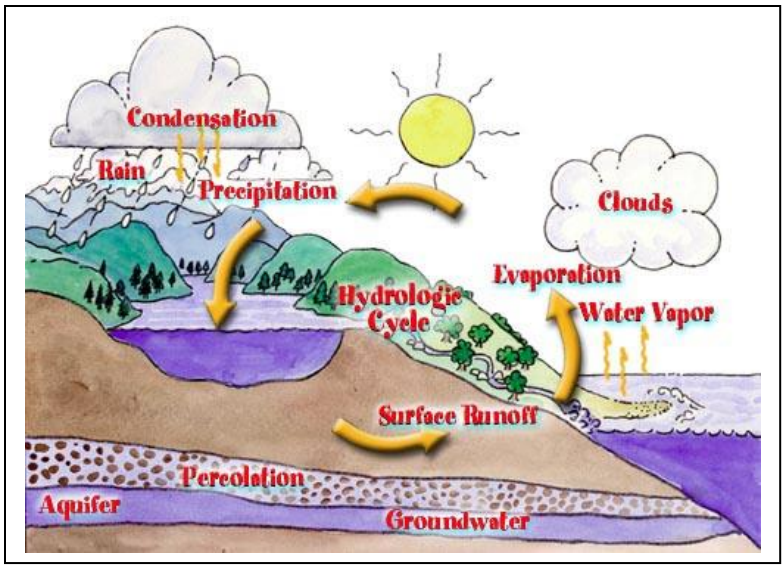



# POSTER CONTEST STUDY GUIDE

# "Water: The Cycle of Life"

**by Sheila B. Jones** © **2022 updated**
**Wake Soil & Water Conservation District, Raleigh, NC**

## CONSERVATION POSTER MESSAGE

1) **How** do people change the land and **How** does that create the urban water cycle?
2) **What** is an innovative way or "best practice" that people can use to reduce stormwater runoff and increase infiltration into the soil?
3) **Why** is it important to work within the natural water cycle and **Why** should people care?

## THE BIG PICTURE

**Q: Why is the urban water cycle the nation's #1 threat to clean water?**

A: Billions of gallons of untreated stormwater runoff damage our rivers and streams, according to the U.S. Environmental Protection Agency. This is true in North Carolina & Wake County too!

**Q: Where does all this stormwater runoff come from in the urban water cycle?**

A: By changing natural forests and fields to pavement and buildings, people have replaced permeable soil with concrete and asphalt. This reduces the amount of native soil that rainwater can soak into. Instead…rainwater becomes a huge volume of stormwater runoff that delivers pollutants to our waterways, erodes streambanks causing sedimentation, and causes floods downstream. Hard, impervious or waterproof surfaces have increased by 20% over the past 2 decades in urban areas, greatly altering the natural hydrology of our watersheds.

**Q: What real-world examples prove this?**

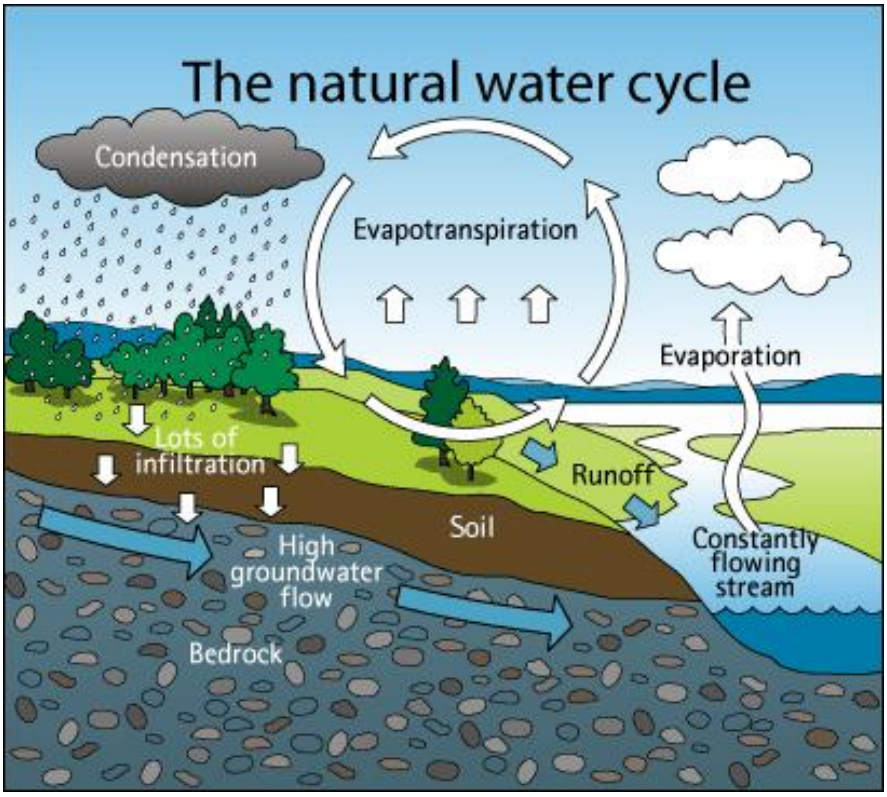
A: During an intense rainstorm (with no lightning!), go outside your home or school and follow the path of rainwater as it hits the impervious roof, runs down the roof gutters & downspouts to the impervious concrete driveway to the concrete sidewalk to the asphalt street gutter to the stormdrain that empties the stormwater directly and untreated into a nearby creek! All these hard surfaces have created what some water quality specialists call the "stormwater superhighway" and some call the stormwater pollutants "urban slobber"!

**Q: Why is this a problem? What are possible solutions?**

A: The answers to these important questions are for you to research and illustrate on your Water Cycle poster! Use the front of your poster to creatively show how people are learning to work with the natural water cycle instead of against it. Illustrate, label and carefully choose a few words to describe one "best management practice" that people can do to reduce stormwater runoff and increase water infiltration in their backyards, neighborhoods, and whole communities. The next 7 pages will help you create a winning "Water: The Cycle of Life" poster!

**IMPORTANT!** If you have a "wordier report" required, please write it directly on the back of the poster or place the report inside a manilla envelope taped to the back. Keep the front of your poster "artistic" with colorful drawings and a creative & concise conservation message!

## STEP 1: LEARN the DIFFERENCE BETWEEN the NATURAL vs. URBAN WATER CYCLE!




The water cycle is one of the Earth's greatest processes and life-support systems! Powered by heat energy from the sun and due to the force of gravity, water moves from the atmosphere to the land, moves through all living things, and then moves from the land back to the atmosphere. The six components of the water cycle are: evaporation, condensation, precipitation, accumulation/storage, infiltration/percolation, and runoff (see Step 3 for water cycle terms & definitions or the first web link below). The water cycle cleanses the Earth's finite fresh water supply and continually recycles it on a global scale.

It is important to note that Earth's groundwater and surface waters are connected! The water cycle's precipitation & infiltration replenish groundwater -- and groundwater replenishes streams, rivers and wetlands! A perfect example of the 1st Law of Ecology: "Everything is Connected to Everything Else!"

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**GREAT WEBSITE:** U.S. Geological Survey https://water.usgs.gov/edu/watercycle-kids.html

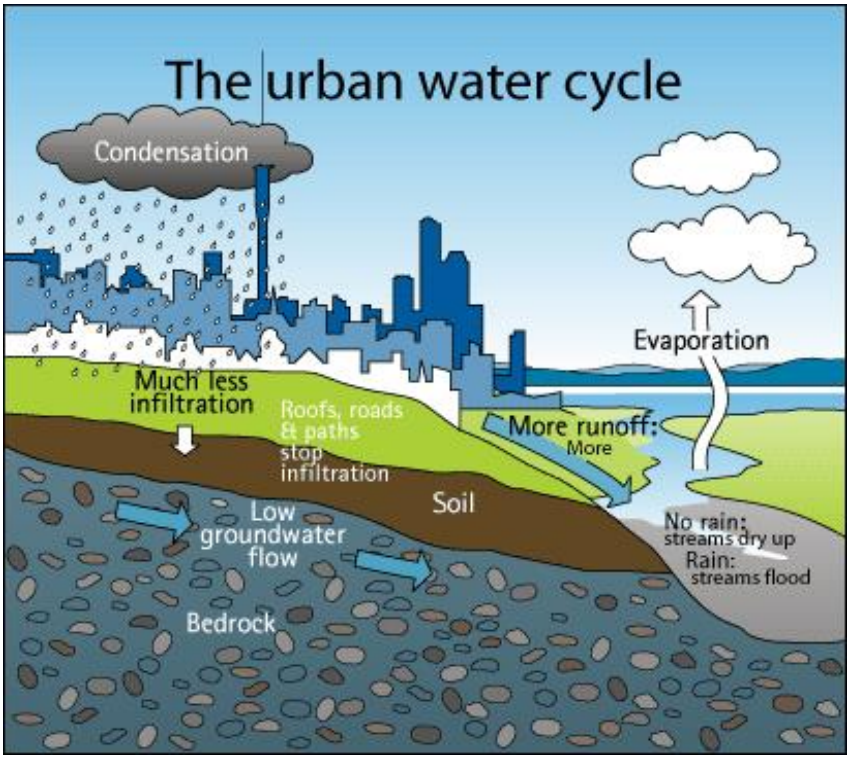
**MUSIC MAKES IT STICK! Check out these YouTube videos!**

"Ever wondered where the rain goes?" by CIRIA's Susdrain.org https://www.youtube.com/watch?v=LMq6FYiF1mo
"COOL Water Cycle Song Lyrics" by Mr. Davis https://www.youtube.com/watch?v=u3QwLYfgwP0
Water Cycle parody of "Cups (When I'm Gone") by Anna Kendrick https://www.youtube.com/watch?v=JFasFIdZ704
Water Cycle parody of "Shake It Off" by Taylor Swift https://www.youtube.com/watch?v=yjWUhL8yU0Q
Water Cycle by Blazer Fresh/GoNoodle https://www.youtube.com/watch?v=KM-59ljA4Bs&t=3s
"The Scoop on Stormwater" by U.S. EPA https://www.youtube.com/watch?v=grWVQjNtLus
"Slow It Down, Spread It Out, Soak It In" by U.S. EPA https://www.youtube.com/watch?v=hMbIgclX4EQ

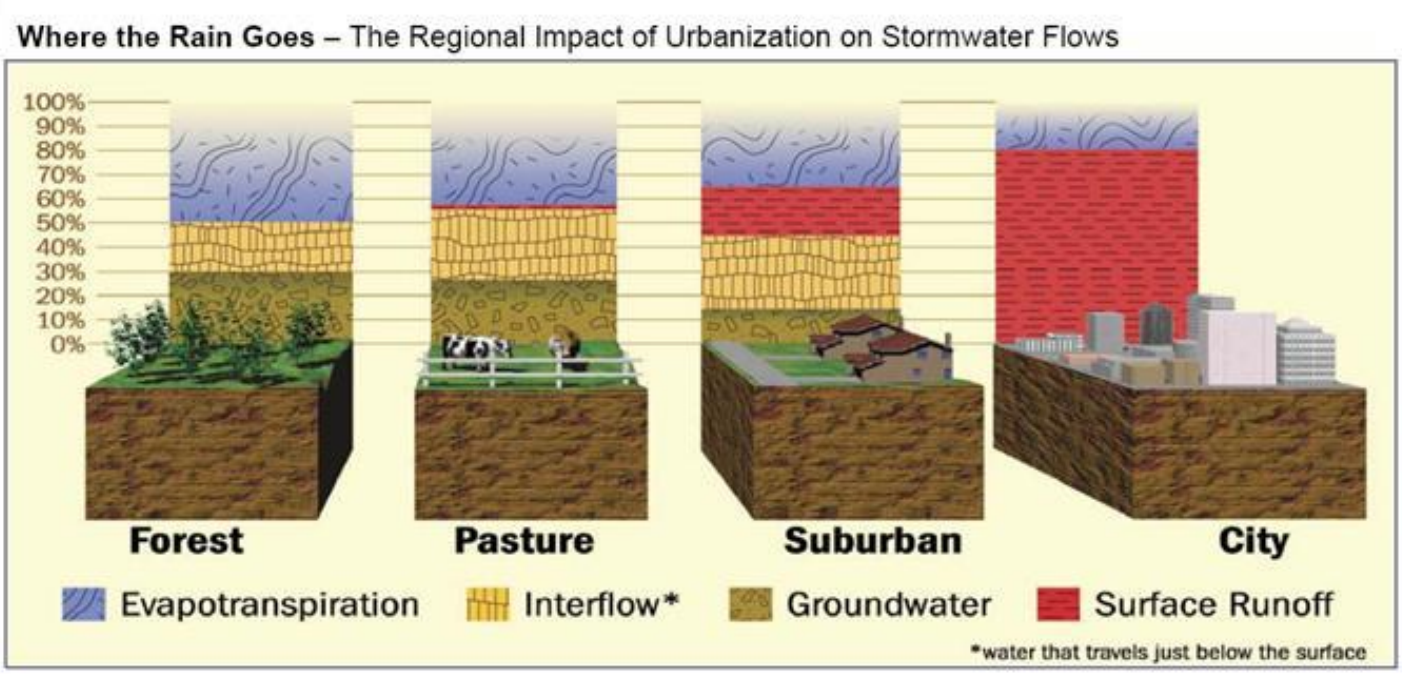
**Our favorite songs by Billy B., Natural Science Song & Dance Man**

"That's Runoff Man!" by Billy B https://www.youtube.com/watch?v=dgVDGMa11kk
"Water Cycle" by Billy B https://www.youtube.com/watch?v=fBsgMK4bX_U

Colorful graphics in this study guide by **King County in Seattle, WA and The Council of Auckland, New Zealand**

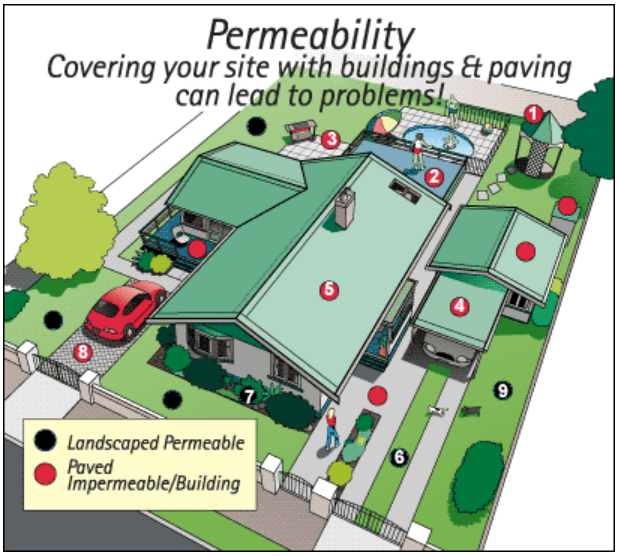



Normally, when precipitation hits the surface of the Earth, the rainwater or snow melt soaks into the soil to replenish water for growing plants and soil organisms or recharges groundwater. However, when people cover the land with asphalt, concrete, and rooftops, rainwater cannot penetrate these "impervious" surfaces so it becomes stormwater runoff. This large volume of stormwater runs off the land fast and furious, picking up pollutants on its way downhill and delivering them untreated into our streams, rivers, lakes, estuaries, and oceans. Fast-flowing stormwater has force and erodes streambanks, causing sedimentation and nutrient pollution of our streams. Huge volumes of stormwater overflow stream and riverbanks, causing ecological havoc and flooding which endangers life and property!




In the graphic above, compare the changes in the natural water cycle as vegetation and soil are replaced by hard surfaces on the land. Runoff is drastically increased while groundwater recharge is almost nil.

# STEP 2: LEARN ABOUT BEST MANAGEMENT PRACTICES DESIGNED TO WORK WITH THE NATURAL WATER CYCLE




**Stormwater education begins with the 4 R's:**

1. **Rain** 2. **Roads** 3. **Rooftops** 4. **Runoff**

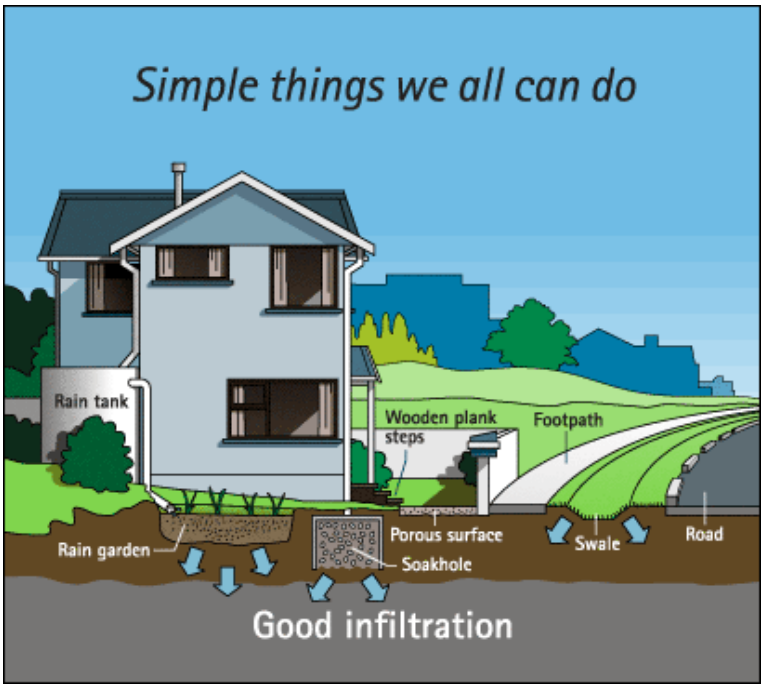
Rain & runoff are components of the natural water cycle, but roads & rooftops increase runoff by not allowing precipitation to infiltrate the ground, or recharge groundwater. Imperviousness is a problem!

To learn more, check out the website and 2 videos below that offer great stormwater information!

https://nc-cleanwater.com/stormwater-pollution/
https://www.youtube.com/watch?v=fLXcJiA-azA
https://www.youtube.com/watch?v=BBe675pb8A8

There are many different innovative strategies -or- **"best management practices" (BMPs)** that people are using to reduce the amount of impervious surfaces and/or allow rainfall to soak into the ground. Water quality specialists are working every day to conduct scientific research that tests new approaches to determine what works "best" in different situations and regions of the state. Choose your favorite BMP for your poster!

And instead of "retrofitting" the problems stormwater creates, we could always leave permeable soil, native trees and natural wetlands undisturbed in the first place!




LOW IMPACT DEVELOPMENT (LID): "Design with nature in mind!" LID is a new approach in building or re-building subdivisions, shopping centers, and schools in a way that works with nature to manage stormwater as close to its source as possible. Following the natural path of rainwater from the roof to the yard, one or more BMPs are strategically placed to slow, capture and infiltrate stormwater runoff and recharge groundwater. Many of the BMPs in this study guide are used in LID, plus green roofs.

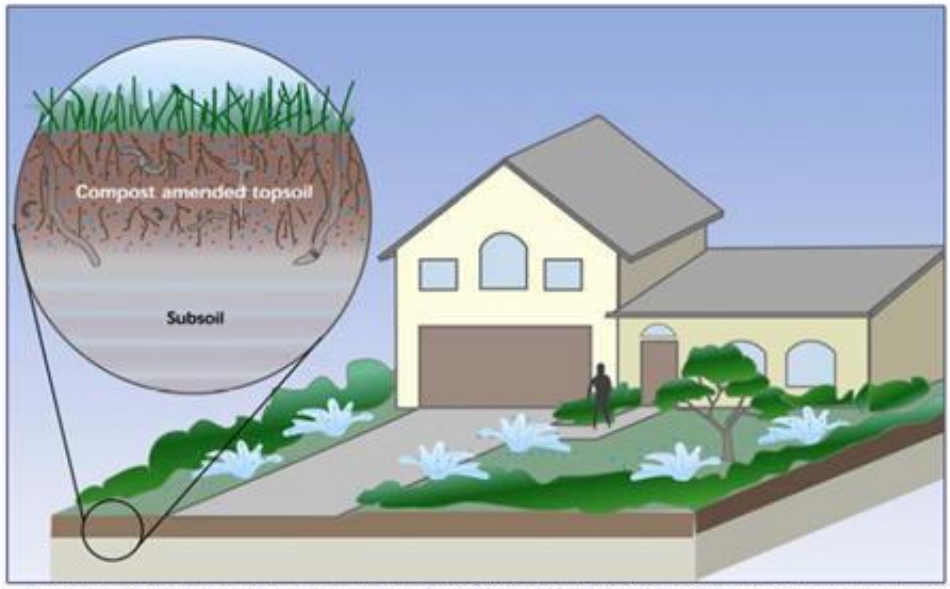
Be A LID KID! Check out these videos that explain how LID mimics nature:

VIDEO Architects build green (4:03) https://www.asla.org/sustainablelandscapes/Vid_Watermanagement.html
VIDEO LID examples = function + beauty (6:29) https://www.youtube.com/watch?v=AiaVLWqQee0&t=125s
VIDEO Green roof examples (4:49) http://www.youtube.com/watch?v=pp79mGpomf4&feature=player_embedded

## STORMWATER BEST MANAGEMENT PRACTICES continued…

NATIVE SOIL, COMPOST & MULCH: "Soil loves compost the most!" Unpaved and undisturbed soil that is enhanced with compost can breathe, absorb water and support a rich diversity of life. Mulch can act as a sponge and, if properly managed, can absorb, store and slowly release many thousands of gallons of water into soil each year. Healthy soil is nature's best water filter and stormwater sponge!

Our favorite soil health website: https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/




**Amending soils with compost or other organic materials can restore soil functions:**

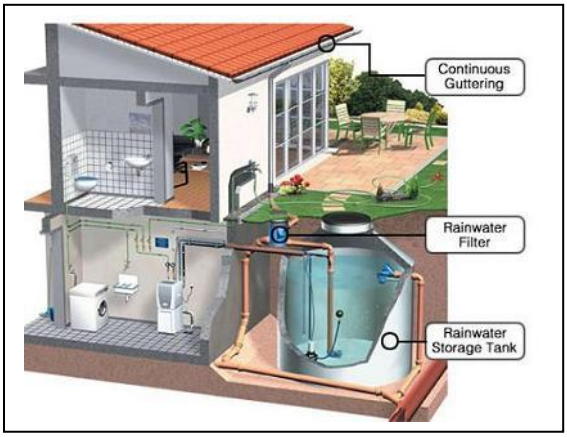
- Restores soil water infiltration and storage capacities
- Decreases surface water runoff and erosion
- Traps sediments, heavy metals and excess nutrients; and biodegrades chemical contaminants
- Rebuilds the beneficial soil life that fights pests and disease, and supplies plants with nutrients and water
- Improves plant health, with reduced need for additional water, fertilizers and pesticides
- Aids deep plant root growth and vigorous vegetative cover.

*Illustrations for this section were created by the King County Department of Natural Resources and Parks*

RIPARIAN BUFFERS: "Trees are the oldest new thing in stormwater treatment!" Riparian streamside buffers are areas planted in native trees, shrubs and perennials to slow stormwater runoff and filter out its pollutants. In Wake County, landowners are required to maintain 50-feet of riparian buffer along both sides of perennial streams. Research has shown that rivers and streams are cleaner when grass, trees and other plants grow along the banks in these buffer areas. Buffers also prevent erosion of streambanks and provide vital wildlife habitat and travel corridors.

Here's two videos that describe how riparian buffers are naturally tree-riffic:
https://www.youtube.com/watch?v=KIhZEfMGTxI
http://www.chesapeakebay.net/issues/forest_buffers

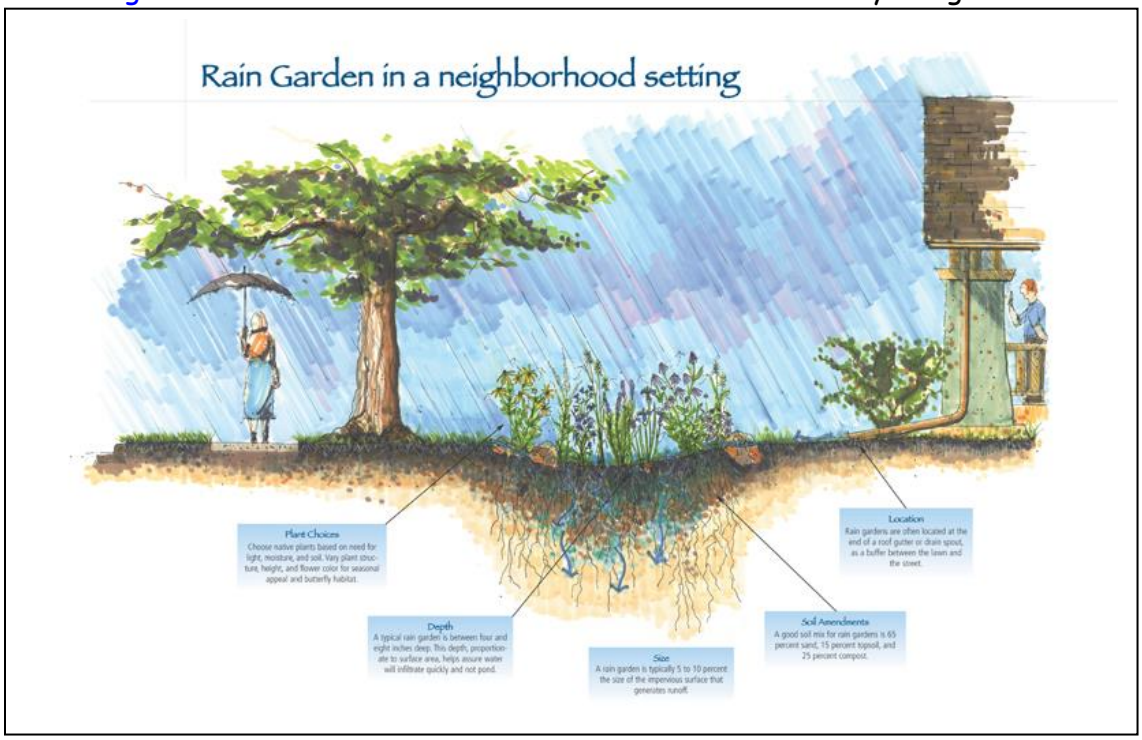
GRASS and GRASS CYCLING: "Mow, mow, mow. But not too low, low, low!" Too often people mow their lawn too short. This severely reduces the grass blade's ability to make food → which weakens the grass → which retards root growth → so roots can no longer anchor soil in place → which leads to soil erosion. (Mow 3" for fescue, 1" for bermuda grass.) Remember: When you mow, "leaf" 3 inches to grow and to slow stormwater flow! You can also use a mulching mower to leave grass clippings on your lawn = instant food and water!




CISTERN: "One good turn deserves a cistern…" A cistern is an above or below ground storage system that collects, stores and distributes rain or snow melt from roofs, stormwater runoff, and even condensation from air-conditioning units! This "harvested" water is used during dry weather for watering the garden, or in some cases, for flushing toilets! Amazing cisterns were engineered by the ancient Romans, Egyptians, and Middle Eastern cultures. An old idea that is appreciated again for conserving water, reducing environmental impact, and saving money!

STORMWATER WETLAND: "A great BMP for reducing pollutants!"
The creation of a pond, marsh, or swamp to capture & filter stormwater runoff and recharge groundwater. Constructed or artificial wetlands are designed to mimic natural wetlands.
Check out these two videos:
VIDEO from Durham https://www.youtube.com/watch?v=iK8rgCj_Nqg
VIDEO Wetland RAP! https://www.youtube.com/watch?v=X33FX8pG-Dc


RAIN GARDEN: "Rain, rain go away. No…make that: Rain, rain come my way!" A rain garden is a shallow depression installed at the lowest point of a yard between the source of runoff (roofs and driveways) and the runoff destination (storm drains or streams). A rain garden has a berm around the bottom edge to capture and retain stormwater, acting as a "sponge" to slowly drain water into the ground within 2 days. Most rain gardens are constructed in well-drained or sandy soils and are planted with vegetation that can handle fluctuating levels of soil wetness. Underground drains and imported sand can help a rain garden function in areas with clay soils. Also called "bioretention areas". Here's how-to-build-a-rain-garden website:
https://durhamnc.gov/787/Rain-Gardens Illustration below by Doug Adamson.



# STEP 3: LEARN & USE WATER CYCLE AND STORMWATER TERMS & DEFINITIONS

***Water Cycle or Hydrologic Cycle*** = the paths water takes through its various states—vapor, liquid & solid—as it moves throughout the Earth's systems (oceans, atmosphere, groundwater, streams, etc.); a global life-support system that is driven by heat energy from the sun. For definitions of the water cycle paths, see the U.S. Geological Survey's website: https://water.usgs.gov/edu/watercycle-kids.html

***Stormwater Runoff*** = water from rain or melting snow that is prevented from soaking into the ground by impervious surfaces such as saturated soil, compacted soil, rooftops, concrete, asphalt and cement; i.e. rainwater that has nowhere to go, but downhill *fast with erosive power and force!*

***Groundwater*** = fresh water stored beneath the surface of the earth in spaces between soil particles (gravel, sand, silt & clay = unconsolidated rock) and in rock fractures (bedrock = consolidated rock).

***Surface Water*** = Water above the surface of the land, including lakes, rivers, streams, ponds, floodwater, and runoff.

***Permeable*** = a layer of porous material (like sand, gravel & fractured rock) through which water freely passes as it moves downward through the ground surface to deep below ground.

***Impermeable*** = a non-porous layer (like clay or pavement) through which water cannot pass. "Impervious surfaces" that do not allow precipitation to percolate into the ground (and thus, prevent groundwater recharge) include: house & building rooftops, paved or hard clay tennis courts, cement patios & sidewalks, paved driveways, asphalt streets, highways & airport runways, etc.

***Discharge*** = the loss of ground water from an aquifer or ground water system by irrigation or wells (water is mechanically pumped out) or by natural means--artesian wells, springs, or when ground water is released naturally into connected surface waters like lakes, streams, rivers, & wetlands.

***Recharge*** = the addition of water to an aquifer or ground water system by precipitation (rain or snow melt) and/or by lakes, streams, rivers and wetlands, or by artificial injection.

***Best Management Practices*** = the currently most successful methods adopted by resource users to reduce or prevent harm to the environment from their activities. BMPs are the "best" solution that science and ingenuity have to offer at this time…until we think and design something better!

***Riparian Buffer*** = protective strips of native vegetation or native trees planted along, adjacent to, or associated with a water body that filter stormwater runoff before it reaches streams and rivers.

***Sustainable Living*** = to use Earth's precious, finite resources conscientiously to meet life's current needs without compromising the ability of future generations to meet theirs.

***Action*** = applying awareness, knowledge, attitudes, values, and skills toward preventing and resolving water-related issues at all levels (home, community, state, country, etc.)

***Wetland*** = a landform having all 3 of these characteristics: evidence of water, hydric (wet) soils, and hydrophytic (water-tolerant) vegetation (NC wetlands: freshwater marsh, headwater forest, savanna, pocosin, bottomland hardwood forest, mountain bog, and Carolina Bay (a seasonal wetland).

## STEP 4: BE CREATIVE in USING ARTISTIC ELEMENTS of DESIGN!

- **Keep it simple!** Choose one or two of your favorite stormwater BMP(s) to showcase on your poster.
- **Keep it legal!** Make sure poster board is NO smaller than 22" x 28" and mounted materials extend NO higher than 1/8" above poster's surface (go easy on 3-D items!)
- **Tout the theme!** Position the contest title in a prominent place on your poster in an interesting way!
- **Keep your balance!** Thoughtfully arrange and balance your illustrations and text.
- **Get their attention!** Let your illustration help people visualize your message.
- **Craft a clever conservation message!** Carefully choose your words to briefly describe the stormwater BMP and explain how it reduces stormwater runoff & helps the natural water cycle.
- **Ask for help!** Ask an adult to read & edit your work for accuracy, spelling, and effectiveness.
- **Use your imagination!** Ask an Art teacher or a local artist for brainstorming help and a critique!
- **Be original!** Do your own artwork and lettering by hand! Avoid copying or using the work of others.
- **Go Van Gogh!** Use artistic elements of design:
  - Paint with **watercolors** to illustrate your wonderful water cycle poster!
  - Make your own **precipitation paint** by mixing non-toxic tempura powder with real rainwater! Write on the front of your poster that you did this to let the Judges know!
  - Use **bright colors**! Add gift wrap, foil, glitter, and cut-out letters in unique ways.
  - Draw a poster in **comic strip** fashion with your own cartoon characters. If it looks like "Garfield" or "Bart Simpson", that's someone else's creation. *Yours will be better!*
  - Artistically arrange **real photographs that you've taken** to portray your message.
  - Use **3-D materials** that only stick up 1/8" from the poster surface to add eye-appeal & texture like real sand & clay, wisps of cotton, paper, fabric, fur, ribbons.
  - Incorporate **moving parts**: turn-the-circle, lift-up-the-flap, pull-down-the-tab, & slide-the-door.
  - Look less wordy by **"hiding text"** under interactive parts as described above. Have fun with "paper engineering." People will have fun interacting and learning from your poster!

## SIGN YOUR MASTERPIECE - PUT YOUR NAME ON BACK OF POSTER!

All student artists are asked to "sign" their artwork on the poster back with the label provided below. Students can write their wordier reports on the poster back or place it in an envelope taped to back.

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**POSTER I.D** Please complete and glue this label on the back of each poster entry. Thank you!

**STUDENT'S NAME:**_____ **GRADE:**___th

**SCHOOL:**_____ **COUNTY: WAKE**

**TEACHER'S NAME:**_____

**BEST THING I LEARNED FROM THIS POSTER CONTEST:**_____

_____

_____

_____

_____

**THANK YOU FOR ENTERING the 2023 CONSERVATION POSTER CONTEST!**
**Wake Soil & Water Conservation District, 4001-D Carya Drive, Raleigh, NC 27610**
**(919) 410-2676 www.WakeGov.com/wakeswcd**