



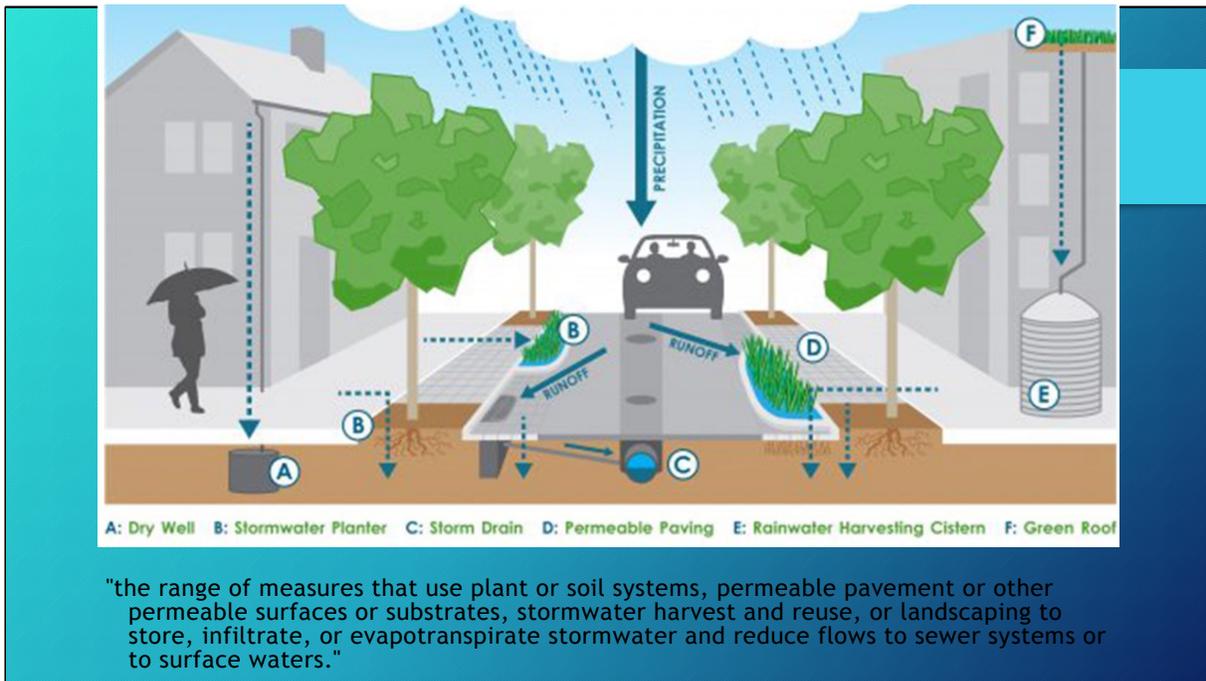
# N. Woods Rain Gardens

Green Infrastructure and it's benefits for municipalities



By: Kristin Moretz  
November 2, 2023

Hello everyone. For those of you who don't know me yet, my name is Kristin Moretz. I am the stormwater and capital projects director here in the city of Avondale Estates. This presentation is going to give you some background about the origins and design elements of the North Woods project, as well as the ways you, as a resident, can learn more about green infrastructure and conservation tips for your own homes.



## WHAT IS STORMWATER?

Stormwater refers to water, such as rain or snow, that falls to the surface of the Earth. It is important to understand that wastewater and drinking water is treated while Storm water **never gets to a treatment plant**. It discharges directly to our water, along with everything it picks up on its journey over the land. Storm water, becomes a concern when it picks up debris, chemicals, dirt and other pollutants as it flows eventually reaching a lake, river, stream, wetland, or local waterway.

Historically, communities have used gray infrastructure—systems that include gutters, pipes, and tunnels— but as gray infrastructure in many areas is aging and weather patterns change, the existing capacity to manage large volume of stormwater is decreasing in areas across the country. Heavy rainstorms can cause flooding that damages property and infrastructure, especially in older communities like Avondale that have little infrastructure to begin with. To meet this challenge, many communities are installing green infrastructure systems to bolster their capacity to manage stormwater. By doing so, communities become more resilient and achieve environmental, social and economic benefits.

*Graphic courtesy of the City of Atlanta Department of Watershed Management*

## What is Green Infrastructure?

*“Green Infrastructure is a systematically managed network of open space that conserves ecosystems and provides associated benefits to human populations. This network includes wildlife habitat, water management, air and water quality, climate mitigation, urban forestry, urban agriculture, and the public realm infrastructure needed to support healthy lifestyles such as parks, sidewalks, trails, and street trees.”*



So what is green infrastructure? *“Green Infrastructure is a systematically managed network of open space that conserves ecosystems and provides associated benefits to human populations. Basically green infrastructure filters and absorbs stormwater where it falls.*

These elements can be woven into a community at several scales. Examples at the urban scale could include a rain barrel up against a house or a row of trees along a major city street. Neighborhood-scale green infrastructure could include acres of open park space, planting rain gardens or constructing a wetland. When green infrastructure systems are installed throughout a community, city or across a regional watershed, they can provide cleaner air and water as well as significant value for the community with flood protection, diverse habitat, and beautiful green spaces. The green infrastructure type that was chosen and designed for North Woods was a series of rain gardens.

Photo Source:

[Green infrastructure has benefits, but upkeep can be challenging | Ensia](#)



This 1.27-acre area is located that consists of mostly woodland area, with Cobbs Creek and wetlands cutting through the middle of the property. This sketch shows the beginning of Cobbs Creek and the amount of wetlands located within the area. The design of North Woods entailed special challenges and goals due to the presence of both elements, including protecting the stream buffers. Now we can get into a little more detail about the environmental history of the North Woods and Cobbs Creek.

## Environmental History of North Woods

Headwaters of  
four watersheds

South Fork  
Peachtree  
Creek

Shoal  
Creek

Cobbs  
Creek

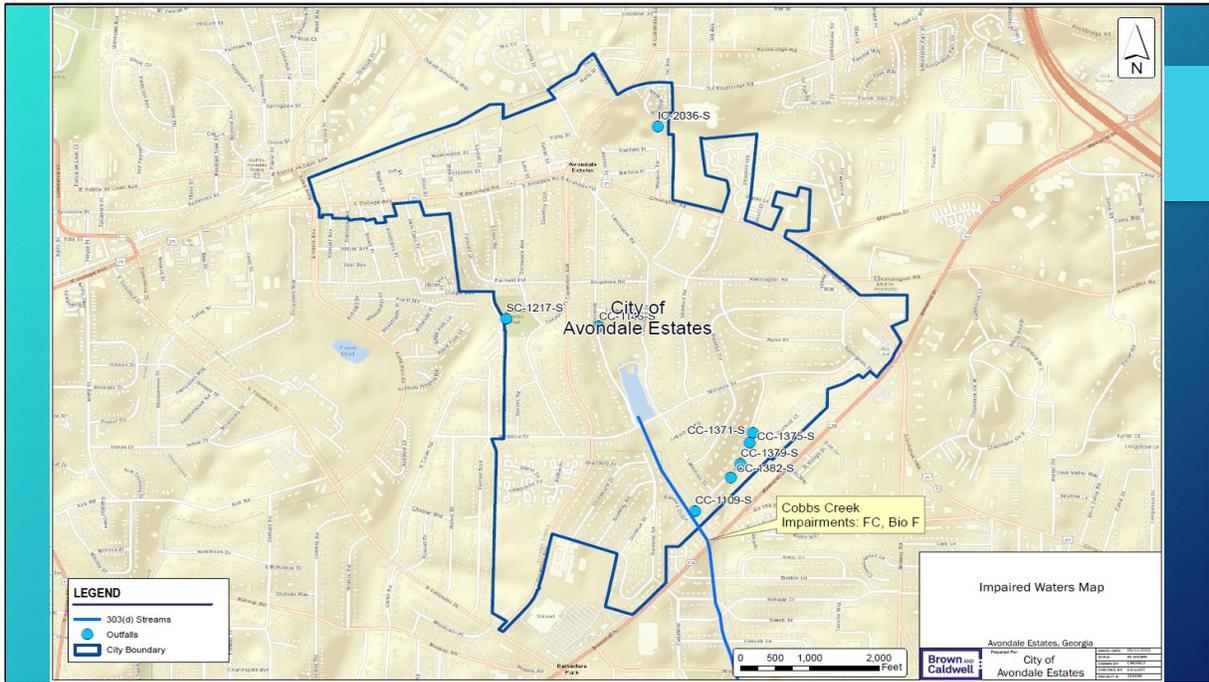
Indian  
Creek

- ❖ Cobbs Creek on the Environmental Protection Divisions 2018 Integrated 303(d)/305(b) streams list
- ❖ Drainage channel causing severe bank erosion

Waterbody	Water Use Classification	Criterion Violated	Impaired Stream Miles	Potential Source
Cobbs Creek	Fishing	Fecal Coliform and Bio F (Sediment)	7	Urban

Cobbs Creek has significance because it is the headwaters of four major watersheds: South Fork Peachtree Creek, Shoal Creek, Cobbs Creek and Indian Creek. While this is positive for Avondale Estates since we are not getting polluted water from watersheds upstream, it also means there is a responsibility to protect our own watershed for ourselves and downstream communities.

In 2018 Cobbs Creek was added to the Environmental Protection Divisions 2018 Integrated 303(d)/305(b) streams list. The listed stream segment was identified as not meeting the designated use of fishing due to elevated levels of fecal coliform bacteria and sediment impacts on fish. Later in the presentation, we will discuss the potential sources for these impacts and how the North Woods Rain Gardens will assist in decreasing pollutant loads in Cobbs Creek.



This map shows the location of Cobbs Creek in relation to the City's boundaries.



Here is a map of the estimated contributing area into Cobbs Creek. There are roughly 36 acres of urban runoff that flows into the creek. If you recall the map table from a few slides ago, it mentions urban runoff as the potential source for pollutants, specifically fecal coliform bacteria. When many people think of urban, they think of higher-density developments, but even single-family homes have the potential for such issues.

Potential causes for this fecal coliform in Avondale Estates include:

- sanitary sewer overflows,
- poor sanitary sewer connections, and
- not collecting pet waste or bird feces that are carried by stormwater.

Another important item to note in this map is the 36 acre contributing basin heading into this small creek. Because Avondale Estates does not have significant underground stormwater utilities, most of the stormwater is carried above ground. As we discussed earlier in the presentation stormwater does not get treated before entering the waterways, therefore a large drainage area gives even more opportunity to pick up pollutants along the way.



We spoke about the bacterial pollutants and where they potentially come from; now let's focus on our other pollutant of Cobbs Creek, sediment. If we think back to the size of the drainage basin, the amount of water is very high in both speed and volume. Due to the water coming in at a concentrated location, the bank of Cobbs Creek became severely eroded, causing sediment to enter Cobbs Creek and subsequently Lake Avondale. The blue arrows show the location where water would flow quickly downhill along Berkeley Road, jump the curb and enter the creek. In the photo on the right is taken where the yellow circle is listed, you can see in the photo that a fence was placed around this location for public safety.

## 2022 Conditions



These were some photos that I took back in 2022 before the project started and you can see how the fence is no longer even useful and the problem continued to grow. After just 3 years you can see how much more the bank has eroded and how much more sediment was entering the lake.

Now that you have the background on current site conditions, we can focus on the North Woods project.

## North Woods Design Concept and Goals

- Meeting NPDES permit requirements - reduce pollutants, mitigate erosion and improve water quality
- Protecting wetlands and Lake Avondale with green infrastructure
- Mitigating erosion and hazardous safety conditions
- Expanding on the city's sustainability goals



NPDES permit requires Avondale Estates to take steps to address impaired streams including and implement best management practices to

- restore the stream bank,
- reduce pollutants and
- improve water quality in Lake Avondale and the adjacent wetlands.

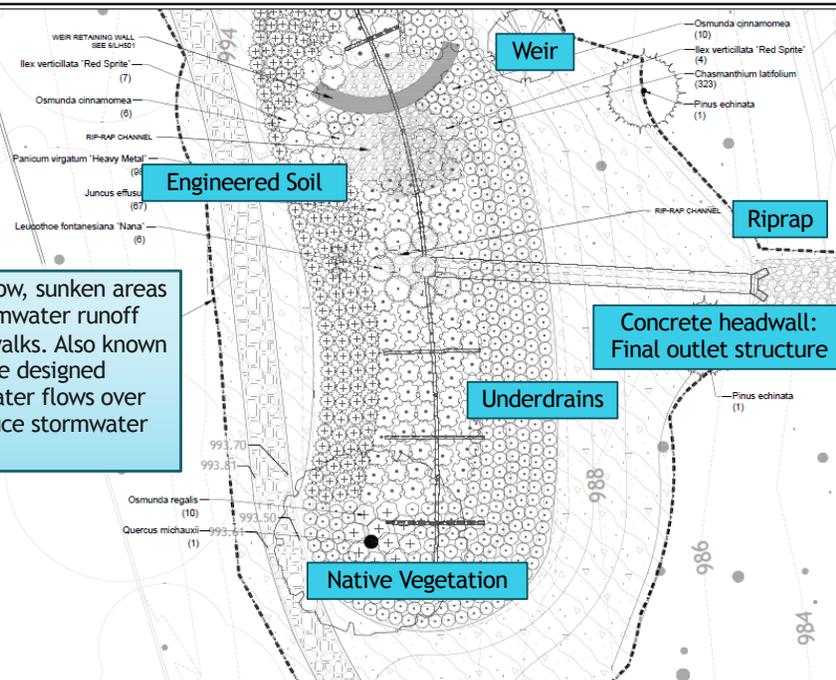
Now we will take a look at the plans to improve North Woods using green infrastructure.

### **The Rain Garden Concept Plan**

The addition of rain gardens will improve elements causing serious bank erosion and hazardous conditions. While keeping these needs in mind, the city wanted to support its sustainability goals with a green infrastructure approach instead of relying on solely grey infrastructure options.

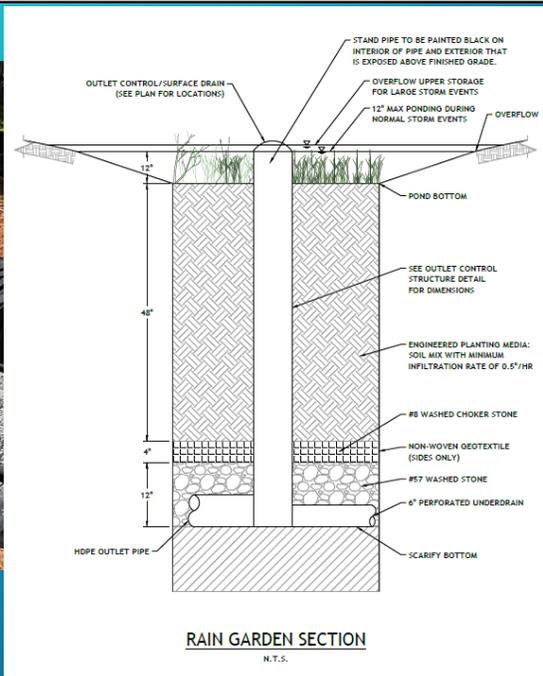
## What is a rain garden?

Rain gardens are small, shallow, sunken areas of plantings that collect stormwater runoff from roofs, streets and sidewalks. Also known as bioretention cells, they are designed to mimic the natural ways water flows over and absorbs into land to reduce stormwater pollution.



**So, what is a rain garden?** Rain gardens are small, shallow, sunken areas of plantings that collect stormwater runoff from roofs, streets and sidewalks. Also known as bioretention cells, they are designed to mimic the natural ways water flows over and absorbs into land to reduce stormwater pollution.

This drawing from the North Woods plan shows the underdrains as well as the final outfall location for the water to discharge into Cobbs Creek. These pieces will work together in this vegetated depression to treat and detain rainwater runoff. It is filtered by the dense native vegetation and engineered soil. The pollutants are removed by plants and bacteria in the soil. The riprap is a blanket of large rock and the final method to slow the water coming from the headwall before it finally enters Cobbs Creek.

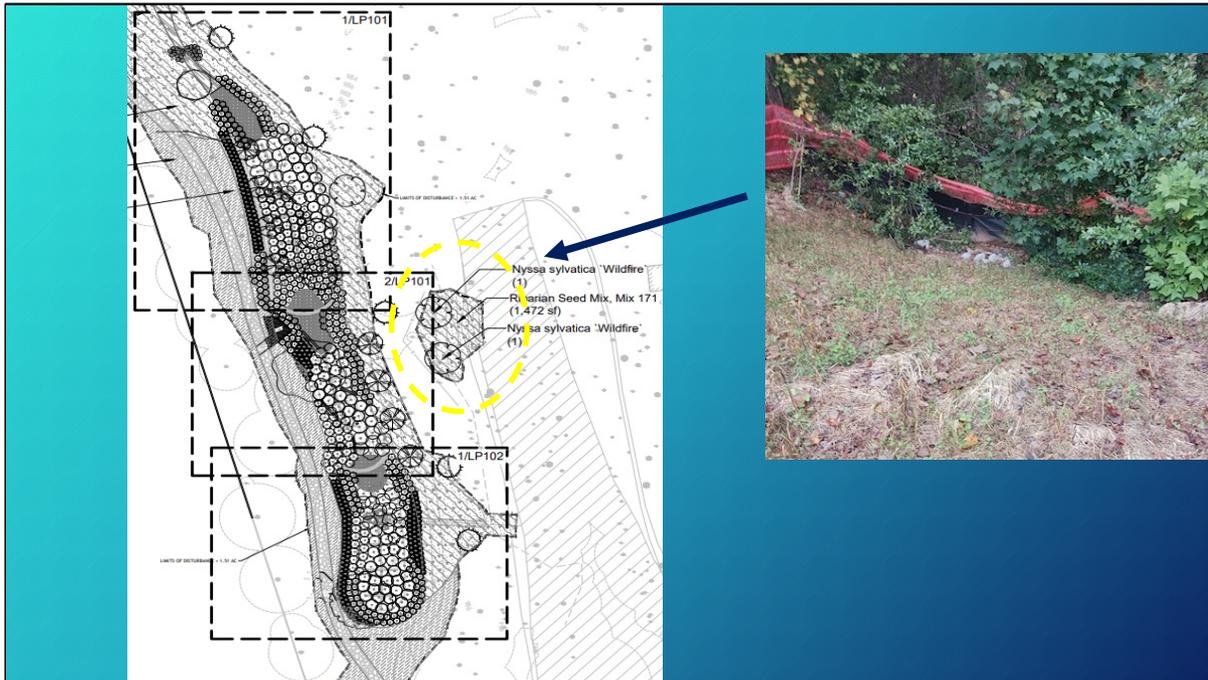


This is a photo of the drains installed at the north woods rain gardens.

Another point to emphasize is that the rain gardens for the North Woods project are significant in size, and these type of green infrastructure projects can be scaled down to capture and filter water on a single lot too. One of the questions I often get is if mosquitos will form from rain gardens, but as you can see from the graphic the gravel, drains and soil type promote infiltration, meaning a properly constructed rain garden will not cause an increase of mosquitos and is a great solution for a low spot in your yard that currently puddles. A rain garden can stop that puddling!



After the installation of the filter fabric and underdrains, crushed and washed stone is added. In the photo on the left, you can see the precast structure for when the rain garden is full during large rain events, which leads to an outfall structure. The photo on the right shows engineered soil mix added on top. The plants will be added as the final step.

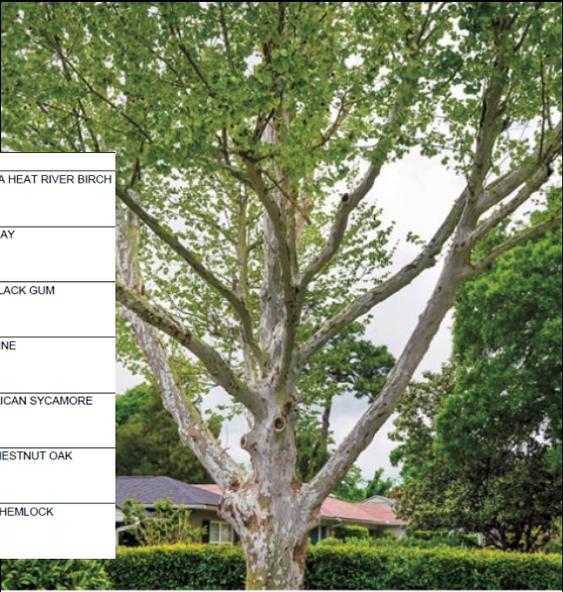


Here is an excerpt from the North Woods rain garden plan showing all three of the rain gardens. The landscape plan shows the plant types and locations. The early phases of this project did require tree removal due to the need for a certain volume within the rain gardens to capture and filter the large amount of water that was running down Berkeley Rd. These primarily native plants will increase infiltration and divert the water to an outfall on the southern end of the property. Focusing on infiltration and stream bank preservation will protect Cobbs Creek and also Lake Avondale.

The yellow circle shows the replanting where the bank erosion occurred. This area has been backfilled and compacted. Here is a photo taken in mid-October of the current site conditions. Back in August, we had record rainfall numbers in Avondale Estates and the bank survived those rainfalls without issues, giving proof that the diversion of the water is working and the bank is now stabilized.



Dura Heat River Birch



American Sycamore

QTY	BOTANICAL / COMMON NAME
3	BETULA NIGRA 'BNMTF'™ / DURA HEAT RIVER BIRCH
9	MAGNOLIA VIRGINIANA / SWEET BAY
3	NYSSA SYLVATICA 'WILDFIRE' / BLACK GUM
5	PINUS ECHINATA / SHORT LEAF PINE
1	PLATANUS OCCIDENTALIS / AMERICAN SYCAMORE
1	QUERCUS MICHAUXII / SWAMP CHESTNUT OAK
2	TSUGA CANADENSIS / CANADIAN HEMLOCK



Swamp chestnut oak

The next few slides I'm going to show a few of the types of trees/plants we are adding. For example the American sycamore, or swamp chestnut oak.

Heat river birch.

[Dura Heat® River Birch Trees For Sale | The Tree Center](#)

Swamp chestnut oak.

[Swamp Chestnut Oak – Wildlife Habitat Resources](#)

American sycamore

[American Sycamore Tree: Native and Landscape Trees \(gurneys.com\)](#)

QTY	BOTANICAL / COMMON NAME
73	CHASMANTHIUM LATIFOLIUM / WOOD OATS
27	CORNUS AMOMIUM / SILKY DOGWOOD
39	CYRILLA RACEMIFLORA 'MISSISSIPPI QUEEN' / MISSISSIPPI QUEEN CYRILLA
7	ILEX VERTICILLATA 'JIM DANDY' / JIM DANDY WINTERBERRY
81	ILEX VERTICILLATA 'RED SPRITE' / RED SPRITE WINTERBERRY
7	ILICIAM PARVIFLORUM / ANISE TREE
101	ITEA VIRGINICA 'SARAH EVE' / SARAH EVE SWEETSPIRE
15	LEUCOTHOE FONTANESIANA 'NANA' / DWARF DROOPING LEUCOTHOE
56	MYRICA HETEROPHYLLA / SWAMP BAYBERRY
33	OSMUNDA CINNAMOMEA / CINNAMON FERN
25	OSMUNDA REGALIS / ROYAL FERN
202	PANICUM VIRGATUM 'SQUAW' / SQUAW SWITCH GRASS
10	RHODODENDRON CATAWBIENSE 'ALBUM' / WHITE CATAWBA RHODODENDRON
53	VIBURNUM NUDUM 'WINTERTHUR' / WINTERTHUR VIBURNUM
160	VIBURNUM OBOVATUM 'MRS. SCHILLER'S DELIGHT' / MRS. SCHILLERS DELIGHT WALTER'S VIBURNUM

Here are some of the shrubs we are adding to the rain gardens. With trees and shrubs alone, we are adding over 900 new plants into the North Woods construction area. These types of plants will also provide habitat for local species and are low maintenance, providing an ideal environment for the City Staff and local fauna. If you are planning to attend the community planting day, you may be able to plant some of these yourself!

Wood Oat

[Wood oats - Mammoth Cave Area Flora \(hartcountyclora.org\)](http://hartcountyclora.org)

Red sprite winterberry

[Ilex verticillata 'Red Sprite' \(Winterberry 'Red Sprite'\) \(florafinder.org\)](http://florafinder.org)

Cinnamon fern

[Cinnamon Fern - Save Our Green](http://saveourgreen.org)

White Catawba rhododendron

[White Flowers of Catawba Rhododendron | Nature Photo Gallery \(my-photo-gallery.com\)](http://my-photo-gallery.com)

Swamp Mayberry

[Myrica pensylvanica \(Bayberry, Candleberry, Northern Bayberry, Swamp Candleberry\)](#)  
[| North Carolina Extension Gardener Plant Toolbox \(ncsu.edu\)](#)

Sarah Eve Sweetspire

[Sarah Eve a stunning pink \(savannahnow.com\)](#)

# Green Infrastructure for your home



Photo from raingardenarts.files.wordpress.com

Photo from rainbarrelmar.com

Photo from landscapecast.com

Photo from nianticriverwatershed.org

Photo from watershedcouncil.org

Photo perfectpavers.com

While most of this presentation has been focused on large scale Green Infrastructure projects, it's important to remember that these can easily be adapted to residential lots.

This slide gives some ideas of how to use green infrastructure in your home to assist with stormwater runoff and help benefit the community. As the footprint of our homes and driveways increases, so does the number of impervious surfaces within Avondale's community. The photos on the left show rerouting a downspout from an impervious surface like a driveway and creating a smaller scale rain garden. The photos on the right demonstrate ways you can repave your driveway to assist with infiltration and lessen the amount of water entering the storm drain system. As we think of the 36-acre drainage facility that drains into North Woods, if homes within that drainage basin used some of these techniques, we would reduce the amount of water and the pollutants it picks up along the way!

Stay tuned over the next few months as the City gathers resources for residents on what you can do to increase infiltration and decrease stormwater runoff from your property. We have all experienced flooding in Avondale and green infrastructure is one of the tools we have in our pockets to improve our community and environment.

The infographic features a central illustration of a house with a green roof and a brown door. To the left, a sprinkler head is shown spraying water. To the right, a WaterSense irrigation controller is connected to a pipe. The background is a green lawn with a grey driveway on the right. The text is arranged in three main sections: 'Inspect' on the left, 'Connect' in the middle, and 'Direct' on the right. A blue banner at the bottom contains the EPA WaterSense logo and the website address.

**Inspect** sprinkler heads.  
A broken one can waste **25,000** gallons of water in six months!

**Connect** hoses and pipes well.  
A leak as small as the tip of a pen can waste **6,300** gallons of water per month!

**Select** a WaterSense® labeled irrigation controller and water smarter.

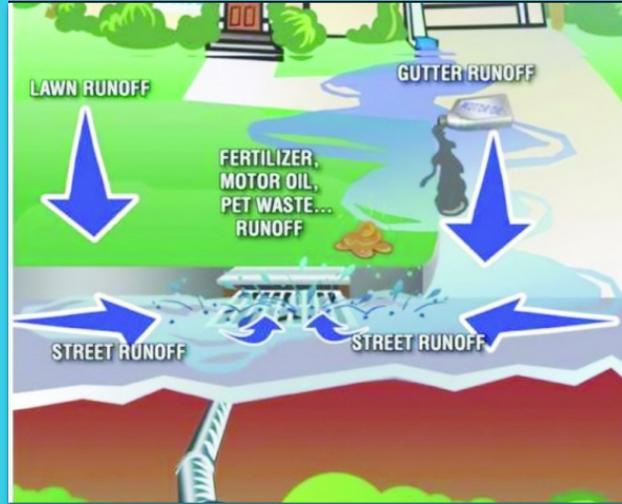
**Direct** spray on landscapes, not pavement!

 [epa.gov/watersense](http://epa.gov/watersense)

Even if you are not installing green infrastructure, there are other ways to reduce stormwater runoff. This slide gives a few tips about the location of your sprinkler system. Pay close attention to broken lines and direct contact of the spray onto the pavement. These sprinkler issues only add to the city's stormwater systems and will collect pollutants from your driveway or grass.

## Put the breaks on auto pollution

- Wash your car at a professional/commercial car wash that recycles water to keep the grease, detergents, and other solvents out of the storm sewer system.
- If you do wash your car at home, do so in a grassy area instead of on pavement so the water infiltrates into the ground.
- Use low or nonphosphate soap to wash your car.
- Use a drip pan under cars while working on them.
- Clean up spilled fluids with absorbent material like cat litter. Don't rinse the spills into the storm drain.
- Dispose of and recycle used batteries, motor oil, and other auto fluids at designated drop off locations. Ask local service stations about where to recycle.
- Improperly disposing of paint, pool water or household cleaners into storm drains or impervious surfaces.



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Some other things you can do to decrease the pollutants coming from your lot:

## N Woods Work Day Information

RESCHEDULED FOR TUESDAY NOVEMBER 28<sup>TH</sup>

9am to noon

- Please bring a shovel, gloves and a water bottle.
- Light refreshments will be provided.
- Come prepared to plant ½ gallon and 1 gallon native plants on the engineered soil media of the rain gardens.
- Dress for the weather, comfortable work shoes, and layers highly recommended.

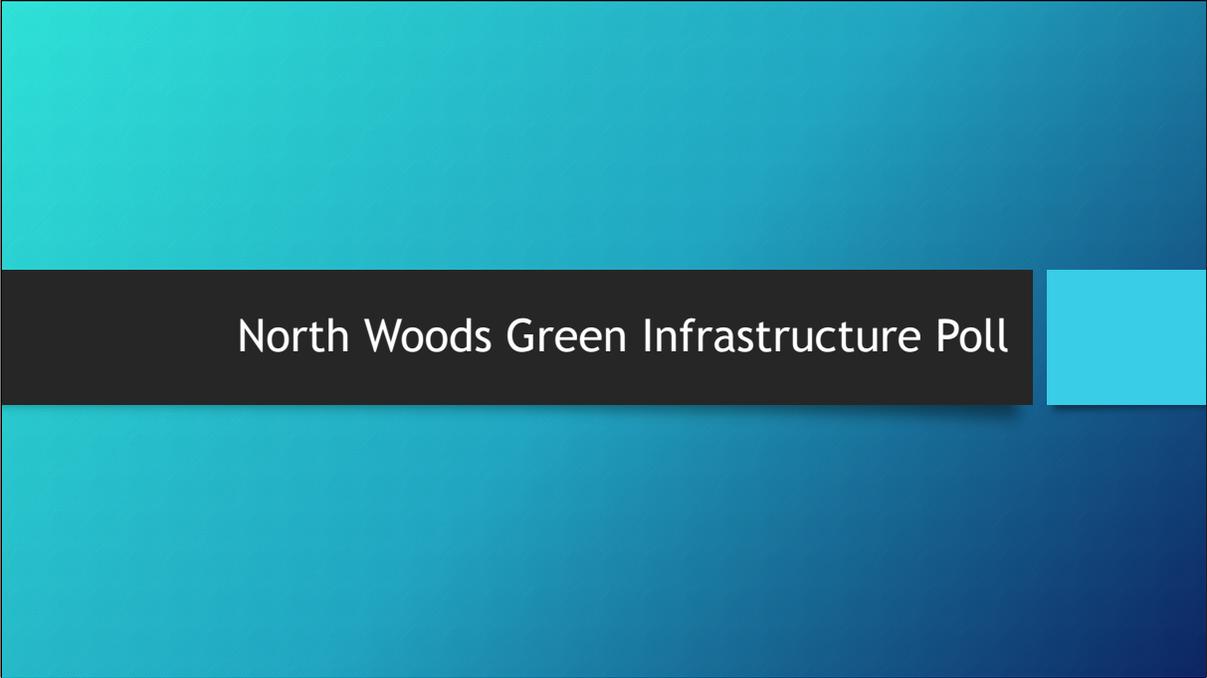


# Questions?

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C (404) 823-2427

Thank you all for coming to the N Woods and Green Infrastructure webinar.

I will now be looking at the questions presented in the Q&A below, all responses are recorded therefore if I do not get to your question, I will make sure to send a personal response after the webinar is complete.

The image features a teal-to-blue gradient background. A black horizontal bar is positioned across the middle, containing the text "North Woods Green Infrastructure Poll" in white. To the right of this bar, there is a small, light blue square.

## North Woods Green Infrastructure Poll