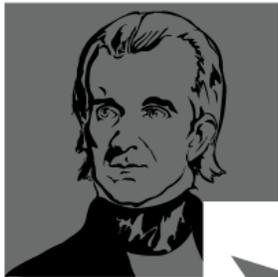


CITY OF COLUMBIA



T E N N E S S E E

Something good around every corner.

Municipal Separate Storm Sewer System

Annual Report

2014-2015



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)

Municipal Separate Storm Sewer System (MS4) Annual Report

1. MS4 INFORMATION

City of Columbia TNS075248

Name of MS4 MS4 Permit Number

Douglas Toney dtoney@columbiatn.com

Name of Contact Person Email Address

931-560-1560
 Telephone (including area code)

700 North Garden Street
 Mailing Address

Columbia	TN	38401
City	State	ZIP code

What is the current population of your MS4? 35000

What is the reporting period for this annual report? From 2014 to 2015

2. WATER QUALITY PRIORITIES (SECTION 3.1)

A. Does your MS4 discharge into waters listed as impaired on TN's most current 303(d) list and/or according to the on-line GIS mapping tool? Yes No

B. If yes, please attach a list all impaired waters within your jurisdictional area.

C. Does your MS4's jurisdictional area contain any waterbodies where a TMDL has been approved for parameters other than pathogens, siltation and habitat alterations? If yes, please attach a list. Yes No

D. Does your MS4 discharge to any Exceptional TN Waters (ETWs) or Outstanding National Resource Waters (ONRWs)? If yes, please attach a list. Yes No

E. Are you implementing additional specific provisions to ensure the continued integrity of ETWs or ONRWS located within your jurisdiction? Yes No

3. PROTECTION OF STATE OR FEDERALLY LISTED SPECIES (SECTION 3.2.1 General Permit for Phase II MS4s)

A. Are there any state or federally listed species within the MS4's jurisdiction? Yes No

B. Are any of the MS4 discharges or discharge-related activities likely to jeopardize any state or federally listed species? Yes No

C. Please attach any authorizations or determinations by U.S. Fish & Wildlife Service on the effect of the MS4 discharges on state or federally listed species.

4. PUBLIC EDUCATION AND PUBLIC PARTICIPATION (SECTION 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 of those pollutants, such as Hot Spots? Yes No

Municipal Separate Storm Sewer System (MS4) Annual Report

C. If yes, what are the specific causes, sources and/or pollutants addressed by your public education program?
Household chemicals, pet waste, yard care and organic materials entering the MS4

- D. Note specific successful outcome(s) (NOT tasks, events, publications) fully or partially attributable to your public education program during this reporting period. Several stream buffers have been improved along corridors, and a number of business owners have allowed the regrowth of native foliage in high risk areas.
- E. Do you have an advisory committee or other body comprised of the public and other stakeholders that provides regular input on your stormwater program? Yes No
- F. How do you facilitate, advertise, and publicize public involvement and participation opportunities? email, Facebook, website, and print media.
- G. Do you have a webpage dedicated to your stormwater program? Yes No
If so, what is the link/URL: www.columbiatn.com/dservices/stormwater.htm
- H. Are you tracking and maintaining records of public education, outreach, involvement and participation activities? Please attach a summary of these activities. Yes No

5. ILLICIT DISCHARGE DETECTION AND ELIMINATION (SECTION 4.2.3)

- A. Have you completed a map of all outfalls and receiving waters of your storm sewer system? Yes No
- B. Have you completed a map of all storm drain pipes of storm sewer system? Yes No
- C. How many outfalls have you identified in your system? We are currently in the process of redefining our outfall map. We plan to map all outfalls with a contributing drainage area of 1 acre or greater. Previously, we annually inspected 23 outfalls during dry weather.
- D. Have any of these outfalls been screened for dry weather discharges? Yes No
- F. What is your frequency for screening outfalls for illicit discharges? Annually
- G. Do you have an ordinance that effectively prohibits illicit discharges? Yes No
- H. During this reporting period, how many illicit discharges/illegal connections have you discovered (or been reported to you)? 1
- I. Of those illicit discharges/illegal connections that have been discovered or reported, how many have been eliminated? 1

6. CONSTRUCTION SITE STORMWATER RUNOFF (SECTION 4.2.4)

- A. Do you have an ordinance or adopted policies stipulating:
- Erosion and sediment control requirements? Yes No
- Other construction waste control requirements? Yes No
- Requirement to submit construction plans for review? Yes No
- MS4 enforcement authority? Yes No
- B. How many active construction sites disturbing at least one acre were there in your jurisdiction this reporting period? 18
- C. How many of these active sites did you inspect this reporting period? 18
- D. On average, how many times each, or with what frequency, were these sites inspected (e.g., weekly, monthly, etc.)? Biweekly

Municipal Separate Storm Sewer System (MS4) Annual Report

E. Do you prioritize certain construction sites for more frequent inspections? Yes No

If Yes, based on what criteria? Proximity to waters of the State and previous issues with compliance

7. PERMANENT STORMWATER CONTROLS (SECTION 4.2.5)

A. Do you have an ordinance or other mechanism to require:

Site plan reviews of all new and re-development projects? Yes No

Maintenance of stormwater management controls? Yes No

Retrofitting of existing BMPs with green infrastructure BMPs? Yes No

B. What is the threshold for new/redevelopment stormwater plan review? (e.g., all projects, projects disturbing greater than one acre, etc.) 5,000 square feet

C. Have you implemented and enforced performance standards for permanent stormwater controls? Yes No

D. Do these performance standards go beyond the requirements found in Section 4.2.5.2 and require that pre-development hydrology be met for:

Flow volumes Yes No

Peak discharge rates Yes No

Discharge frequency Yes No

Flow duration Yes No

E. Please provide the URL/reference where all permanent stormwater management standards can be found.

<http://www.columbiatn.com/DServices/Stormwater.htm>

F. How many development and redevelopment project plans were reviewed for this reporting period? 15

G. How many development and redevelopment project plans were approved? 15

H. How many permanent stormwater management practices/facilities were inspected? 2

I. How many were found to have inadequate maintenance? 2

J. Of those, how many were notified and remedied within 30 days? (If window is different than 30 days, please specify) 2

K. How many enforcement actions were taken that address inadequate maintenance? 0

L. Do you use an electronic tool (e.g., GIS, database, spreadsheet) to track post-construction BMPs, inspections and maintenance? Yes No

M. Do all municipal departments and/or staff (as relevant) have access to this tracking system? Yes No

N. Has the MS4 developed a program to allow for incentive standards for redeveloped sites? Yes No

O. How many maintenance agreements has the MS4 approved during the reporting period? 15

8. CODES AND ORDINANCES REVIEW AND UPDATE (SECTION 4.2.5.3)

A. Is a completed copy of the EPA Water Quality Scorecard submitted with this report? Yes No

Municipal Separate Storm Sewer System (MS4) Annual Report

- B. Include status of implementation of code, ordinance and/or policy revisions associated with permanent stormwater management. Our stormwater ordinance is in the process of being reviewed and approved by the City Council. It makes the requirements more concise and clear, and outlines guidelines in a more concrete manner.

9. STORMWATER MANAGEMENT FOR MUNICIPAL OPERATIONS (SECTION 4.2.6)

- A. Have stormwater pollution prevention plans (or an equivalent plan) been developed for:
- | | | |
|---|---|--|
| All parks, ball fields and other recreational facilities | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| All municipal turf grass/landscape management activities | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| All municipal vehicle fueling, operation and maintenance activities | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| All municipal maintenance yards | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| All municipal waste handling and disposal areas | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
- B. Are stormwater inspections conducted at these facilities? Yes No
1. If Yes, at what frequency are inspections conducted? Annually
- C. Have standard operating procedures or BMPs been developed for all MS4 field activities? (e.g., road repairs, catch basin cleaning, landscape management, etc.) Yes No
- D. Do you have a prioritization system for storm sewer system and permanent BMP inspections? Yes No
- E. On average, how frequently are catch basins and other inline treatment systems inspected? Monthly
- F. On average, how frequently are catch basins and other inline treatment systems cleaned out/maintained? Monthly, or during significant rain events.
- G. Do municipal employees in all relevant positions and departments receive comprehensive training on stormwater management? Yes No
- H. If yes, do you also provide regular updates and refreshers? Yes No
- If so, how frequently and/or under what circumstances? Bi-annually

10. STORMWATER MANAGEMENT PROGRAM UPDATE (SECTION 4.4)

- A. Describe any changes to the MS4 program during the reporting period including but not limited to:
- Changes adding (but not subtracting or replacing) components, controls or other requirements (Section 4.4.2.a). None
- Changes to replace an ineffective or unfeasible BMP (Section 4.4.2.b). None
- Information (e.g. additional acreage, outfalls, BMPs) on program area expansion based on annexation or newly urbanized areas. None
- Changes to the program as required by the division (Section 4.4.3). Full time employee hired to manage stormwater permit.

11. EVALUATING/MEASURING PROGRESS

- A. What indicators do you use to evaluate the overall effectiveness of your Stormwater Management Program, how long have you been tracking them, and at what frequency? Note that these are not measurable goals for individual BMPs or tasks, but large-scale or long-term metrics for the overall program, such as in-stream macroinvertebrate community indices, measures of effective impervious cover in the watershed, indicators of in-stream hydrologic stability, etc.

Municipal Separate Storm Sewer System (MS4) Annual Report

Indicator	Began Tracking (year)	Frequency	Number of Locations
<i>Example: E. coli</i>	2003	<i>Weekly April–September</i>	20
benthic Macroinvertebrates and chemical/physical analysis	2014		11

B. Provide a summary of data (e.g., water quality information, performance data, modeling) collected in order to evaluate the performance of permanent stormwater controls installed throughout the system. This evaluation may include a comparison of current and past permanent stormwater control practices. A comprehensive stream health assessment was performed to establish a baseline for evaluating overall performance in coming years.

12. ENFORCEMENT (SECTION 4.5)

A. Identify which of the following types of enforcement actions you used during the reporting period, indicate the number of actions, the minimum measure (e.g., construction, illicit discharge, permanent stormwater control) or note those for which you do not have authority:

Action	Construction	Permanent Stormwater Controls	Illicit Discharge	Authority?	
Notice of violation	#_____	#_____	# <u>1</u>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Administrative fines	#_____	#_____	#_____	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Stop Work Orders	# <u>1</u>	#_____	#_____	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Civil penalties	#_____	#_____	#_____	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Criminal actions	#_____	#_____	#_____	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Administrative orders	#_____	#_____	#_____	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Other <u>Informal Conversation or Phone Conversation</u>	#_____	# <u>2</u>	#_____		

B. Do you use an electronic tool (e.g., GIS, data base, spreadsheet) to track the locations, inspection results, and enforcement actions in your jurisdiction? Yes No

C. What are the 3 most common types of violations documented during this reporting period? EPSC and illegal dumping/illicit discharge

13. PROGRAM RESOURCES (OPTIONAL)

A. What was your annual expenditure to implement the requirements of your MS4 NPDES permit and SWMP this past reporting period? 150,000

B. What is next year's budget for implementing the requirements of your MS4 NPDES permit and SWMP? 150,000

C. Do you have an independent financing mechanism for your stormwater program? Yes No

D. If so, what is it/are they (e.g., stormwater fees), and what is the annual revenue derived from this mechanism?

Source: Amount \$

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Source:

Amount \$

E. How many full time employees does your municipality devote to the stormwater program (specifically for implementing the stormwater program vs. municipal employees with other primary responsibilities that dovetail with stormwater issues)? 1 full time employee.

F. Do you share program implementation responsibilities with any other entities? Yes No

Entity	Activity/Task/Responsibility	Your Oversight/Accountability Mechanism
Public Works	Drainage	Engineering will field the complaints, and evaluate them then pass them to Public Works where they are valuated based on risk, cost, and citizens impacted.
Parks and Recreation	Maintenance of Public Facilities and Greenspaces	No mechanism in place
Emergency Management		No mechanism in place

G. Please attach a copy of your Organizational Chart

14. CERTIFICATION

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

"I certify under penalty of law that this document and all attachments were prepared by me, or under my direction or supervision. The submitted information 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. As specified in Tennessee Code Annotated Section 39-16-702(a)(4), this declaration is made under penalty of perjury."

Printed Name and Title

Signature

Date

Annual reports must be submitted in accordance with the requirements of Section 5.4. (Reporting) of the permit. Annual reports must be submitted to the appropriate Environmental Field Office (EFO) by September 30 of each calendar year, as shown in the table below:

EFO	Street Address	City	Zip Code	Telephone
Chattanooga	540 McCallie Avenue STE 550	Chattanooga	37402	(423) 634-5745
Columbia	1421 Hampshire Pike	Columbia	38401	(931) 380-3371
Cookeville	1221 South Willow Ave.	Cookeville	38506	(931) 432-4015
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

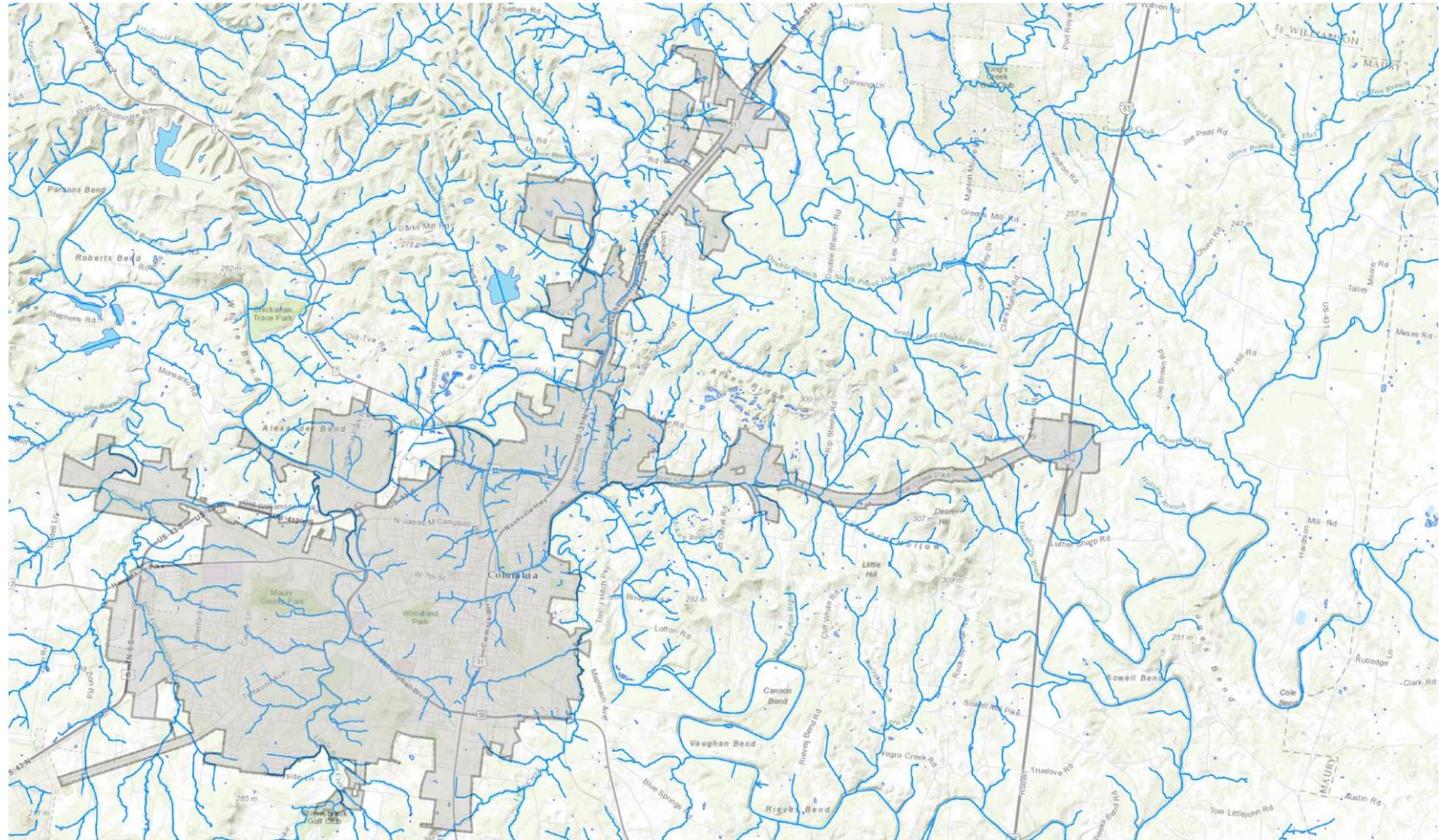
Appendix A

Stream Assessment

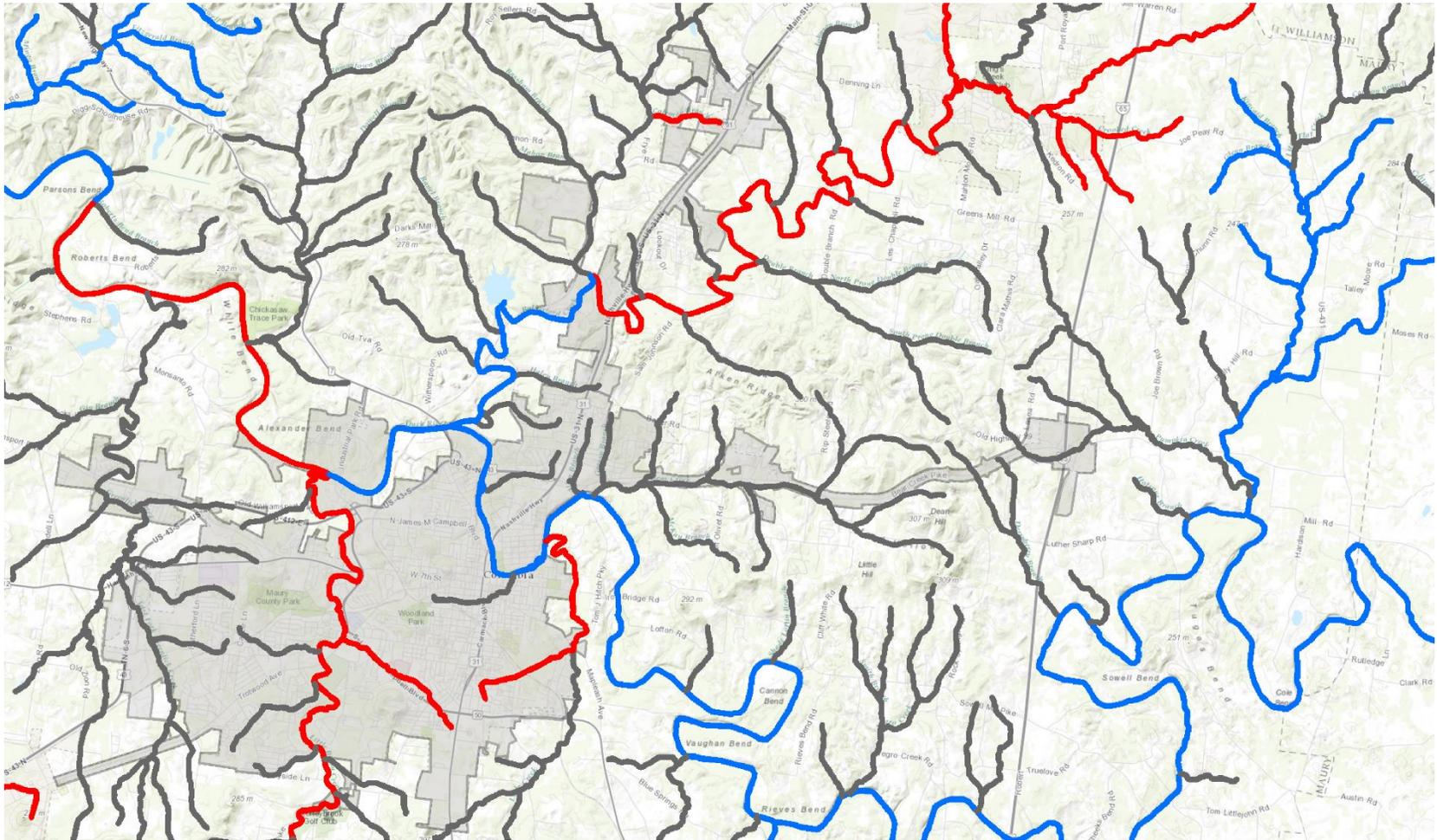
Water Listed as Impaired		
<i>Waterbody ID</i>	<i>Impacted Waterbody</i>	<i>Cause</i>
TN06040003 027-0100	UNNAMED TRIB TO LITTLE BIGBY CR	Physical Substrate Habitat Alterations
TN06040003 030-0100	UNNAMED TRIB TO LYTLE CREEK	Loss of biological integrity due to siltation. Physical Substrate Habitat Alterations
TN06040003 034-0260	COLEMAN BRANCH	Loss of biological integrity due to siltation
TN06040003 026-1000	DUCK RIVER	Phosphate, Low Dissolved Oxygen
TN06040003 027-1000	LITTLE BIGBY CREEK	Loss of biological integrity due to siltation
TN06040003 030-1000	LYTLE CREEK	Loss of biological integrity due to siltation
TN06040003 034-2000	RUTHERFORD CREEK	Loss of biological integrity due to siltation

Water Listed as High Quality	
<i>Waterbody</i>	<i>Description</i>
LYTLE CREEK	From Duck River to unnamed tributary near Morgan Springs
DUCK RIVER	From Tennessee River (Kentucky Lake) to River Mile 137.7 including unnamed tributaries in Tennessee National Wildlife Refuge

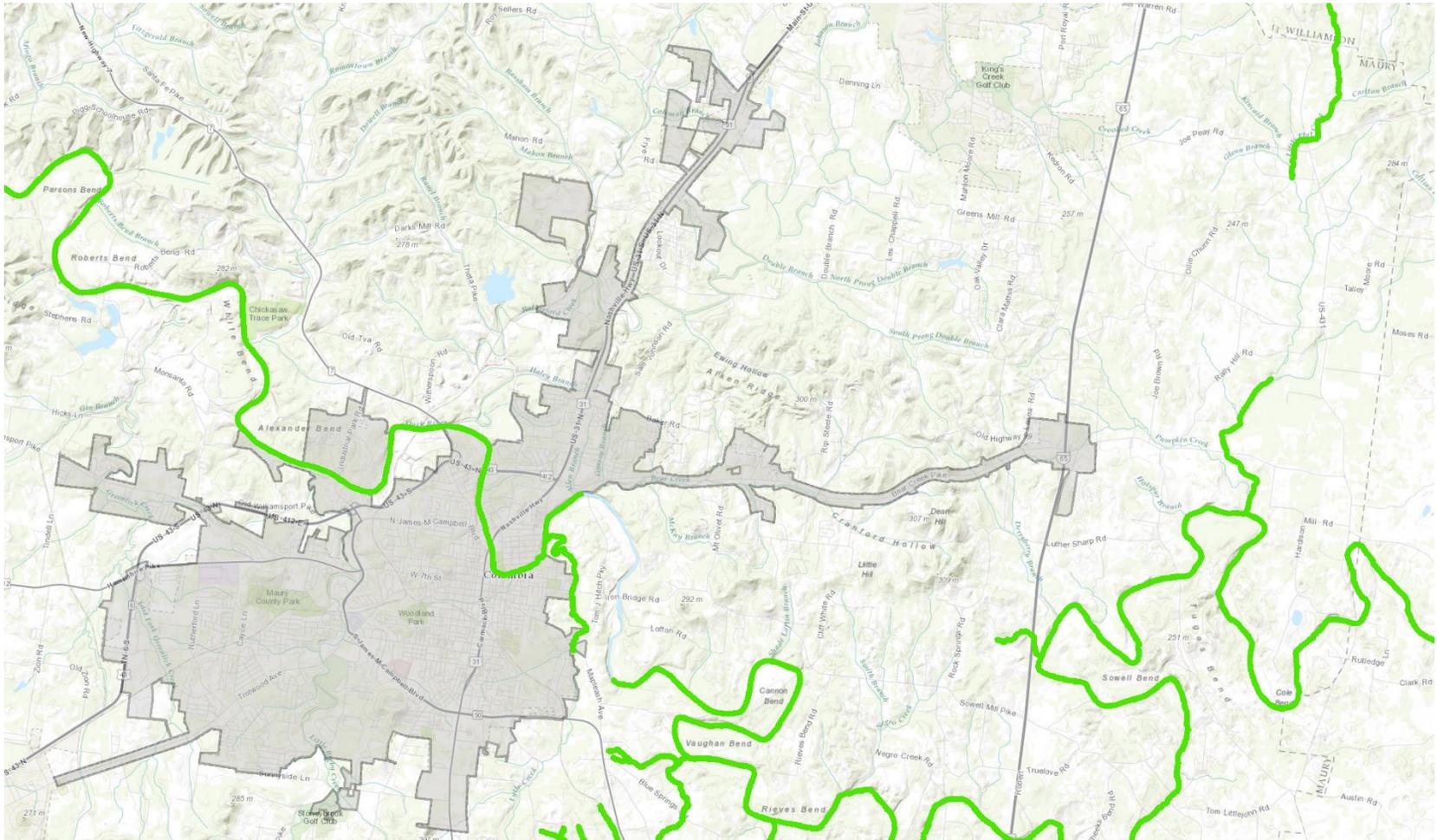
Waterbodies Map



Stream Assessment Map



Exceptional TN Waters Map



Appendix B

Educational and Program Assessments

2014-2015 Permit Year Educational Event Log

Event	Date	# of People	Topics Discussed
Boys and Girls Club of Maury County Tweens and Teens (with TN Enviromental Council and GM)	7/17/2014	60	Conducted habitat survey and water quality sampling of Bear Creak off SR-99 at Berea Church for macro invertibrates and well as chemical sampling for nitrates, phosphates, disolved oxygen, pH, temperature and turbidity.
Boys and Girls Club of Maury County Tweens and Teens (with TN Enviromental Council and GM)	6/9/2015	65	Conducted habitat survey and water quality sampling of Bear Creak off SR-99 at Berea Church for macro invertibrates and well as chemical sampling for nitrates, phosphates, disolved oxygen, pH, temperature and turbidity.

Water Quality Score Card

PROTECT NATURAL RESOURCES (INCLUDING TREES) AND OPEN SPACE

SENSITIVE NATURAL LANDS/CRITICAL AREA PROTECTION (1.A.1)

Adopt Plans/Educate:			
Identify and map critical natural resource areas (e.g., steep slopes, wildlife habitat, forests, drinking water source areas).	1	1	
The local comprehensive plan contains a natural resource protection element with goals calling for preservation of identified critical natural resource areas.	1	1	
Identify key natural resource areas for protection in jurisdiction's parks and open space plan.	1	1	
Provide assistance to landowners in identifying sensitive natural areas and laying out developments to avoid such areas.	1	1	
Local plans establish and enforce areas which are available for development and which lands are a priority for preservation.	1	0	
Remove Barriers:			
Protection of sensitive natural areas and wildlife habitat qualifies for credit towards local open space dedication and set-aside requirements.	1	0	
Adopt Incentives:			
Provide financial support to or partner with land trusts to acquire critical natural areas.	1	0	
Establish a dedicated source of funding for open space acquisition and management (e.g., bond proceeds, sales tax, etc.).	2	0	
Adopt a transferable developments rights program to provide an incentive for landowners to preserve sensitive natural lands and wildlife habitat.	1	0	
Land use regulations provide for the creation of cluster and conservation subdivision on the periphery of urban growth areas to encourage preservation of intact blocks of sensitive natural areas.	1	0	
Exact Regulations			
Adopt regulations to protect steep slope, hillsides, and other sensitive natural lands (e.g., by limiting development on slopes > 30% or requiring larger lot sizes in sensitive areas).	2	1	Currently the Zoning Ordinance limits a percentage of the lot size where steep slopes are present. If the natural slope is greater than 25% then only 15% is buildable
Adopt wildlife habitat protection regulations aimed at preserving large contiguous blocks of habitat areas.	2	0	
Create agriculture/natural resource zoning districts (e.g., minimum lot size of 80 acres and larger) to preserve agricultural areas and forests.	2	0	

PROTECTION OF WATER BODIES/AQUIFERS (1.A.2A)

Adopt Plans/Educate:			
Identify and map critical water resource areas.	1	1	
The local comprehensive plan contains a water quality protection element with goals calling for protection of identified water bodies and other water resource areas such as wetlands.	1	1	
Identify key critical water resource areas for protection in jurisdiction’s parks and open space plan.	1	1	
Cooperate in developing regional approaches to watershed protection and stormwater management.	1	0	
Remove Barriers			
Wetlands and other water bodies and buffer areas qualify for credit against local open space dedication/set-aside regulations.	1	0	
Adopt Incentives			
Protected water bodies and buffer areas qualify for 2X (or more) credit against open space requirements set by the municipality.	1	0	
Restoration of degraded riparian/wetland areas qualifies for additional open space credit within the local municipal system.	1	0	
Density from protected riparian areas/buffers can be transferred to upland portions of development sites.	1	0	
Enact Regulations			
Riparian and wetland buffer areas required by local land use regulations <ul style="list-style-type: none"> • Buffer is at least 50 feet (as measured from the top of bank) = 1 point • Buffer is at least 100 feet (as measured from the top of bank) = 2 points • Buffer is greater than 100 feet (as measured from the top of bank) = 3 points 	1 to 3	0	
Critical water resource areas cannot be counted in calculating allowable density on a site (e.g., on a 200-acre site with 50 acres of wetlands, only 150 acres can be used to calculate density under zone district regulations, and only those 150 acres may be developed).	1	0	
Any development in floodplains is prohibited or must demonstrate no adverse impacts upstream and downstream (See resources below for details on “no adverse impact” approach to floodplain management).	2	2	
Stormwater quality and quantity performance standards exist for development sites (e.g., restrictions on sedimentation levels, pre/post development flows).	1	1	
Local regulations require restoration of degraded riparian/wetland areas on a development site.	1	0	
Damage to riparian/wetland areas must be compensated for on a minimum 2:1 basis on- or off-site.	1	0	

Performance standards exist and are well-enforced for stormwater discharges to wetlands that protect the hydrologic regimes and limit pollutant loads.	1	0	
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PROTECTION OF WATER BODIES/AQUIFERS (1.A.2B)

Adopt Plans/Educate:			
Local land use plans identify aquifer recharge/source water areas and recommend protective measures.	1	0	
Require that all stormwater inlets carry a notice regarding discharge to receiving waters.	1	1	
Map and publish wellhead and aquifer recharge areas to alert developers to potential restrictions	1	0	
Adopt Incentives			
Drinking water source protection and aquifer recharge areas have been identified and a dedicated funding source is in place to purchase and protect such areas.	1	0	
Protection of critical water source areas qualifies for additional credit towards local open space requirements.	1	0	
Enact Regulations			
Adopt well-head protection regulations/zones to prevent incompatible development and uses.	1	0	
Adopt aquifer protection regulations/zones to prevent incompatible development and uses.	2	0	

OPEN SPACE PROTECTION (1.B.1)

Adopt Plans/Educate:			
Adopt a community-wide open space and parks plan	1	1	
The local comprehensive plan contains an open space/parks element that recognizes the role of open space in sustainable stormwater management.	1	0	
Remove Barriers			
Green infrastructure practices count towards local open space set aside requirements up to 50% of total.	1	0	
Allow and encourage retrofits of abandoned or underutilized public lands to serve as permanent or temporary open space and green infrastructure sites.	1	0	
Create Incentives			
Additional open space credits are given for green stormwater management facilities that are improved/created for public recreational purposes.	1	0	
Provide credit against open space impact fees for green roofs.	1	0	
Enact Regulations			

Adopt neighborhood policies and ordinances that work to create neighborhood—not development site—open space amenities that are within ¼ to ½ mile walking distance from every residence.	1	0	
Adopt an open space impact fee that is used to purchase passive open space that can assist in stormwater management.	1	0	
Adopt open space dedication and/or set aside requirements based on the demand generated by the development. As a baseline, use the average open space requirements adopted by the National Recreation and Park Assn. (e.g., 10 acres of community and neighborhood parks for every 1,000 persons in a development or fraction thereof).	1	0	

TREE PROTECTION (1.C.1)

Adopt Plans/Educate:			
Survey and inventory existing trees on public lands and street rights-of-way. Document the characteristics and location of street trees and urban tree canopy to inform public tree planting, adoption, and maintenance programs.	1	0	
Select tree species based on known performance for managing stormwater runoff. Publish list and make widely available for homeowners/others that plant street trees.	1	0	
Conduct education and outreach about tree protection, proper maintenance and replanting opportunities through printed materials, workshops, events and signage.	1	0	
Adopt a policy to protect existing trees on local government development sites (e.g., municipal parking lots, municipal buildings, etc.).	1	1	
Maintain an active tree maintenance program for public trees, including pest control, pruning, watering, and similar measures.	1	0	
Remove Barriers			
Acknowledge trees as part of community infrastructure and develop a coordinated design for locating public utilities to provide enough space for mature tree canopy and root development.	1	0	
Adapt Incentives			
Provide free or reduced-price trees to homeowners to be used as street trees.	1	0	
Enact Regulations			
Require any public trees removed or damaged during construction associated with private development to be replaced on- or off-site with an equivalent amount of tree caliper. (e.g., remove a 24-diameter tree/replace with 6 four-inch diameter trees.	1	0	
Adopt construction protection rules for all public trees (e.g., fencing, no storage of hazardous materials, avoid cutting into root zones, etc.).	1	0	

TREE PROTECTION (1.C.2)

Adopt Plans/Educate			
Community plans specifically include tree preservation and replacement as community goals.	1	1	
Conduct educational sessions for builders and developers regarding appropriate tree protection techniques and/or publish a technical tree protection manual.	1	0	
Follow maintenance and inspection timelines and meet canopy goals and milestones by ensuring old trees survive, replacing dead or diseased trees, and planting new trees.	1	0	
Remove Barriers			
Set up maintenance and inspection agreements for private properties meeting stormwater requirements or receiving stormwater fee credit for trees	1	1	
Set up long-term maintenance and inspection schedules for trees on public lands.	1	0	
Adopt Incentives			
Support local non-profits that plant trees and provide educational services.	1	0	
Provide financial incentives for tree purchases and planting.	1	0	
A tree fund has been established to receive in-lieu payments when trees must be removed from a development site to accommodate permitted projects.	1	0	
Trees of a specified minimum size count towards a percentage of stormwater management requirements (e.g., partial credit given for each mature tree exceeding a specified height or canopy size	1	0	
Trees over a specified minimum size (e.g., 3-inch caliper) protected during development are credited towards landscaping requirements. <ul style="list-style-type: none"> meeting the established landscape requirement = 1 point exceeding the established landscape requirement = 2 points 	1 to 2	2	Heritage trees located on the interior of a site are credited at a rate of 200% where each heritage tree is preserved, it will count for 2 required canopy trees.
Enact Regulations			
Require permits before removing trees on proposed development or redevelopment sites. Provide fines and/or stop-work authority for permit violations.	1	0	
Set minimum tree preservation standards for new development sites.	1	1	
Require site plans or stormwater plans to include tree preservation.	1	1	
Require/allow tree replacement off-site for infill sites.	1	0	

TREE PROTECTION (1.C.3)

Adopt Plans/Educate:			
Local comprehensive and transportation plans support the planting of street trees by all private and public development projects	1	1	
Capital improvement plans include tree planning as part of project budgets.	1	1	
Adopt Incentives			
Offer incentives, such as reduced setbacks or increased building densities, in exchange for additional tree preservation beyond ordinance requirements.	1	0	
Enact Regulations			
All private and public developments are required to plant street trees in accordance with size, spacing, and other local government requirements.	1	1	
New street designs and redesigns of existing streets take into account space for tree development and require necessary surface area and volume of soil dependent on type of tree species selected (this includes lateral root growth as well as direct downward growth to accommodate mature tree canopy and roots without adversely affecting other utilities).	1	1	
Street specifications require permeable paving for sidewalks and other surfaces to reduce stormwater runoff and allow street trees to benefit from the available water.	1	0	
Total score for PROTECT NATURAL RESOURCES AREAS AND OPEN SPACE	83	24	

PROMOTE EFFICIENT, COMPACT DEVELOPMENT PATTERNS AND INFILL

SUPPORT INFILL AND REDEVELOPMENT (2.A.1)

Adopt Plans/Educate:			
Local plans identify potential brownfield sites and support their redevelopment.	1	0	
Capital improvement plans include infrastructure improvements (water, sewer, road, sidewalk, etc. upgrades) for identified brownfield and greyfield sites.	1	0	
Educate lending and financial institutions about benefits and local priorities of directing development to existing areas.	1	0	
Conduct outreach to the community to ensure local form and pattern of development are supported.	1	0	
Remove Barriers			
Establish a brownfields program to remove uncertainty regarding clean-up and liability issues.	1	0	
Adopt Incentives			
Provide incentives such as density bonuses and accelerated permitting for brownfield and greyfield sites.	1	0	
Adopt funding mechanisms for remediating/redeveloping brownfield and greyfield sites.	1	0	
Streamlined permitting procedures are put into place for infill and brownfield redevelopment plan review.	1	0	
Establish tax increment financing (TIF) districts to encourage redevelopment	1	0	
Enact Regulation			
In local codes, ordinances, and policies, the municipality differentiates between greenfield and infill development	1	0	

DIRECT DEVELOPMENT TO EXISTING INFRASTRUCTURE (2.B.1)

Adopt Plans/Educate:			
Local plans recommend/establish urban growth areas and urban growth boundaries. Development is encouraged within urban growth boundaries and discouraged outside of them	1	1	
Analyze which areas within the jurisdiction are appropriate for higher density development based on existing infrastructure capacity, cost of providing new services, and access.	2	1	
Capital improvement plans for public infrastructure (roads, water, sewer, etc.) target funding inside urban growth boundary.	2	2	
Local sewer/water authority capital improvement plans follow development policies established in local comprehensive plans and target areas with existing development/infrastructure.	1	1	

Remove Barriers			
Development standards addressing landscaping, buffering, parking, and open space are tailored for infill areas to avoid creating unnecessary hurdles to development (e.g., imposing suburban parking requirements in high-density infill areas).	2	0	
Remove prohibitions on accessory dwelling units in infill areas to increase density of development.	2	0	
Off-site, regional water retention/detention encouraged/allowed to avoid costly on-site retention in densely developed infill areas and to provide benefit to priority retrofit sites, such as schools.	2	0	
Package plants and other wastewater treatment trains are encouraged for development in limited circumstance areas where growth is appropriate but sewers/treatment capacity does not exist	1	0	
Technical information and analysis on the effectiveness of various treatment systems are readily available to developers. Local governments have completed the research and have determined which systems work best for their soil conditions and topography and have made this information available to the development community.	1	0	
Allow a wide variety of housing types and sizes within infill areas and reduced minimum lot sizes.	1	0	
Adopt Incentives			
Increase development densities and allowable height in infill areas.	1	0	
Reduce impact fees for infill development based on less demand for new infrastructure.	1	0	
Create development incentives for green roofs (e.g., increased floor area ratio (FAR) bonus, additional building height, etc.).	1	0	
Include provision in stormwater management requirement that reduces on site management requirements for projects that decrease total imperviousness on previously developed sites.	1	0	
Enact Regulations			
Zoning and land development regulations implement urban service areas/urban growth boundary policies by restricting development in outlying areas.	1	0	
Adopt adequate public facility and concurrency ordinances that require adequate public infrastructure to be available when development comes on line (e.g., water, sewer, roads).	1	0	
Adopt large-lot/agricultural zoning (e.g., 1 unit/160 acres) on fringe of city to restrict inappropriate greenfield development	1	0	
Enact transitional compatibility standards to ensure that new denser infill development is compatible with existing neighborhoods/adjacent development.	1	0	

ENCOURAGE MIXED-USE DEVELOPMENTS (2.C.1)

Adopt Plans/Educate			
Comprehensive plans identify appropriate areas for higher-density mixed-use developments (e.g., at transit stops) and recommend policies to encourage their development.	1	1	
Local capital improvement plans and funding are targeted to areas appropriate for mixed-use development.	2	0	
Remove Barriers			
Zoning ordinances are amended to create by-right mixed-use and transit-oriented development districts or overlays.	1	0	
Initiate map amendments to designate mixed-use and transit-oriented development areas, eliminating the need for developers to secure zoning amendments.	1	0	
Adopt Incentives			
Parking requirements are reduced to reflect decreased automobile use.	1	0	
Credit given for adjacent on-street parking, which can count for local parking requirements.	1	0	
Shared parking and alternative parking arrangements encouraged.	1	0	
Mixed-use districts/areas feature increased densities and height.	1	0	
Accessory parking structures are not counted against maximum floor area ratio (FAR) on a site.	1	0	
Enact Regulations			
Zoning code requires a minimum mix of uses and minimum density in designated mixed-use and transit-oriented development areas.	1	0	
Auto-oriented uses and drive-throughs are restricted or prohibited in mixed-use and transit-oriented development areas.	1	0	
Total score for PROMOTE EFFICIENT, COMPACT DEVELOPMENT PATTERNS AND INFILL	45	6	

DESIGN COMPLETE, SMART STREETS THAT REDUCE OVERALL IMPERVIOUSNESS

STREET DESIGN (3.A.1)

Adopt Plans/Educate			
Comprehensive plan/transportation plan emphasizes alternative modes of transportation (walking, biking, transit) to reduce vehicle miles traveled and width and prominence of roads/streets.	1	1	
Comprehensive/transportation plan calls for distributing traffic across several parallel streets, reducing the need for high capacity streets with wide rights-of-way.	1	0	
Comprehensive/transportation planning process brings emergency response and other local government departments (e.g., public works, utilities) to the table early in the process to discuss street design.	1	1	
Adopt formal bicycle/pedestrian master plan.	1	0	
Create "safe routes to school" programs or other pedestrian/bike safety initiatives.	1	1	
Make consistent improvements to walking/biking conditions or develop a formal bicycle/pedestrian master plan.	1	1	
Remove Barriers			
Comprehensive plan endorses context-sensitive street design with narrower streets in appropriate locations.	1	1	
Improve pedestrian crossing at intersections to encourage walking.	1	1	
Consolidate utilities in street right-of-way to improve sidewalk design and function.	1	0	
Negotiate with state department of transportation or county transportation department to allow different design standards for regional roads passing through downtowns or other key areas.	1	0	
Promote street standards for fire safety that include attributes of narrow streets (20 feet widths) while identifying factors relevant to local government departments involved with streets such as public works, engineering and utilities	2	1	
Take formal control of state or county roads within city boundaries to ensure power over design and operations.	2	0	
Adopt Incentives			
Developments that provide comprehensive pedestrian/bicycle circulation systems allowed to reduce number of vehicle parking spaces. (See parking section below for greater detail.)	1	0	
Developments with approved comprehensive mobility/transportation plans allowed to build narrower, less costly streets and alleys.	1	0	
Enact Regulations			
Revamp local government technical street specifications to allow context-sensitive, innovative street design with narrower travel lanes, without curb and gutter, etc., in appropriate circumstances (See Institute of Transportation Engineers Recommended Practice document below).	2	2	

Design standards for narrower neighborhood streets have been endorsed/adopted by emergency response professionals and other local government departments involved with streets such as public works, engineering, and utilities.	1	1	
Development review process involves emergency response early on to reach consensus on appropriate project street design and access.	1	1	
Development review process requires submittal of project pedestrian/bicycle circulation plans with safe street routes and other pedestrian/bicycle-friendly features in addition to traffic circulation plans for larger developments.	1	0	
Apply formal connectivity index ¹ or other measures to ensure adequate internal street and pedestrian/bicycle connections.	2	1	
Zoning/subdivision regulations require minimum number of connections between new project and surrounding developments and neighborhoods.	2	2	

STREET DESIGN (3.A.2)

Remove Barriers			
Allow developments that utilize shared driveways and rear-loaded garages to permit overnight parking in driveways and on-street.	1	1	
Development code prohibits homeowner covenants forbidding overnight parking in driveways, on-street overnight parking and shared driveways.	1	0	
Adopt Incentives			
Allow developments with narrow driveways and rear-loaded garages to reduce number of parking spaces for guests.	1	0	
Zoning/subdivision regulations require minimum number of connections between new project and surrounding developments and neighborhoods.	1	1	
Exact Regulations			
Shared driveways are permitted or required for single-family residential developments.	1	1	
Minimum widths for single-family driveways reduced to 9 feet.	1	0	
Two-track driveways allowed by technical street/subdivision specifications.	1	0	
Single-family residential developments encouraged/required to be designed with minimum percentage of alley-accessible, rear-loading garages. <ul style="list-style-type: none"> • Alleys/garages encouraged = 1 points • Alleys/garages required = 2 points 	1 to 2	0	

GREEN INFRASTRUCTURE DESIGN AND STREET DESIGN (3.B.1)

Adopt Plans/Educate			
Comprehensive/transportation plans promote green infrastructure practices in street design.	1	0	
Street project cost estimates include green infrastructure designs and assess cost savings from reduced hard infrastructure.	1	0	
Remove Barriers			
Technical street specifications allow/require integration of green infrastructure elements into street project construction.	1	1	
Allow street-side swales to replace conventional curb and gutter for managing stormwater and for separating sidewalks from street traffic in appropriate circumstances.	1	1	
Adopt Incentives			
Undertake consistent effort to secure state and federal funds (e.g. transportation enhancements) to pay for green infrastructure elements.	1	0	
Streets with green infrastructure count towards stormwater requirements.	1	1	
Enact Regulations			
Adopt green infrastructure retrofit standards for major street projects.	1	0	
Adopt technical specifications and design templates for green infrastructure in private and public rights-of-way.	1	1	
All local road projects required to allocate a minimum amount of the total project cost to green infrastructure elements.	1	0	

GREEN INFRASTRUCTURE DESIGN AND STREET DESIGN (3.B.2)

Adopt Plans/Educate			
Sponsor/approve pilot programs to determine appropriate pervious materials for different paving areas (e.g., permeable concrete for sidewalks, permeable pavers for driveways, etc.), as well as process for installation and maintenance.	1	0	
Pilot project results incorporated into standard practice for all new paved areas and retrofits of existing paved surfaces.	1	0	
Adopt policy to replace impervious materials with pervious materials where practical.	1	0	
Remove Barriers			
Technical street specifications allow pervious paving materials in appropriate circumstances (e.g., not allowed over aquifer recharge areas).	1	0	

Adopt Incentives			
Create formal program offering incentives (e.g., cost sharing, reduction in street widths/parking requirements, assistance with maintenance) to property owners who utilize pervious pavement elements.	1	0	
Enact Regulations			
Adopt requirement that some percentage of parking lots, alleys, or roads in a development utilize pervious materials.	1	0	
Development approvals that allow/require use of pervious materials include requirements for continuing maintenance/cleaning of pervious surfaces.	1	0	
Total score for DESIGN COMPLETE, SMART STREETS THAT REDUCE OVERALL IMPERVIOUSNESS	50	21	

ENCOURAGE EFFICIENT PARKING

REDUCED PARKING REQUIREMENTS (4.A.1)

Adopt Plans/Educate			
The comprehensive plan recognizes the advantages to reduced parking requirements generally and specifically for mixed-use and transit-oriented developments.	1	0	
The comprehensive plan recommends alternative, flexible approaches to meeting parking demands (e.g., shared parking, counting on-street spaces towards site parking requirements, etc.)	1	0	
Comprehensive/bicycle plans recommend provision of bicycle parking spaces/storage lockers and concomitant reduction in vehicle parking space requirements.	1	0	
Remove Barriers			
Allow flexibility in meeting parking space requirements through shared parking, off-site parking, and similar approaches.	1	1	
Permit businesses with different peak demand periods to share their required parking spaces.	1	0	
Adopt Incentives			
Permit reduction in vehicle parking spaces when minimum number of bicycle parking spaces is provided	1	0	
Allow by-right reduction in required parking spaces (e.g., 25%) in mixed-use and transit-oriented developments and districts.	1	0	
Permit developers to undertake parking studies to establish that specific developments (e.g., senior housing, affordable housing) require fewer parking spaces than typical projects	1	0	
Create parking districts to finance/construct centralized parking lots/structures to be utilized as shared parking facilities and reduce on-site parking.	1	0	
Enact Regulations			
Revise parking regulations to reduce minimums below standard ITE (Institute of Transportation Engineers) requirements based on analysis of local developments and actual parking demand/experience.	2	0	
Charge developers for every space beyond parking minimums to offset environmental impacts.	1	0	
Enact parking standards that allow credit for adjacent on-street parking.	1	0	

Create zones with reduced parking requirements (e.g. transit overlay districts, mixed-use activity centers, multi-modal districts).	1	0	
Waive all parking minimums in downtown and other locations that are pedestrian-oriented and/or have good transit access.	1	0	
Adopt parking standards that reduce requirements based on sliding scale tied to degree of walkability/transit access locations (20% reduction in areas well served by bus, 30% reduction in areas served by rail stations).	1	0	
Require shared parking agreements where appropriate complementary uses exist.	1	1	
Adopt maximum parking caps (e.g., 125% above minimum) for multi-family and commercial developments.	2	0	
Reduce minimum parking space size based on analysis of average vehicle size in jurisdiction.	1	0	

TRANSPORTATION DEMAND MANAGEMENT ALTERNATIVES (4.B.1)

Adopt Plans/Educate			
Comprehensive/transportation plans recognize transportation demand management as an approach to reducing vehicle miles traveled and parking requirements.	1	0	
Remove Barriers			
Rather than include parking spaces with an apartment lease, allow tenants to opt-out by treating parking as a separate optional lease agreement.	1	0	
Adopt Incentives			
Allow businesses that offer employee transit passes, provide vans for employee commuting, allow flexible working arrangements, or charge market rates for parking to 1) provide fewer parking spaces or 2) pay less into a parking district fund for required parking spaces.	2	0	
Allow developers to make in-lieu fee payments for parking. Fees utilized by local government/parking authority to provide off-site parking lots/structures.	1	0	
Provide mechanisms for car sharing in transit oriented development. Where done, area parking requirements are reduced.	1	0	
Enact Regulations			
Create a parking district and allow/require businesses to support public garages rather than provide their own on site parking.	1	0	

Require large developments to adopt transportation demand management techniques to lower vehicle use and parking demand.	1	0	
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MINIMIZE STORMWATER FROM PARKING LOTS (4.C.1)

Adopt Plans/Educate			
Comprehensive plan calls for landscaping in parking lots to help reduce stormwater runoff.	1	0	
Remove Barriers			
Allow alternative or innovative landscaping solutions that provide stormwater management functions to count towards perimeter or other landscaping requirements.	1	0	
Adopt Incentives			
Parking lot landscaping and green roofs on parking structures credited towards meeting local stormwater management requirements.	1	0	
Give additional landscaping credit for preservation of large, mature trees within parking lots.	1	1	
Do not count parking structures with green roofs against the allowable floor area ratio of a site.	1	0	
Enact Regulations			
Adopt parking lot landscape regulations that require provision of trees, minimum percent of parking lot interior area to be landscaped (e.g., 10%), and minimum sized landscaping areas (e.g., minimum of 25 square feet for island planting areas).	1	1	
In parking lot landscaping regulations, specify the types and sizes of shrubs and trees most appropriate for controlling/reducing stormwater runoff.	1	0	
Adopt standard requiring a minimum area of the parking lot that must be drained to landscaped areas.	1	0	
Require that runoff from parking lots is managed with green infrastructure practices, including trees, vegetated islands, swales, rain gardens or other approaches.	1	0	
Enact specific alternative landscaping and parking regulations to support infill development (parking requirements, parking lot landscaping options that focus on perimeter landscaping to encourage smaller lots, etc.).	2	0	
Require parking structures to incorporate green roofs to reduce stormwater runoff.	1	0	

Reduce drive aisle widths in parking lots to decrease the amount of pervious surface. For multi-family developments, drive aisles can be shared. In commercial developments, typical drive aisles can be reduced 5-10%.	1	0	
Total score for ENCOURAGE EFFICIENT PARKING	41	4	

ADOPT GREEN INFRASTRUCTURE STORMWATER MANAGEMENT PROVISIONS

GREEN INFRASTRUCTURE PRACTICES (5.A.1)

Adopt Plans/Educate			
Inform the public, through education and outreach programs, that green infrastructure practices can be used to manage stormwater runoff on their property.	1	1	
Create a green infrastructure workshop or training program for internal and external reviewers to ensure that the stakeholders who use this tool will have the ability to understand and use it effectively.	1	0	
Remove Barriers			
Development and other codes encourage and allow property owners to adopt home-based green infrastructure practices, such as rain gardens, rain barrels and other rainwater harvesting practices.	1	1	
Review and change, where necessary, building codes or other local regulations to ensure that all local government departments/agencies have coordinated with one another to ensure that green infrastructure implementation is legal, e.g. remove restrictions on downspout disconnection.	1	0	
Adopt Incentives			
Green infrastructure practices credited towards required controls for stormwater runoff.	1	1	
Establish a “Green Tape” expedited review program for applications that include green infrastructure practices.	1	0	
Reduce stormwater utility rates based on the use of green infrastructure practices.	1	0	
Enact Regulations			
Zoning and subdivision regulations specifically permit green infrastructure facilities, including but not limited to: (1 point for each technique to a maximum of 4 points) <ul style="list-style-type: none"> • Green roofs; • Infiltration approaches, such as rain gardens, curb extensions, planter gardens, permeable and porous pavements, and other designs where the intent is to capture and manage stormwater using soils and plants; • Water harvesting devices, such as rain barrels and cisterns; • Downspout disconnection. 	1 to 4	0	

Developers are required to meet stormwater requirements using green infrastructure practices where site conditions allow. Developers must provide documentation for sites that do not allow on-site infiltration, reuse or evapotranspiration to meet locally determined performance stormwater management standards.	1 to 2	1	
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GREEN INFRASTRUCTURE PRACTICES (5.A.3)

Adopt Plans/Educate			
Encourage/require a pre-site plan meeting with developers to discuss stormwater management and green infrastructure approaches. <ul style="list-style-type: none"> • Voluntary = 1 point • Mandatory = 2 points 	1 to 2	1	
Include landscape architects in design and review of stormwater management plans.	1	0	
Adopt Incentives			
Provide accelerated review of projects where developer attended a pre-application meeting.	1	0	
Enact Regulations			
Preliminary stormwater plan review occurs contemporaneously with preliminary site plan review and before any development approvals.	1	1	
Development applications must be accompanied by preliminary/conceptual stormwater management plans that incorporate green infrastructure elements and describe how stormwater management standards will be met.	1	0	

GREEN INFRASTRUCTURE PRACTICES (5.A.4)

Adopt Plans/Educate			
For infill and redevelopment areas, off-site green stormwater management plans should be developed in cooperation between local government and landowner/developers. Allowing off-site management of stormwater runoff requires sewershed designation within the local government to ensure that true mitigation is possible and equal stormwater management and water quality benefits are achieved with off-site management.	2	0	
Retrofit projects that will utilize green infrastructure stormwater management techniques should be identified and prioritized within the sewershed.	1	0	

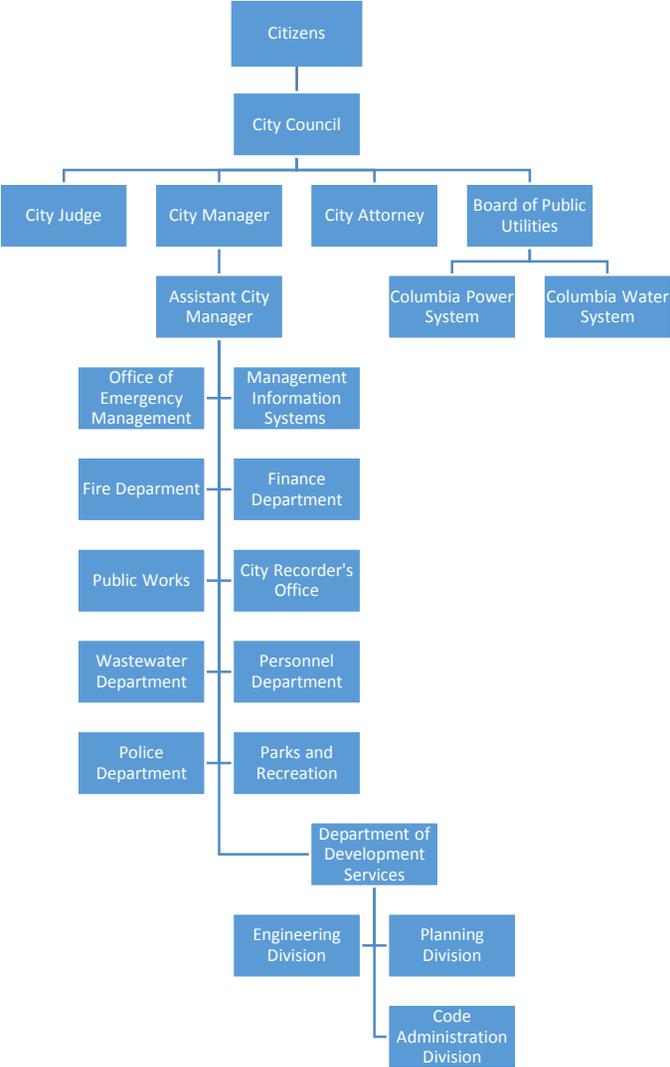
Remove Barriers			
Amend stormwater management regulations and development codes as necessary to allow off-site stormwater management, especially for infill and redevelopment areas.	1	0	
Enact Regulations			
Establish system that allows/requires payment-in-lieu fees for off-site stormwater management facilities. Fees should be set sufficiently high as to cover the true cost of off-site management. Consider limitations on amount of off-site management allowed (more for infill areas, less for greenfield sites).	1	0	

MAINTENANCE/ENFORCEMENT (5.B.1)

Adopt Plans/Educate			
Develop a system to monitor and track stormwater management practices deployed at greenfield and redevelopment sites. Tracking of management practices should begin during the plan review and approval process with a database or geographic information system (GIS). The database should include both public and private projects.	1	0	
Provide model checklist for maintenance protocols for ease of inspection, tracking and enforcement.	1	0	
Sponsor demonstration projects for green infrastructure management best practices	1	0	
Remove Barriers			
Ensure that proper local agencies have authority to enforce maintenance requirements.	1	1	
Adopt Incentives			
Create self-inspection maintenance certification program that allows developers/landowners to train/retain private inspectors to certify compliance with stormwater management plans and long-term maintenance.	1	0	
Enact Regulations			
Require long-term maintenance agreements that allow for public inspections of the management practices and also account for transfer of responsibility in leases and/or deed transfers.	1	1	

Conduct inspections every 3 to 5 years, prioritizing properties that pose the highest risk to water quality, inspecting at least 20% of approved facilities annually.	1	0	
Develop a plan approval and post-construction verification process to ensure that stormwater standards are being met, including enforceable procedures for bringing noncompliant projects into compliance.	1	1	
Inspections of construction sites are carried out for at least 25% of permitted projects to ensure proper installation of approved practices.	1	1	
Require conservation/green infrastructure bond/escrow in zoning/subdivision ordinances to ensure installation/maintenance of green infrastructure storm water management facilities.	1	0	
Total score for ADOPT GREEN INFRASTRUCTURE STORMWATER MANAGEMENT PROVISIONS	39	10	

City of Columbia Organizational Chart



Appendix C

Stream Testing Data Summary

LOCATIONS

The streams where benthic macroinvertebrate surveys, visual stream surveys and impairment inventories were conducted are as follows:

STREAM NAME	OUTFALL I.D.	I.D. NO. (TN06040003)	LOCATION
Unnamed Tributary to Little Bigby Creek	No. 9	027-0100	Trotwood Ave. N35.60374°W87.06903°
Little Bigby Creek	No. 12	027-1000	Just Upstream of Old Williamsport Pike N35.62416° W87.06950°
Unnamed Tributary to Lytle Creek	No. 25	030-0100	Just Upstream Mapleash Ave. N35.60231°W87.01373°
Lytle Creek	No. 7	030-1000	Just Downstream Martin Drive N35.62096°W87.01759°
Coleman Branch		034-0260	Just Upstream Conf. with Carters Creek N35.70858°W86.99442°
Duck River	No. 23	026-1000	Near mouth of Knob Creek N35.66288°W87.09364°
Unnamed Tributary to Little Bigby Creek	No. 11		Hwy 50 and Hwy 412 N35.61743°W87.06464°
Unnamed Tributary to the Duck River Draining Stock Yard Properties	No. 16		West of Industrial Park Road N35.64162°W87.08812°
Unnamed Tributary to the Duck River Draining West Industrial Park	No. 17		West of Industrial Park Road N35.63736°W87.07327°
Unnamed Tributary to the Duck River Just West of WWTP	No. 21		Off Waste Water Treatment Road N35.64120°W87.09222°
Unnamed Tributary to the Duck River Originating at the Waste Water Treatment Plant (WWTP)	No. 22		Off Waste Water Treatment Road N35.63889°W87.08847°

Table 1. Physical Characteristics, Biological Sites, City of Columbia, Maury County, Tennessee, June 26, 2014.

PARAMETER	STATIONS (TN06040003)					
	Unnamed Trib. To Little Bigby Crk.	Little Bigby Creek	Unnamed Trib. To Lytle Creek	Lytle Creek	Coleman Branch	Duck River
	027-0100	027-1000	030-0100	030-1000	034- 0260	026-1000
Drainage Area (sq miles)	1.83	44.44	1.23	10.52	0.59	1396
Stream Width (ft)	5	28	11	24	2	140
Average Depth (ft)	0.2	0.76	0.213	0.227	0.2	
^a Velocity (ft/sec)	1.132	0.871	0.389	1.25	0.384	
Flow (ft³/sec)	1.132	14.750	0.729	5.448	0.123	340
% Canopy Cover	97	42	93	10	99	<1
^b Habitat Scores	155	163	158	156	126	177
Habitat Rating	Not Impaired	Not Impaired	Not Impaired	Not Impaired	Impaired	Not Impaired
SUBSTRATE - See Pebble Count in Table 2						

^a A correction factor of 0.8 is used for velocity if the substrate is rough while a value of 0.9 is used if the substrate is smooth.

^b Habitat which score ≥ 127 in streams with a drainage > 2 sq miles or ≥ 132 in drainages ≤ 2 square miles in Ecoregion 71h is considered not impaired.

Table 2. Substrate Characteristics, Biological Sites, City of Columbia, Maury County, Tennessee, June 26, 2014.

Substrate		STATION (TN06040003)											
		Unnamed Trib to Little Bigby Crk 027-0100		Little Bigby Crk. 027-1000		Unnamed Trib to Lytle Crk. 030-0100		Lytle Creek 030-1000		Coleman Branch 034-0260		Duck River 026-1000	
Size Class	Size Range	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
	(mm)												
SILT/CLAY TOTAL	<0.062					3	3%	9	9%	14	14%		

SAND													
Very fine sand	0.062-0.125											2	
Fine sand	0.125-0.25												
Medium sand	0.25-0.50												
Course sand	0.50-1.0											3	
Very coarse sand	1.0-2.0	2		4		23		5		22			
SAND TOTAL			2%		4%		23%		5%		27%		

GRAVEL													
Very fine gravel	2-4	1								2			3
Fine gravel	4-6	3		1		2				7			2
Fine gravel	6-8	3						2		6			
Medium gravel	8-12	5		3		1		3		7			4
Medium gravel	12-16	4						2		4			4
Coarse gravel	16-24	2		6		4		8		3			9
Coarse gravel	24-32	1		4		3		1		5			15
Very coarse gravel	32-48	5		8				4					25
Very coarse gravel	48-64			6		5		7		2			21
GRAVEL TOTAL			24%		28%		15%		27%		36%		83%

Table 2. Substrate Characteristics, Biological Sites, City of Columbia, Maury County, Tennessee, June 26, 2014.

Substrate		STATION (TN06040003)												
		Unnamed Trib to Little Bigby Crk 027-0100		Little Bigby Crk. 027-1000		Unnamed Trib to Lytle Crk. 030-0100		Lytle Creek 030-1000		Coleman Branch 034-0260		Duck River 026-1000		
Size Class	Size Range	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	
	(mm)													
COBBLE														
Small cobble	64-96	6		12		3		14		1		14		
Small cobble	96-128	4		3		2		1				3		
Large cobble	128-192			5		4		6						
Large cobble	192-256	2		6		3		7		1				
COBBLE TOTAL			12%		26%		12%		28%		2%			17%

BOULDER														
Small boulder	256-384	2		3		5		10						
Small boulder	384-512			5		2								
Medium boulder	512-1024			3				1						
Large-Very large boulder	1024-4096			1										
BOULDER TOTAL			2%		12%		7%		11%					

BEDROCK TOTAL	>4096	60	60%	30	30%	40	40%	20	20%	21	21%			
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Table 3. Water Quality Characteristics, Biological Sites, City of Columbia, Maury County, Tennessee, June 26, 2014.

PARAMETER	STATIONS (TN06040003)					
	Unnamed Trib. To Little Bigby Crk.	Little Bigby Creek	Unnamed Trib. To Lytle Creek	Lytle Creek	Coleman Branch	Duck River
	027-0100	027-1000	030-0100	030-1000	034-0260	026-1000
PH (Std. Units)	7.89	8.14	7.72	7.71	7.38	7.89
Conductivity ($\mu\text{s}/\text{cm}$)	478.0	365.2	431.9	375.3	442.6	358.3
TDS (ppm)	368	250	345	288	349	255
Temperature ($^{\circ}\text{C}$)	20.7	22.9	18.8	20.7	18.1	25.4
Dissolved Oxygen (mg/l)	8.90	9.17	8.97	8.63	7.76	7.40
Turbidity (ntu's)	0.39	1.78	0.50	3.62	1.70	4.41

Table 4. Benthic Macroinvertebrates (Genus Level) Taken from the Biological Sites, City of Columbia, Maury County, Tennessee, June 26, 2014.

SPECIES	T.V.	F.F.G.	CL	STATIONS (TN06040003)					
				Tributary	Little	Tributary	Lytle Creek	Coleman	Duck
				Little Bigby	Bigby	Lytle Creek		Branch	River
				027-0100	027-1000	030-0100	030-1000	034-0260	026-1000
PLATYHELMINTHES									
Turbellaria									
Tricladida									
Dugesiidae									
<i>Giardia sp.</i>	7.23	P		33	4	3	21		
NEMERTEA		P			1				
MOLLUSCA									
Bivalvia									
Unionoida									
Unionidae									
<i>Villosa sp.</i>					1				
Veneroida									
Corbiculidae									
<i>Corbicula sp.</i>	6.12	FC					1		2
Sphaeriidae	6.6	FC						1	
Gastropoda									
Mesogastropoda									
Pleuroceridae									
<i>Elimia sp.</i>	2.46	SC		42	9	41	10		1
ANNELIDA									
Clitellata									
Oligochaeta		CG							
Tubificida									

Table 4. Benthic Macroinvertebrates (Genus Level) Taken from the Biological Sites, City of Columbia, Maury County, Tennessee, June 26, 2014.

SPECIES	T.V.	F.F.G.	CL	STATIONS (TN06040003)					
				Tributary	Little	Tributary	Lytle Creek	Coleman	Duck
				Little Bigby	Bigby	Lytle Creek		Branch	River
				027-0100	027-1000	030-0100	030-1000	034-0260	026-1000
Naididae	6.1	CG			1	1			
<i>Nais sp.</i>	8.88	CG		1	1	3		1	
Tubificinae w.o.h.c.	9.5	CG			1	1	5	1	
Lumbriculida									
Lumbriculidae		CG		1					
ARTHROPODA									
Arachnoidea									
Acariformes	5.53			1		1			
Lebertiidae	5.53								
<i>Lebertia sp.</i>	5.53	-					1		
Crustacea									
Isopoda									
Asellidae		SH							
<i>Lirceus sp.</i>	7.85	CG		84	2	59	2	48	
Amphipoda	7.4	CG							
Crangonyctidae									
<i>Crangonyx sp.</i>	7.87	CG		2	1	21		21	
Decapoda									
Cambaridae									
<i>Orconectes sp.</i>	2.6	SH			1	1		1	
Insecta									
Ephemeroptera									
Baetidae	6.1	CG		2	12		10	4	

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				Tributary	Little	Tributary	Lytle Creek	Coleman	Duck
				Little Bigby	Bigby	Lytle Creek		Branch	River
				027-0100	027-1000	030-0100	030-1000	034-0260	026-1000
<i>Acentrella sp.</i>	3.6								
<i>Acerpenna sp.</i>	3.7				3		1		
<i>Baetis sp.</i>	4.51	CG		4	80	1	23	1	40
<i>Dipheter sp.</i>	1.2						3	9	
Caenidae		CG							
<i>Caenis sp.</i>	7.41	CG			1				1
Heptageniidae	4	SC	CL		3				3
<i>Maccaffertium sp.</i>	3.15	SC	CL		3				6
Isonychiidae		FC							
<i>Isonychia sp.</i>	3.45	FC			2				3
Leptophlebiidae	1.8	CG							1
Potamanthidae		CG							
<i>Anthopotamus (Potamanthus) sp.</i>	4								2
Tricorythidae		CG							
<i>Tricorythodes sp.</i>	5.06	CG							1
Odonata									
Aeshnidae	5.6	P							
<i>Boyeria vinosa</i>	5.97	P					1		
Plecoptera									
Perlodidae	1.6	P	CL						1
Hemiptera									
Veliidae	6	P							
<i>Microvelia sp.</i>	6	P						2	

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				Tributary	Little	Tributary	Lytle Creek	Coleman	Duck
				Little Bigby	Bigby	Lytle Creek		Branch	River
				027-0100	027-1000	030-0100	030-1000	034-0260	026-1000
Megaloptera									
Corydalidae		P							
<i>Corydalus sp.</i>	5.16	P	CL						1
Trichoptera									
Brachycentridae		SH							
<i>Micrasema sp.</i>	0.56	SH	CL				12		
Helicopsychidae		SC							
<i>Helicopsyche sp.</i>	0	SC	CL				2		
Hydropsychidae	4	FC	CL	2	5				
<i>Cheumatopsyche sp.</i>	6.22	FC	CL		29	7	11	1	67
<i>Hydropsyche sp.</i>	4.3	FC	CL	3	8	3	31	1	2
Hydroptilidae	4	PI							
<i>Hydroptila sp.</i>	6.22	PI	CL					2	
Philopotamidae	1.4	FC	CL			2			
<i>Chimarra sp.</i>	2.76	FC	CL	8	2	15	1		
Polycentropodidae		FC	CL						
<i>Cyrnellus sp.</i>	7.34	FC	CL			1			
Psychomyiidae	4	CG							
<i>Psychomyia sp.</i>	2.44	CG	CL				1		
Coleoptera									
Elmidae		CG							
<i>Dubiraphia sp.</i>	5.93	SC	CL				12		
<i>Microcylloepus sp.</i>	2.11	SC	CL	4					2

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SPECIES	T.V.	F.F.G.	CL	STATIONS (TN06040003)					
				Tributary	Little	Tributary	Lytle Creek	Coleman	Duck
				Little Bigby	Bigby	Lytle Creek		Branch	River
				027-0100	027-1000	030-0100	030-1000	034-0260	026-1000
<i>Optioservus sp.</i>	2.36	SC	CL			6		1	
<i>Stenelmis sp.</i>	5.1	SC	CL	8	9	12	8	1	8
Psephenidae		SC							
<i>Ectopria sp.</i>	4.16	SC	CL			3			
<i>Psephenus sp.</i>	2.35	SC	CL		8	3	1		
Lepidoptera									
Pyralidae	4.3	SH							
<i>Petrophila sp.</i>	2.09	SC	CL		2				
Diptera									
Ceratopogonidae	5.9	P							
<i>Bezzia/Palpomyia gp.</i>	6	P					1		
Chironomidae	6.2								
<i>Ablabesmyia sp.</i>	7.2	P							1
<i>Cladotanytarsus sp.</i>	4.09	FC						1	6
<i>Conchapelopia sp.</i>	4.5	P		1	1	1			2
<i>Corynoneura sp.</i>	6.01	CG		1	1				1
<i>Cricotopus sp.</i>	5.78	CG	CL	2	3				2
<i>Cryptochironomus sp.</i>	6.4	P							3
<i>Eukiefferiella sp.</i>	3.43	CG		2					
<i>Lopescladius sp.</i>	1.67								1
<i>Microtendipes sp.</i>	5.53	CG	CL						1
<i>Nanocladius sp.</i>	7.07	CG				1			
<i>Parametrioctenus sp.</i>	3.65	CG		1	1	4	1	8	1

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				Tributary	Little	Tributary	Lytle Creek	Coleman	Duck
				Little Bigby	Bigby	Lytle Creek		Branch	River
				027-0100	027-1000	030-0100	030-1000	034-0260	026-1000
<i>Polypedilum sp.</i>	5.69			2	6	5	5	32	24
<i>Rheotanytarsus sp.</i>	5.89	FC	CL				8	10	
<i>Stempellinella sp.</i>	4.62	CG			1				2
<i>Tanytarsus sp.</i>	6.76	FC			2	1		8	3
<i>Thienemanniella sp.</i>	5.86			1			2	3	
<i>Tvetenia sp.</i>	3.65	CG			2		4	16	1
Empididae	7.6	P							1
<i>Hemerodromia sp.</i>	7.57	P			1		1		1
<i>Neoplasta sp.</i>	7.57	P						2	
Simuliidae	3.5	FC	CL						
<i>Simulium sp.</i>	4	FC	CL	13	8		4	8	3
Tipulidae	4.9	SH							1
<i>Antocha sp.</i>	4.25	CG	CL				2		
<i>Tipula sp.</i>	7.33	SH				1			
TOTAL NO. OF ORGANISMS				216	213	194	186	182	202
TOTAL NO. OF TAXA				18	29	23	31	22	35

Table 5. Summary of Tennessee Bioassessment Metrics, Protocol K, Biological Sites, City of Columbia, Maury County, Tennessee, June 26, 2014.

METRIC	^a Unnamed Trib to Little Bigby Creek		^b Little Bigby Creek		^a Unnamed Trib to Lytle Creek		^b Lytle Creek		^a Coleman Branch		^b Duck River	
	027-0100		027-1000		030-0100		030-1000		034-0260		026-1000	
	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
1. Taxa Richness (Genera -TR)	18	2	29	6	23	4	31	6	22	4	35	6
2. EPT Richness (Genera - EPT)	3	0	8	4	5	2	9	4	5	2	10	6
3. %EPT-Cheum.	8.80	0	55.87	6	11.34	0	45.16	4	7.14	0	31.68	2
4. % Oligochaets and Chironomids (%OC)	4.63	6	8.92	6	7.73	6	13.44	6	45.60	4	24.75	6
5. North Carolina Biotic Index (NCBI)	5.77	4	4.78	6	5.43	6	4.83	6	6.10	4	5.30	4
6. % Clingers	18.52	0	37.56	4	26.80	2	50.00	4	13.19	0	47.52	4
7. TNUTOL	63.89	2	28.17	6	64.95	2	21.51	6	47.80	4	51.98	4
TOTAL VALUE	14		38		22		36		18		32	
INDEX SCORE RATING	Impaired		Non-Impaired		Impaired		Non-Impaired		Impaired		Non-Impaired	
BIOCRITERIA GUIDELINES	Not Passing		Passing		Not Passing		Passing		Not Passing		Passing	

^a Drainage less than 2 square miles.

^b Drainage greater than 2 square miles

Target Index Score for Bioregion 71h from January-December = 32.

Table 6. Water Quality Characteristics, MS4 Sites (Non Biological), City of Columbia, Maury County, Tennessee.

PARAMETER	STATION (Date)				
	Unnamed Trib. to Little Bigby Crk.	Unnamed Trib. Maury Co., Stockyards	Unnamed Trib. West of Industrial Park	West of WWTP	WWTP
	No. 11	No. 16	No. 17	No. 21	No. 22
	(June 19, 2014)	(June 26, 2014)		(June 19, 2014)	(June 19, 2014)
PH (Std. Units)	7.04	7.22	a	6.96	7.98
Conductivity (us/cm)	472.5	484.6	a	361.8	562
Temperature (°C)	19.6	20.5	a	15.7	22.3
Dissolved Oxygen (mg/l)	8.96	7.78	a	10.44	8.69

^a Dry