CITY OF OAK HILL

2021-2022 Annual MS4 Report

State of Tennessee General NPDES Permit
Small Municipal Separate Storm Sewer Systems (MS4) Permit No.
TNS075477

Annual Report
July 1, 2021 – June 30, 2022

Submitted by
The City of Oak Hill
5548 Franklin Pike, Tennessee 37220

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 Oak Hill		MS4 Permit Number: TNS075477
Contact Person: J. Steven Collie		Email Address: citymanager@oakhilltn.us
Telephone: (615) 371-8291		MS4 Program Web Address: oakhilltn.us
Mailing Address: 5548 Franklin Pike, Suite 101		
City: Nashville	State: Tennessee	ZIP code: 37072

What is the current population of your MS4? 4800 2010 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/)? If yes, attach a list. ☒ Yes ☐ No

B. Are there established and approved TMDLs (http://www.tn.gov/environment/article/wr-ws-tennessees-total-maximum-daily-load-tmdl-program) with waste load allocations for MS4 discharges in your jurisdiction? If yes, attach a list. ☒ Yes ☐ No

C. Does your MS4 discharge to any Exceptional Tennessee Waters (ETWs - http://environment-online.tn.gov:8080/pls/enf_reports/f?p=9034:34304:4880790061142)? If yes, attach a list. ☒ Yes ☐ No

D. Are you implementing specific Best Management Practices (BMPs) to control pollutant discharges to waterbodies with unavailable parameters or ETWs? If yes, describe the specific practices: Planning Commission reviews plans to ensure quality standards are met. ☒ 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: Program targets contruction contractors at pre-application meeting to promote water quality/quantity regulations and public to promote clean water and recycling to keep water ways clean ☒ Yes ☐ No

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

D. Summarize how you advertise and publicize your public education, outreach, involvement and participation opportunities: Newsletter, Website posters and notifications and BOC Meeting

E. Summarize the public education, outreach, involvement and participation activities you completed during this reporting period: Contracted Public Works employees trained to spot and clean up as needed, materials that enter the drainage system.

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: Citizens made aware to clean storm drains of all debris to prevent anything entering the drainage systems.

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? 12		
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: Contracted Public Works employees are trained to spot and clean as needed material that enter the drainage system.	☒ Yes	☐ No

F. How many illicit discharge related complaints were received this reporting period? 0

G. How many illicit discharge investigations were performed this reporting period? 0

H. Of those investigations performed, how many resulted in valid illicit discharges that were addressed and/or eliminated? 0

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

A. Do you have an ordinance or other regulatory mechanism requiring:

Construction site operators to implement appropriate erosion prevention and sediment control BMPs consistent with those described in the TDEC EPSC Handbook?	☒ Yes	☐ No
Construction site operators to control wastes such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste?	☒ Yes	☐ No
Design storm and special conditions for unavailable parameters waters or Exceptional Tennessee Waters consistent with those of the current Tennessee Construction General Permit (TNR100000)?	☒ Yes	☐ No
B. Do you have specific procedures for construction site plan (including erosion prevention and sediment BMPs) review and approval?	☒ Yes	☐ No
C. Do you have sanctions to enforce compliance?	☒ Yes	☐ No
D. Do you hold pre-construction meetings with operators of priority construction activities and inspect priority construction sites at least monthly?	☒ Yes	☐ No

E. How many construction sites disturbing at least one acre or greater were active in your jurisdiction this reporting period? 12

F. How many active priority and non-priority construction sites were inspected this reporting period? 170

G. How many construction related complaints were received this reporting period? 20

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

A. Do you have a regulatory mechanism (e.g. ordinance) requiring permanent stormwater pollutant removal for development and redevelopment projects? If no, have you submitted an Implementation Plan to the Division? ☒ Yes ☐ No / ☒ Yes ☐ No

B. Do you have an ordinance or other regulatory mechanism requiring:

Site plan review and approval of new and re-development projects? ☒ Yes ☐ No

A process to ensure stormwater control measures (SCMs) are properly installed and maintained? ☒ Yes ☐ No

Permanent water quality riparian buffers? If yes, specify requirements: _____ ☐ 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 requiring a TDEC permit and construction within the Radnor Lake Impact Zone.

D. How many development and redevelopment project plans were reviewed for this reporting period? 20

E. How many development and redevelopment project plans were approved? 20

F. How many permanent stormwater related complaints were received this reporting period? 21

G. How many enforcement actions were taken to address improper installation or maintenance? 5

H. Do you have a system to inventory and track the status of all public and private SCMs installed on development and redevelopment projects? ☒ Yes ☐ No

I. Does your program include an off-site stormwater mitigation or payment into public stormwater fund? If yes, specify. _____ ☐ Yes ☒ No

7. Stormwater Management for Municipal Operations (Section 4.2.6)

A. As applicable, have stormwater related operation and maintenance plans that include information related to maintenance activities, schedules and the proper disposal of waste from structural and non-structural stormwater controls been developed and implemented at the following municipal operations:

Streets, roads, highways? ☒ Yes ☐ No

Municipal parking lots? ☐ Yes ☒ No

Maintenance and storage yards? ☐ Yes ☒ No

Fleet or maintenance shops with outdoor storage areas? ☐ Yes ☒ No

Salt and storage locations? ☐ Yes ☒ No

Snow disposal areas? ☐ Yes ☒ No

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

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

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

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

A. Describe any revisions to your program implemented during this reporting period including but not limited to:

Modifications or replacement of an ineffective activity/control measure. We continue to review our SCMs in the field during inspections on the jobsite.

Changes to the program as required by the division to satisfy permit requirements. None

Information (e.g. additional acreage, outfalls, BMPs) on newly annexed areas and any resulting updates to your program. No annexation during this annual reporting period.

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. We continue to review ERPs from past MS4s to stay current. ☒ Yes ☐ No

9. Enforcement Response Plan (Section 4.5)

A. Have you implemented an enforcement response plan that includes progressive enforcement actions to address non-compliance, and allows the maximum penalties specified in TCA 68-221-1106? If no, explain. _____ ☒ Yes ☐ No

B. As applicable, identify which of the following types of enforcement actions (or their equivalent) were used during this reporting period; indicate the number of actions, the minimum measure (e.g., construction, illicit discharge, permanent stormwater management), and note those for which you do not have authority:

Action	Construction	Permanent Stormwater	Illicit Discharge	In Your ERP?	
Verbal warnings	#1	#0	#0	☒ Yes	☐ No
Written notices	#0	#0	#0	☒ Yes	☐ No
Citations with administrative penalties	#0	#0	#0	☒ Yes	☐ No
Stop work orders	#0	#0	#0	☒ Yes	☐ No
Withholding of plan approvals or other authorizations	#0	#4	#0	☒ Yes	☐ No
Additional Measures	#0	#0	#0	Describe: _____	

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

D. What were the most common types of non-compliance instances documented during this reporting period? Offsite tracking and monitoring

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. None

B. Summarize any non-analytical monitoring activities (e.g., planning, collection, evaluation of results) performed during this reporting period. During inspections of jobsites storm structures are inspected to check working conditions.

C. If applicable, are monitoring records for activities performed during this reporting period submitted with this report. ☐ Yes ☒ No

11. Certification

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

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

J. Steven Collie,
City Manager
Printed Name and Title

Signature

10/10/2022
Date

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

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

CITY OF OAK HILL
MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)
ANNUAL REPORT
SEPTEMBER 2022

Q 2A. West, Middle, and East Forks Browns Creek and Otter Creek

Q 2B. – See Exhibit A

Q 2C. – See Exhibit B

Q 3C. – See Exhibit C https://oakhilltn.us/

Q 4D. – See Exhibit D

Q 6C. – See Exhibit E

Q 9A – See Exhibit F

WBID	NAME	CAUSE OF IMPAIRMENT	SOURCE OF IMPAIRMENT
	Otter Creek TN05130204021_0100	Habitat loss due to alteration in stream-side or littoral vegetative cover, Loss of biological integrity due to siltation	Land development
	East Fork of Brown's Creek TN05130202023_0100	Nitrate+Nitrite, Total phosphorus, Other anthropogenic habitat alterations, E. coli, Oil and grease	Minor industrial point source, Discharges from MS4 area, Municipal high density area
	Middle Fork of Brown's Creek TN05130202023_0200	Nitrate+Nitrite, Total phosphorus, Other anthropogenic habitat alterations, E. coli	Discharges from MS4 area, Failing collection system, Land development
	West Fork of Brown's Creek TN05130202023_0300	Nitrate+Nitrite, Total phosphorus, E. coli	Discharges from MS4 area, Failing collection system
	Briarwood Branch (2 miles to Sevenmile Crk)	Low dissolved oxygen, Total phosphorus, Other anthropogenic habitat alterations, E. coli	Discharges from MS4 area

2B

Exhibit A

2C

Exhibit B

Otter Creek TN05130204021_0100	Habitat loss due to alteration in stream-side or littoral vegetative cover, Loss of biological integrity due to siltation
	The section of Otter Creek in the City of Oak Hill discharges directly from Radnor Lake in Radnor Lake State Park.

Exhibit D

ORDINANCE NO. O-18-03-01-80
AN ORDINANCE PROVIDING FOR STORMWATER REGULATIONS IN REFERENCE TO ILLICIT DISCHARGES IN THE CITY OF OAK HILL

WHEREAS, the current storm water regulations do not address components identified under the catergory of illicit discharge; and

WHEREAS, the City believes that it is in the best interest of the citizens of Oak Hill to have appropriate standards identifying illicit discharges; and

WHEREAS, the Tennessee Department of Environment and Conservation as well as the City Engineer agree that additional standards are necessary to ensure prohibition of illicit discharges throughout the City; and

NOW, THEREFORE, BE IT ORDAINED BY THE CITY OF OAK HILL, TENNESSEE, AS FOLLOWS:

Section 14-237. Delete SIGN REGULATIONS

See Ordinance No. 10-03; Part 121 "Billboards and Signs" of the Oak Hill Municipal Code.

Section 14-237. Add ILLICIT DISCHARGES.

(1) Scope. This section shall apply to all water generated on developed or undeveloped land entering Oak Hill's municipal separate storm sewer system.

(2) Prohibition of illicit discharges. No person shall introduce or cause to be introduced into the municipal separate storm sewer system any discharge that is not composed entirely of stormwater. No person shall allow discharges that flow from a stormwater facility that is not inspected in accordance with Tennessee General Permit Stormwater Discharges from Construction Activities Section 3.5.8.2. Non-stormwater discharges shall include, but shall not be limited to, sanitary wastewater, car wash wastewater, radiator flushing disposal, spills from roadway accidents, carpet cleaning wastewater, effluent from septic tanks, improper oil disposal, laundry wastewater/gray water, improper disposal of auto and household toxics. The commencement, conduct or continuance of any non-stormwater discharge to the municipal separate storm sewer system is prohibited except as described as follows:

(a) Uncontaminated discharges from the following sources:
   a. Water line flushing or other potable water sources

b. Landscape irrigation or lawn watering with potable water
c. Properly authorized diverted stream flows
d. Rising ground water
e. Groundwater infiltration to storm drains
f. Pumped groundwater
g. Discharges from potable water sources
h. Air conditioning condensate
i. Irrigation water
j. Springs
k. Water from crawl space pumps
l. Footing Drains
m. Lawn watering
n. Individual residential car washing
o. Natural riparian habitat or wetland flows
p. Swimming pools (if dechlorinated – typically less than one PPM chlorine)
q. Street wash water
r. Firefighting activities
s. Any other uncontaminated water source.

(b) Discharges specified in writing by the City as being necessary to protect public health and safety.

(c) Dye testing is an allowable discharge if the City has so specified in writing.

(d) Discharges authorized by the Construction General Permit (CGP):

a. Dewatering of collected stormwater and ground water.
b. Wash removal of process materials such as oil, asphalt or concrete is not authorized.
c. Water used to control dust in accordance with CGP.
d. Potable water sources, including waterline flushing, from which chlorine has been removed to the maximum extent practicable.
e. Routine external building wash down that does not use detergents or other chemicals.
f. Uncontaminated groundwater or spring water.
g. Foundation or footing drains where flows are not contaminated with pollutants (e.g., process materials such as solvents, heavy metals, etc.)

(3) Prohibition of illicit connections. The construction, use, maintenance or continued existence of illicit connections to the municipal separate storm sewer system is prohibited. This prohibition expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection. This prohibition expressly includes Stormwater

Control Measures connected to the system not properly inspected and maintained in accordance with this ordinance.

(4) Reduction of stormwater pollutants by the use of best management practices. Any person responsible for a property or premises, which is, or may be, the source of an illicit discharge, may be required to implement, at the person's expense, the BMP's necessary to prevent the further discharge of pollutants to the municipal separate storm sewer system. Compliance with all terms and conditions of a valid NPDES permit authorizing the discharge of stormwater associated with industrial activity, to the maximum extent practicable, shall be deemed in compliance with the provisions of this section. Discharges from existing SCM's that have not been maintained and/or inspected in accordance with this ordinance shall be regarded as illicit.

(5) Notification of spills. Notwithstanding other requirements of law, as soon as any person responsible for a facility or operation, or responsible for emergency response for a facility or operation has information of any known or suspected release of materials which are resulting in, or may result in, illicit discharges or pollutants discharging into, the municipal separate storm sewer system, the person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release. In the event of such a release of hazardous materials the person shall immediately notify emergency response agencies of the occurrence via emergency dispatch services. In the event of a release of non-hazardous materials, the person shall notify Oak Hill in person or by telephone, fax, or email, no later than the next business day. Notifications in person or by telephone shall be confirmed by written notice addressed and mailed to Oak Hill within three (3) business days of the telephone notice. If the discharge of prohibited materials emanates from a commercial or industrial establishment, the owner or operator of such establishment shall also retain an on-site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least three (3) years.

(6) No illegal dumping allowed. No person shall dump or otherwise deposit outside an authorized landfill, convenience center or other authorized garbage or trash collection point, any trash or garbage of any kind or description on any private or public property, occupied or unoccupied, inside the city. Such illegal activity exposes runoff to contamination; generating an illicit discharge.

(7) Violations and penalty. It shall be unlawful for any person to violate or fail to comply with any provision of Illicit Discharge regulations as herein adopted by reference and modified. Any violation of this chapter may be prosecuted in city court before the administrative hearing officer or in any other court of competent jurisdiction at the election of the city. Violations of this chapter shall subject the offender to penalties under the general penalty provision of this code or as otherwise authorized by law. Each day a violation is allowed to continue shall constitute a separate offense. Nothing herein shall preclude the city from taking other legal or equitable action to restrain, correct or abate a violation of this chapter.

ORDINANCE NO. O-18-03-01-80

Passed First Reading: February 27, 2018

Passed Second Reading: March 27, 2018

Mayor Heidi Campbell

ATTEST:

City Recorder Victoria Talbott

Approved as to form and legality:

City Attorney Sharon Jacobs

(b) Natural drainage ways and systems shall be maintained, except that surface water may be diverted around a house or slope area to a natural drain using acceptable construction techniques,

(c) Development shall require a minimum of two (2) acres of land per parcel. The Planning Commission may require additional acreage when justified by the soil tests and/or slope of the site and limit development to a maximum of ten percent (10%) of the lot,

(d) Off-road vehicles shall be prohibited from all such areas and may not be operated off streets and driveways,

(e) Operations that increase loads, reduce slope support, and cause instability of the slope shall be prohibited to the maximum extent possible which will permit reasonable development of the site. These include filling, irrigation systems, accessory buildings, and on-site soil absorption sewage disposal systems,

(f) Where sanitary sewers are not available, any on-site sewage disposal system shall be shown on the site plan and located to avoid slide prone areas. Said system shall be approved by the County Health Department prior to the Planning Commission's review taking into account these requirements,

(g) Erosion control measures shall be employed to prevent all soil material from leaving the site. Additionally, soil from excavation on the site shall not be deposited as fill on a potential slide area. Additionally, all aspects of the Metropolitan Nashville Storm Water Management Ordinance shall apply,

(h) No construction, including for roads which would cut the toe of the slope shall be permitted, except as approved as a part of a soil stabilization plan submitted by a licensed geotechnical engineer on behalf of developer.

~~14-239~~ ~~Radnor Lake Natural Area Impact Zone~~

The Radnor Lake State Natural Area is identified as a unique natural resource for the use and enjoyment of the citizens of Oak Hill and the larger metropolitan area and is worthy of special protection. Therefore, the Radnor Lake Natural Area Impact Zone is hereby recognized and established as a part of this ordinance. The Radnor Lake Natural Area Impact Zone ("impact zone") includes all areas determined as having a visual and/or watershed impact on the natural area and is delineated on the City Zoning Map. Said map is adopted by reference and available in the office of the City Manager. The applicant shall pay, as adopted by Board of

Commissioners resolution, for review by the Planning Commission for the Radnor Lake Impact Ordinance or in connection with the steep slope ordinance.

14-239.1 *Site plan required*

No building permit shall be issued for any lot in the impact zone until a site plan meeting the following requirements has been approved by the Planning Commission. Said site plan shall show:

(a) The exact size, shape, and location of the lot, and the existing drainage pattern,

(b) The proposed location of all buildings, driveways, and drainage ways,

(c) The type and location of erosion control methodology,

(d) Contours at vertical intervals of no more than five feet (5'),

(e) The extent of natural tree cover and vegetation,

(f) The location of any on-site soil absorption sewage disposal system,

(g) The exact area where any natural vegetation is proposed to be removed,

(h) The size, type, and height of all buildings proposed to be constructed.

14-239.2 *Development standards*

The following standards shall be used as a guide for builders, developers, property owners, and the Planning Commission in minimizing the impact on the natural area:

(a) The clearing of trees and vegetation shall be limited to the area required for driveways, turnarounds, the house site, and a reasonable area around the house for landscaping purposes for all areas within the Radnor Lake Natural Area Impact Zone. The intent here is to limit visibility from the natural area to any structure. The Planning Commission may require replacement of removed trees up to the caliper inches removed.

(b) The site for the house shall be situated so that ridgelines and down slopes to the natural area are avoided to the maximum extent possible,

(c) Erosion control measures shall be employed to prevent all soil material from leaving the site. Additionally, all aspects of the Metropolitan

Nashville Storm Water Management Ordinance shall apply as appropriate,

(d) The maximum height of any building shall not extend more than forty feet (40') above the ground level at any point.

14-239.3 *Subdivision review requirements*

Any development occurring within the Radnor Lake Impact Zone which is a subdivision as defined by the Oak Hill Subdivision Regulations shall be required to observe the following provisions, which are supplemental to the other regulations:

(a) Road locations shall be situated so as to minimize to the maximum extent possible any visibility from the lake or trails.

(b) Erosion control measures shall be employed to prevent all soil materials from entering the natural or man-made drainage ways which are located within the Radnor Lake watershed. This shall be required as a part of the preliminary plat approval process, and certification as to the effectiveness of the erosion control measures shall be required of the design engineer.

(c) Cutting trees and removal of the natural vegetation shall be discouraged and limited to the subdivision roadways and required slopes. Individual lots shall be subject to the requirements in § 14-239.2 above.

14-240 Opening or extension of streets

No public street, alley, roadway or right-of-way shall be opened, extended, blockaded, accessed or otherwise changed except upon approval of the Planning Commission except as otherwise provided as a temporary measure and approved by the City Manager or designee.

14-241 Lighting – dark sky regulations

14-241.1 *Purpose*

- Permit reasonable uses of outdoor lighting for nighttime safety, utility, security, and enjoyment while preserving the ambiance of the night;
- Curtail and reverse any degradation of the nighttime visual environment and the night sky;
- Minimize glare and obtrusive light by limiting outdoor lighting that is misdirected, excessive, or unnecessary;

Q9A

Exhibit F

City of Oak Hill
ENFORCEMENT RESPONSE PLAN

a. Introduction. The intent of this plan is to provide guidance to City officials in enforcing stormwater management. It should be used only as a guide while recognizing that each situation is unique. The provisions of this enforcement response plan are not mandatory. Actual enforcement procedures should consider any unusual aspects of a violation or condition, as well as special characteristics of an enforcement action, in determining the proper response.

While the purpose is to provide guidance for administration of stormwater management, it is not intended to limit the judgment and flexibility of the Code Compliance Officer in determining an appropriate response.

Minor infractions may be resolved by a verbal notice, telephone call, or warning letter advising the owner/operator/person of the nature of the violation. If such action fails to generate an adequate response by the owner/operator/person, further enforcement actions as provided by this plan may be taken.

Complaints concerning stormwater compliance will be documented and investigated within 7 days of receipt of complaint.

b. Enforcement Responses. The order of precedence for enforcement responses outlined in this guide should not be construed to prevent the Code Compliance Officer from taking a stronger action without first implementing less stringent steps, if in his opinion, a more forceful response is necessary.

A show cause hearing should be held prior to any enforcement action other than a telephone call, warning letter or Notice of Violation (NOV). The purpose of a show cause hearing is to provide a forum for the owner to present a defense to charges as outlined, or to obtain additional information.

c. Documented Phone Calls or Informal Discussions. In the case of the most minor violation of a permit or the stormwater regulations, a telephone call or informal meeting may be sufficient to obtain the desired compliance. Phone calls must be documented by contemporaneous notes. A copy of the notes should be placed in the owner's master file and another copy mailed to the owner.

Likewise, if an informal discussion is held, notes shall be kept summarizing the discussion. Copies of the notes should be distributed to all entities involved. Anyone wishing to take exception to the notes should be required to respond in writing.

d. Warning Letter. A warning letter is the lowest level of formal response to a violation. It is intended for minor violations which would not cause harm to the environment.

e. Notice of Violation. A notice of violation (NOV) is an official notification to inform a non-compliant owner/operator/person of a violation of stormwater management regulations. Within ten (10) days of receipt of this notice, a written explanation of the violation and a plan for the satisfactory correction and prevention thereof, to include specific required actions, shall be submitted by the owner/operator/person to the Code Compliance Officer. Inspection to ensure performance of any corrective actions may be conducted by the Code Compliance Officer at his/her discretion. Submission of this plan in no way relieves the owner of liability for any violations occurring before or after receipt of the Notice of Violation.

f. Administrative Orders. Administrative orders (AO) are enforcement documents which direct owners to perform, or to cease, specific activities. Administrative orders may also invoke a penalty. There are three (3) primary types of administrative orders: consent orders; compliance orders; and cease and desist orders.

Consent orders are entered into between the city and the owner to assure compliance as to specific actions to be taken by the owner to correct non-compliance within a specified time period. The Code Compliance Officer may enter into consent orders, assurances of voluntary compliance or other similar documents establishing an agreement with any owner responsible for noncompliance. Such documents shall include specific action to be taken by the owner to correct the noncompliance within a time period specified in the document. Such documents shall have the same force and effect as orders issued pursuant to the Stormwater Management Ordinance.

Compliance orders may be issued when the Code Compliance Officer finds that an owner has violated, or continues to violate, the ordinance or an order issued thereunder. It is similar to a consent order except that the consent of the owner is not implied in its issuance. When the Code Compliance Officer finds that an owner has violated or continues to violate any section of this article, or a permit or order issued under this article, the Code Compliance Officer may issue an order to the owner responsible for the violation directing that the owner come into compliance within a specified time, and such order may include assessment of a penalty to be paid if the owner does not come into compliance within the time provided. Compliance orders also may contain other requirements to address the noncompliance, including additional self-monitoring and management practices designed to minimize the amount of pollutants discharged offsite. A compliance order does not relieve the owner of liability for any violation, including any continuing violation. Issuance of a compliance order shall not be a bar against or a prerequisite for taking any other action against the owner.

Cease and desist orders may be issued when the Code Compliance Officer finds that an owner has violated, or continues to violate, the stormwater management ordinance or order issued thereunder. The order shall require that the owner:

(a) Comply forthwith; and
(b) Take such appropriate remedial or preventive action as may be needed or deemed necessary to properly address a continuing or threatened violation, including halting operations and terminating the discharge. Issuance of a cease and desist order shall not be a bar against or a prerequisite for taking any other action against the owner.

Administrative Orders contain the following components:

1. Title – The title specifies the type of order being issued (see below), states to whom it is being issued, summarizes the purpose of the order, and contains an identification number.
2. Legal Authority – Indicates the authority under which the order is issued (the stormwater management ordinance).
3. The Finding of Noncompliance – All violations must be described, including the dates, the specific permit and/or ordinance provisions violated, and any damages known and attributable to the violation.
4. Required Activity – All orders should specify the required actions, such as installation of Best Management Practices (BMPs), additional inspections, appearance at show cause hearing, etc.
5. Milestone Dates for Corrective Actions – When compliance schedules are appropriate, all milestone dates must be established including due dates for required written reports.
6. Supplemental Clauses – The document should contain standard clauses providing that:
    a. Compliance with the terms and conditions of the administrative order shall not be construed to relieve the owner of their obligation to comply with applicable state, Federal or local law, or the permit;
    b. Violation of the administrative order itself may subject the owner to additional penalties as set out in the stormwater management ordinance;
    c. No provision of the order shall be construed to limit the City's authority to issue supplementary or additional orders, or to take action deemed necessary to implement this program or ordinance;
    d. The order shall be binding upon the owner, its officers, directors, agents, employees, successors, assigns, and all persons, firms or corporations acting under, through or on behalf of the owner.

Administrative orders issued as a result of a violation of the stormwater management ordinance shall contain a penalty as determined using Tables 'A' and "B" in this document. Administrative orders may also be used to advise an owner of the need to take, or cease, certain actions, and in such case, may or may not be associated with penalties as defined in the Stormwater Management Ordinance or in this enforcement ordinance.

g. Civil Litigation. Pursuant to the Stormwater Management Ordinance, the Code Compliance Officer may, through the city attorney, petition the appropriate court(s) for issuance of preliminary or permanent injunctions to restrain or compel activities by an owner.

h. Penalties, Administrative or Civil. The stormwater management ordinance authorizes assessment of penalties not to exceed $5,000 per violation per day. Additionally, the Stormwater Management Ordinance authorizes the Code Compliance Officer to assess a civil penalty for actual damages incurred by the City. Before assessment of any administrative penalty, a show cause hearing must be held with the non-compliant owner.

   If a violation results in conditions requiring the expenditure of public funds for mitigation of damages, a penalty shall be assessed in such amount as to offset the public funds so expended. This will in no way reduce or offset the liability of the owner with respect to damages incurred.

i. Explanation of Use of Tables. This guide is based primarily on the use of two tables; "A" and "B". Table "A" indicates how point values are assigned for each violation, considering the severity, duration, degree of harm, and compliance history of the owner. All possible violations may not be listed; however, this does not preclude an appropriate enforcement response.

   In Table "A", three columns are associated with each listed violation - the "Initial Points" column, the "Repeat Value" column, and the "Cumulative" column. If no history of violations is noted, the value in the "Initial Points" column may be used in conjunction with Table "B" to assess a typical response to the violation.

   If the user has a history of similar violations, the initial point value plus the product of the number of previous occurrences times the repeat value should be used as shown in the following formula: Total Point Value (TP) = P + (N x R), where:

   P = Initial Point Value for a single violation
   N = Number of previous occurrences
   R = Repeat Value from Table "A"

Should more than one violation be noted at a time, the cumulative column should be consulted. If violations are cumulative in nature, the sum of the individual point values should be used to judge the response. If not, the greatest individual values should be used to judge response, with the documentation for that response, noting all violations.

Once a point value is determined, Table "B" should be consulted for recommended responses. Table "B" provides a schedule of appropriate responses based upon the number of points determined by Table "A".

EXAMPLE

An owner violates a single requirement of Erosion Prevention and Sediment Control. This violation is considered significant and causes harm. Investigation reveals the owner has been cited twice in the past for the same violation. Total Point Value (TP) = P + (N x R). Therefore: TP = 2 + (2 x 1) = 4, where:

2 = Points charged for isolated but significant discharge from Table "A"
2 = Number of previous occurrences; and
1 = Repeat Value from Table "A"

Resulting Options: Civil injunction or administrative order with a $300.00 penalty.

TABLE "A"
Response Guide for Violation

DESCRIPTION OF VIOLATION	INITIAL POINTS	REPEAT VALUE	CUMULATIVE
EROSION PREVENTION AND SEDIMENT CONTROL			
Violation of a single requirement:			
Not significant	1	1	Yes
Significant, no harm	2	1	Yes
Significant, causes harm	2	1	Yes
Violation of more than one requirements:			
Not significant	2	1	Yes
Significant, no harm	3	1	Yes
Significant, causes harm	4	1	Yes

UNAUTHORIZED DISCHARGES

Illicit Discharge:

Owner unaware of requirement, no harm	1	N/A	No
Owner unaware of requirement, harm	2	N/A	No
Owner aware of requirement, no harm	2	1	Yes
Owner aware of requirement, harm	3	1	Yes

Illicit Connections:

Owner unaware of requirement, no harm	1	N/A	No
Owner unaware of requirement, harm	2	N/A	No
Owner aware of requirement, no harm	2	1	Yes
Owner aware of requirement, harm	3	1	Yes

Inspection:

Entry Denied	2	2	Yes

Inspection Records

Incomplete	1	2	No
Not available	1	2	No

Maintenance

Failure to properly operate and Maintain BMPs	1	1	Yes

Stormwater Management

Pre-Construction

Failure to obtain Notice of Coverage	2	1	No
Failure to obtain grading permit	2	1	No
Failure to provide performance bond	2	1	No

Post Construction

Failure to provide water quality BMP's	2	2	No
Failure to provide channel protection	2	2	No
Failure to provide downstream impact	2	2	No
Failure to provide special pollution Abatement plan	2	2	No

TABLE "B"
VIOLATION RESPONSE GUIDE

POINT TOTAL	ACTION
1	Written warning
2	Notice of Violation
3	Administrative Order with up to $150 Penalty
4	Administrative Order with up to $300 Penalty
5	Administrative Order with up to $500 Penalty
6	Administrative Order with up to $1000 Penalty
7	Administrative Order with up to $2000 Penalty
8	Administrative Order with up to $3000 Penalty
9	Administrative Order with up to $4000 Penalty
10	Administrative Order with up to $5000 Penalty

j. Cease and Desist Order. A civil injunction may be requested at any time, for any violation, if in the opinion of the Code Compliance Officer in consultation with the City attorney, such action is justified, needed or appropriate.

k. Criminal Action. In cases where criminal acts are suspected by the Code Compliance Officer, after consultation with the City attorney, information shall be gathered and forwarded to the District Attorney for Davidson County for action. Criminal prosecution, if pursued, shall be in addition to other actions authorized by ordinance.

PUBLIC INFORMATION AND EDUCATION PLAN (PIE)

CITY OF OAK HILL'S STORMWATER PROGRAM TNS075477

5548 FRANKLIN PIKE SUITE 101
NASHVILLE TN 37220
(615) 371-8291
WWW.OAKHILLTN.US

Public Information and Education Plan (PIE)

Introduction

The City of Oak Hill's public information and education plan is comprised of various components with the goal of educating the citizens on the effects of stormwater pollution and water quality.

Summary

Our population of 4,800 means that the effects of our urban area are significant enough to require more focus on stormwater practices. The City has been designated as having a Municipal Separate Storm Sewer System (MS4). This designation requires that we develop and implement a stormwater management program as part of our NPDES Permit. Part of the program dictates that we educate the citizens, developers, churches and schools on how our actions affect and what can be done to improve water quality.

Established Programs and Continued Goals

School – Age/Classrooms

- Stream clean-up and Tree Planting events.
- Website containing information for teachers, parents, and children.
- Semi-annual water quality education in the City's newsletter

Adults

- Website containing information on suggested best management practices for the home, church or school.
- Pubic Service Announcements in conjunction with the Tennessee Stormwater Association (TNSA).
- Printed materials available at City Hall.
- Stream clean-up and Tree Planting events that address awareness on the impacts on water quality from general good housekeeping and permanent Best Management Practices (BMP) awareness/importance of maintenance activities.
- Good Housekeeping training for municipal employees on a routine basis.

Developers

- Website containing information on suggested best management practices for the home, church or school.
- Public Service Announcements in conjunction with Tennessee Stormwater Association (TNSA).
- Printed materials available at City Hall.
- Ordinance and Subdivision regulations requiring pre-construction meetings.
- Regular on-site inspections and one-on-one meetings when needed.

Existing Churches and Schools

- Website containing information on suggested best management practices for the churches or schools.
- Public Service Announcements in conjunction with Tennessee Stormwater Association (TNSA).
- Printed materials available at information tables at City Hall.
- Inspections

Future Programs

Goals

- Increase involvement with all age groups.
- Enhance Relationship with TN Environmental Council 250K Tree Day
- Enhance Relationship with TN Environmental Council Recycling Efforts

Plan

- Develop workshops to meet needs of developers, churches and schools, and home owners.
- Look at large group projects and programs for school-aged citizens such as Think Green, Think Clean, World Water Monitoring Day, Earth Day, etc.
- Work alongside other stormwater agencies throughout Davidson County to expand public education opportunities and efforts.
- Conduct After-Action Analysis following each project so improvements for future events can be implemented.

Media

Printed materials

- Brochures

- Flyers

Radio Public Service Announcements (PSAs)

- Through the Tennessee Stormwater Association
- The PSAs address awareness on the impacts of our actions on water quality
- Through Tennessee Environmental Council (Tree Day)

Electronic media (Email, website, texting)

- Utilizing the City's website and cellular application feature to generate emails.
- City's website contains up-to-date information
- Utilize other social media outlets (Facebook, etc.) to distribute event information

Items to Address

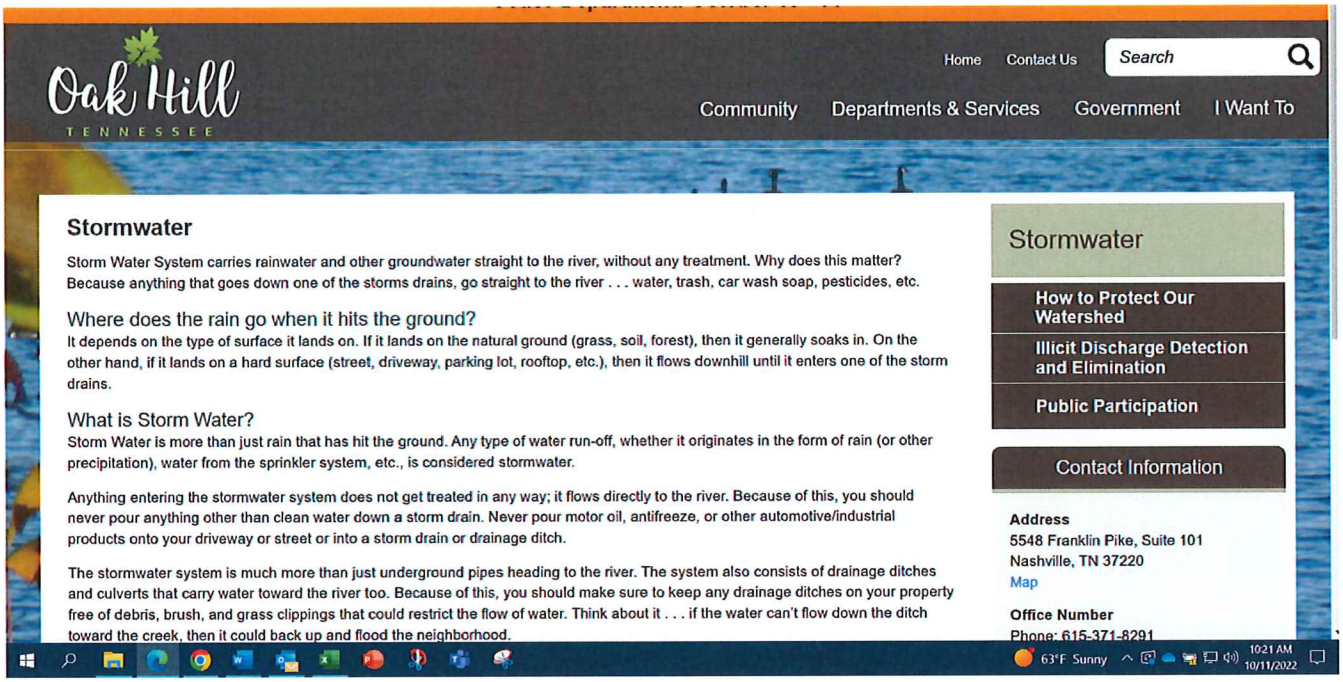
- General housekeeping; chemical disposal, vehicle washing, yard maintenance, rain garden installation, rain barrel installation.
- Good housekeeping for municipal employees; training conducted on an annual basis and as-needed.
- Litter pick-up/illegal dumping; clean-up these sites, post no dumping signs, etc.

Judging Effectiveness

- Education and outreach are vital to the success of the City's stormwater/water quality program. Each avenue of distribution – printed materials, website, radio ads, etc. will have quantities associated with them in terms of numbers of items distributed.
- Long-term goals of education are to see habits change about how people take care of the environment, to see less litter, and to see less illegal dumping.
- If the City is not seeing improvements in litter pick-ups etc., then it will need to re-evaluate the way the information is being distributed and what information is being distributed.

The City of Oak Hill

Website: https://oakhilltn.us/stormwater



Home Repair & Remodeling

1. **Household Hazardous Waste Disposal**
   Household toxics--such as common household cleaners, paint products and motor oil--can pollute our Tennessee River and streams, as well as groundwater, if not disposed of as hazardous waste.
   - Minimize your use of hazardous chemicals by using safe, effective non-toxic substitutes. Buy the least toxic products available such as those labeled "non-toxic", "non-petroleum based" and "free of ammonia, phosphates, dye or perfume."
   - Store your unused household chemicals securely.
   - Household Hazardous Waste Disposal is provided on the 2nd Saturday of each month from 8:00 a.m. to 12:00 noon at 3925 N. Hawthorne. Old paint, insecticides, pool chemicals, and other hazardous wastes are accepted. Please call the City of Chattanooga Brush Recycling Center at 698-9531 for more information.
   - Take used motor oil to an oil recycling center.

2. **Concrete and Masonry**
   Fresh concrete and mortar application materials can wash down or blow into the street, gutter, or storm drains posing a hazard to aquatic life. Also, these materials could clog the storm drain system causing flooding to your and your neighbors.
   - Do not mix up more fresh concrete or cement than you will use.
   - Store bags of cement and plaster under cover, protected from rainfall, runoff, and wind, and away from gutters and storm drains.
   - Never dispose of cement washout or concrete dust onto driveways, streets, gutters or storm drains.

3. **Painting**
   All paints and solvents contain chemicals that are harmful to aquatic life. Toxic chemicals can come from liquid or solid products or from cleaning residues on rags. It is especially important to prevent these chemicals from entering storm drains.

   Paint Cleanup
   - Never clean bushes or rinse paint containers into a street, gutter or storm drain.
   - For oil-based paints, paint out brushes to the extent possible. Clean with thinner and then filter and reuse thinner.
   - For water-based paints, paint out brushes to the extent possible, then rinse in the sink.
   - When thoroughly dry, used brushes, empty cans (lids off), rags and drop cloths may be disposed of as trash.

   Paint Removal
   - Chemical paint stripping residue is a hazardous waste and should be taken to the next Household Hazardous Waste Collection Event.
   - Sweep paint chips and dust and dispose as trash.

   Paint Recycling

- Use leftover paint for touch-ups or recycle it at a Household Hazardous Waste Recycling Event. Donate lead-free paint to a local church, school, or other local community organization.

4. **Landscaping & Gardening**

Intensive gardening and landscaping increase the likelihood that garden chemicals and soil will wash into storm drains. Pesticides and herbicides not only kill garden invaders, they also harm beneficial insects, poison fish and contaminate ground and surface water.

- Use organic or non-toxic fertilizers and pesticides. Do not fertilize or use pesticides near ditches, gutters or storm drains.
- Store pesticides, fertilizers, and other chemicals in a covered area to prevent runoff.
- Do not blow, sweep or rake leaves or grass clippings into gutters or storm drains. Besides polluting our water, they plug drainage ditches and cause flooding for you and your neighbors.

- Chattanooga has curbside yard waste pick-up. Leave clippings and pruning waste beside the street for pickup. Or, compost the clipping at home and use the compost around your plants.
- Conserve water by using drip irrigation, soaker hoses, or micro-spray systems.

5. **Construction**

Sediment, from excavation and other construction projects is the most common pollutant washed from work sites. Sediment entering the river through storm drains harms aquatic life and disrupts the food chain upon which both fish and people depend.

6. **General Practices**

- Keep all construction debris away from the street, gutter, and storm drain. Look for and clean up material that may have traveled away from your property.
- Keep materials out of the rain by storing them indoors or outdoors with a secure roof or plastic sheeting.

7. **Erosion Control**

- Schedule grading and excavation projects for dry weather.
- Cover excavated material and stockpiles of asphalt, sand, etc. with plastic tarps.
- Prevent erosion by planting fast-growing annual and perennial grasses. These will shield and bind the soil.
- Obtain an erosion control "Best Management Practices Manual" from Chattanooga Storm Water Management and Hamilton County Storm Water Pollution Control Program. This manual provides detailed examples of how to control erosion from your project.

Landscaping, Gardening & Pest Control

Problems

Landscaping and garden maintenance activities can be major contributors to storm water pollution. Soils, yard wastes, over-watering, and garden chemicals become part of the urban runoff mix that winds its way through streets, gutters and storm drains before entering our river tributaries.

Over-watering lawns and using sprinklers that function improperly not only squander water, but increase pollutants, such as fertilizer, that flow into storm drains.
Fertilizers, pesticides and herbicides are washed off lawns and landscaped areas. These chemicals not only kill garden pests, they also harm useful insects, poison fish, and contaminate ground and surface water.

Leaves, grass clippings and tree trimmings that are swept or blown into the street and gutter also cause storm water pollution. These wastes clog catch basins, increasing the risk of flooding on your street, and carry lawn chemicals into the river. As they decompose, they also absorb the oxygen that fish need to survive.

Solutions

1. General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Schedule grading and excavation projects for dry weather.
- Use temporary check dams or ditches to divert runoff away from storm drains.
- Prevent erosion by planting fast-growing annual and perennial grasses. Grass blades reduce the erosive effects of rain drops and the roots bind the soil.

2. Garden and Lawn Maintenance

- Do not over water lawns or gardens. Conserve water by using irrigation practices such as drip irrigation, soaker hoses, or micro-spray systems.
- Do not blow or rake leaves into the street, gutter or storm drains.
- Compost the clippings at home and use the compost around your plants.
- Use organic or non-toxic fertilizers.
- Do not over fertilize and do not fertilize near ditches, streams. or other water bodies.
- Store pesticides, fertilizers, and other chemicals in a covered area to prevent runoff.

3. Pesticide Alternatives

The "chemicals-only" approach to pest control is only a temporary fix.
A more common sense approach is needed for a long-term solution. It's called:
Integrated Pest Management

Plan your "IPM" strategy in this order:
A) Physical controls
- Caulking holes
- Hand picking
- Barriers
- Traps

B) Biological Controls

- Predatory Insects - Green lacewings eat aphids
- Bacterial insecticides - Bacillus thuringiensis kills caterpillars

C) Chemical Controls - Your Last Resort

Use these least toxic products:

- Dehydrating dusts (e.g. silica gel)
- Insecticidial soaps
- Boric acid powder
- Horticultural oils
- Pyrethrin-based insecticides

4. Safe Substitutes for Pest Control

Garden Aphids and Mites- Mix 1 tablespoon of liquid soap and 1 cup of vegetable oil. Add 1 teaspoon of the mixture to a cup of water and spray. (Oil may harm vegetable plants in the cabbage family).

Caterpillars- When caterpillars are eating, apply products containing Bacillus thuringiensis to leaves.

Ants- Place boric acid dust or hydramethylnon baits in problem areas, cracks and insect walkways. Be sure it is inaccessible to children and pets (it is a mild poison).

Roaches- Apply boric acid dust to cracks and entry points (see ants above). Place bay leaves on pantry shelves.

5. If You Must Use Pesticides. . .

- Use a pesticide that is specifically designed to control your pest. The insect should be listed on the label. Approximately 90% of the insects on your lawn and garden are not harmful.
- Read labels! Use only as directed. In their zeal to control the problem, many gardeners use pesticides at over 20 times the rate farmers do.

6. Pesticide Disposal

- Household toxics- such as pesticides, cleansers, and motor oil- can pollute our streams and river and poison groundwater if disposed of in storm drains or gutters.
- Rinse empty pesticide containers and use rinse water as you would the product. Dispose of empty rinsed containers in the trash.
- Hamilton County residents can dispose of unused household toxics at periodically announced Household Hazardous Waste Collection Events. Call 423-697-1408 or 423-757-5464 for more information.

Keep Jonesborough Beautiful

Common Stormwater Pollutants

And How to Prevent Them From Entering Our Waterways

Pet Waste

Pick up after your pets. Animal waste contains E. coli as well as high levels of nitrates and phosphates. These contaminate our creeks when rain carries waste into the water. Bags and trashcans are placed along most walking trails and parks for this purpose.

Mop Water & Cleaning Chemicals

Mop water and cleaning chemicals can be toxic to wildlife, alter water chemistry, and add bacteria to the water. Dispose of mop water down a sink or drain connected to the sewer system so it can be treated. Check with manufacturer to see whether the chemical should be put down a sink or brought somewhere special.

Plant Clippings & Leaves

Sweep away leaves and other yard debris from your storm drains often. They add nitrate and phosphate to the water, causing harmful algal blooms.

Trash

Never throw trash on the ground or on a storm drain. It will end up in the creek. Always dispose of things in a trashcan or recycling bin.

Cooking Oil & Grease

Dispose of these in the trash. Oil and grease clog pipes and create problems for wastewater plants when dumped down a sink. If they solidify, let them do so before disposal. Otherwise pour the oil in a sealable container and throw it away.

Motor Oil , Antifreeze, Etc.

These are toxic to the water and wildlife in it. Check your car for leaks and get them fixed. When changing fluids at home, work carefully to prevent spills and NEVER dump or throw away the used oil. Check with auto stores to see how you can recycle the used fluids.

Car Wash Soap

The soapy water and all of the pollutants washing off of your car are harmful. When washing at home, do so in the grass so that the soil can filter out these chemicals.

Fertilizer

Fertilizer contains high levels of nitrate and phosphorus, which cause excess algae and low oxygen levels in the water that kill aquatic life. Don't over fertilize, don't apply right before a big rain, and remember to sweep up any fertilizer on pavement once you're done applying it.

Remember...

Dumping anything into the street, a storm drain, or waterway is ILLEGAL.

To report an illegal dumping please call Town Hall at 423-753-1030.

ARE YOU A DO-IT-YOURSELFER?

YOU CAN PUT THE BRAKES ON WATER POLLUTION

Did You Know?

Each year millions of gallons of used motor oil are disposed of improperly: dripped, spilled or poured directly onto the ground or down storm drains.

It only takes four quarts, or about one oil change, of used motor oil to foul one million gallons of drinking water.

Many brake pads contain metals that wear away a little by little. The metal breaks down into dust each time you apply the brakes. Brake pads can contain as much as 20 percent copper, which is toxic to aquatic life at the base of the food chain. They also contain lead and zinc. (Source: US EPA)

BE A SOLUTION TO WATER POLLUTION.

www.cleanwatercampaign.com

CLEAN WATER CAMPAIGN
SOLUTIONS TO STORMWATER POLLUTION

Clean Water Campaign
40 Courtland Street, NE
Atlanta, Georgia 30303

PUT THE BRAKES ON WATER POLLUTION

TIPS FOR MAINTAINING OR REPAIRING YOUR VEHICLE AT HOME

BY PREVENTING FLUIDS FROM REACHING THE STREET OR STORM DRAIN, YOU CAN PREVENT STORMWATER POLLUTION AND HELP PROTECT OUR RIVERS, LAKES AND STREAMS.

BE AWARE OF WHERE YOU WORK

- Any drips or spills on the ground can be carried away by rainwater to a storm drain and into a nearby river, lake or stream.
- Choose to work on a flat concrete surface where you can easily clean up accidental spills. Remember the phrase "keep it clean, drains to stream" when you work on paved surfaces.
- Never work on a vehicle in the street or near a storm drain.

FOLLOW THESE TIPS WHEN CHANGING YOUR OIL OR OTHER VEHICLE FLUIDS

- Use funnels or pumps when handling liquid products or wastes to avoid spills.
- Capture vehicle fluids in separate drip pans or containers. Properly recycle used oil, antifreeze and other vehicle fluids. Do not mix vehicle fluids.
- Use plastic tarps and drip pans if a car is leaking. Pour the oil collected on tarp back into a drip pan.
- Drain and recycle used oil filters. Poke holes in the filer and let it drain into your oil pan for several hours before you recycle.
- As an alternative, you can use kitty litter, sawdust or oil absorbent to clean spills. Apply it to the spill, sweep it up and dispose of the waste in the trash.
- If spills occur, use an absorbent pad to clean the spill. Squeeze the pad to wring out excess liquids. Place the used pad in a plastic bag and then dispose in the trash.
- Collect your used motor oil, antifreeze and oil filters in separate containers for transport to a nearby recycling station. Tires and batteries are some other items that can be recycled.

PUT THE BRAKES ON POLLUTION WHEN REPLACING BRAKE PARTS

- Many brake pads contain copper, which wears off as the pads wear and contributes to stormwater pollution.
- Don't hose down brake pads, rotors or drums.
- Use shop cloths to wipe as much brake dust as possible from the rotors and drums before using brake cleaner fluid. The shop cloths can be laundered and reused.
- Recycle cleaner fluid by using a drip pan. Reuse collected cleaner to clean rotors and drums.

WASH YOUR CAR AT A NEARBY CAR WASH

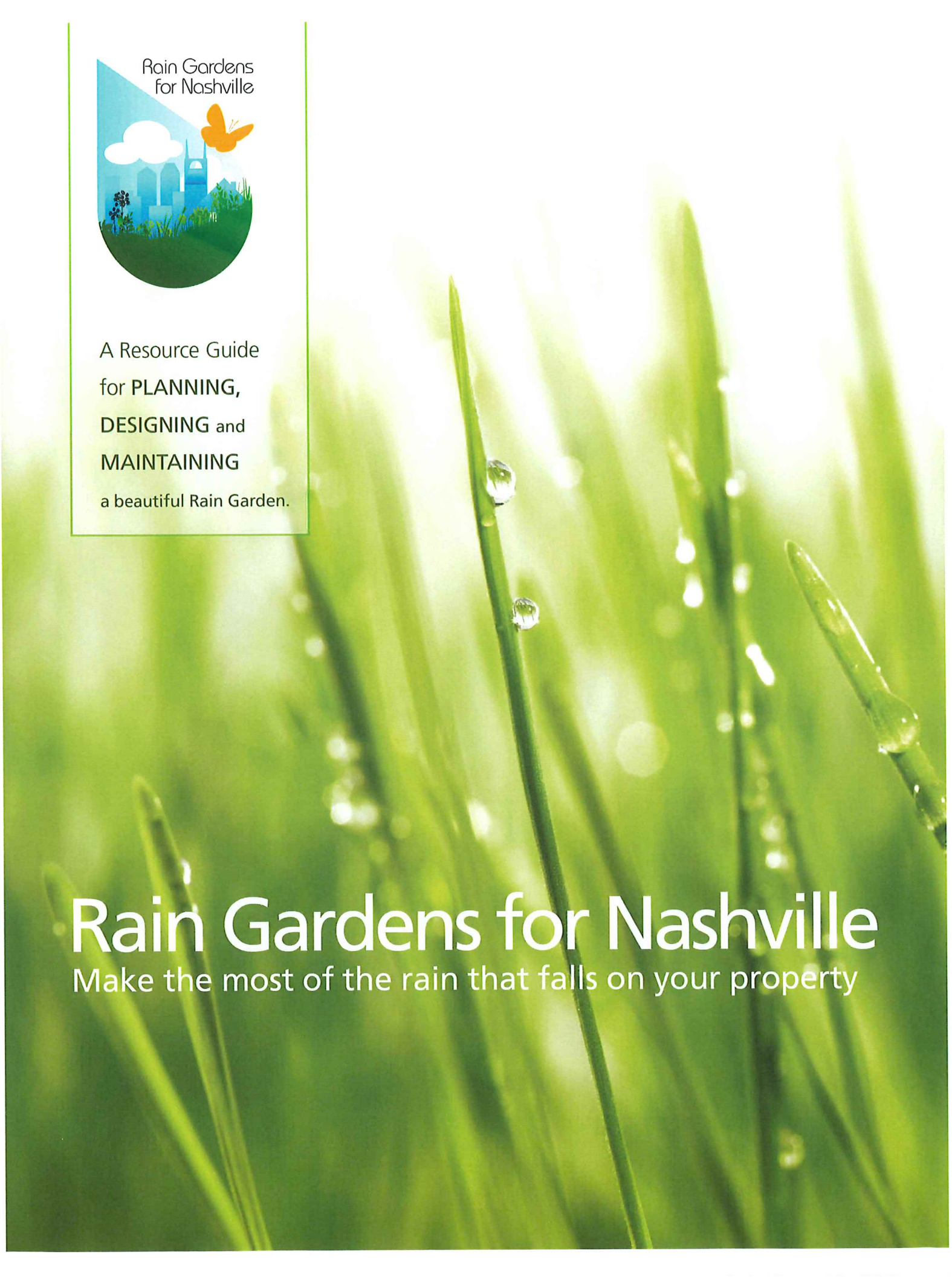
- Wash water from washing your car at home can contain detergents, metals, oil, sediment and other debris that can pollute nearby rivers, lakes and streams.
- For spot cleaning, wipe the vehicle with a damp cloth instead of washing it.
- Take your vehicle to a commercial car wash that recycles water. This will prevent detergents and other contaminants from being washed down a storm drain or drainage ditch.

DID YOU KNOW THE FOLLOWING CAN BE RECYCLED?

- Transmission fluid
- Used tires
- Brake fluid
- Used oil filters
- Car batteries
- Antifreeze
- Used motor oil

For the nearest location near you, call ***1-800-CLEANUP*** *or visit* ***www.1800cleanup.org.***


Maintain your BMPs!
Cover or seed dirt stockpiles.
Stabilize exposed areas with vegetation.
Reduce slope steepness and length by terracing. Use diversion to route clean water away from disturbed areas.
Recycle as much waste as possible.
CONSTRUCTION ENTRANCE
Plan construction entrances to limit runoff.
Physically remove sediment from street or drainage structures immediately.
Landscape after final grading to stabilize exposed areas.
Install and maintain appropriate sediment controls.
CONSTRUCTION ENTRANCE
Use 2-3" sized gravel with geotextile beneath gravel.
Protect and maintain proper controls at storm drain inlets.
For more information, visit
epa.gov/npdes/stormwater/menuofbmps
Protect existing vegetation.
Protect streams with adequate buffers to limit runoff.
Clean water begins on site...
tennesseewaterworks.org
tnstormwater.org



A Resource Guide
for **PLANNING,**
DESIGNING and
MAINTAINING
a beautiful Rain Garden.

Rain Gardens for Nashville

Make the most of the rain that falls on your property

Contents

Overview

Do you want to be part of improving the health and beauty of our streams? **Rain Gardens for Nashville** has created this simple step-by-step guide to show you how.

A RAINY DAY STORY... or what can happen when it rains.

If you live in Nashville, much of the land around you has been covered with roads, parking lots and buildings. Rain water that falls onto these hard surfaces becomes runoff that flows across paved areas warming and collecting contaminants, such as oil, pesticides and pet waste, along its way. This warm polluted water flows into storm water sewer systems eventually entering streams. Even worse, in some older areas of the city with combined storm water and sewage pipes, runoff can combine with raw sewage during heavy rains. If the volume of this combined sewage is too great it can overflow untreated into our rivers. All this runoff puts a heavy burden on our streams and leads to flooding, erosion and habitat loss. This costs our city extra money in water treatment and repairs.

A GOOD CLEAN STORY... or what we can do to help.

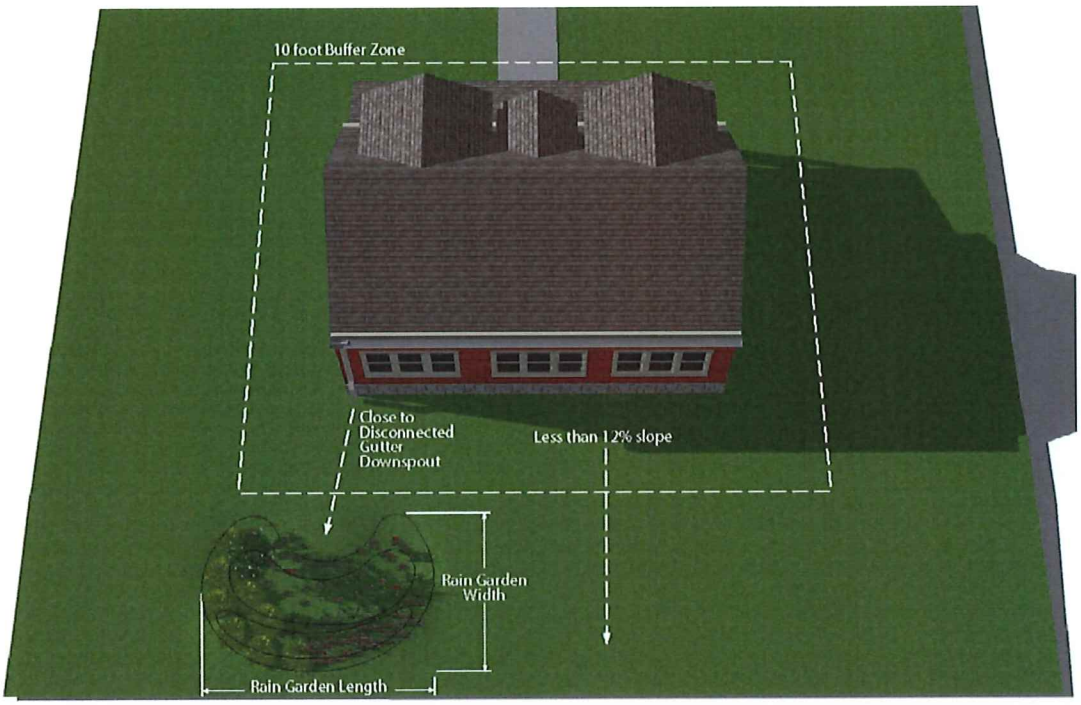
Rain Gardens are a natural and beautiful way to reduce and clean storm water. They are shallow, depressed gardens designed to collect rain water and allow it time to filter into the ground. This results in cleaner water, less water entering our storm systems and more water refilling the underground water table that keeps small streams flowing during the dry summer months.

Rain Gardens are lovely, lively, colorful, low maintenance habitats for insects and animals. Their native plants provide food to song birds and butterflies.

Join Rain Gardens for Nashville in planting 300 Rain Gardens to keep our streams clean, flowing and healthy.

Planning

Many things need to be considered when locating and planning your rain garden. Although each site is different, the following general guidelines will help make your rain garden a success.



LOCATING YOUR RAIN GARDEN

Build your rain garden at least 10 feet downhill from your or your neighbor's house to avoid water getting in the foundation.

Never build a rain garden above a septic system or shallow underground utilities. Call TN One Call (811) before you begin.

Your rain garden should not be located in an area of your yard where water pools because the water can't drain quickly enough.

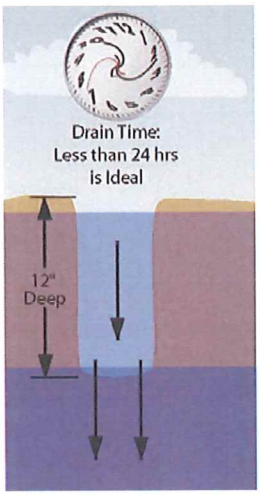
Tennessee is known for its shallow bedrock, so make sure the soil is at least 24 inches deep in your garden location for proper drainage.

Make sure the slope of your site is less than 12% (see page 5). A site too steep will drain too quickly and needs increased excavation work.

Try not to build your rain garden under existing trees because it can damage roots.

If your downspouts are routed into pipes or onto the ground, disconnect them and try to locate your garden to catch and treat the water.

Make sure your rain garden is not within a stream's floodway or the plants may wash away!



TESTING AND AMENDING YOUR SOIL

Once you have picked a potential location for your rain garden, you will need to test the soil to determine if it will drain properly. If the infiltration rate of your soil is too low, water may pond in your garden for too long breeding mosquitoes and killing your plants.

First, dig a hole 12 inches deep, fill it with water and allow the water to saturate the surrounding soil.

Next, refill the hole and time how long it takes to drain. If it drains in:

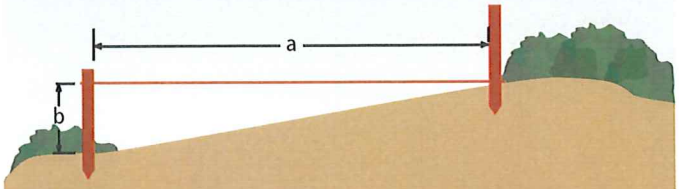
- **Less than 24 hours, your infiltration rate is good**
- **Between 24 and 48 hours, your soil will infiltrate, but should be amended with a mixture of 20-30% of the existing soil, 20-30% compost, & 40-60% sand to a depth of 6 inches**
- **Greater than 48 hours, this is not the best spot for a rain garden.**

If there are no other suitable locations, you can replace the soil to a depth of 2 feet with a mixture of 20-30% imported topsoil, 20-30% compost, & 40-60% sand.

Another option is to install an under drain system, gravel, or both. Please contact Metro Water Services Stormwater Department for more details at **615-880-2420.**

MEASURING SLOPE

To calculate the percentage of slope follow these steps



1. Pound two stakes into the ground; one at the uphill side of your rain garden and one at the downhill side.
2. Tie a string to the uphill stake at ground level.
3. Tie the other end of the string to the downhill stake, ensuring the string is level.
4. Measure the width in inches between the two stakes (a).
5. Measure the height in inches from the ground to the string on the downhill stake (b).
6. Divide the height (b) by the length (a) and multiply by 100 to calculate the percentage of slope.

SIZING YOUR GARDEN

Whatever the size of your rain garden, catching and infiltrating runoff will improve our water quality. Rain Gardens typically range from 100 – 300 square feet to catch most of the runoff from your yard, although smaller gardens are sometimes necessary due to lot constraints. A simple equation to calculate the best size for your garden is:

$$\text{Rain Garden (ft}^2\text{)} = \frac{\text{Rain Depth (in)} \times \text{Drainage Area (ft}^2\text{)}}{\text{Garden Depth (in)}}$$

Since most of the rainfall events in Nashville are 1 inch or less and your rain garden should be about 6 inches deep, you should use these values in the equation. For example, if the roof area draining to your rain garden is 1000 square feet, then your rain garden will be:

$$\text{Rain Garden} = \frac{1 \text{ in} \times 1{,}000 \text{ ft}^2}{6 \text{ in}} = 167 \text{ ft}^2$$

Design

Rain gardens come in a variety of shapes and sizes. You can select from the templates in this manual, or invent your own shape. The best designs are typically longer than they are wide, with the longer side perpendicular to the direction of water flowing into your garden. You can also get water to your garden by routing a pipe from your gutters or building a stone lined channel to carry the flow. In any of these cases, you should make certain that the water is not entering your rain garden too fast or erosion may occur.

"The first rule of sustainability is to align with natural forces, or at least not try to defy them."

—Paul Hawken

Follow these seven steps for success.

Tools you'll need:

Tape measure 

Shovels 

Rake 

Trowels 

Wheelbarrow 

Carpenter's level 

Marking paint 

String 

Eye, hand and foot protection. Hard hats if using machinery such as a bobcat or backhoe. 

1 

GETTING STARTED

- ✓ Remember to call TN One-Call (811) in advance to mark underground utilities.
- ✓ Rent machinery in advance such as a tiller, backhoe, or bobcat if needed.
- ✓ Check the weather forecast and schedule your work for a dry day. Rain will delay construction and cause sediment to wash into the storm system.
- ✓ Gather tools and material close to the site.
- ✓ Ask your friends and neighbors for help with the construction. If you don't want to build it yourself, hire a professional landscaper with rain garden experience.

2 

SITE PREPARATION

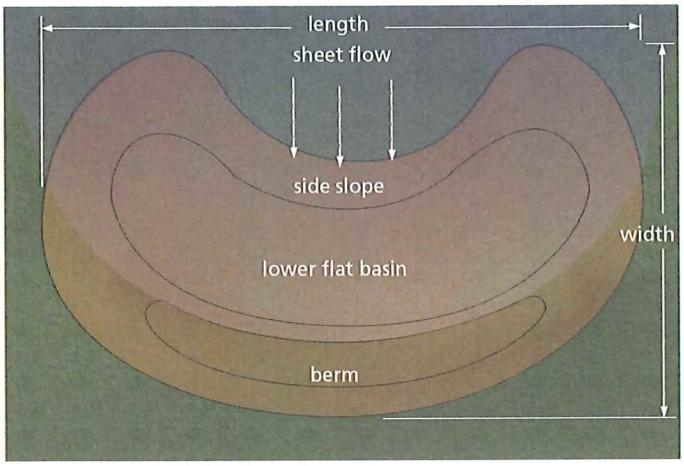
- ✓ Mark the outline of the rain garden on the ground with loose chalk, spray paint, stakes, flags or a garden hose.
- ✓ Install appropriate erosion controls such as silt fence or fiber logs if you are creating run off sediment or mud that will enter storm drains or water bodies. Refer to *The Tennessee Erosion and Sediment Control* Handbook for more information: http://www.tn.gov/environment/wpc/sed_ero_controlhandbook/

3 

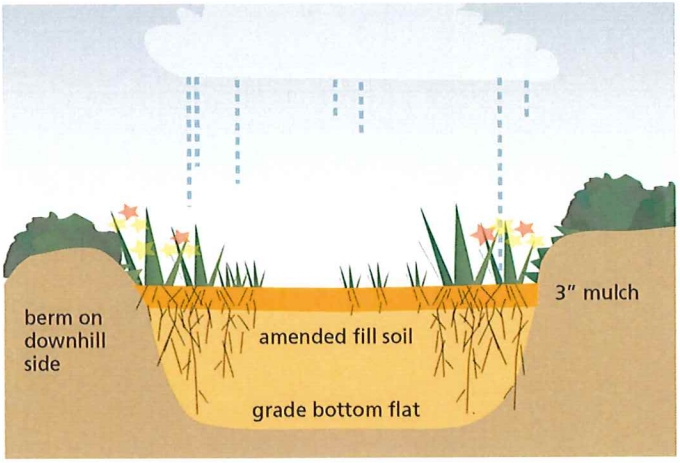
EXCAVATION

- ✓ Dig your garden the size, shape and depth that you have determined during planning. Remember to take into account the soil amendment depth (if needed) and the final 3 inch mulch layer. Your final rain garden should be around 6 inches deep.
- ✓ Do not compact the soil during excavation.
- ✓ **It is crucial to make the bottom flat and level so water will infiltrate evenly and not pool.** Use survey methods or a carpenter's level laid on top of a board to check and correct your work.
- ✓ If your rain garden is on a slope, place excavated soil on the downhill side to be used later to form the berm.

Remember to call TN One-Call (811)



SHAPE OF RAIN GARDEN *Generally twice as long as wide. Length is perpendicular to slope.*



RAIN GARDEN CROSS SECTION

4 AMENDING THE SOIL

- ✓ If your infiltration rate calculation indicated your soil needs amending, backfill the excavated soil mixed to a ratio of 20-30% existing soil or top soil, 20-30% compost and 40-60% coarse sand to the depth outlined in the 'Amending your Soil' section.
- ✓ Mix small portions at a time by hand or with machinery. Allow it to settle overnight and add additional soil if needed. Keep the soil level.

Any work within the public right-of-way should be approved by Metro Public Works. 615-862-8782

5 THE BERM

- ✓ If the garden is located on a slope, use the remaining excavated soil to construct a berm on the downhill side of the rain garden.
- ✓ The berm should be rounded and gradually taper on the sides until it meets the existing lawn. Once the berm is shaped, compact it with your feet or a tamping bar. The berm will act as a dam to hold more water in the garden.
- ✓ To prevent erosion the berm will need to be planted with grass or incorporated into the planting design.

6 PLANTING

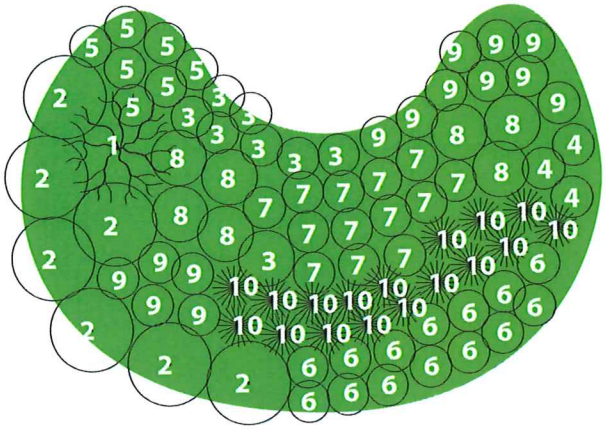
- ✓ Carefully choose native plants that are quality, established nursery stock.
- ✓ Store plants in protected shady area until ready to plant.
- ✓ Do not allow plants to dry out during storage or installation.
- ✓ Lay out plants according to spacing guidelines on design templates and plant lists. Dig holes twice as wide as the root ball.
- ✓ Plant the crown of the plant level with the existing soil.
- ✓ Gently tamp soil around the roots.
- ✓ Do not step on or compact the roots.
- ✓ Water immediately after installation.
- ✓ Keep tags during warranty period.

7 EDGING & MULCHING

- ✓ A strong edge for your rain garden has multiple benefits. Using trenches, metal or plastic edging, stone, brick, or even a thick border of native grasses creates a strong visual line and prevents weeds from creeping into your rain garden. Make sure your edge is buried low enough for runoff to flow over it into the garden.
- ✓ Mulch is used to retain moisture, prevent erosion, control weeds and nourish the soil.
- ✓ Spread 3 inches of pine straw or shredded wood mulch over the rain garden taking care not to damage plants.

Design template

A Colorful, Full Sun Rain Garden Planting Design. Size, 20′ x 10′.



Plan View - Full Sun Rain Garden

Perspective View - Full Sun Rain Garden

Native Plant List

KEY	QUANTITY	LATIN NAME	COMMON NAME	SIZE	SPACING	COLOR	HEIGHT
		SHRUBS					
1	1	Cephalanthus occidentalis	Buttonbush	2 gal.	5′	White	15′
2	7	Ilex glabra compacta	Dwarf Inkberry	2 gal.	3′		4-6′
		PERENNIALS					
3	7	Asclepias syriaca	Common Milkweed	plugs-1 gal	1 plant/18″ s.f., o.c.	Orange	2-5′
4	3	Asclepias verdis	Green Milkweed	plugs-1 gal	1 plant/18″ s.f., o.c.	Green	2′
5	7	Coreopsis lanceolata	Lance-leaf Coreopsis	plugs-1 gal	1 plant/18″ s.f., o.c.	Yellow	6-8′
6	14	Echinacea purpurea	Purple Coneflower	plugs-1 gal	1 plant/18″ s.f., o.c.	Purple	3-4′
7	13	Iris virginica sherevi	Blue Flag Iris	plugs-1 gal	1 plant/18″ s.f., o.c.	Blue	1.5-3′
8	8	Monarda didyma	Bee Balm	plugs-1 gal	1 plant/2 s.f., o.c.	Red	3′
9	14	Rudbeckia hirta	Black-eyed Susan	plugs-1 gal	1 plant/18″ s.f., o.c.	Yellow	3′
		GRASSES & SEDGES					
10	17	Carex stricta	Tussock Sedge	plugs-1 gal	1 plant/18″ s.f., o.c.		2-3′

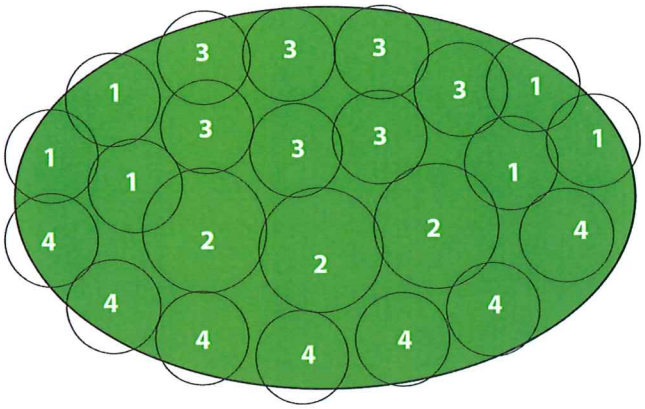
DID YOU KNOW:

Rain Gardens can reduce the amount of nitrogen entering storm sewers by 40% or more.

North Carolina State University

Design template

A Small Full Sun Rain Garden Planting Design. Size, 10′ x 6′.



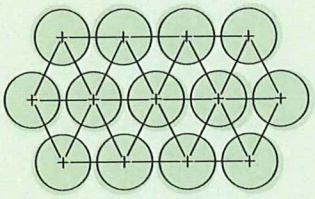
Plan View - Small Rain Garden

Perspective View - Small Rain Garden

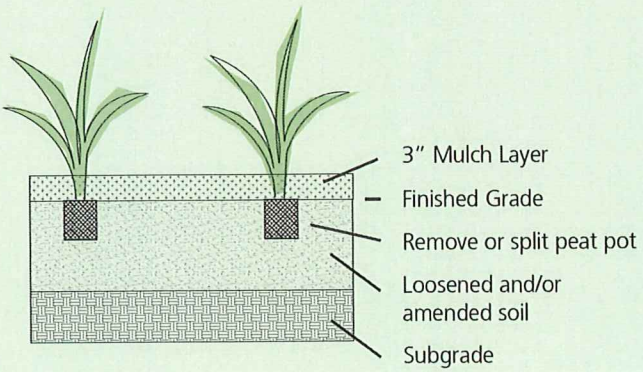
Native Plant List

KEY	QUANTITY	LATIN NAME	COMMON NAME	SIZE	SPACING	COLOR	HEIGHT
		PERENNIALS					
1	6	Echinacea purpurea	Purple coneflower	plugs	1 plant/18″ s.f., o.c.	Purple	3-4′
2	3	Monarda didyma	Bee balm	plugs	1 plant/2 s.f., o.c.	Red	3′
3	7	Oenethera fruticosa	Sundrops	plugs	1 plant/18″ s.f., o.c.	Yellow	1-1.5′
4	7	Rudbeckia hirta	Black-eyed Susan	plugs	1 plant/18″ s.f., o.c.	Yellow	3′

PLANTING DETAIL

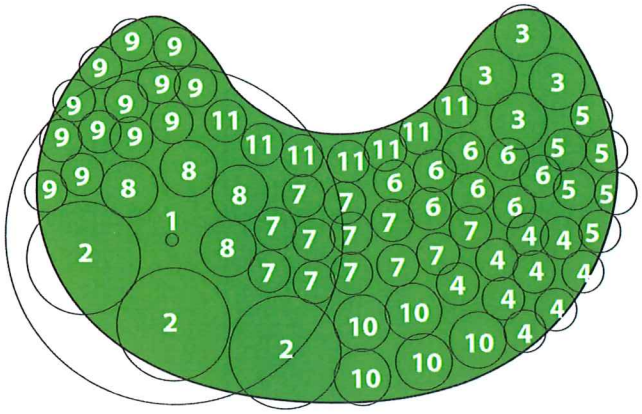


NOTE:
PLANT PERENNIALS USING TRIANGULAR SPACING. REFER TO PLANTING LISTS FOR ON-CENTER PLANTING DIMENSIONS.

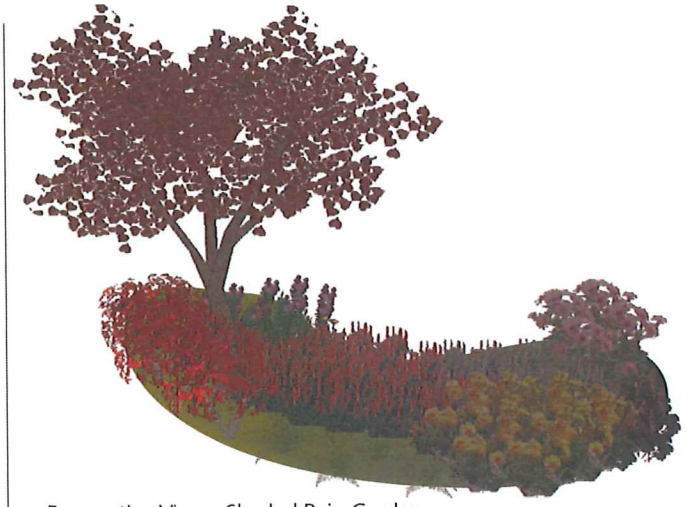


Design template

A Shaded Rain Garden Planting Design. Size, 20′ x 10′



Plan View - Shaded Rain Garden



Perspective View - Shaded Rain Garden

Native Plant List

KEY	QUANTITY	LATIN NAME	COMMON NAME	SIZE	SPACING	NOTE	COLOR	HEIGHT
		TREES						
1	1	Cercus canadensis	Redbud	1-2" cal.			Purple	20-30′
		SHRUBS						
2	3	Itea virginica	Virginia Sweetspire	2 gal.	4′ o.c.		White	4-8′
		PERENNIALS						
3	4	Aster novea-angliae	New England aster	plugs-1 gal.	1 plant/24" s.f., o.c.		Blue/Purple	3-4′
4	9	Coreopsis major	Tickseed coreopsis	plugs-1 gal.	1 plant/18" s.f., o.c.		Yellow	3′
5	6	Heuchera americana	Alumroot	plugs-1 gal.	1 plant/18" s.f., o.c.		Pink	1′
6	8	Lobelia siphilicata	Great blue lobelia	plugs-1 gal.	1 plant/18" s.f., o.c.	Riparian	Blue	1.5-3′
7	12	Lobelia cardinalis	Cardinal flower	plugs-1 gal.	1 plant/18" s.f., o.c.	Riparian	Red	2-4′
8	4	Osmunda cinnamomea	Cinnamon Fern	plugs-1 gal.	1 plant/24" s.f., o.c.	Riparian	Green	3-4′
9	13	Phlox divaricata	Blue phlox	plugs-1 gal.	1 plant/18" s.f., o.c.		Blue	.5-2′
10	5	Polystichum acrostichoides	Christmas fern	plugs-1 gal.	1 plant/24" s.f., o.c.	Evergreen	Green	2′
11	7	Stylophorum diphyllum	Wood poppy	plugs-1 gal.	1 plant/18" s.f., o.c.		Yellow	1.5′

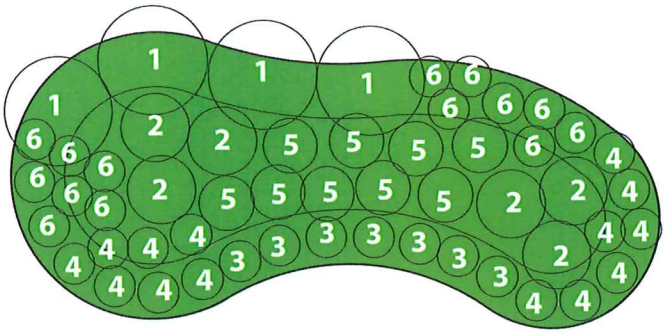
DID YOU KNOW:

Rain gardens can reduce water temperatures by five to ten degrees Fahrenheit.

Low Impact Development (LID) Center

Design template

A No Fail Rain Garden. Size, 24′ x 10′.



Plan View - No Fail Rain Garden

Perspective View - No Fail Rain Garden

Native Plant List

KEY	QUANITITY	LATIN NAME	COMMON NAME	SIZE	SPACING	COLOR	HEIGHT
		SHRUBS					
1	4	Itea virginica	Virginia Sweetspire	2 gal.	4′	White	4-8′
2	6	Hibiscus moscheutos	Swamp Mallow	2 gal.	2.5′	Red-White	4-7′
		PERENNIALS					
3	7	Echinacea purpurea	Purple coneflower	plugs- 1gal.	1 plant/18″ s.f., o.c.	Purple	3-4′
4	14	Rudbeckia hirta	Black-eyed Susan	plugs- 1gal.	1 plant/18″ s.f., o.c.	Yellow	3′
5	9	Vernonia gigantea	Tall ironweed	plugs- 1gal.	1 plant/2 s.f., o.c.	Purple	4-6′
		GRASSES & SEDGES					
6	14	Chasmanthium latifolium	Upland Sea Oats	plugs- 1gal.	1 plant/18″ s.f., o.c.		4′

DID YOU KNOW:

Rain Gardens are like a sponge. They soak up water, clean pollutants and slowly release it back into the ground.

Plant List: Native Perennial List for Rain Garden Design

Full Sun						
Latin name	Common name	Size	Spacing	Moisture	Color	Height
Asclepias incarnata	Marsh milkweed	plugs-1 gal.	1 plant/24" o.c.	Wet	Pink	3-4'
Asclepias purpurescens	Purple milkweed	plugs-1 gal.	1 plant/18" o.c.	Moist	Purple	3'
Asclepias syriaca	Common milkweed	plugs-1 gal.	1 plant/18" o.c.	Moist-Dry	Orange	2-5'
Asclepias tuberosa	Butterfly milkweed	plugs-1 gal.	1 plant/18" o.c.	Dry-Moist	Orange	2
Asclepias verdis	Green milkweed	plugs-1 gal.	1 plant/18" o.c.	Moist	Green	2'
Asclepias verticillata	Whorled milkweed	plugs-1 gal.	1 plant/18" o.c.	Moist	White	2.5'
Aster laevis	Smooth aster	plugs-1 gal.	1 plant/18" o.c.	Moist	Blue	2-4'
Aster novae-angliae	New England aster	plugs-1 gal.	1 plant/24" o.c.	Wet-Moist	Blue	2-5'
Aster sericeus	Silky aster	plugs-1 gal.	1 plant/18" o.c.	Dry	Purple	1-2'
Chamaecrista fasciculata	Partridge pea	plugs-1 gal.	1 plant/18" o.c.	Dry	Yellow	1-2'
Conoclinium coelestinum	Mist flower	plugs-1 gal.	1 plant/18" o.c.	Moist-Dry	Blue	1-2'
Coreopsis lanceolata	Lance-leaf coreopsis	plugs-1 gal.	1 plant/18" o.c.	Moist-Dry	Yellow	6-8'
Echinacea pallida	Pale purple coneflower	plugs-1 gal.	1 plant/18" o.c.	Dry	Purple	2-3'
Echinacea purpurea	Purple coneflower	plugs-1 gal.	1 plant/18" o.c.	Moist-Dry	Purple	3-4'
Eupatorium perfoliatum	Boneset	plugs-1 gal.	1 plant/24" o.c.	Wet	White	3-5'
Eupatorium purpureum	Sweet Joe-Pye weed	plugs-1 gal.	1 plant/24" o.c.	Wet-Moist	Purple	3-6'
Iris cristata	Dwarf crested iris	plugs-1 gal.	1 plant/18" o.c.	Moist-dry	Purple	4"
Liatris aspera	Rough blazingstar	plugs-1 gal.	1 plant/18" o.c.	Moist-Dry	Purple	2-5'
Liatris microcephalla	Small-headed blazingstar	plugs-1 gal.	1 plant/18" o.c.	Moist-Dry	Purple	3'
Liatris spicata	Dense blazingstar	plugs-1 gal.	1 plant/24" o.c.	Wet-Moist	Purple	1.5'
Liatris squarrulosa	Southern blazingstar	plugs-1 gal.	1 plant/18" o.c.	Moist-Dry	Purple	2-6'
Lobelia cardinalis	Cardinal flower	plugs-1 gal.	1 plant/18" o.c.	Wet-Moist	Red	1.5-3'
Lobelia siphilitica	Great blue lobelia	plugs-1 gal.	1 plant/18" o.c.	Wet-Moist	Blue	2-4'
Monarda didyma	Bee balm	plugs-1 gal.	1 plant/24" o.c.	Wet-Moist	Red	3'
Monarda fistulosa	Wild bergamot	plugs-1 gal.	1 plant/18" o.c.	Moist	Purple	1-3'
Oenethera fruticosa	Sundrops	plugs-1 gal.	1 plant/18" o.c.	Moist-Dry	Yellow	
Penstemon digitalis	Smooth white beardtongue	plugs-1 gal.	1 plant/24" o.c.	Wet	White	2-3'
Penstemon hirsutus	Hairy beardtongue	plugs-1 gal.	1 plant/18" o.c.	Dry	White	1-3'
Penstemon smallii	Beardtongue	plugs-1 gal.	1 plant/18" o.c.	Moist	Purple	1-2'
Pycnanthemum tenuifolium	Slender mountain mint	plugs-1 gal.	1 plant/18" o.c.	Moist	White	1.5-2.5'
Ratibida pinata	Gray-headed coneflower	plugs-1 gal.	1 plant/18" o.c.	Moist	Yellow	5-Feb
Rudbeckia hirta	Black-eyed Susan	plugs-1 gal.	1 plant/18" o.c.	Moist-Dry	Yellow	3'
Salvia lyrata	Lyre-leaf sage	plugs-1 gal.	1 plant/18" o.c.	Moist	Purple	1-2'
Solidago nemoralis	Gray goldenrod	plugs-1 gal.	1 plant/18" o.c.	Dry	Yellow	2'
Solidago rugosa	Rough-leaved goldenrod	plugs-1 gal.	1 plant/24" o.c.	Wet	Yellow	1-6'
Veronacastrum virginicum	Culver's root	plugs-1 gal.	1 plant/24" o.c.	Dry	White	3-6'
Vernonia gigantea	Tall ironweed	plugs-1 gal.	1 plant/24" o.c.	Wet-Moist	Purple	3-4'

Native Perennial List for Rain Garden Design (continued)

Shade						
Latin name	Common name	Size	Spacing	Moisture	Color	Height
Aquilegia canadensis	Wild columbine	plugs-1gal.	1 plant/18", o.c.	Moist-Dry	Pink	1-2.5'
Athyrium filix-femina	Lady Fern	1 gal.	1 plant/18" o.c.	Moist	Green	3'
Arisaema triphyllum	Jack-in-the-pulpit	plugs-1 gal.	1 plant/18" o.c.	Moist	Green	1.5-2.5'
Ariseama dricontium	Green dragon	plugs-1 gal.	1 plant/18" o.c.	Wet-Moist	Green	3'
Asarum canadense	Wild ginger	plugs-1 gal.	1 plant/18" o.c.	Wet-Moist	Red-brown	.5-1'
Aster cordifolius	Blue wood aster	plugs-1 gal.	1 plant/18" o.c.	Moist-Dry	Blue	1-3'
Aster novea-angliae	New England aster	plugs-1 gal.	1 plant/24" o.c.	Moist-Dry	Blue/Purple	3-4'
Aster oblongifolius	Aromatic aster	plugs-1 gal.	1 plant/24" o.c.	Moist-Dry	Blue/Purple	1.5-3'
Coreopsis major	Tickseed coreopsis	plugs-1 gal.	1 plant/18" o.c.	Moist-Dry	Yellow	3'
Dryopteris marginalis	Shield Fern	plugs-1 gal.	1 plant/18" o.c.	Moist	Green	2-3'
Geranium maculatum	Wild geranium	plugs-1 gal.	1 plant/18" o.c.	Moist	Pink	2'
Heuchera americana	Alumroot	plugs-1 gal.	1 plant/18" o.c.	Moist-Dry	Pink	1'
Iris cristata	Dwarf crested iris	plugs-1 gal.	1 plant/18" o.c.	Moist-Dry	Purple	4"
Lobelia cardinalis	Cardinal Flower	plugs-1 gal.	1 plant/18" o.c.	Wet-Moist	Blue	1.5-3'
Lobelia siphilitica	Great blue lobelia	plugs-1 gal.	1 plant/18" o.c.	Wet-Moist	Red	2-4'
Mertensia virginica	Virginia bluebells	plugs-1 gal.	1 plant/18" o.c.	Moist	Blue	1.5'
Osmunda cinnamomea	Cinnamon Fern	plugs-1 gal.	1 plant/24" o.c.	Wet-Moist	Green	3-4'
Phlox divaricata	Blue phlox	plugs-1 gal.	1 plant/18" o.c.	Moist	Blue	.5-2'
Polemonium reptans	Jacob's Ladder	plugs-1 gal.	1 plant/18" o.c.	Moist-Dry	Blue	15"
Polystichum acrostichoides	Christmas fern	plugs-1 gal.	1 plant/24" o.c.	Moist-Dry	Evergreen	2'
Stylophorum diphyllum	Wood poppy	plugs-1 gal.	1 plant/18" o.c.	Wet-Moist	Yellow	1.5'
Grasses & Sedges						
Carex grayi	Gray's Sedge	1 gal.	1 plant/24" o.c.	Moist	Green	3'
Carex muskingumensis	Palm Sedge	1 gal.	1 plant/24" o.c.	Moist	Green	3'
Carex stricta	Tussock Sedge	1 gal.	1 plant/24" o.c.	Moist	Green	3-4'
Chasmanthium latifolium	Upland Sea Oats	Plugs - 1 gal.	1 plant/18" o.c.	Moist-dry	Green	4'
Equisetum hyemale	Horsetail	Plugs - 1 gal.	1 plant/18" o.c.	Wet	Green	3'
Juncus effesus	Soft Rush	Plugs - 1 gal.	1 plant/24" o.c.	Wet-dry	Green	4-6'
Muhlenbergia capallaris	Muhly Grass	1 gal.	1 plant/24" o.c.	Moist	Pink	3'
Panicum virgatum	Switchgrass	1-3 gal.	1 plant/48" o.c.	Moist - dry	Yellow	5-7'
Schizachyrium scoparium	Little Blue Stem	1 gal.	1 plant/24" o.c.	Moist-dry	Yellow	3'

Native Trees

DT-FT Drought Tolerant-Flood Tolerant

Latin Name	Common Name	DT-FT	Light	Moisture	Notes	Flower Color	Height
Acer rubrum	Red Maple	DT-FT	sun-shade	dry-wet	Fall color		50-70′
Acer saccharum	Sugar Maple		sun-pt shade	moist	Fall color		50-75′
Ameleanchier canadensis	Serviceberry		sun-pt shade	moist-wet	Edible berries	White	15-25′
Asimina triloba	Paw Paw		sun-pt shade	moist	Edible fruits	Maroon	15-30′
Betula nigra	River Birch	FT	sun-pt shade	moist-wet	Exfoliating bark		40-70′
Carpinus caroliniana	Ironwood		sun-pt shade	moist		White	40-60′
Cercus canadensis	Redbud	DT	sun-shade	moist	Pea-like flowers, seed pods	Purple	20-30′
Chionanthus virginicus	Fringetree		sun-pt shade	moist	Panicled, fragrant flowers	White	12-20′
Cladratis lutea	Yellowwood	DT	sun	dry-moist	Fall color	White	30-45′
Cornus florida	Flowering Dogwood		part shade	moist	Red fruit, wildlife	White	15-30′
Fraxinus pennsylvanica	Green Ash	DT-FT	sun	dry-wet		Purple	50-60′
Ilex opaca	American Holly	DT	sun-pt shade	moist	Evergreen	White	30-50′
Liquidambar styracifula	Sweetgum	DT-FT	sun-pt shade	dry-moist	Spiny fruit		60-100′
Magnolia virginiana	Sweetbay Magnolia		sun-pt shade	moist-wet	Evergreen	White	10-60′
Oxydendrum arboreum	Iromwood		sun-pt shade	dry-moist	Wildlife	White	20-40′
Platanus occidentalis	Sycamore	FT	sun-pt shade	moist	White mottled bark		70-100′
Quercus bicolor	Swamp White Oak	DT	sun-pt shade	moist-wet	Acorns		50-60′
Quercus shumardii	Shumard Oak	DT	sun	moist	Acorns		40-60′
Rhamnus caroliniana	Carolina Buckthorn		sun	moist	Black fruit		15-30′
Salix nigra	Black Willow	FT	sun-pt shade	moist-wet	White catkins	Yellow	40-60′

Native Shrubs

DT-FT Drought Tolerant-Flood Tolerant

Latin Name	Common Name	DT-FT	Light	Moisture	Spacing	Notes	Flower Color	Height
Aronia arbutifolia	Red Chokeberry	FT	sun-pt. shade	dry-wet	4′	Red berries, wildlife	White	6-12′
Buddleia davidii	Butterfly Bush	DT	sun-pt sun	dry-moist	4′	Non-native	Blue	5′
Callicarpa americana	American Beautyberry	DT	sun-pt. shade	dry-wet	5′	Showy purple fruit	Lilac	4-6″
Cephalanthus occidentalis	Button Bush	FT	sun-shade	moist-wet	5′	Attracts wildlife	White	6-12′
Clethra alnifolia	Sweet Pepper Bush		sun-pt. shade	dry-moist	3′	Hummingbirds	White	5-8′
Cornus amomum	Silky Dogwood		sun-shade	moist-wet	6′	Blue berries, wildlife	White	6-12′
Corylus americana	American Hazelnut		sun-pt. shade	dry-moist	8′	Edible nuts, wildlife	Yellow	8-15′
Hamamelis virginiana	Witch-hazel		sun-pt. shade	dry-moist	8′	Winter bloom	Yellow	10′
Hibiscus moscheutos	Swamp Mallow	FT	sun	moist-wet	30″	Cold-hardy	White-Red	4-7′
Hydrangea quercifolia	Oakleaf Hydrangea	DT	pt. shade-shade	moist	4′	Winter texture	White	3-6′
Hypericum frondosum	Goldern St. John's Wort	DT	sun-pt. shade	dry-moist	30″	Semi-evergreen	Yellow	2-3′
Hypericum prolificum	Shrubby St. John's Wort	DT	sun-pt. shade	dry-moist	3′	Semi-evergreen	Yellow	3′
Ilex decidua (dwarf varieties)	Possumhaw Viburnum	DT	sun-pt. shade	moist	4-6′	Red berries		6-14′
Ilex glabra	Inkberry	DT	sun-pt. shade	moist-wet	3′	Evergreen		4-8′
Ilex verticillata	Winterberry Holly	FT	sun-pt. shade	moist-wet	3′	Red berries		10′
Itea virginica	Virginia Sweetspire	DT/FT	sun-shade	moist-wet	4′	Fall color	White	4-8′
Lindera benzoin	Spicebush	DT	pt. shade-shade	moist-wet	8′	Butterflies, wildlife	Yellow	6-12′
Viburnum dentatum	Arrowwood Viburnum		sun-shade	dry-wet	6′	Wildlife	White	6-8′

Rain Garden Maintenance

During the first several years your plants are getting established and will need extra maintenance and watering. After establishment maintenance is low. Watering is required during droughts.

Plant Material Tasks
Check plants for signs of distress such as wilting, yellow/brown leaves etc. Relocate or amend soil as needed.
Remove weeds by hand and limit use of herbicides.
Deadhead and clean dead debris from plants in early spring before new growth appears.

Berm Tasks
After a heavy rainstorm, check for failure such as water going through the berm. Erosion ridges can lead to failure. Repair as needed.

Ponding Tasks
If areas do not drain, this indicates the soil pores have become clogged or the soil may have become compacted. Soil may need to be replaced or loosened. Remove excessive accumulated sediment or debris.

Soil Tasks
Perform a pH test as needed for excessive acidity or alkalinity. Adjust pH with amendments if needed. The University of Tennessee Soil, Plant and Pest Center, located at Ellington Agricultural Center in Nashville will perform inexpensive soil tests, recommend amendments and is a great resource for other questions concerning the health of your rain garden.
http://soilplantandpest.utk.edu/

Mulch Tasks
Check regularly to see that mulch has not washed away.
Add a fresh layer of mulch in early spring after clean-up.

DEADHEADING - *or cutting off blooms after they fade, but before they go to seed, will generate more blooms and fuller growth.*

Estimating Rain Garden Costs

An important part of planning your Rain Garden is knowing what it will cost. Rain Gardens of Nashville has provided information on average costs for materials and labor in the Middle Tennessee area for your use. These prices can vary based on individual conditions.

	ITEM	UNIT	AVG. COST
	EQUIPMENT:		
	Backhoe w/operator	per hour	$50-$100
	Backhoe only	per day	$200-$300
	SOIL AMENDMENTS:		
6" layer of amended soil with 20-30% compost for a 20' x 10' rain garden = 1 cubic yard	Compost	cubic yard	$30
6" layer of amended soil with 40-60% sand for a 20' x 10' rain garden = 2 tons	Coarse sand w/o delivery	ton	$20-$30
	Delivery	each	$50
Plants with installation- multiply plant cost by 2.5	PLANTS:		
	Trees	caliper inch	$100/inch
	Shrubs	1 gal.	$15-$25
		2 gal.	$20-$30
	Perennials, grasses	plugs	$20/flat
		4" pots	$4-$6
		1 gal.	$7-$9
2 cubic yards for 20' x 10' rain garden	MULCH:		
3" layer of mulch for 20' x 10' rain garden= 2 cubic yards	Delivered and installed	lump sum	$250
	Mulch only	cubic yard	$50-$70

Rain Garden Construction Cost comparison

Cost for 10' x 6' Do It Yourself Rain Garden - $200 - $300 Includes no rental or delivery costs.
Cost for 20' x 10' Do It Yourself Rain Garden - $750-$900 Includes no rental or delivery costs.
Cost for 20' x 10' Do It Yourself Rain Garden - $1,200- $1,700 Includes backhoe rental and material delivery
Cost for 20' x 10' Rain Garden constructed by Landscape Contractor - $3,500 - $4,500

For additional cost saving tips contact: info@cumberlandrivercompact.org

References and Additional Resources:

10,000 Rain Gardens. http://www.rainkc.com/

How to build your own rain garden. Mid-America Regional Council.
http://www.marc.org/environment/water/pdfs/raingardens.pdf

Rain Garden Design and Construction. Northern Virginia Soil and Water Conservation District.
http://www.fairfaxcounty.gov/nvswcd/raingardenbk.pdf

Rain Garden Design Templates. Low Impact Development Center.
http://www.lowimpactdevelopment.org/raingarden_design/whatisaraingarden.htm

Rain Garden Handbook for Western Washington Homeowners. Washington State University.
http://pierce.wsu.edu/Lid/raingarden/Raingarden_handbook.pdf

Rain Gardens: A Do-It-Yourself Guide for Homeowners in Middle Tennessee. Patty Ghertner.
http://www.cumberlandrivercompact.org/pdf/raingardenguide12109.pdf

Rain Gardens: A How-to manual for homeowners. Wisconsin Department of Natural Resources.
http://dnr.wi.gov/runoff/pdf/rg/rgmanual.pdf

Rain Gardens for Home Landscapes. Clean Water Campaign, Atlanta, GA.
http://www.cleanwatercampaign.com/files/rain_garden_brochure.pdf

Rain Gardens Technical Guide. Virginia Dept of Forestry.
http://www.dof.virginia.gov/mgt/resources/pub-Rain-Garden-Tech-Guide_2008-05.pdf

Start-To-Finish Rain Garden Design: A Workbook for Homeowners.
Faribault County Soil & water Conservation District.
http://www.faribaultcountyswcd.com/FileLib/Rain%20Garden%20Design%20Templates.pdf

Three Rivers Garden Alliance. http://raingardenalliance.org/

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Please contact Metro Water Services Stormwater NPDES Department (www.nashville.gov/stormwater) with any comments or questions: 615.880.2420

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METRO WATER SERVICES

US Army Corps of Engineers ®
Nashville District

Metro Water Services is in the process of complying with all appropriate Americans with Disabilities Act Guidelines. For additional information contact Joseph A. Estes, Sr., 1600 2nd Avenue North, Nashville, TN 37208-2206; telephone 615 862 4862.