18 meters. Score high if areas < 18 meters are small or are minimally disturbed.  | <b>MARGINAL</b> | Average width of riparian zone 6-11 meters. Score high if areas less than 12 meters are small or are minimally disturbed.                                  | <b>POOR</b> | Average width of riparian zone <6 meters. Score high if areas less than 6 meters are small or are minimally disturbed.  |    |    |    |                   |   |   |   |   |   |   |   |   |
|   | <b>SCORE (LDB)</b> 9 | LEFT  | 10  | 9   | 8               | 7  | 6           | 5   | 4  | 3  | 2  | 1                 | 0 |   |   |   |   |   |   |   |
| <b>SCORE (RDB)</b> 9  | RIGHT                | 10  | 9   | 8   | 7               | 6  | 5           | 4   | 3  | 2  | 1  | 0                 |   |   |   |   |   |   |   |   |
| Comments:   |                      |   |   |   |                 |  |             |   |    |    |    |                   |   |   |   |   |   |   |   |   |
| <b>TOTAL SCORE</b> 0 170  |                      |   | Comparison to Ecoregion Guidelines (circle): ABOVE or BELOW |   |                 |  |             |   |    |    |    |                   |   |   |   |   |   |   |   |   |
| If score is below guidelines, result of (circle)  |                      |   | Natural Conditions  |   |                 |  |             |   |    |    |    | Human Disturbance |   |   |   |   |   |   |   |   |
| Comments:   |                      |   |   |   |                 |  |             |   |    |    |    |                   |   |   |   |   |   |   |   |   |

**STREAM SURVEY INFORMATION**

|  |  |                            |
|--|--|----------------------------|
| DWR Station ID: <u>BLACK000.4RN</u>  | Samplers: <u>C. D. Lue, J. L. Middle</u> |                            |
| Monitoring Location Name: <u>Black River</u>   | Date: <u>6/22/21</u>                     | Time:                      |
| Monitoring Location: <u>Springfield</u>  | Organization: <u>CR</u>                  | Drainage Area: <u>0.94</u> |
| County: <u>Robertson</u>   | Ecoregion: <u>71e</u>                    | u/s ECO: <u>-</u>          |
| Latitude: <u>36.51421</u>  | HUC: <u>05130202</u>                     | WS Grp: <u>-</u>           |
| Longitude: <u>-86.88219</u>  | WBID: <u>-</u>                           | Field Log #: <u>-</u>      |
| Project Name: <input type="checkbox"/> Watershed <input type="checkbox"/> 303(d) <input type="checkbox"/> Antideg <input type="checkbox"/> ECO <input type="checkbox"/> FECO Other: <u>11541</u> |  |                            |

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 |                                     |                  | Periphyton             |            |         |
| SQKICK   | <input checked="" type="checkbox"/> | <u>Collected</u> | Other                  |            |         |
| SQBANK   |                                     |                  | Describe Other Sample: |            |         |

Chemicals/Bacteria:  None  Routine  Nutrient  Metals  E. coli  Organics  Other \_\_\_\_\_

Field Parameters: Meter(s) Used: YSI

|                               |              |                    |              |
|-------------------------------|--------------|--------------------|--------------|
| pH (su)                       | <u>7.85</u>  | Dissolved Oxygen % | <u>141.5</u> |
| Conductivity (umhos)          | <u>612</u>   | Turbidity (NTU)    |              |
| Temperature (C°)              | <u>18.7°</u> | TDS (mg/L)         |              |
| Dissolved Oxygen (ppm = mg/L) | <u>12.8</u>  | Flow (cfs)         |              |

Meter Problems? NO

Photos Taken?  No  Yes: Description: D/L/S

Previous 48 hours precipitation:  Unknown  None  Slight  Moderate  Heavy  Flooding

Air Temperature (°F) 65

**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: 100 %

% Canopy Cover Measured (mid-reach): 100 u/s + 100 d/s + 100 LDB + 100 RDB = Total/384\*100

**Channel Characteristics:**

Bank Height: 1 (yd.) High Water Mark: 15 (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: BLACKWOOD 472N Date: 6/22/21 Assessors: C. D. W.

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

- | Riffle  | Run  | Pool  |
|---|--|---|
| <input type="checkbox"/> Boulders (>10")              | <input type="checkbox"/> Boulders (>10")             | <input type="checkbox"/> Boulders (>10")    |
| <input checked="" type="checkbox"/> Cobble (2.5-10")  | <input checked="" type="checkbox"/> Cobble (2.5-10") | <input type="checkbox"/> Cobble (2.5-10")   |
| <input checked="" type="checkbox"/> Gravel (0.1-2.5") | <input type="checkbox"/> Gravel (0.1-2.5")           | <input type="checkbox"/> Gravel (0.1-2.5")  |
| <input checked="" type="checkbox"/> Bedrock           | <input checked="" type="checkbox"/> Bedrock          | <input checked="" type="checkbox"/> Bedrock |
| <input type="checkbox"/> Sand                         | <input type="checkbox"/> Sand                        | <input type="checkbox"/> Sand               |
| <input type="checkbox"/> Silt (not gritty)            | <input type="checkbox"/> Silt (not gritty)           | <input type="checkbox"/> Silt (not gritty)  |
| <input type="checkbox"/> Clay (Slick)                 | <input type="checkbox"/> Clay (Slick)                | <input type="checkbox"/> Clay (Slick)       |

**Surrounding Land Uses** (list additional land uses under comments)

- |  |                                     |   |   |  |
|--|-------------------------------------|---|---|--|
| <input checked="" type="checkbox"/> Forest | <input type="checkbox"/> Grazing    | <input checked="" type="checkbox"/> Stormwater  | <input type="checkbox"/> STP/WWTP               | <input checked="" type="checkbox"/> Construction |
| <input type="checkbox"/> Wetland           | <input type="checkbox"/> Row Crops  | <input checked="" type="checkbox"/> Urban       | <input type="checkbox"/> Industry               | <input type="checkbox"/> Impoundment             |
| <input type="checkbox"/> Park              | <input type="checkbox"/> CAFO/Dairy | <input type="checkbox"/> Commercial             | <input type="checkbox"/> Mining/Dredging        | <input type="checkbox"/> ATV/OHV                 |
| <input type="checkbox"/> Hay/Fields        | <input type="checkbox"/> Logging    | <input checked="" type="checkbox"/> Residential | <input checked="" type="checkbox"/> Road/Hwy/RR | <input type="checkbox"/> Golf Course             |

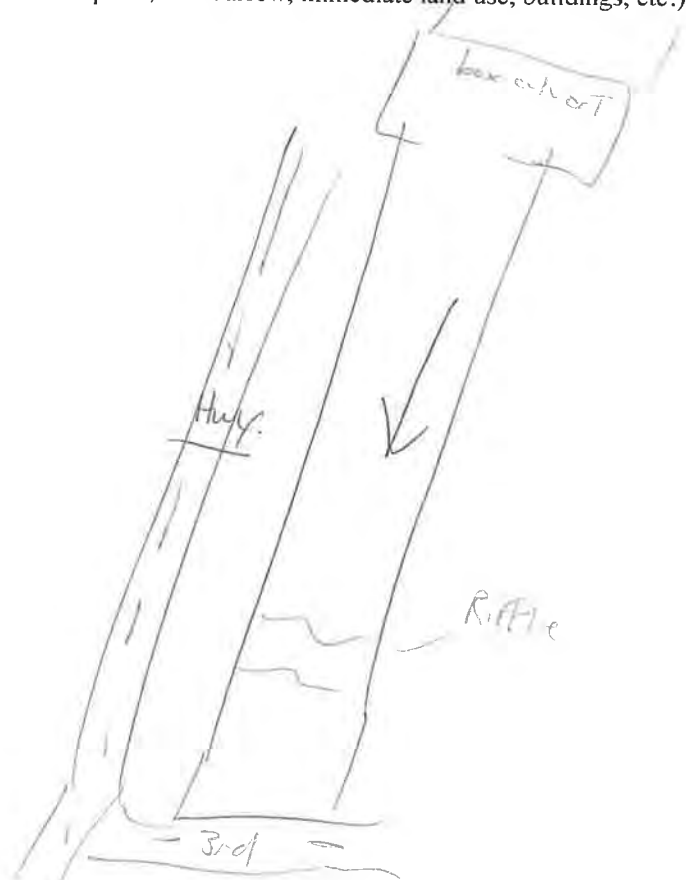
**Observed Human Disturbance to Stream:** Blank (not observed) S (Slight) M (Moderate) H (High)

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

| station | depth | Flow |
|---------|-------|------|
| 0.0     | 0.0   | 0.0  |
| 2.0     | .03   | 0.0  |
| 4.0     | .2    | .54  |
| 6.0     | .25   | .20  |
| 8.0     | .40   | .56  |
| 10.0    | .60   | 1.12 |
| 12.0    | .35   | 1.14 |
| 14.0    | .10   | .05  |
| 16.0    | .05   | 0.0  |
| 17.0    | 0.0   | 0.0  |



## HABITAT ASSESSMENT FIELD DATA SHEET – MODERATE TO HIGH GRADIENT STREAM (FRONT)

(Refer to Protocol E for detailed descriptions and rank information)

|   |  |  |    |    |    |    |  |    |    |    |                           |   |   |          |          |   |  |   |   |   |   |
|---|--|--|----|----|----|----|--|----|----|----|---------------------------|---|---|----------|----------|---|--|---|---|---|---|
| <b>PROJECT:</b> <i>Springfield MS4 Branches</i> |  | <b>HABITAT ASSESSED BY:</b> <i>C. D. Drake &amp; J. Williams</i>   |    |    |    |    |  |    |    |    |                           |   |   |          |          |   |  |   |   |   |   |
| <b>STA:</b>                                     |  | <b>DATE:</b> <i>1/22/21</i>  |    |    |    |    |  |    |    |    | <b>TIME:</b> <i>10:20</i> |   |   |          |          |   |  |   |   |   |   |
| <b>STREAM NAME:</b> <i>Black Branch</i>         |  | <b>ECOREGION:</b> <i>71c</i>   |    |    |    |    |  |    |    |    |                           |   |   |          |          |   |  |   |   |   |   |
| <b>MAP LABEL:</b> <i>Black Branch</i>           |  | <b>QC:</b> <i>Consensus / Duplicate</i>  |    |    |    |    |  |    |    |    |                           |   |   |          |          |   |  |   |   |   |   |
| <b>HUC:</b> <i>05130206</i>                     |  |  |    |    |    |    |  |    |    |    |                           |   |   |          |          |   |  |   |   |   |   |
|   |  | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |    |                           | <b>MARGINAL</b>   |   |          |          |   | <b>POOR</b>  |   |   |   |   |
| <b>1. Epifaunal Substrate / Available Cover</b> |  | 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.   |   |   |   |   |
| <b>SCORE</b> <i>7</i>                           |  | 20   | 19 | 18 | 17 | 16 | 15   | 14 | 13 | 12 | 11                        | 10  | 9 | 8        | <u>7</u> | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |  |    |    |    |                           |   |   |          |          |   |  |   |   |   |   |
|   |  | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |    |                           | <b>MARGINAL</b>   |   |          |          |   | <b>POOR</b>  |   |   |   |   |
| <b>2. Embeddedness of Riffles</b>               |  | 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 boulders 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.                                       |   |   |   |   |
| <b>SCORE</b> <i>11</i>                          |  | 20   | 19 | 18 | 17 | 16 | 15   | 14 | 13 | 12 | <u>11</u>                 | 10  | 9 | 8        | 7        | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |  |    |    |    |                           |   |   |          |          |   |  |   |   |   |   |
|   |  | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |    |                           | <b>MARGINAL</b>   |   |          |          |   | <b>POOR</b>  |   |   |   |   |
| <b>3. Velocity/ Depth Regime</b>                |  | 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.   |   |   |   |   |
| <b>SCORE</b> <i>8</i>                           |  | 20   | 19 | 18 | 17 | 16 | 15   | 14 | 13 | 12 | 11                        | 10  | 9 | <u>8</u> | 7        | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |  |    |    |    |                           |   |   |          |          |   |  |   |   |   |   |
|   |  | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |    |                           | <b>MARGINAL</b>   |   |          |          |   | <b>POOR</b>  |   |   |   |   |
| <b>4. Sediment Deposition</b>                   |  | 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. |   |   |   |   |
| <b>SCORE</b> <i>15</i>                          |  | 20   | 19 | 18 | 17 | 16 | <u>15</u>  | 14 | 13 | 12 | 11                        | 10  | 9 | 8        | 7        | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |  |    |    |    |                           |   |   |          |          |   |  |   |   |   |   |
|   |  | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |    |                           | <b>MARGINAL</b>   |   |          |          |   | <b>POOR</b>  |   |   |   |   |
| <b>5. Channel Flow Status</b>                   |  | 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.   |   |   |   |   |
| <b>SCORE</b> <i>20</i>                          |  | <u>20</u>  | 19 | 18 | 17 | 16 | 15   | 14 | 13 | 12 | 11                        | 10  | 9 | 8        | 7        | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |  |    |    |    |                           |   |   |          |          |   |  |   |   |   |   |

**HABITAT ASSESSMENT FIELD DATA SHEET – MODERATE TO HIGH GRADIENT STREAM (BACK)**

|  |   |    |    |              |    |   |    |    |                           |                   |  |   |   |   |   |   |   |   |   |   |
|--|---|----|----|--------------|----|---|----|----|---------------------------|-------------------|--|---|---|---|---|---|---|---|---|---|
| <b>MAP LABEL:</b>  |   |    |    | <b>DATE:</b> |    |   |    |    | <b>ASSESSOR INITIALS:</b> |                   |  |   |   |   |   |   |   |   |   |   |
|  | <b>OPTIMAL</b>  |    |    |              |    | <b>SUBOPTIMAL</b>   |    |    |                           |                   | <b>MARGINAL</b>  |   |   |   |   | <b>POOR</b>   |   |   |   |   |
| <b>6. Channel Alteration</b>   | 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. In-stream habitat greatly altered or removed. Artificial structures have greatly affected flow pattern.                     |   |   |   |   |
| <b>SCORE</b> 16  | 20  | 19 | 18 | 17           | 16 | 15  | 14 | 13 | 12                        | 11                | 10   | 9 | 8 | 7 | 6 | 5   | 4 | 3 | 2 | 1 |
| Comments:  |   |    |    |              |    |   |    |    |                           |                   |  |   |   |   |   |   |   |   |   |   |
|  | <b>OPTIMAL</b>  |    |    |              |    | <b>SUBOPTIMAL</b>   |    |    |                           |                   | <b>MARGINAL</b>  |   |   |   |   | <b>POOR</b>   |   |   |   |   |
| <b>7. Frequency of re-oxygenation zones.</b><br>Use frequency of riffles 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.  |   |   |   |   |
| <b>SCORE</b> 18  | 20  | 19 | 18 | 17           | 16 | 15  | 14 | 13 | 12                        | 11                | 10   | 9 | 8 | 7 | 6 | 5   | 4 | 3 | 2 | 1 |
| Comments:  |   |    |    |              |    |   |    |    |                           |                   |  |   |   |   |   |   |   |   |   |   |
|  | <b>OPTIMAL</b>  |    |    |              |    | <b>SUBOPTIMAL</b>   |    |    |                           |                   | <b>MARGINAL</b>  |   |   |   |   | <b>POOR</b>   |   |   |   |   |
| <b>8. Bank Stability (score each bank)</b><br>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.  |   |   |   |   |
| <b>SCORE (LDB)</b> 9   | LEFT  | 10 | 9  |              |    | 8   | 7  | 6  |                           |                   | 5  | 4 | 3 |   |   | 2   | 1 | 0 |   |   |
| <b>SCORE (RDB)</b> 4   | RIGHT   | 10 | 9  |              |    | 8   | 7  | 6  |                           |                   | 5  | 4 | 3 |   |   | 2   | 1 | 0 |   |   |
| Comments:  |   |    |    |              |    |   |    |    |                           |                   |  |   |   |   |   |   |   |   |   |   |
|  | <b>OPTIMAL</b>  |    |    |              |    | <b>SUBOPTIMAL</b>   |    |    |                           |                   | <b>MARGINAL</b>  |   |   |   |   | <b>POOR</b>   |   |   |   |   |
| <b>9. Bank Vegetative Protection</b> (score each bank) include 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 banks 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%). |   |   |   |   |
| <b>SCORE (LDB)</b> 9   | LEFT  | 10 | 9  |              |    | 8   | 7  | 6  |                           |                   | 5  | 4 | 3 |   |   | 2   | 1 | 0 |   |   |
| <b>SCORE (RDB)</b> 2   | RIGHT   | 10 | 9  |              |    | 8   | 7  | 6  |                           |                   | 5  | 4 | 3 |   |   | 2   | 1 | 0 |   |   |
| Comments:  |   |    |    |              |    |   |    |    |                           |                   |  |   |   |   |   |   |   |   |   |   |
|  | <b>OPTIMAL</b>  |    |    |              |    | <b>SUBOPTIMAL</b>   |    |    |                           |                   | <b>MARGINAL</b>  |   |   |   |   | <b>POOR</b>   |   |   |   |   |
| <b>10. Riparian Vegetative Zone Width</b> (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.  |   |   |   |   |
| <b>SCORE (LDB)</b> 1   | LEFT  | 10 | 9  |              |    | 8   | 7  | 6  |                           |                   | 5  | 4 | 3 |   |   | 2   | 1 | 0 |   |   |
| <b>SCORE (RDB)</b> 9   | RIGHT   | 10 | 9  |              |    | 8   | 7  | 6  |                           |                   | 5  | 4 | 3 |   |   | 2   | 1 | 0 |   |   |
| Comments:  |   |    |    |              |    |   |    |    |                           |                   |  |   |   |   |   |   |   |   |   |   |
| <b>TOTAL SCORE</b> 0 129   | Comparison to Ecoregion Guidelines (circle): ABOVE or BELOW   |    |    |              |    |   |    |    |                           |                   |  |   |   |   |   |   |   |   |   |   |
| If score is below guidelines, result of (circle)   | Natural Conditions  |    |    |              |    |   |    |    |                           | Human Disturbance |  |   |   |   |   |   |   |   |   |   |
| Comments:  |   |    |    |              |    |   |    |    |                           |                   |  |   |   |   |   |   |   |   |   |   |

**STREAM SURVEY INFORMATION**

|  |                                 |                            |
|--|---------------------------------|----------------------------|
| DWR Station ID: <u>N/A</u>   | Samplers: <u>ADUC, J. White</u> |                            |
| Monitoring Location Name: <u>Peppers Branch</u>  | Date: <u>6/27/21</u>            | Time: <u>9:15am</u>        |
| Monitoring Location: <u>Springfield</u>  | Organization: <u>CEC</u>        | Drainage Area: <u>3.49</u> |
| County: <u>Robertson</u>   | Ecoregion: <u>71c</u>           | u/s ECO: <u>-</u>          |
| Latitude: <u>36.522214</u>   | HUC: <u>05130206</u>            | WS Grp: <u>-</u>           |
| Longitude: <u>-86.887308</u>   | WBID: <u>-</u>                  | Field Log #: <u>-</u>      |
| Project Name: <input type="checkbox"/> Watershed <input type="checkbox"/> 303(d) <input type="checkbox"/> Antideg <input type="checkbox"/> ECO <input type="checkbox"/> FECO Other: <u>MSU</u> |                                 |                            |

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 |                                     |                  | Periphyton             |            |         |
| SQKICK   | <input checked="" type="checkbox"/> | <u>Collected</u> | Other                  |            |         |
| SQBANK   |                                     |                  | Describe Other Sample: |            |         |

Chemicals/Bacteria:  None  Routine  Nutrient  Metals  E. coli  Organics  Other \_\_\_\_\_

Field Parameters: Meter(s) Used:

|                               |             |                    |              |
|-------------------------------|-------------|--------------------|--------------|
| pH (su)                       | <u>8.02</u> | Dissolved Oxygen % | <u>110.6</u> |
| Conductivity (umhos)          | <u>1284</u> | Turbidity (NTU)    |              |
| Temperature (C°)              | <u>21.4</u> | TDS (mg/L)         |              |
| Dissolved Oxygen (ppm = mg/L) | <u>9.79</u> | Flow (cfs)         |              |

Meter Problems? No

Photos Taken?  No  Yes: Description: ds / us

Previous 48 hours precipitation:  Unknown  None  Slight  Moderate  Heavy  Flooding

Air Temperature (°F) 65

**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: 95 %

% Canopy Cover Measured (mid-reach): 95 u/s + 95 d/s + 95 LDB + 95 RDB = Total/384\*100

**Channel Characteristics:**

Bank Height: 3.5 (yd.) High Water Mark: 7.3 (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: NA Date: 6/22/21 Assessors: CTD, JW

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

- | Riffle  | Run  | Pool  |
|---|--|---|
| <input type="checkbox"/> Boulders (>10")              | <input type="checkbox"/> Boulders (>10")             | <input type="checkbox"/> Boulders (>10")    |
| <input checked="" type="checkbox"/> Cobble (2.5-10")  | <input checked="" type="checkbox"/> Cobble (2.5-10") | <input type="checkbox"/> Cobble (2.5-10")   |
| <input checked="" type="checkbox"/> Gravel (0.1-2.5") | <input type="checkbox"/> Gravel (0.1-2.5")           | <input type="checkbox"/> Gravel (0.1-2.5")  |
| <input type="checkbox"/> Bedrock                      | <input checked="" type="checkbox"/> Bedrock          | <input checked="" type="checkbox"/> Bedrock |
| <input type="checkbox"/> Sand                         | <input type="checkbox"/> Sand                        | <input type="checkbox"/> Sand               |
| <input checked="" type="checkbox"/> Silt (not gritty) | <input type="checkbox"/> Silt (not gritty)           | <input type="checkbox"/> Silt (not gritty)  |
| <input type="checkbox"/> Clay (Slick)                 | <input type="checkbox"/> Clay (Slick)                | <input type="checkbox"/> Clay (Slick)       |

**Surrounding Land Uses** (list additional land uses under comments)

- |  |                                     |                                      |   |                                       |
|--|-------------------------------------|--------------------------------------|---|---------------------------------------|
| <input checked="" type="checkbox"/> Forest | <input type="checkbox"/> Grazing    | <input type="checkbox"/> Stormwater  | <input type="checkbox"/> STP/WWTP               | <input type="checkbox"/> Construction |
| <input type="checkbox"/> Wetland           | <input type="checkbox"/> Row Crops  | <input type="checkbox"/> Urban       | <input checked="" type="checkbox"/> Industry    | <input type="checkbox"/> Impoundment  |
| <input checked="" type="checkbox"/> Park   | <input type="checkbox"/> CAFO/Dairy | <input type="checkbox"/> Commercial  | <input type="checkbox"/> Mining/Dredging        | <input type="checkbox"/> ATV/OHV      |
| <input type="checkbox"/> Hay/Fields        | <input type="checkbox"/> Logging    | <input type="checkbox"/> Residential | <input checked="" type="checkbox"/> Road/Hwy/RR | <input type="checkbox"/> Golf Course  |

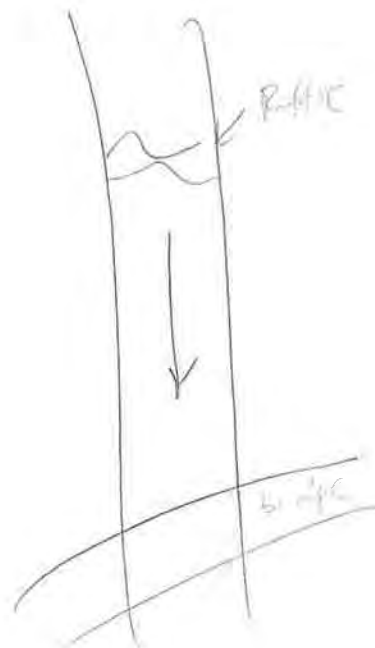
**Observed Human Disturbance to Stream:** Blank (not observed) S (Slight) M (Moderate) H (High)

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

**Other Stream Information and Stressors:** down stream up TDEC location

**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.

| Station | depth | flow |
|---------|-------|------|
| 0.0     | 0.0   | 0.0  |
| 2.0     | 0.15  | .05  |
| 4.5     | .20   | .25  |
| 7.0     | .25   | .68  |
| 9.0     | .25   | 1.23 |
| 11.5    | .60   | 1.34 |
| 12.5    | .45   | 1.34 |
| 15.5    | .55   | 1.44 |
| 17.5    | .65   | 1.72 |
| 19.5    | .50   | .35  |
| 20.0    | 0.0   | 0.0  |



# HABITAT ASSESSMENT FIELD DATA SHEET – MODERATE TO HIGH GRADIENT STREAM (FRONT)

(Refer to Protocol E for detailed descriptions and rank information)

|   |  |  |    |    |    |    |   |    |    |    |    |  |   |   |   |   |   |   |   |   |
|---|--|--|----|----|----|----|---|----|----|----|----|--|---|---|---|---|---|---|---|---|
| <b>PROJECT:</b> Springfield MSW Branch          |  | <b>HABITAT ASSESSED BY:</b> DJW  |    |    |    |    |   |    |    |    |    |  |   |   |   |   |   |   |   |   |
| <b>STA:</b>                                     |  | <b>DATE:</b> 6/27/21   |    |    |    |    | <b>TIME:</b> 9:25   |    |    |    |    |  |   |   |   |   |   |   |   |   |
| <b>STREAM NAME:</b> Deppes Branch               |  | <b>ECOREGION:</b> 71e  |    |    |    |    |   |    |    |    |    |  |   |   |   |   |   |   |   |   |
| <b>MAP LABEL:</b> Deppes Branch                 |  | <b>QC (Consensus / Duplicate)</b>  |    |    |    |    |   |    |    |    |    |  |   |   |   |   |   |   |   |   |
| <b>HUC:</b> 05130206                            |  |  |    |    |    |    |   |    |    |    |    |  |   |   |   |   |   |   |   |   |
| <b>1. Epifaunal Substrate / Available Cover</b> | <b>OPTIMAL</b>   | <b>SUBOPTIMAL</b>  |    |    |    |    | <b>MARGINAL</b>   |    |    |    |    | <b>POOR</b>  |   |   |   |   |   |   |   |   |
|   | 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.   |   |   |   |   |   |   |   |   |
| <b>SCORE</b> 10                                 | 20   | 19   | 18 | 17 | 16 | 15 | 14  | 13 | 12 | 11 | 10 | 9  | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |   |    |    |    |    |  |   |   |   |   |   |   |   |   |
| <b>2. Embeddedness of Riffles</b>               | <b>OPTIMAL</b>   | <b>SUBOPTIMAL</b>  |    |    |    |    | <b>MARGINAL</b>   |    |    |    |    | <b>POOR</b>  |   |   |   |   |   |   |   |   |
|   | 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 boulders 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.                                       |   |   |   |   |   |   |   |   |
| <b>SCORE</b> 15                                 | 20   | 19   | 18 | 17 | 16 | 15 | 14  | 13 | 12 | 11 | 10 | 9  | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |   |    |    |    |    |  |   |   |   |   |   |   |   |   |
| <b>3. Velocity/ Depth Regime</b>                | <b>OPTIMAL</b>   | <b>SUBOPTIMAL</b>  |    |    |    |    | <b>MARGINAL</b>   |    |    |    |    | <b>POOR</b>  |   |   |   |   |   |   |   |   |
|   | 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.   |   |   |   |   |   |   |   |   |
| <b>SCORE</b> 14                                 | 20   | 19   | 18 | 17 | 16 | 15 | 14  | 13 | 12 | 11 | 10 | 9  | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |   |    |    |    |    |  |   |   |   |   |   |   |   |   |
| <b>4. Sediment Deposition</b>                   | <b>OPTIMAL</b>   | <b>SUBOPTIMAL</b>  |    |    |    |    | <b>MARGINAL</b>   |    |    |    |    | <b>POOR</b>  |   |   |   |   |   |   |   |   |
|   | 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. |   |   |   |   |   |   |   |   |
| <b>SCORE</b> 15                                 | 20   | 19   | 18 | 17 | 16 | 15 | 14  | 13 | 12 | 11 | 10 | 9  | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |   |    |    |    |    |  |   |   |   |   |   |   |   |   |
| <b>5. Channel Flow Status</b>                   | <b>OPTIMAL</b>   | <b>SUBOPTIMAL</b>  |    |    |    |    | <b>MARGINAL</b>   |    |    |    |    | <b>POOR</b>  |   |   |   |   |   |   |   |   |
|   | 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.   |   |   |   |   |   |   |   |   |
| <b>SCORE</b> 20                                 | 20   | 19   | 18 | 17 | 16 | 15 | 14  | 13 | 12 | 11 | 10 | 9  | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Comments:                                       |  |  |    |    |    |    |   |    |    |    |    |  |   |   |   |   |   |   |   |   |

**HABITAT ASSESSMENT FIELD DATA SHEET – MODERATE TO HIGH GRADIENT STREAM (BACK)**

|  |   |    |    |              |   |    |    |    |                           |  |    |   |   |   |   |   |   |   |   |                   |
|--|---|----|----|--------------|---|----|----|----|---------------------------|--|----|---|---|---|---|---|---|---|---|-------------------|
| <b>MAP LABEL:</b>  |   |    |    | <b>DATE:</b> |   |    |    |    | <b>ASSESSOR INITIALS:</b> |  |    |   |   |   |   |   |   |   |   |                   |
|  | <b>OPTIMAL</b>  |    |    |              | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |   |   |   | <b>POOR</b>   |   |   |   |   |                   |
| <b>6. Channel Alteration</b>   | 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. In-stream habitat greatly altered or removed. Artificial structures have greatly affected flow pattern.                     |   |   |   |   |                   |
| <b>SCORE</b> 14  | 20  | 19 | 18 | 17           | 16  | 15 | 14 | 13 | 12                        | 11   | 10 | 9 | 8 | 7 | 6   | 5 | 4 | 3 | 2 | 1                 |
| Comments:  |   |    |    |              |   |    |    |    |                           |  |    |   |   |   |   |   |   |   |   |                   |
|  | <b>OPTIMAL</b>  |    |    |              | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |   |   |   | <b>POOR</b>   |   |   |   |   |                   |
| <b>7. Frequency of re-oxygenation zones.</b><br>Use frequency of riffles 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.  |   |   |   |   |                   |
| <b>SCORE</b> 20  | 20  | 19 | 18 | 17           | 16  | 15 | 14 | 13 | 12                        | 11   | 10 | 9 | 8 | 7 | 6   | 5 | 4 | 3 | 2 | 1                 |
| Comments:  |   |    |    |              |   |    |    |    |                           |  |    |   |   |   |   |   |   |   |   |                   |
|  | <b>OPTIMAL</b>  |    |    |              | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |   |   |   | <b>POOR</b>   |   |   |   |   |                   |
| <b>8. Bank Stability (score each bank)</b><br>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.  |   |   |   |   |                   |
| <b>SCORE (LDB)</b> 6   | LEFT  | 10 | 9  |              | 8   | 7  | 6  | 5  | 4                         | 3  | 2  | 1 | 0 |   |   |   |   |   |   |                   |
| <b>SCORE (RDB)</b> 9   | RIGHT   | 10 | 9  |              | 8   | 7  | 6  | 5  | 4                         | 3  | 2  | 1 | 0 |   |   |   |   |   |   |                   |
| Comments:  |   |    |    |              |   |    |    |    |                           |  |    |   |   |   |   |   |   |   |   |                   |
|  | <b>OPTIMAL</b>  |    |    |              | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |   |   |   | <b>POOR</b>   |   |   |   |   |                   |
| <b>9. Bank Vegetative Protection</b> (score each bank) include 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 banks 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%). |   |   |   |   |                   |
| <b>SCORE (LDB)</b> 7   | LEFT  | 10 | 9  |              | 8   | 7  | 6  | 5  | 4                         | 3  | 2  | 1 | 0 |   |   |   |   |   |   |                   |
| <b>SCORE (RDB)</b> 9   | RIGHT   | 10 | 9  |              | 8   | 7  | 6  | 5  | 4                         | 3  | 2  | 1 | 0 |   |   |   |   |   |   |                   |
| Comments:  |   |    |    |              |   |    |    |    |                           |  |    |   |   |   |   |   |   |   |   |                   |
|  | <b>OPTIMAL</b>  |    |    |              | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |   |   |   | <b>POOR</b>   |   |   |   |   |                   |
| <b>10. Riparian Vegetative Zone Width</b> (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.  |   |   |   |   |                   |
| <b>SCORE (LDB)</b> 0   | LEFT  | 10 | 9  |              | 8   | 7  | 6  | 5  | 4                         | 3  | 2  | 1 | 0 |   |   |   |   |   |   |                   |
| <b>SCORE (RDB)</b> 7   | RIGHT   | 10 | 9  |              | 8   | 7  | 6  | 5  | 4                         | 3  | 2  | 1 | 0 |   |   |   |   |   |   |                   |
| Comments:  |   |    |    |              |   |    |    |    |                           |  |    |   |   |   |   |   |   |   |   |                   |
| <b>TOTAL SCORE</b> 0 151   | Comparison to Ecoregion Guidelines (circle): ABOVE or BELOW   |    |    |              |   |    |    |    |                           |  |    |   |   |   |   |   |   |   |   |                   |
| If score is below guidelines, result of (circle)   |   |    |    |              |   |    |    |    |                           | Natural Conditions   |    |   |   |   |   |   |   |   |   | Human Disturbance |
| Comments:  |   |    |    |              |   |    |    |    |                           |  |    |   |   |   |   |   |   |   |   |                   |

**STREAM SURVEY INFORMATION**

|   |                          |                            |
|---|--------------------------|----------------------------|
| DWR Station ID: <u>WATERCROSS 70W</u>   | Samplers: <u>PD JW</u>   |                            |
| Monitoring Location Name: <u>WATERCROSS COLLINS</u>   | Date: <u>6/21/21</u>     | Time: <u>1:00</u>          |
| Monitoring Location: <u>Springfield</u>   | Organization: <u>CEC</u> | Drainage Area: <u>5.64</u> |
| County: <u>Plumas</u>   | Ecoregion: <u>71e</u>    | u/s ECO: <u>-</u>          |
| Latitude: <u>36.49371</u>   | HUC: <u>05130202</u>     | WS Grp: <u>-</u>           |
| Longitude: <u>-121.84808</u>  | WBID: <u>-</u>           | Field Log #: <u>-</u>      |
| Project Name: <input type="checkbox"/> Watershed <input type="checkbox"/> 303(d) <input type="checkbox"/> Antideg <input type="checkbox"/> ECO <input type="checkbox"/> FECO Other: <u>WU</u> |                          |                            |

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 |                                     |                  | Periphyton             |            |         |
| SQKICK   | <input checked="" type="checkbox"/> | <u>Collected</u> | Other                  |            |         |
| SQBANK   |                                     |                  | Describe Other Sample: |            |         |

Chemicals/Bacteria:  None  Routine  Nutrient  Metals  E. coli  Organics  Other \_\_\_\_\_

Field Parameters: Meter(s) Used: YST

|                               |              |                    |              |
|-------------------------------|--------------|--------------------|--------------|
| pH (su)                       | <u>7.97</u>  | Dissolved Oxygen % | <u>109.7</u> |
| Conductivity (umhos)          | <u>439.8</u> | Turbidity (NTU)    |              |
| Temperature (C°)              | <u>26.06</u> | TDS (mg/L)         |              |
| Dissolved Oxygen (ppm = mg/L) | <u>4.70</u>  | Flow (cfs)         |              |

Meter Problems? no

Photos Taken?  No  Yes: Description: DS/US

Previous 48 hours precipitation:  Unknown  None  Slight  Moderate  Heavy  Flooding

Air Temperature (°F) 80

**Physical Characteristics & Light Penetration:**

|  |
|--|
| Gradient (sample reach): <input type="checkbox"/> Flat <input type="checkbox"/> Low <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> High <input type="checkbox"/> Cascades   |
| Average Stream Width: <input type="checkbox"/> Very Small (<1.5yd) <input type="checkbox"/> Small (1.5-3yd) <input checked="" type="checkbox"/> Med. (3-10yd) <input type="checkbox"/> Large (10-25yd) <input type="checkbox"/> Very Large (>25yd) |
| Maximum Stream Depth: <input type="checkbox"/> Shallow (<0.3yd) <input checked="" type="checkbox"/> Medium (0.3-0.6yd) <input type="checkbox"/> Deep (0.6 - 1yd) <input type="checkbox"/> Very Deep(>1yd)  |
| % Canopy Cover Estimated for Reach: <u>95</u> %  |
| % Canopy Cover Measured (mid-reach): <u>100</u> u/s + <u>90</u> d/s + <u>85</u> LDB + <u>100</u> RDB = Total/384*100   |

**Channel Characteristics:**

|  |
|--|
| Bank Height: <u>1-2</u> (yd.) High Water Mark: <u>1</u> (yd.)  |
| Bank Slope LDB: <input type="checkbox"/> Deeply incised <input type="checkbox"/> Bluff/Wall <input checked="" type="checkbox"/> Undercut <input type="checkbox"/> Sloughing <input type="checkbox"/> Steep terrain <input type="checkbox"/> Gentle Slope   |
| Bank Slope RDB: <input type="checkbox"/> Deeply incised <input type="checkbox"/> Bluff/Wall <input type="checkbox"/> Undercut <input type="checkbox"/> Sloughing <input type="checkbox"/> Steep terrain <input type="checkbox"/> Gentle Slope  |
| Manmade Modification: <input type="checkbox"/> None <input type="checkbox"/> Rip-Rap <input type="checkbox"/> Cement <input type="checkbox"/> Gabions <input type="checkbox"/> Channelized <input type="checkbox"/> Dam <input type="checkbox"/> Dredging <input type="checkbox"/> Bridge <input type="checkbox"/> ATV |

**Stream Characteristics:**

|   |
|---|
| Sediment Deposits: <input type="checkbox"/> None <input checked="" type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Excessive <input type="checkbox"/> Blanket   |
| Sediment Type: <input type="checkbox"/> None <input type="checkbox"/> Sand <input checked="" type="checkbox"/> Silt <input type="checkbox"/> Mud <input type="checkbox"/> Clay <input type="checkbox"/> Sludge <input type="checkbox"/> Mn Precipitant <input type="checkbox"/> Orange Flocculent                               |
| Turbidity: <input type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly Turbid <input type="checkbox"/> Muddy <input type="checkbox"/> Milky <input type="checkbox"/> Tannic <input type="checkbox"/> Planktonic Algae <input type="checkbox"/> Dyed   |
| Foam/Surface Sheen: <input checked="" type="checkbox"/> None <input type="checkbox"/> Nutrient <input type="checkbox"/> Surfactant <input type="checkbox"/> Bacteria  |
| Algae: <input checked="" type="checkbox"/> None <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> High <input type="checkbox"/> Choking Type: <input type="checkbox"/> Diatoms <input type="checkbox"/> Green <input type="checkbox"/> Filamentous <input type="checkbox"/> Blue-green |

**TDEC-DWR Stream Survey Field Sheet (Back)**

DWR Station ID: WARTROOD.7RN Date: 6/21/21 Assessors: C. Duke

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

- | Riffle  | Run   | Pool  |
|---|---|---|
| <input type="checkbox"/> Boulders (>10")              | <input type="checkbox"/> Boulders (>10")              | <input type="checkbox"/> Boulders (>10")              |
| <input checked="" type="checkbox"/> Cobble (2.5-10")  | <input type="checkbox"/> Cobble (2.5-10")             | <input checked="" type="checkbox"/> Cobble (2.5-10")  |
| <input checked="" type="checkbox"/> Gravel (0.1-2.5") | <input checked="" type="checkbox"/> Gravel (0.1-2.5") | <input checked="" type="checkbox"/> Gravel (0.1-2.5") |
| <input type="checkbox"/> Bedrock                      | <input type="checkbox"/> Bedrock                      | <input type="checkbox"/> Bedrock                      |
| <input type="checkbox"/> Sand                         | <input type="checkbox"/> Sand                         | <input type="checkbox"/> Sand                         |
| <input type="checkbox"/> Silt (not gritty)            | <input type="checkbox"/> Silt (not gritty)            | <input type="checkbox"/> Silt (not gritty)            |
| <input type="checkbox"/> Clay (Slick)                 | <input type="checkbox"/> Clay (Slick)                 | <input type="checkbox"/> Clay (Slick)                 |

**Surrounding Land Uses** (list additional land uses under comments)

- |  |                                     |                                      |   |                                       |
|--|-------------------------------------|--------------------------------------|---|---------------------------------------|
| <input checked="" type="checkbox"/> Forest     | <input type="checkbox"/> Grazing    | <input type="checkbox"/> Stormwater  | <input type="checkbox"/> STP/WWTP               | <input type="checkbox"/> Construction |
| <input checked="" type="checkbox"/> Wetland    | <input type="checkbox"/> Row Crops  | <input type="checkbox"/> Urban       | <input type="checkbox"/> Industry               | <input type="checkbox"/> Impoundment  |
| <input type="checkbox"/> Park                  | <input type="checkbox"/> CAFO/Dairy | <input type="checkbox"/> Commercial  | <input type="checkbox"/> Mining/Dredging        | <input type="checkbox"/> ATV/OHV      |
| <input checked="" type="checkbox"/> Hay/Fields | <input type="checkbox"/> Logging    | <input type="checkbox"/> Residential | <input checked="" type="checkbox"/> Road/Hwy/RR | <input type="checkbox"/> Golf Course  |

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

|                |   |             |   |                  |   |                  |  |
|----------------|---|-------------|---|------------------|---|------------------|--|
| Riparian Loss  | 5 | Logging     |   | Industry         |   | ATV/OHV          |  |
| Channelization |   | Urban       |   | Mining/ Dredging |   | Golf Course      |  |
| Active Grazing |   | Commercial  |   | Road/Hwy/RR      | 5 | Garbage/Trash    |  |
| Row Crops      |   | Residential | 5 | Construction     |   | Landfill         |  |
| CAFO/Dairy     |   | STP/WWTP    |   | Impoundment      |   | 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.

| Station | depth | flow |
|---------|-------|------|
| 0.0     | 0.0   | 0.0  |
| 13.0    | 0.0   | 0.0  |
| 14.0    | 0.1   | 0.05 |
| 16.0    | 0.2   | 0.32 |
| 20.0    | 0.1   | 0.05 |
| 22.0    | 0.2   | 0.94 |
| 24.0    | 0.25  | 0.89 |
| 26.0    | 0.30  | 1.15 |
| 27.0    | 0.35  | 1.47 |
| 28.0    | 0.25  | 1.05 |
| 30.0    | 0.2   | 0.95 |
| 32.0    | 0.0   | 0.0  |
| 34.0    | 0.0   | 0.05 |
| 36.0    | 0.15  | 0.5  |
| 37.0    | 0.0   | 0.0  |

## HABITAT ASSESSMENT FIELD DATA SHEET – MODERATE TO HIGH GRADIENT STREAM (FRONT)

(Refer to Protocol E for detailed descriptions and rank information)

|   |  |    |    |    |    |  |    |    |    |                                   |   |   |   |                   |   |  |   |   |   |   |
|---|--|----|----|----|----|--|----|----|----|-----------------------------------|---|---|---|-------------------|---|--|---|---|---|---|
| <b>PROJECT:</b> Springfield Reach, MWL          |  |    |    |    |    |  |    |    |    |                                   |   |   |   |                   |   |  |   |   |   |   |
| <b>STA:</b> WPT 200, TRN                        |  |    |    |    |    |  |    |    |    | <b>HABITAT ASSESSED BY:</b> AD JW |   |   |   |                   |   |  |   |   |   |   |
| <b>STREAM NAME:</b> Little Creek                |  |    |    |    |    |  |    |    |    | <b>DATE:</b>                      |   |   |   | <b>TIME:</b> 1:00 |   |  |   |   |   |   |
| <b>MAP LABEL:</b> Whitestone Creek 1150         |  |    |    |    |    |  |    |    |    | <b>ECOREGION:</b> 71e             |   |   |   |                   |   |  |   |   |   |   |
| <b>HUC:</b> 08100206                            |  |    |    |    |    |  |    |    |    | <b>QC:</b> Consensus / Duplicate  |   |   |   |                   |   |  |   |   |   |   |
|   | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |    |                                   | <b>MARGINAL</b>   |   |   |                   |   | <b>POOR</b>  |   |   |   |   |
| <b>1. Epifaunal Substrate / Available Cover</b> | 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.   |   |   |   |   |
| <b>SCORE</b> 15                                 | 20   | 19 | 18 | 17 | 16 | 15   | 14 | 13 | 12 | 11                                | 10  | 9 | 8 | 7                 | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |    |    |    |    |  |    |    |    |                                   |   |   |   |                   |   |  |   |   |   |   |
|   | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |    |                                   | <b>MARGINAL</b>   |   |   |                   |   | <b>POOR</b>  |   |   |   |   |
| <b>2. Embeddedness of Riffles</b>               | 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 boulders 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.                                       |   |   |   |   |
| <b>SCORE</b> 10                                 | 20   | 19 | 18 | 17 | 16 | 15   | 14 | 13 | 12 | 11                                | 10  | 9 | 8 | 7                 | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |    |    |    |    |  |    |    |    |                                   |   |   |   |                   |   |  |   |   |   |   |
|   | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |    |                                   | <b>MARGINAL</b>   |   |   |                   |   | <b>POOR</b>  |   |   |   |   |
| <b>3. Velocity/ Depth Regime</b>                | 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.   |   |   |   |   |
| <b>SCORE</b> 11                                 | 20   | 19 | 18 | 17 | 16 | 15   | 14 | 13 | 12 | 11                                | 10  | 9 | 8 | 7                 | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |    |    |    |    |  |    |    |    |                                   |   |   |   |                   |   |  |   |   |   |   |
|   | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |    |                                   | <b>MARGINAL</b>   |   |   |                   |   | <b>POOR</b>  |   |   |   |   |
| <b>4. Sediment Deposition</b>                   | 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. |   |   |   |   |
| <b>SCORE</b> 11                                 | 20   | 19 | 18 | 17 | 16 | 15   | 14 | 13 | 12 | 11                                | 10  | 9 | 8 | 7                 | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |    |    |    |    |  |    |    |    |                                   |   |   |   |                   |   |  |   |   |   |   |
|   | <b>OPTIMAL</b>   |    |    |    |    | <b>SUBOPTIMAL</b>  |    |    |    |                                   | <b>MARGINAL</b>   |   |   |                   |   | <b>POOR</b>  |   |   |   |   |
| <b>5. Channel Flow Status</b>                   | 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.   |   |   |   |   |
| <b>SCORE</b> 14                                 | 20   | 19 | 18 | 17 | 16 | 15   | 14 | 13 | 12 | 11                                | 10  | 9 | 8 | 7                 | 6 | 5  | 4 | 3 | 2 | 1 |
| Comments:                                       |  |    |    |    |    |  |    |    |    |                                   |   |   |   |                   |   |  |   |   |   |   |

**HABITAT ASSESSMENT FIELD DATA SHEET – MODERATE TO HIGH GRADIENT STREAM (BACK)**

|  |   |    |    |   |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |
|--|---|----|----|---|---|----|----|----|---------------------------|--|----|-------------------|---|---|---|---|---|---|---|---|
| <b>MAP LABEL:</b>  |   |    |    | <b>DATE:</b>  |   |    |    |    | <b>ASSESSOR INITIALS:</b> |  |    |                   |   |   |   |   |   |   |   |   |
|  | <b>OPTIMAL</b>  |    |    |   | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |                   |   |   | <b>POOR</b>   |   |   |   |   |   |
| <b>6. Channel Alteration</b>   | 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. In-stream habitat greatly altered or removed. Artificial structures have greatly affected flow pattern.                     |   |   |   |   |   |
| <b>SCORE</b> 18  | 20  | 19 | 18 | 17  | 16  | 15 | 14 | 13 | 12                        | 11   | 10 | 9                 | 8 | 7 | 6   | 5 | 4 | 3 | 2 | 1 |
| Comments:  |   |    |    |   |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |
|  | <b>OPTIMAL</b>  |    |    |   | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |                   |   |   | <b>POOR</b>   |   |   |   |   |   |
| <b>7. Frequency of re-oxygenation zones.</b><br>Use frequency of riffles 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.  |   |   |   |   |   |
| <b>SCORE</b> 16  | 20  | 19 | 18 | 17  | 16  | 15 | 14 | 13 | 12                        | 11   | 10 | 9                 | 8 | 7 | 6   | 5 | 4 | 3 | 2 | 1 |
| Comments:  |   |    |    |   |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |
|  | <b>OPTIMAL</b>  |    |    |   | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |                   |   |   | <b>POOR</b>   |   |   |   |   |   |
| <b>8. Bank Stability (score each bank)</b><br>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.  |   |   |   |   |   |
| <b>SCORE (LDB)</b> 8   | LEFT  | 10 | 9  |   |   | 8  | 7  | 6  | 5                         | 4  | 3  | 2                 | 1 | 0 |   |   |   |   |   |   |
| <b>SCORE (RDB)</b> 7   | RIGHT   | 10 | 9  |   |   | 8  | 7  | 6  | 5                         | 4  | 3  | 2                 | 1 | 0 |   |   |   |   |   |   |
| Comments:  |   |    |    |   |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |
|  | <b>OPTIMAL</b>  |    |    |   | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |                   |   |   | <b>POOR</b>   |   |   |   |   |   |
| <b>9. Bank Vegetative Protection</b> (score each bank) include 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 banks 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%). |   |   |   |   |   |
| <b>SCORE (LDB)</b> 8   | LEFT  | 10 | 9  |   |   | 8  | 7  | 6  | 5                         | 4  | 3  | 2                 | 1 | 0 |   |   |   |   |   |   |
| <b>SCORE (RDB)</b> 8   | RIGHT   | 10 | 9  |   |   | 8  | 7  | 6  | 5                         | 4  | 3  | 2                 | 1 | 0 |   |   |   |   |   |   |
| Comments:  |   |    |    |   |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |
|  | <b>OPTIMAL</b>  |    |    |   | <b>SUBOPTIMAL</b>   |    |    |    |                           | <b>MARGINAL</b>  |    |                   |   |   | <b>POOR</b>   |   |   |   |   |   |
| <b>10. Riparian Vegetative Zone Width</b> (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.  |   |   |   |   |   |
| <b>SCORE (LDB)</b> 8   | LEFT  | 10 | 9  |   |   | 8  | 7  | 6  | 5                         | 4  | 3  | 2                 | 1 | 0 |   |   |   |   |   |   |
| <b>SCORE (RDB)</b> 4   | RIGHT   | 10 | 9  |   |   | 8  | 7  | 6  | 5                         | 4  | 3  | 2                 | 1 | 0 |   |   |   |   |   |   |
| Comments:  |   |    |    |   |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |
| <b>TOTAL SCORE</b> 0 143   |   |    |    | Comparison to Ecoregion Guidelines (circle): ABOVE or BELOW |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |
| If score is below guidelines, result of (circle)   |   |    |    | Natural Conditions  |   |    |    |    |                           |  |    | Human Disturbance |   |   |   |   |   |   |   |   |
| Comments:  |   |    |    |   |   |    |    |    |                           |  |    |                   |   |   |   |   |   |   |   |   |

**STREAM SURVEY INFORMATION**

|  |                                       |                            |
|--|---------------------------------------|----------------------------|
| DWR Station ID: <u>WRTSP000.3RN</u>  | Samplers: <u>C. Dine, J. Willhide</u> |                            |
| Monitoring Location Name: <u>WRTSP000.3RN 1100</u>   | Date: <u>6/21/21</u>                  | Time: <u>12:00</u>         |
| Monitoring Location: <u>Scrubfield</u>   | Organization: <u>CFC</u>              | Drainage Area: <u>7.25</u> |
| County: <u>Robertson</u>   | Ecoregion: <u>71c</u>                 | u/s ECO: <u>-</u>          |
| Latitude: <u>36.50997</u>  | HUC: <u>0513206</u>                   | WS Grp: <u>-</u>           |
| Longitude: <u>-86.86292</u>  | WBID: <u>-</u>                        | Field Log #:               |
| Project Name: <input type="checkbox"/> Watershed <input type="checkbox"/> 303(d) <input type="checkbox"/> Antideg <input type="checkbox"/> ECO <input type="checkbox"/> FECO Other: <u>MS4</u> |                                       |                            |

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 |                                     |                  | Periphyton             |            |         |
| SQKICK   | <input checked="" type="checkbox"/> | <u>Collected</u> | Other                  |            |         |
| SQBANK   |                                     |                  | Describe Other Sample: |            |         |

Chemicals/Bacteria:  None  Routine  Nutrient  Metals  E. coli  Organics  Other \_\_\_\_\_

Field Parameters: Meter(s) Used: YSI

|                               |              |                    |              |
|-------------------------------|--------------|--------------------|--------------|
| pH (su)                       | <u>7.79</u>  | Dissolved Oxygen % | <u>107.1</u> |
| Conductivity (umhos)          | <u>272.1</u> | Turbidity (NTU)    |              |
| Temperature (C°)              | <u>26.9</u>  | TDS (mg/L)         |              |
| Dissolved Oxygen (ppm = mg/L) | <u>8.14</u>  | Flow (cfs)         |              |

Meter Problems? NO

Photos Taken?  No  Yes: Description: US / DS

Previous 48 hours precipitation:  Unknown  None  Slight  Moderate  Heavy  Flooding

Air Temperature (°F) 80

**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: 100 %

% Canopy Cover Measured (mid-reach): 100 u/s + 100 d/s + 28 LDB + 100 RDB = Total/384\*100 \_\_\_\_\_

**Channel Characteristics:**

Bank Height: 3-6 (yd.) High Water Mark: 1 (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: WART200032N Date: 6/21/21 Assessors: C. Duke

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

- | Riffle   | Run   | Pool  |
|--|---|---|
| <input type="checkbox"/> Boulders (>10")             | <input type="checkbox"/> Boulders (>10")              | <input type="checkbox"/> Boulders (>10")              |
| <input checked="" type="checkbox"/> Cobble (2.5-10") | <input checked="" type="checkbox"/> Cobble (2.5-10")  | <input checked="" type="checkbox"/> Cobble (2.5-10")  |
| <input type="checkbox"/> Gravel (0.1-2.5")           | <input checked="" type="checkbox"/> Gravel (0.1-2.5") | <input checked="" type="checkbox"/> Gravel (0.1-2.5") |
| <input type="checkbox"/> Bedrock                     | <input type="checkbox"/> Bedrock                      | <input type="checkbox"/> Bedrock                      |
| <input type="checkbox"/> Sand                        | <input type="checkbox"/> Sand                         | <input type="checkbox"/> Sand                         |
| <input type="checkbox"/> Silt (not gritty)           | <input type="checkbox"/> Silt (not gritty)            | <input type="checkbox"/> Silt (not gritty)            |
| <input type="checkbox"/> Clay (Slick)                | <input type="checkbox"/> Clay (Slick)                 | <input type="checkbox"/> Clay (Slick)                 |

**Surrounding Land Uses** (list additional land uses under comments)

- |  |                                     |                                      |   |                                       |
|--|-------------------------------------|--------------------------------------|---|---------------------------------------|
| <input checked="" type="checkbox"/> Forest | <input type="checkbox"/> Grazing    | <input type="checkbox"/> Stormwater  | <input type="checkbox"/> STP/WWTP               | <input type="checkbox"/> Construction |
| <input type="checkbox"/> Wetland           | <input type="checkbox"/> Row Crops  | <input type="checkbox"/> Urban       | <input type="checkbox"/> Industry               | <input type="checkbox"/> Impoundment  |
| <input type="checkbox"/> Park              | <input type="checkbox"/> CAFO/Dairy | <input type="checkbox"/> Commercial  | <input type="checkbox"/> Mining/Dredging        | <input type="checkbox"/> ATV/OHV      |
| <input type="checkbox"/> Hay/Fields        | <input type="checkbox"/> Logging    | <input type="checkbox"/> Residential | <input checked="" type="checkbox"/> Road/Hwy/RR | <input type="checkbox"/> Golf Course  |

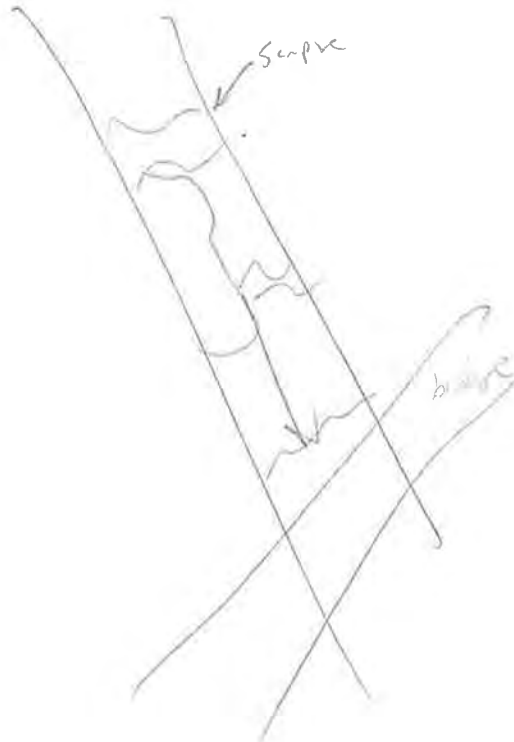
**Observed Human Disturbance to Stream:** Blank (not observed) S (Slight) M (Moderate) H (High)

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

**Other Stream Information and Stressors:** Bridge downstream

**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.

| Station | depth | Flow |
|---------|-------|------|
| 0.0     | 0.0   | 0.0  |
| 7.0     | 0.0   |      |
| 12.0    | 0.0   |      |
| 15.0    | 0.0   | 0.0  |
| 17.0    | .05   | 0.0  |
| 20.0    | .1    | 0.0  |
| 24.0    | .2    | .15  |
| 26.0    | .25   | .05  |
| 29.0    | .25   | .07  |
| 32.0    | .20   | .12  |
| 36.0    | .20   | .11  |
| 38.0    | .30   | .21  |
| 40.0    | .35   | .41  |
| 42.0    | .50   | .90  |
| 44.0    | .55   | 1.17 |
| 46.0    | .70   | .99  |
| 48.0    | 0.0   | 0.0  |



## HABITAT ASSESSMENT FIELD DATA SHEET – MODERATE TO HIGH GRADIENT STREAM (FRONT)

(Refer to Protocol E for detailed descriptions and rank information)

|   |  |    |    |    |  |    |    |   |    |   |    |   |                    |   |  |   |   |   |   |   |
|---|--|----|----|----|--|----|----|---|----|---|----|---|--------------------|---|--|---|---|---|---|---|
| <b>PROJECT:</b> Springfield 17centrics 154      |  |    |    |    |  |    |    |   |    |   |    |   |                    |   |  |   |   |   |   |   |
| <b>STA:</b> WAT02.000.370                       |  |    |    |    |  |    |    | <b>HABITAT ASSESSED BY:</b> C. Duffe J. Wilhite |    |   |    |   |                    |   |  |   |   |   |   |   |
| <b>STREAM NAME:</b> Wolfcreek Creek             |  |    |    |    |  |    |    | <b>DATE:</b> 6/21/21                            |    |   |    |   | <b>TIME:</b> 12:00 |   |  |   |   |   |   |   |
| <b>MAP LABEL:</b> Wolfcreek Creek 1100          |  |    |    |    |  |    |    | <b>ECOREGION:</b> 71e                           |    |   |    |   |                    |   |  |   |   |   |   |   |
| <b>HUC:</b> 05130206                            |  |    |    |    |  |    |    | <b>QC:</b> Consensus / Duplicate                |    |   |    |   |                    |   |  |   |   |   |   |   |
| <b>1. Epifaunal Substrate / Available Cover</b> | <b>OPTIMAL</b>   |    |    |    | <b>SUBOPTIMAL</b>  |    |    |   |    | <b>MARGINAL</b>   |    |   |                    |   | <b>POOR</b>  |   |   |   |   |   |
|   | 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.   |   |   |   |   |   |
| <b>SCORE</b> 14                                 | 20   | 19 | 18 | 17 | 16   | 15 | 14 | 13  | 12 | 11  | 10 | 9 | 8                  | 7 | 6  | 5 | 4 | 3 | 2 | 1 |
| Comments:                                       |  |    |    |    |  |    |    |   |    |   |    |   |                    |   |  |   |   |   |   |   |
| <b>2. Embeddedness of Riffles</b>               | <b>OPTIMAL</b>   |    |    |    | <b>SUBOPTIMAL</b>  |    |    |   |    | <b>MARGINAL</b>   |    |   |                    |   | <b>POOR</b>  |   |   |   |   |   |
|   | 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 boulders 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.                                       |   |   |   |   |   |
| <b>SCORE</b> 14                                 | 20   | 19 | 18 | 17 | 16   | 15 | 14 | 13  | 12 | 11  | 10 | 9 | 8                  | 7 | 6  | 5 | 4 | 3 | 2 | 1 |
| Comments:                                       |  |    |    |    |  |    |    |   |    |   |    |   |                    |   |  |   |   |   |   |   |
| <b>3. Velocity/ Depth Regime</b>                | <b>OPTIMAL</b>   |    |    |    | <b>SUBOPTIMAL</b>  |    |    |   |    | <b>MARGINAL</b>   |    |   |                    |   | <b>POOR</b>  |   |   |   |   |   |
|   | 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.   |   |   |   |   |   |
| <b>SCORE</b> 16                                 | 20   | 19 | 18 | 17 | 16   | 15 | 14 | 13  | 12 | 11  | 10 | 9 | 8                  | 7 | 6  | 5 | 4 | 3 | 2 | 1 |
| Comments:                                       |  |    |    |    |  |    |    |   |    |   |    |   |                    |   |  |   |   |   |   |   |
| <b>4. Sediment Deposition</b>                   | <b>OPTIMAL</b>   |    |    |    | <b>SUBOPTIMAL</b>  |    |    |   |    | <b>MARGINAL</b>   |    |   |                    |   | <b>POOR</b>  |   |   |   |   |   |
|   | 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. |   |   |   |   |   |
| <b>SCORE</b> 15                                 | 20   | 19 | 18 | 17 | 16   | 15 | 14 | 13  | 12 | 11  | 10 | 9 | 8                  | 7 | 6  | 5 | 4 | 3 | 2 | 1 |
| Comments:                                       |  |    |    |    |  |    |    |   |    |   |    |   |                    |   |  |   |   |   |   |   |
| <b>5. Channel Flow Status</b>                   | <b>OPTIMAL</b>   |    |    |    | <b>SUBOPTIMAL</b>  |    |    |   |    | <b>MARGINAL</b>   |    |   |                    |   | <b>POOR</b>  |   |   |   |   |   |
|   | 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.   |   |   |   |   |   |
| <b>SCORE</b> 18                                 | 20   | 19 | 18 | 17 | 16   | 15 | 14 | 13  | 12 | 11  | 10 | 9 | 8                  | 7 | 6  | 5 | 4 | 3 | 2 | 1 |
| Comments:                                       |  |    |    |    |  |    |    |   |    |   |    |   |                    |   |  |   |   |   |   |   |

**HABITAT ASSESSMENT FIELD DATA SHEET – MODERATE TO HIGH GRADIENT STREAM (BACK)**

|  |   |   |              |    |    |   |    |                           |    |                    |  |   |   |   |                   |   |   |   |   |   |
|--|---|---|--------------|----|----|---|----|---------------------------|----|--------------------|--|---|---|---|-------------------|---|---|---|---|---|
| <b>MAP LABEL:</b>  |   |   | <b>DATE:</b> |    |    |   |    | <b>ASSESSOR INITIALS:</b> |    |                    |  |   |   |   |                   |   |   |   |   |   |
| <b>6. Channel Alteration</b>   | <b>OPTIMAL</b>  |   |              |    |    | <b>SUBOPTIMAL</b>   |    |                           |    |                    | <b>MARGINAL</b>  |   |   |   |                   | <b>POOR</b>   |   |   |   |   |
|  | 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. In-stream habitat greatly altered or removed. Artificial structures have greatly affected flow pattern.                     |   |   |   |   |
| <b>SCORE</b> 18  | 20  | 19  | 18           | 17 | 16 | 15  | 14 | 13                        | 12 | 11                 | 10   | 9 | 8 | 7 | 6                 | 5   | 4 | 3 | 2 | 1 |
| Comments:  |   |   |              |    |    |   |    |                           |    |                    |  |   |   |   |                   |   |   |   |   |   |
| <b>7. Frequency of re-oxygenation zones.</b><br>Use frequency of riffles or bends for category Rank by quality.  | <b>OPTIMAL</b>  |   |              |    |    | <b>SUBOPTIMAL</b>   |    |                           |    |                    | <b>MARGINAL</b>  |   |   |   |                   | <b>POOR</b>   |   |   |   |   |
|  | 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.  |   |   |   |   |
| <b>SCORE</b> 17  | 20  | 19  | 18           | 17 | 16 | 15  | 14 | 13                        | 12 | 11                 | 10   | 9 | 8 | 7 | 6                 | 5   | 4 | 3 | 2 | 1 |
| Comments:  |   |   |              |    |    |   |    |                           |    |                    |  |   |   |   |                   |   |   |   |   |   |
| <b>8. Bank Stability (score each bank)</b><br>Determine left or right side by facing downstream.   | <b>OPTIMAL</b>  |   |              |    |    | <b>SUBOPTIMAL</b>   |    |                           |    |                    | <b>MARGINAL</b>  |   |   |   |                   | <b>POOR</b>   |   |   |   |   |
|  | 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.  |   |   |   |   |
| <b>SCORE (LDB)</b> 8   | LEFT  | 10  | 9            | 8  | 7  | 6   | 5  | 4                         | 3  | 2                  | 1  | 0 |   |   |                   |   |   |   |   |   |
| <b>SCORE (RDB)</b> 8   | RIGHT   | 10  | 9            | 8  | 7  | 6   | 5  | 4                         | 3  | 2                  | 1  | 0 |   |   |                   |   |   |   |   |   |
| Comments:  |   |   |              |    |    |   |    |                           |    |                    |  |   |   |   |                   |   |   |   |   |   |
| <b>9. Bank Vegetative Protection</b> (score each bank) include vegetation from top of bank to base of bank Determine left or right side by facing downstream | <b>OPTIMAL</b>  |   |              |    |    | <b>SUBOPTIMAL</b>   |    |                           |    |                    | <b>MARGINAL</b>  |   |   |   |                   | <b>POOR</b>   |   |   |   |   |
|  | 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 banks 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%). |   |   |   |   |
| <b>SCORE (LDB)</b> 8   | LEFT  | 10  | 9            | 8  | 7  | 6   | 5  | 4                         | 3  | 2                  | 1  | 0 |   |   |                   |   |   |   |   |   |
| <b>SCORE (RDB)</b> 8   | RIGHT   | 10  | 9            | 8  | 7  | 6   | 5  | 4                         | 3  | 2                  | 1  | 0 |   |   |                   |   |   |   |   |   |
| Comments:  |   |   |              |    |    |   |    |                           |    |                    |  |   |   |   |                   |   |   |   |   |   |
| <b>10. Riparian Vegetative Zone Width</b> (score each bank ) Zone begins at top of bank  | <b>OPTIMAL</b>  |   |              |    |    | <b>SUBOPTIMAL</b>   |    |                           |    |                    | <b>MARGINAL</b>  |   |   |   |                   | <b>POOR</b>   |   |   |   |   |
|  | 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.  |   |   |   |   |
| <b>SCORE (LDB)</b> 10  | LEFT  | 10  | 9            | 8  | 7  | 6   | 5  | 4                         | 3  | 2                  | 1  | 0 |   |   |                   |   |   |   |   |   |
| <b>SCORE (RDB)</b> 10  | RIGHT   | 10  | 9            | 8  | 7  | 6   | 5  | 4                         | 3  | 2                  | 1  | 0 |   |   |                   |   |   |   |   |   |
| Comments:  |   |   |              |    |    |   |    |                           |    |                    |  |   |   |   |                   |   |   |   |   |   |
| <b>TOTAL SCORE</b> 0 164   |   | Comparison to Ecoregion Guidelines (circle): ABOVE or BELOW |              |    |    |   |    |                           |    |                    |  |   |   |   |                   |   |   |   |   |   |
| If score is below guidelines, result of (circle)   |   |   |              |    |    |   |    |                           |    | Natural Conditions |  |   |   |   | Human Disturbance |   |   |   |   |   |
| Comments:  |   |   |              |    |    |   |    |                           |    |                    |  |   |   |   |                   |   |   |   |   |   |

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**APPENDIX C**  
**TAXA LIST**

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| PAI ID NO.                   |      |        |    | 54974        | 54975        | 54976        | 54977        | 54978          | 54979        | 54980       |
|------------------------------|------|--------|----|--------------|--------------|--------------|--------------|----------------|--------------|-------------|
| STATION                      |      |        |    | SULPH023.3RN | SULPH023.2RN | WARTR000.3RN | WARTR000.7RN | Peppers Branch | BLACK000.4RN | CARR005.2RN |
| DATE                         |      |        |    | 6/21/2021    | 6/21/2021    | 6/21/2021    | 6/21/2021    | 6/22/2021      | 6/22/2021    | 6/22/2021   |
| FRACTION                     |      |        |    | 9/128        | 5/32         | 3/256        | 1/3          | 1/15           | 8/45         |             |
| SPECIES                      | T.V. | F.F.G. | CL |              |              |              |              |                |              |             |
| <b>MOLLUSCA</b>              |      |        |    |              |              |              |              |                |              |             |
| <b>Gastropoda</b>            |      |        |    |              |              |              |              |                |              |             |
| <b>Mesogastropoda</b>        |      |        |    |              |              |              |              |                |              |             |
| Pleuroceridae                | 6    |        |    |              |              |              |              |                |              |             |
| <i>Elimia sp.</i>            | 2.7  | SC     |    | 2            | 3            |              | 4            | 59             |              |             |
| <b>ARTHROPODA</b>            |      |        |    |              |              |              |              |                |              |             |
| <b>Arachnoidea</b>           |      |        |    |              |              |              |              |                |              |             |
| <b>Acariformes</b>           |      |        |    |              |              |              |              |                |              |             |
| Hygrobatidae                 | 5.5  |        |    |              |              |              |              |                |              |             |
| <i>Hygrobates sp.</i>        | 5.5  |        |    |              |              |              |              | 1              |              |             |
| Torrenticolidae              | 5.5  |        |    |              |              |              |              |                |              |             |
| <i>Torrenticola sp.</i>      | 5.5  | -      |    | 1            |              |              |              |                |              |             |
| <b>Crustacea</b>             |      |        |    |              |              |              |              |                |              |             |
| <b>Isopoda</b>               |      |        |    |              |              |              |              |                |              |             |
| Asellidae                    | 7.9  | SH     |    |              |              |              |              |                |              |             |
| <i>Lirceus sp.</i>           | 7.4  | CG     |    | 5            | 5            | 11           | 5            | 3              |              | 6           |
| <b>Amphipoda</b>             |      |        |    |              |              |              |              |                |              |             |
| Crangonyctidae               | 7.2  |        |    |              |              |              |              |                |              |             |
| <i>Crangonyx sp.</i>         | 7.2  | CG     |    |              |              |              | 1            |                |              |             |
| <b>Decapoda</b>              |      |        |    |              |              |              |              |                |              |             |
| Cambaridae                   | 6    |        |    |              |              |              |              |                |              |             |
| <i>Faxonius sp.</i>          | 2.7  | SH     |    |              | 1            |              | 2            | 1              | 5            | 1           |
| <b>Insecta</b>               |      |        |    |              |              |              |              |                |              |             |
| <b>Ephemeroptera</b>         |      |        |    |              |              |              |              |                |              |             |
| <b>Baetidae</b>              |      |        |    |              |              |              |              |                |              |             |
| <i>Acentrella sp.</i>        | 2.5  | CG     |    |              | 2            |              | 1            |                |              | 1           |
| <i>Baetis sp.</i>            | 6    | CG     |    | 84           | 93           | 5            | 41           |                | 2            | 57          |
| <i>Dipheter sp.</i>          | 1.2  | CG     |    |              |              |              |              |                |              | 1           |
| Caenidae                     | 6    | CG     |    |              |              |              |              |                |              |             |
| <i>Caenis sp.</i>            | 6.8  | CG     |    |              | 4            |              |              |                |              | 6           |
| Heptageniidae                | 3    | SC     | CL |              |              |              |              |                |              |             |
| <i>Leucrocuta sp.</i>        | 2    | SC     | CL | 1            |              |              | 3            |                |              |             |
| <i>Maccaffertium sp.</i>     | 3.1  | SC     | CL | 3            | 8            | 3            | 11           |                |              | 11          |
| Isonychiidae                 | 3.6  | FC     |    |              |              |              |              |                |              |             |
| <i>Isonychia sp.</i>         | 3.6  | FC     |    |              |              |              | 3            |                |              | 4           |
| Leptohyphidae                | 2    | CG     |    |              |              |              |              |                |              |             |
| <i>Tricorythodes sp.</i>     | 5    | CG     |    | 2            | 4            | 1            |              |                |              |             |
| <b>Odonata</b>               |      |        |    |              |              |              |              |                |              |             |
| Gomphidae                    | 4    | P      |    |              |              |              |              |                |              |             |
| <i>Lanthus sp.</i>           | 1.6  | P      |    |              |              |              |              |                |              | 1           |
| <b>Plecoptera</b>            |      |        |    |              |              |              |              |                |              |             |
| Leuctridae                   | 0    | SH     |    |              |              |              |              |                |              |             |
| <i>Leuctra sp.</i>           | 1.5  | SH     | CL | 1            |              |              |              |                |              |             |
| <b>Megaloptera</b>           |      |        |    |              |              |              |              |                |              |             |
| Corydalidae                  | 5.28 | P      |    |              |              |              |              |                |              |             |
| <i>Corydalus sp.</i>         | 5.2  | P      | CL | 1            |              |              |              |                |              | 1           |
| <b>Trichoptera</b>           |      |        |    |              |              |              |              |                |              |             |
| Hydropsychidae               | 4.1  | FC     | CL |              |              |              |              |                |              |             |
| <i>Cheumatopsyche sp.</i>    | 6.6  | FC     | CL | 38           | 29           | 53           | 20           | 30             | 6            | 52          |
| <i>Hydropsyche sp.</i>       | 4.3  | FC     | CL |              |              |              |              | 7              | 111          |             |
| Philopotamidae               | 2.2  | FC     | CL |              |              |              |              |                |              |             |
| <i>Chimarra sp.</i>          | 3.3  | FC     | CL | 1            |              |              | 11           | 19             |              | 10          |
| Polycentropodidae            | 3.68 | FC     | CL |              |              |              |              |                |              |             |
| <i>Plectrocnemia sp.</i>     | 3.1  | FC     | CL |              |              |              | 1            |                |              |             |
| <b>Coleoptera</b>            |      |        |    |              |              |              |              |                |              |             |
| Elmidae                      | 4.41 | CG     | CL |              |              |              |              |                |              |             |
| <i>Optioservus sp.</i>       | 2.1  | SC     | CL |              |              |              | 27           |                |              |             |
| <i>Stenelmis sp.</i>         | 5.60 | SC     | CL | 23           | 24           | 26           | 16           | 10             |              | 17          |
| Psephenidae                  | 3.3  | SC     | CL |              |              |              |              |                |              |             |
| <i>Psephenus sp.</i>         | 2.3  | SC     | CL |              |              |              | 1            |                |              |             |
| <b>Diptera</b>               |      |        |    |              |              |              |              |                |              |             |
| <b>Chironomidae</b>          |      |        |    |              |              |              |              |                |              |             |
| <i>Cardiocladius sp.</i>     | 6.2  | P      |    | 1            |              |              |              |                |              | 1           |
| <i>Chironomus sp.</i>        | 9.3  | CG     |    |              | 1            |              |              |                |              |             |
| <i>Conchapelopia sp.</i>     | 8.4  | P      |    | 4            | 4            | 10           | 12           | 10             | 1            | 10          |
| <i>Cricotopus sp.</i>        | 7.44 |        | CL | 3            | 1            |              |              |                | 28           | 1           |
| <i>Cryptochironomus sp.</i>  | 6.4  | P      |    |              | 3            |              |              |                |              | 4           |
| <i>Dicrotendipes sp.</i>     | 7.2  | CG     |    |              |              |              |              |                |              | 1           |
| <i>Glyptotendipes sp.</i>    | 8.6  | FC     |    |              |              | 3            |              |                |              |             |
| <i>Microtendipes sp.</i>     | 4.6  | CG     | CL | 2            |              | 1            |              |                |              |             |
| <i>Nilotanytus sp.</i>       | 4.1  |        |    | 1            |              |              |              |                |              |             |
| <i>Parametriochnemus sp.</i> | 3.9  | CG     |    | 1            | 3            |              | 1            | 11             | 1            | 4           |
| <i>Phaenopsectra sp.</i>     | 6.85 | SC     | CL | 1            |              |              |              |                |              |             |
| <i>Polypedilum sp.</i>       | 6.1  | SH     |    | 27           | 19           | 64           | 6            | 10             | 2            | 17          |
| <i>Rheocricotopus sp.</i>    | 4.7  | CG     |    |              |              |              |              | 7              |              | 2           |
| <i>Rheotanytarsus sp.</i>    | 6.5  | FC     | CL | 5            |              |              |              | 6              |              | 6           |
| <i>Stempellinella sp.</i>    | 5.6  | CG     |    | 2            |              | 2            |              |                |              | 1           |
| <i>Synorthocladius sp.</i>   | 4.2  | CG     |    | 1            |              |              |              |                |              |             |
| <i>Tanytarsus sp.</i>        | 6.6  | FC     |    | 1            | 1            |              |              |                |              |             |
| <i>Thienemanniella sp.</i>   | 6.4  | CG     |    | 3            |              |              |              | 2              |              |             |

| PAI ID NO.                           |      |        |    | 54974        | 54975        | 54976        | 54977        | 54978          | 54979        | 54980       |
|--------------------------------------|------|--------|----|--------------|--------------|--------------|--------------|----------------|--------------|-------------|
| STATION                              |      |        |    | SULPH023.3RN | SULPH023.2RN | WARTR000.3RN | WARTR000.7RN | Peppers Branch | BLACK000.4RN | CARR005.2RN |
| DATE                                 |      |        |    | 6/21/2021    | 6/21/2021    | 6/21/2021    | 6/21/2021    | 6/22/2021      | 6/22/2021    | 6/22/2021   |
| FRACTION                             |      |        |    | 9/128        | 5/32         | 3/256        | 1/3          | 1/15           | 8/45         |             |
| SPECIES                              | T.V. | F.F.G. | CL |              |              |              |              |                |              |             |
| <i>Tribelos sp.</i>                  | 6.4  | CG     |    |              | 1            |              |              |                |              |             |
| <i>Tvetenia sp.</i>                  | 3.55 | CG     |    | 1            |              |              |              | 3              |              |             |
| Empididae                            | 7.6  | P      |    |              |              |              |              |                |              |             |
| <i>Hemerodromia sp.</i>              | 6    | P      |    | 1            |              | 1            | 2            | 6              | 7            | 3           |
| Psychodidae                          | 9.64 | CG     |    |              |              |              |              |                |              |             |
| <i>Psychoda sp.</i>                  | 9.64 | CG     |    |              | 1            |              |              |                | 2            |             |
| Simuliidae                           | 4.7  | FC     | CL |              |              |              |              |                |              |             |
| <i>Simulium sp.</i>                  | 4.9  | FC     | CL | 13           | 1            |              |              | 4              | 2            | 4           |
| Tipulidae                            | 5.3  | SH     |    |              |              |              | 1            |                |              |             |
| <i>Antocha sp.</i>                   | 4.4  | CG     | CL |              |              |              |              |                | 1            |             |
| <i>Limonia (Dicranomyia) sp.</i>     | 9.3  | SH     |    |              |              |              |              |                | 3            |             |
| <i>Tipula sp.</i>                    | 7.5  | SH     |    |              |              |              |              |                | 4            |             |
| <b>TOTAL NO. OF ORGANISMS</b>        |      |        |    | 232          | 208          | 180          | 169          | 189            | 175          | 222         |
| <b>TOTAL NO. OF TAXA</b>             |      |        |    | 29           | 20           | 12           | 20           | 17             | 14           | 25          |
| <b><sup>a</sup>TOTAL NO. OF TAXA</b> |      |        |    | 28           | 20           | 12           | 20           | 17             | 14           | 25          |
| <b>EPT</b>                           |      |        |    | 8            | 6            | 4            | 8            | 3              | 3            | 8           |
| <b><sup>a</sup>EPT</b>               |      |        |    | 7            | 6            | 4            | 8            | 3              | 3            | 8           |
| <b>%EPT-CHEUM</b>                    |      |        |    | 40.95%       | 53.37%       | 5.00%        | 42.01%       | 13.76%         | 64.57%       | 40.54%      |
| <b>%OC</b>                           |      |        |    | 22.84%       | 15.87%       | 44.44%       | 11.24%       | 25.93%         | 18.29%       | 21.17%      |
| <b>NCBI</b>                          |      |        |    | 5.94         | 5.93         | 6.35         | 4.96         | 4.63           | 5.19         | 5.86        |
| <b>%TNUTOL</b>                       |      |        |    | 42.24%       | 40.87%       | 85.56%       | 30.18%       | 59.26%         | 20.57%       | 44.59%      |
| <b>% CLINGERS-CHEUM</b>              |      |        |    | 23.28%       | 16.35%       | 16.67%       | 41.42%       | 24.34%         | 81.14%       | 22.52%      |