

Charleston Stormwater Program Outdoor Classroom Handbook



URBAN RUNOFF

Charleston, WV 2015



Charleston Stormwater Program

Urban runoff
Outdoor Classroom Handbook
Charleston, WV
Population: 55,000

City Engineer, Chris Knox
Stormwater Manager, Stephen
Birurakis



The Stormwater Management team is committed to ensuring full compliance with the Clean Water Act requirements to ensure our local water resources remain free of harmful pollutants. Our goal is to educate the citizens, general public, school aged children, and businesses (including contractors and developers) on stormwater pollution prevention solutions and techniques to protect our streams, creeks, and rivers to improve the quality of our most precious resource.



City of Charleston, WV
Stormwater Department

114 Dickinson St.
Charleston, WV 25301

304-348-8106





Charleston Stormwater Program

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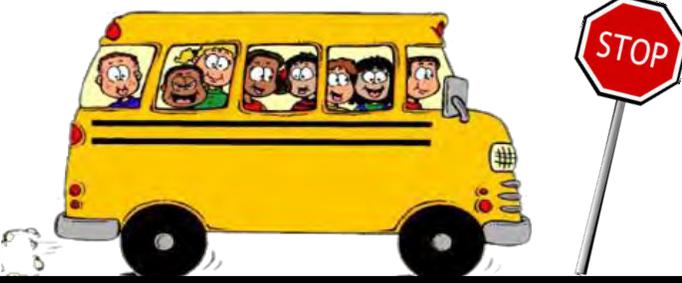


Urban Stormwater

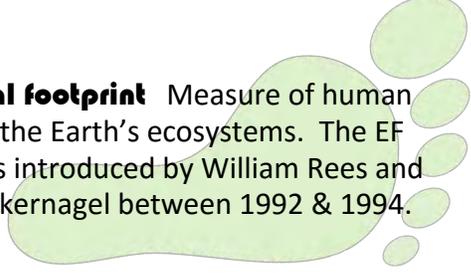
What's the big deal?

Urban runoff is one of the largest contributors to the pollution of our world's waterways. No longer can industry alone be blamed for the contaminants reaching our drinking sources. People are the number one polluters of our water through our trash, vehicles, lifestyles, and luxuries.

We call this
Non-Point Source Pollution!



* **Ecological footprint** Measure of human demand on the Earth's ecosystems. The EF concept was introduced by William Rees and Mathis Wackernagel between 1992 & 1994.



Charleston, WV—Below Garrison Avenue on the West Side is a storm sewer 8' in diameter. Due to age, wear, and an eroding bottom the pipe needs replaced at an estimated cost of \$5,000,000.

For safety reasons, school busses cannot use this section of the road.

What has changed?

Stormwater has always encountered pollutants to some extent, however, development, urban growth and poor water management has drastically increased the trash, chemicals and natural pollution in our watershed. When the destination of our runoff is a river or stream, those pollutants are dumped directly without the benefit of filtration.

Ideally, stormwater should be managed where it falls and allowed to settle into vegetated areas that will filter pollutants. This is known as **bio-filtration** and it is the best way to treat urban runoff.



Urban Stormwater

Charleston, WV is an MS4!

What is an MS4? MS4 stands for Municipal Separate Storm Sewer System.

Charleston, WV has a Municipal Separate Storm Sewer System (MS4) within its city limits. This means that in addition to combined sewer systems that carry sanitary & storm water, we have separate storm sewers that carry only stormwater. Since these storm sewers go directly to the closest river or stream, all trash, chemical and natural pollution picked up in the stormwater goes directly to the nearest water body. Polluted stormwater is dumped without treatment or filtration into rivers and streams, carrying the pollutants listed on the next few pages directly into our waterways.

In addition to this, we have Combined Sewer Overflows (CSOs) that open to allow sewer and stormwater into the river during heavy rains. Without these CSOs, sewage would back up into streets and homes. Decades ago, overflow into the river seemed like the best solution..... now we know better!



Combined Sewer Overflow (CSO) located at Haddad Riverfront Park. Sewer & stormwater overflows into the Kanawha river during heavy rain events.





Urban Stormwater



City of Charleston Stormwater Department

Urban Runoff Outdoor Classroom / Trash Inventory		
Section 1: Inspection Area		
Watershed: Upper Kanawha	Today's Date: Oct. 8, 2015	Time: _____ am _____ pm
Investigators:	Temperature:	
Form completed by:	Rainfall (in.) today:	
Land use in Drainage Area (Check all that apply):		
<input type="checkbox"/> Industrial <input type="checkbox"/> Commercial <input type="checkbox"/> Suburban Residential <input type="checkbox"/> Residential / Commercial	<input type="checkbox"/> Open Space <input type="checkbox"/> Institutional <input type="checkbox"/> Government <input type="checkbox"/> Other:	
Notes:		

Instructions: Visually identify five items of trash on or around the river bank. Detail these items below.					
Section 2: Trash Description					
ITEM	MATERIAL	PATINA/CONDITION		SOURCE	SUBMERGED
	<input type="checkbox"/> Plastic <input type="checkbox"/> Glass <input type="checkbox"/> Paper <input type="checkbox"/> Metal <input type="checkbox"/> Rubber <input type="checkbox"/> Electronic <input type="checkbox"/> Unknown	<input type="checkbox"/> Clean/New <input type="checkbox"/> Dirty <input type="checkbox"/> Other:	<input type="checkbox"/> Intact <input type="checkbox"/> Broken <input type="checkbox"/> Discolored <input type="checkbox"/> Other:	<input type="checkbox"/> Accidental <input type="checkbox"/> Intentional <input type="checkbox"/> Individual <input type="checkbox"/> Business	In Water: <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully
	<input type="checkbox"/> Plastic <input type="checkbox"/> Glass <input type="checkbox"/> Paper <input type="checkbox"/> Metal <input type="checkbox"/> Rubber <input type="checkbox"/> Electronic <input type="checkbox"/> Unknown	<input type="checkbox"/> Clean/New <input type="checkbox"/> Dirty <input type="checkbox"/> Other:	<input type="checkbox"/> Intact <input type="checkbox"/> Broken <input type="checkbox"/> Discolored <input type="checkbox"/> Other:	<input type="checkbox"/> Accidental <input type="checkbox"/> Intentional <input type="checkbox"/> Individual <input type="checkbox"/> Business	In Water: <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully
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TOTALS:	MATERIAL _____ Plastic _____ Paper _____ Rubber _____ Electronic _____ Unknown _____ Glass _____ Metal	PATINA/CONDITION _____ Clean / New _____ Dirty _____ Other	SOURCE _____ Accidental _____ Intentional _____ Individual _____ Business	SUBMERGED _____ No _____ Partially _____ Fully	



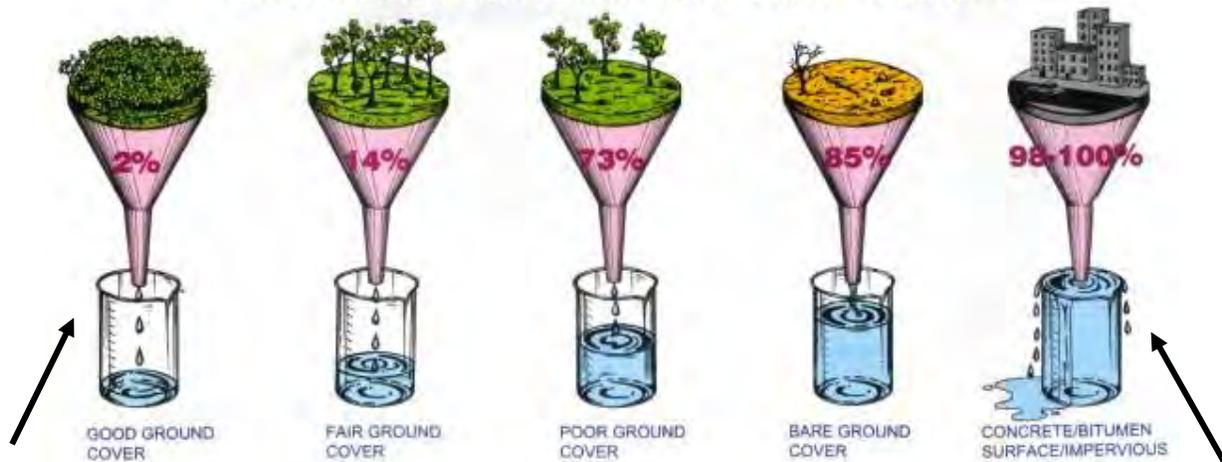
Pollutants in Urban Stormwater Runoff

THERE ARE THREE MAIN TYPES OF STORMWATER POLLUTION:

- **litter** — cigarette butts, cans, food wrappers, plastic bags or paper
- **natural pollution** — leaves, garden clippings or animal feces
- **chemical pollution** — fertilizers, oil or detergents

All of these pollutants can be found in the rivers & streams within the City of Charleston. It is the Stormwater Department's job to reduce polluted runoff and its impact on our waters.

PERCENTAGE (%) OF SURFACE RUNOFF ON A VARIETY OF SURFACES



☺ GOOD

☹ BAD



School of 500 Charleston, WV artist Nik Botkin's resin fish were filled with trash collected from the Kanawha River.



Litter

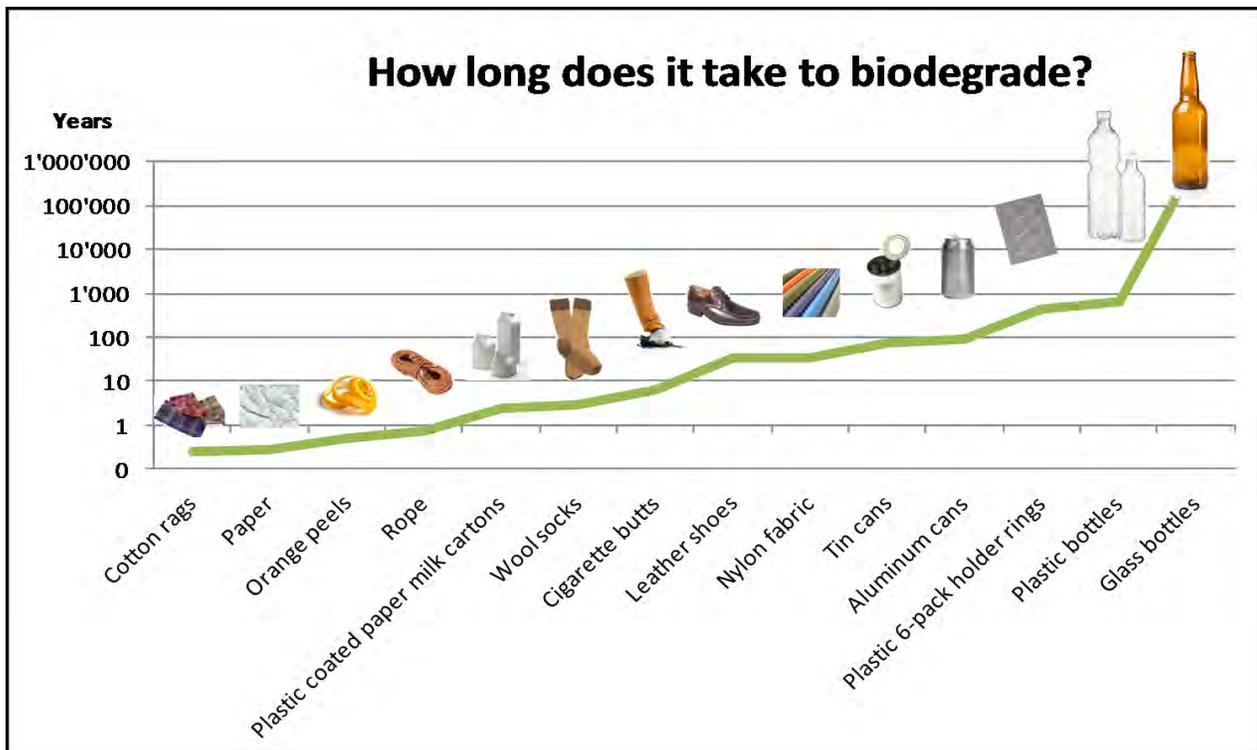
cigarette butts, cans, food wrappers, plastic bags or paper



The City of Charleston pumps trash from inlets like this one on Charleston's East End, _____ hours per week.

Litter and debris are known by many names, such as, gross pollutants, floatables, and flotsam. Not only is this type of pollution unsightly, animals eat, choke and get caught in the litter they encounter in our water systems. Plastic, in particular, poses the strongest threat to water pollution. Common plastics do not break down for 10-500 years, depending on the type of plastic. Polypropylene, also known as plastic #5, resists being degraded for a millennium. In addition to plastic, glass, aluminum, tin, and paper pose threats to our rivers and streams

when not disposed of properly.



Can you guess how many tons of debris the City of Charleston collects from street sweeping per week?

A. 16 tons C. 100 tons
 B. 22 tons D. 219 tons

Answer on next page





Litter

cigarette butts, cans, food wrappers, plastic bags or paper



Uncovered and/or overloaded dumpsters increase litter. These practices violate city ordinances and are punishable by fines.

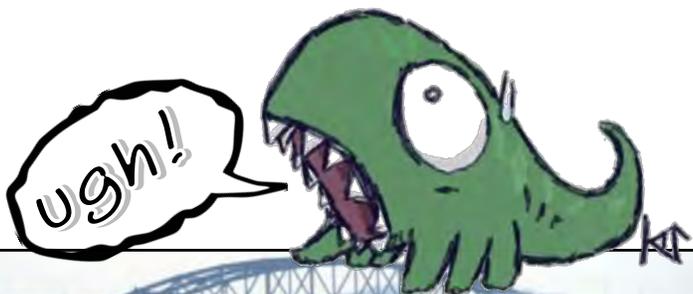
HOW DOES LITTER MAKE ITS WAY TO THE RIVER? Stormwater, storm sewers and wind carry trash thrown from vehicles, cigarette butts, and other littered items to our river. While not as blatant as intentional tossing, improper trash storage by individuals and businesses creates litter. Spills and accidents happen, but disregarding trash clean up and poor storage procedures are just as detrimental to the environment.

Third world and non-developed countries are seeing the impacts of our world's pollution a lot closer than we are. Without municipal trash management systems, street sweepers, pumper trucks, etc. trash is left to accumulate in the rivers and oceans. And it never goes away.

Cigarette butts are plastic!



In a total of four hours, No Butts About It Charlie West! collected over 100,000 cigarette butts littered on the streets of downtown Charleston.



Charleston, WV The release of Marmet Locks brings debris down the Kanawha River after a large storm event.

How many tons of debris does Charleston collect from street sweeping per week?



219 tons



Litter

cigarette butts, cans, food wrappers, plastic bags or paper



\$59,543.67

If you think the only thing litter costs us is our water quality or ecological world, think again! The City of Charleston's two vacuum trucks cost \$59,543.67 per year for fuel, parts and labor. The four street sweepers the City owns cost \$157,447.95 per year to operate. This does NOT include the salaries of the drivers, mechanics, facilities, storage or the purchase price for these machines.



Without these tools, the amount of pollutants in our rivers could be unbearable!



\$157,447.95



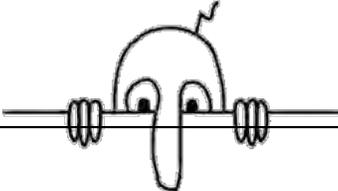
Reduce Your Waste!

In a lifetime, the average American will throw away **600 times** their adult weight in garbage.

Each adult will leave a legacy of **90,000 pounds** of trash for his or her children.

We fill **63,000 garbage trucks** every day in this country.

In addition to this equipment, the City has employees picking up trash by hand, 6 days a week. They empty multiple trash cans downtown twice a day, ash trays and pick up stray litter. We could easily estimate that trash management in the City of Charleston is one of our largest expenses. How can we, as individuals, produce less trash?



trash is for tossers.

SAY NO TO TRASH



Natural Pollution

dirt, leaves, garden clippings or animal feces

Natural pollution does not mean acceptable pollution!

It is the pollution of water by means of excessive natural elements. Fertilizer, lawn clippings, construction sites with loose dirt and removal of green areas cause pollution of urban runoff.



Below you can see the remnants of a Silt Fence that has been washed away. Construction practices in the past allowed large amounts of loose dirt to wash into rivers and streams. In these cases, dirt does hurt! It chokes the beginning of our food chain...the smallest organisms that live on the river bed. Properly installed silt fences that are maintained can easily eliminate this problem.



Dirt Devil



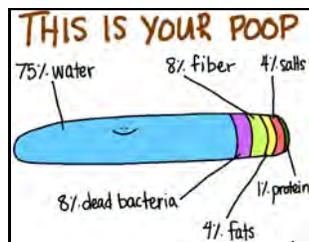
Riparian Areas, which are stream and river banks, need to be vegetated so that runoff is not polluted with sediment.



Natural Pollution

Includes: feces, poop, fecal coli

Sometimes we find a storm pipe flowing with organisms we aren't sure about. Often a sight test, or a smell test can tell us about a pollutant, but most conclusive is an actual water test. Water testing tells us exactly what we have in our water, it cannot tell us, however, where it is coming from.



Storm sewer on the Kanawha River flowing during dry weather. Upon inspection, not only was it flowing, white, stringy fungus was growing. Water was tested for Fecal Coliform.

Test results for Fecal were positive. In parts per million (PPM), it read: TNTC - Too Numerous To Count



Dog POOP!

Yes, it's that bad.



So it seems like dog poop should NOT be that big of a stormwater pollutant! But it is.

Ever leave poop behind?

In your yard, on the trail, out of sight?

Here's what happens

NOT PICKED UP

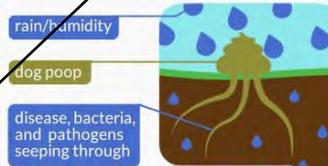
from



Decomposition Begins

Toxic bacteria seeps into the soil

Poop carries dangerous pathogens and pollutes our freshwater supply



Wastewater treatment systems is **NOT** designed to filter dog waste!



Did You Know?

Dog poop is the #3 cause of water pollution

72.8 million dogs currently live in the United States



Beware!

1 gram of dog feces contains 23 million fecal bacteria

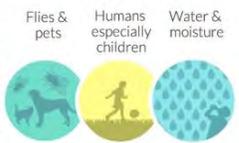


Diseases & Viruses

Campylobacteriosis symptoms: fever, vomiting, swollen lymph nodes	Salmonellosis symptoms: fever, shock, lethargy, dehydration, more
Toxocaris (roundworms) symptoms: vomiting, diarrhea, worms in feces	Coccidia symptoms: bloody diarrhea, vomiting, dehydration, more
Cysticercosis (tapeworms) symptoms: anemia, anorexia	E.coli, Giardia, Parvo symptoms: diarrhea, vomiting

FACT: Our natural ecosystem can handle 2 dogs per square mile. In urban areas, there are 125 dogs per square mile.

Other Methods of Transportation



According to the EPA, dog poop is as toxic to the environment as chemical and oil spills.

72.8 million dogs currently live in the United States



*Ring around the rosie,
A pocketful of posie,
Ashes, Ashes,
They fall down.*

Just one ounce of dog feces contains 23 million microorganisms of bacteria—nearly twice that of human waste.

Never forget a bag again.

PoopBuddy aims to inspire responsibility among dog owners by introducing fun to an otherwise stinky task. Learn more at poopbuddy.com.



SOURCES: GreenvilleCounty.org, National Resources Defense Council, Alamo Area, Partners for Animal Welfare, Keep It Clean Partnership, Environmental Protection Agency, Cable News Network



Chemical Pollution

fertilizers, oil or detergents



Leaking grease container between Virginia and Quarrier Streets. Sept., 2015

GREASE

is the word!

But not on our streets. Restaurants produce two types of grease, brown and yellow. Both are harmful to our rivers and streams. Poor maintenance of grease containers is neglectful and punishable by fines.

This is NOT the



Rural areas have the largest problem with algae blooms but it's not unheard of in urban areas. Lawn fertilizer is often washed away with runoff. This can cause streams from depleted oxygen. Entire seafood supplies have been hurt by algae blooms.

want 2 see!



Oil

Not only can you see evidence of oil being dumped, but each storm event will produce runoff which will carry the remaining oil into the drain over and over again.

How harmful can it be? One drop of oil can potentially contaminate 75,000 gallons of water.



When you see a spill



Cleaning a spill...

Accidents happen! When they do, they need to be cleaned according to certain standards.



Booms or socks such as this, are placed around storm drains to reduce pollution. These can be preventative, (i.e. before an activity that is known to have pollutants), or after in the case of a spill. These also float and can reduce spills that have entered the river.



Professionals, like municipal workers, construction employees and maintenance personnel carry spill response kits like this. They have absorbing pads, a substance like cat litter, called oil dry, to absorb spills from chemicals, and caution tape to warn against certain hazards. Debris is then collected and placed in a disposable container for proper disposal.

Never let trash or any object you are handling slip away into the environment and if it does, retrieve it! If you happen upon trash that isn't yours, pick it up. If every person in Charleston picked up one piece of trash today, 52,000 pieces of trash could be kept out of the river.

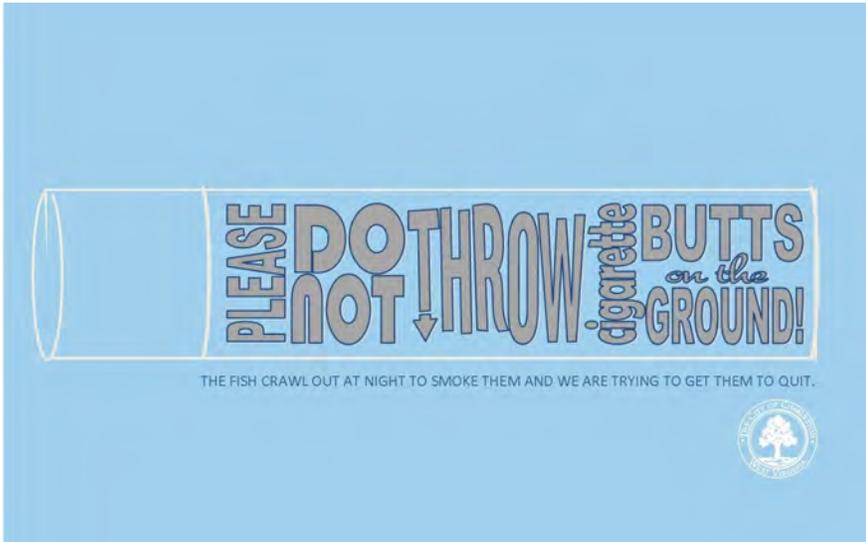


If you see a spill and it is not being cleaned up and it is out of your ability to do so,
Call the WV DEP spill hotline! 800-642-3074
or

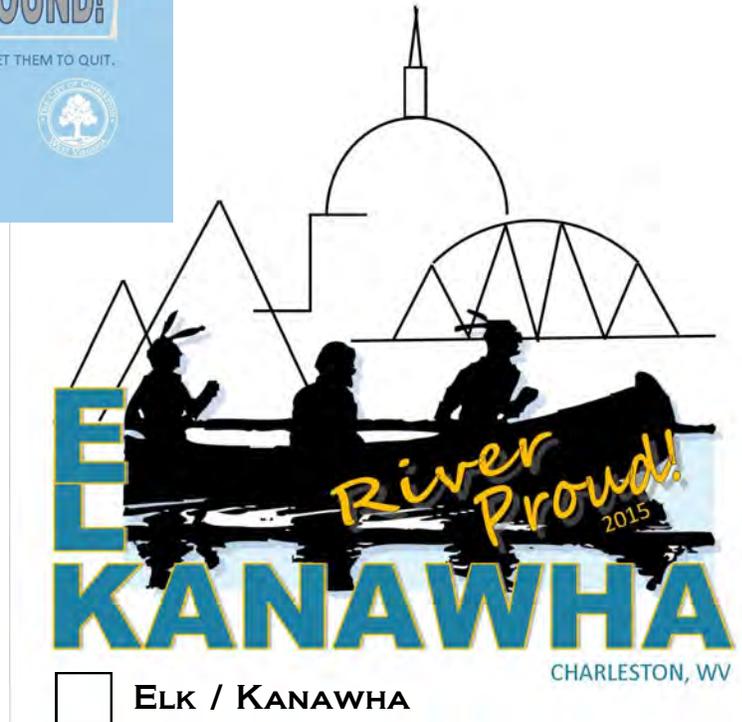
304-348-8106 City of Charleston Stormwater Department

Choose a t-shirt design!

FIRST CHOICE TO FOURTH CHOICE!



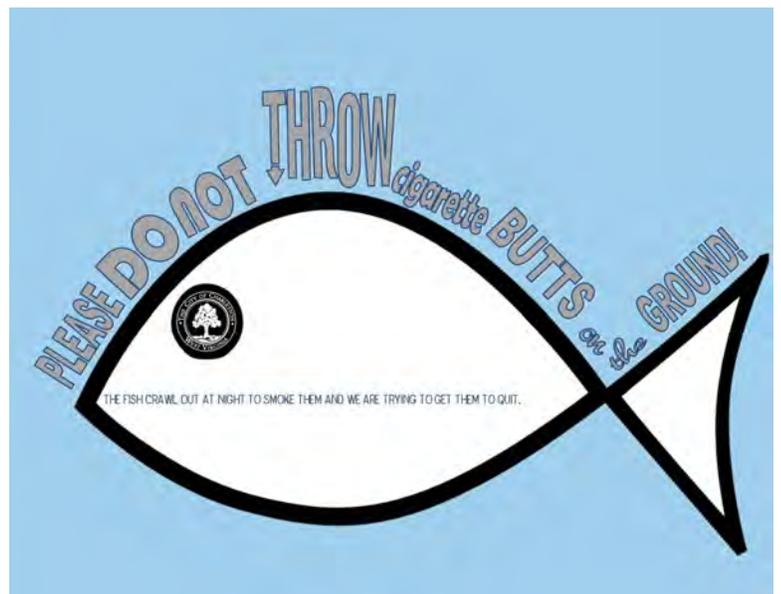
CIGARETTE BUTT



ELK / KANAWHA



KEEP CALM



FISH CIGARETTE



What should we be doing?

MUNICIPALITIES

Cities have an obligation to manage stormwater and reduce runoff. Municipalities, like Charleston, are required by the Federal Clean Water Act to do this. Regulated and enforced by the WV DEP, Charleston's designation as an MS4 comes with specific responsibilities for public education and participation.



INDIVIDUALS

Individuals have a reason to care about stormwater runoff as well. We use our rivers and streams for drinking water, recreation and survival! Our homes are built above or below other homes and their stormwater runoff becomes our problem when not managed correctly.

WATER CAN BE TRICKY!

But there are solutions.



Education

Water Harvesting

Bio-Filtration

Green Infrastructure

Green Roofs

Less Grey Infrastructure

Swales



Water Harvesting



Charleston, WV artist Rob Cleland's 2014 painted rain barrel.



Water harvesting is catching and containing rain water for your use.

Many people use rain barrels in urban settings to collect water from their downspouts. A lot of water can be collected this way: In a one inch rain, a 10' x 10' roof will fill up a 55 gallon drum in 8 minutes. This water is free of chlorine, fluoride and other additives that make it ideal for plants and gardens. Some parts of the country have laws against harvesting stormwater due to their arid conditions and small amount of rain fall. We are lucky to have an abundance of water and no laws prohibiting the collection of it for free.



Rain barrel workshops sponsored by the City and the WV DEP have placed over 500 Rain Barrels into the hands of our citizens. The barrels used in this picture were 55 gallon pickle barrels.

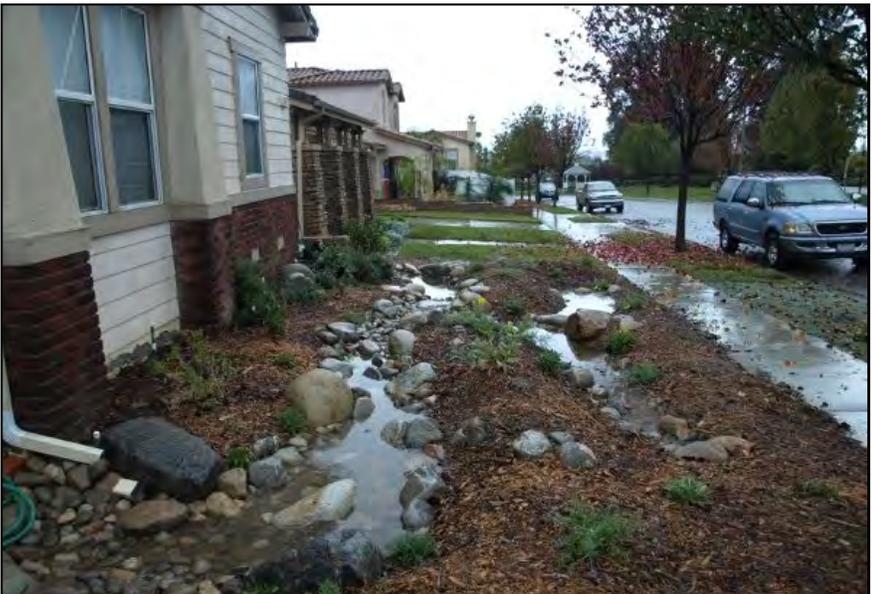
On a 10'x10' roof, with a 1" (one inch) rain, a 55 gallon rain barrel will fill up in how many minutes?



Rain Gardens

No, they AREN'T breeding grounds for skeeters!

Rain gardens are designed to dissipate water within 72 hours of a rain event. Mosquitos require 4-6 days to grow and hatch. If a rain garden is breeding mosquitos, it is not designed or planted correctly. Research can help you with your soil type, subgrade and plant types. Remember, native plants are typically best at water absorption.



This residential rain garden manages water from a downspout by meandering around and over a dry creek bed.

Sometimes under drains are installed in large urban rain gardens while plantings mature. Mature plantings absorb larger amounts of water than immature plantings. Allowing water to be collected in a rain garden prevents it from taking polluted runoff to pipes or rivers and allows the soil to filter the pollutants through bio-filtration. Rain gardens also reduce flooding of streets and yards.

Answer:
8
Minutes!



Rain Garden located on Municipal Property and catches runoff from the adjacent impervious parking lot.
-Atlanta, GA



Green Infrastructure



The presence of trees in a streetscape, neighborhood, and community can decrease the amount of stormwater runoff and pollutants that reach local waters.

- ❖ Trees reduce stormwater runoff by capturing and storing rainfall in their canopy and releasing water into the atmosphere.
- ❖ Tree roots and leaf litter create soil conditions that promote the infiltration of rainwater into the soil.
- ❖ Trees help slow down and temporarily store runoff and reduce pollutants by absorbing nutrients and other pollutants from soils and water through their roots.
- ❖ Trees transform pollutants into less harmful substances.



...timeless, reliable, easy, efficient

A vegetated swale, like you see at the right, is a broad, shallow channel with a dense stand of vegetation covering the side slopes and bottom. Swales can be natural or manmade and are designed to trap pollutants, promote infiltration, and reduce the flow velocity of runoff.

Swales can replace curbs, gutters and storm sewer systems and are best suited for residential, industrial and commercial areas with low flow and smaller population.



Tree wells used in urban areas manage stormwater runoff and pollutants.



Swales are Swell!

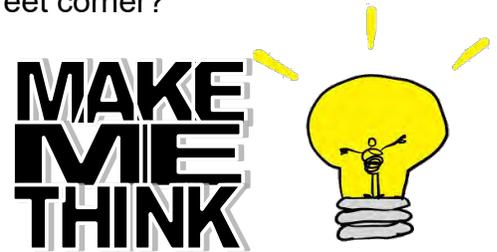
Source: www.dnr.gov ©2008 Brad Lancaster



Education



Public awareness campaigns can be very effective. Informing the public of issues that normally go unnoticed such as the exorbitant number of plastic bags used by individuals, can be illustrated in creative ways. Wouldn't this get your attention on a downtown street corner?



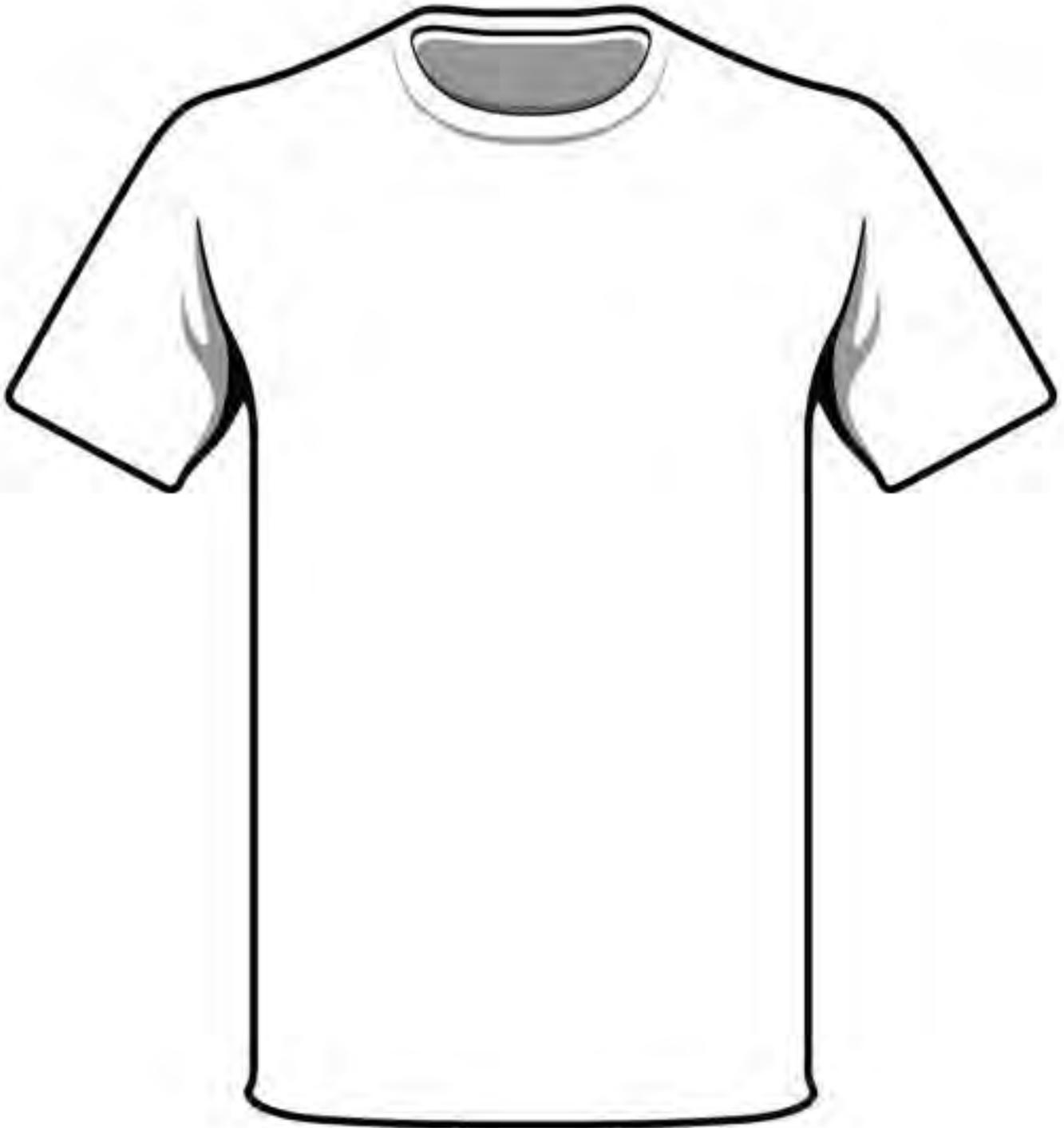
MS4 EPA CSO
NPDES BMPs
Non-Point Source



As a boating community, Charlestonians are on the river a lot, maybe not in it, but on it. Talk to a lot of our inhabitants and they would tell you that they would never swim in the Elk or Kanawha Rivers. We find that interesting, considering we drink from the Elk, wash our hair, our clothes, our dishes, and our children in it. Of course it goes through a processing treatment facility, but are there pollutants that can't be treated? It's your water, love it.

Design your own t-shirt!

What would you say about stormwater?



hint[®]

Create a logo or a slogan!



What others are doing



March 27, 2007

Paper or plastic?

Not anymore in San Francisco. The city's [Board of Supervisors](#) approved groundbreaking legislation to outlaw plastic checkout bags at large supermarkets in six months and large chain pharmacies in a year.

The ordinance, sponsored by Supervisor Ross Mirkarimi, is the first such law in any city in the United States and has been drawing global scrutiny.

Our Nation's Capital -Washington, D.C. The [Anacostia River Clean Up and Protection Act \('Bag Law'\)](#) requires all District businesses that sell food or alcohol to charge five cents for each disposable paper or plastic carryout bag.

The District's Bag Law is the first of its kind in the US. Since the law took effect on January 1, 2010, District businesses have seen a drastic reduction in bag usage, and environmental clean-up groups witnessed fewer bags polluting DC waterways.



plasticpollutioncoalition

Plastic never goes away.

Plastic is a durable material made to last forever, yet illogically, 33 percent of it is used once and then thrown away. Plastic cannot biodegrade; it breaks down into smaller and smaller pieces.

Plastic poisons our food chain.

Even plankton, the tiniest creatures in our oceans and waterways, are eating microplastics and absorbing their toxins. The substance displaces nutritive algae that creatures up the food chain require.

Plastic affects human health.

Chemicals leached by plastics are in the blood and tissue of nearly all of us. Exposure to them is linked to cancers, birth defects, impaired immunity, endocrine disruption and other ailments.





Eliminating Plastics

NEW YORK – July 1, 2015, food service establishments, stores and manufacturers may not possess, sell, or offer for use single service Expanded Polystyrene (EPS) foam articles or polystyrene loose fill packaging, such as “packing peanuts” in New York City. In response the Restaurant Action Alliance sued the city to stop the ban.

Sept.22, 2015, Ban on plastic-foam food containers was overturned. Describing the sanitation commissioner’s ban as “arbitrary and capricious,” Justice Margaret A. Chan of State Supreme Court in Manhattan on Monday denied the city’s claim that recycling used polystyrene containers “was neither environmentally effective nor economically feasible.”



Polypropylene, also known as plastic #5, resists being degraded for a millennium.



Children in India make a Styrofoam doll to bring awareness to plastic pollution and PP #5.



DO YOUR OWN RESEARCH AND DRAW YOUR OWN CONCLUSIONS ABOUT THE BEST SOLUTION TO OUR PLASTIC POLLUTION.

microbeads



Microbeads are tiny plastic beads, less than 1 mm wide, and are found in hundreds of popular beauty products – including exfoliants, shampoos and even toothpastes.





Cleaning up the Water



Righting the wrongs of the past seems like a big job, but **Living Lands and Waters** is up for the task. From the Headwaters in Minnesota, to the Gulf of Mexico in Louisiana, volunteers participate by cleaning up the Mighty Mississippi and taking action that produces results, not rhetoric!

Lead by Chad Pegracke the group has cleaned **107 sites**, and with the help of over **8,000 volunteers** removed over **507,023 tons of debris** from the Mississippi River!



Cleaning up Trash Island: One Man's Waste is Another Woman's Bikini

“While shooting Discovery Channel’s #1 show [Naked and Afraid](#) in the Maldives, I was overwhelmingly shocked by the amount of plastic trash covering the uninhabited, picturesque island. This was only one island, and I couldn’t bear to imagine what the other 1,200 islands looked like, covered in trash. To leave the island, we actually made a raft out of bottles. As we paddled to our rescue boat, I swore I would come back and do something about the plastic pollution. “

-Alison Teal





Getting Creative

Call for Artists!



Dayton, OH City

PAINTED STORM DRAIN INLETS have popped up all around the country, reminding people that what goes down that drain, goes to a river, creek, lake, etc. Visually, it's been a success, reminding the public that these inlets have a destination, and it is our aquatic wildlife habitat and our drinking water.



Forget about MCHM, Charleston, WV's water still deserves continued protection.



Seattle artist Buster Simpson pioneered the idea of art that interacts with environment. This 2001 sculpture is located at Ellington Condominiums in Seattle, WA.



CREATIVE DOWNSPOUT solutions such as these give a new meaning to stormwater runoff management and art installation. Both public and private properties are treating stormwater management opportunities and artistic design as practical partners. Runoff management solutions can be an enhancement to our urban spaces. The possibilities are limited only to our imagination.

Another Buster Simpson creation.



Oh, my!

aren't your mama's downspouts!





Using New Methods



MINNEAPOLIS, MINNESOTA: STRUCTURAL CELLS



GREEN Infrastructure

A former brownfield parking site was retrofitted with sections of permeable concrete. An existing basement was re-purposed as a cistern to manage stormwater and grow big trees. Approximately 40,000 square feet of permeable concrete was used. The pervious concrete accounts for approximately 1/3 of the parking lot. The entire system has perimeter drains for overflow. Runoff is intended to be harvested and stored in an underground cistern, which was essentially the water-proofed basement of a demolished building.



Finley Stadium Parking Lot.
Photo courtesy of Gene Hyde, City of Chattanooga, Tennessee

This downtown street project included installation of structural cells or tree cells to create conditions that promoted healthy mature trees and improved stormwater management in the core of the downtown district.

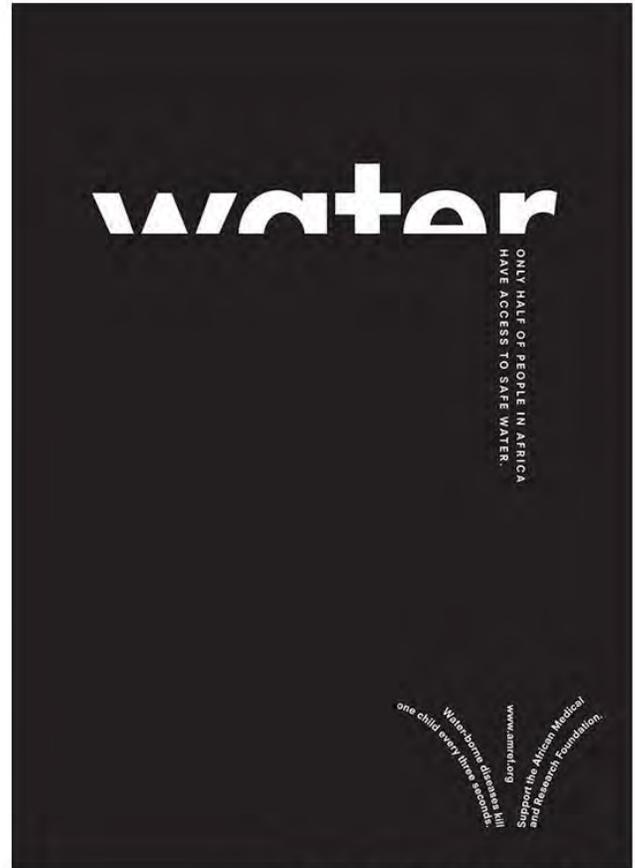
The project installed 173 trees along a new bus corridor using a modular system of structural cells that supported the sidewalk. The system created a void space that held 10 cubic feet of soil per unit (10,800 units were installed), allowing for existing or future utility pipes, protecting tree roots from compaction, and providing room for stormwater.

The system can temporarily hold large volumes of stormwater that will either be used by the trees (evapotranspiration) or will soak into the ground (infiltration)

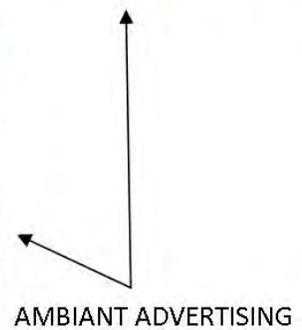
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Charleston, WV



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Stormwater Terms

Best Management Practices (BMPs): Activities or structural improvements that help reduce the quantity and improve the quality of stormwater runoff. BMPs include treatment requirements, operating procedures and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Clean Water Act (CWA): Legislation that provides statutory authority for the NPDES program, which is Public law 92-500; 33U.S.C. 1251 et seq. Also known as the Federal Water Pollution Control Act.

Drinking water: Water, treated or untreated, which is intended for human use and consumption and considered to be free of harmful chemicals and disease-causing bacteria, cysts, viruses, or other microorganisms.



Environmental Protection Agency (EPA): The mission of the Environmental Protection Agency is to protect human health and the environment. Since 1970, EPA has been working for a cleaner, healthier environment for the American people. <http://www.epa.gov/epahome/aboutepa.htm>

Erosion: Removal of soil particles by wind and water. Often the eroded debris (silt or sediment) becomes a pollutant via stormwater runoff. Erosion occurs naturally but can be intensified by human activities such as farming, development, road-building, and timber harvesting.

Impervious Surface or Cover: The characteristic of a material which prevents the infiltration or passage of liquid through it. This may apply to roads, streets, parking lots, rooftops and sidewalks.

Litter: Litter is any solid waste object (disposable item or resource) that can be held or carried in a person's hand that is left behind or placed in an inappropriate location. Any such material or item disposed of in an inappropriate manner is to be regarded as litter - the end outcome of an environmentally undesirable disposal action.



Municipal Separate Storm Sewer System (MS4): a conveyance or system of conveyances that is: owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.; designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.); not a combined sewer; and not part of a Publicly Owned Treatment Works (sewage treatment plant).

National Pollutant Discharge Elimination System (NPDES): Established by Section 402 of the CleanWater Act, this federally mandated system is used for regulating point source and stormwater discharges.



Stormwater Terms

Natural Filter: A grassed, wooded or vegetative strip that acts as a filter for the runoff before the water enters a stream.

Non-Point Source Pollution: Pollutants from many diffuse sources. Nonpoint-source pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even underground sources of drinking water.

Point Source Pollution: Pollutants from a single, identifiable source such as a factory or refinery; also called single-point-source pollution. Most of this pollution is highly regulated at the state and local levels.

Pollutants: A contaminant existing at a concentration high enough to endanger the environment or the public health or to be otherwise objectionable.

Stormwater pollution: Water from rain, irrigation, garden hoses or other activities that picks up pollutants (cigarette butts, trash, automotive fluids, used oil, paint, fertilizers and pesticides, lawn and garden clippings and pet waste) from streets, parking lots, driveways and yards and carries them through the storm drain system and straight to the ocean. Also included are oils, grease and metals.

Runoff: That portion of the precipitation on a drainage area that is discharged from the area in the stream channels. Types include surface runoff, ground water runoff or seepage. Drainage or flood discharge that leaves an area as surface flow or as pipeline flow.

Sanitary sewer (different from the storm sewer system): A system of underground pipes that carries sanitary waste or process wastewater to a treatment plant.

Storm Drain System: A vast network of underground pipes and open channels designed for flood control, which discharges straight to the ocean.

Sediment: Solid material, both mineral and organic, that is being transported or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level. Soil, sand, and minerals washed from land into water, usually after rain. Sediment can destroy fish-nesting areas, clog animal habitats, and cloud waters so that sunlight does not reach aquatic plants.



Storm drain: An opening leading to an underground pipe or open ditch for carrying surface runoff, separate from the sanitary sewer or wastewater system.

Stormwater: Precipitation that accumulates in natural and/or constructed storage and stormwater systems during and immediately following a storm event



Stormwater Terms



Stream: A body of water, confined within a bed and banks and having a detectable current. Stream is the umbrella term used in the scientific community for all flowing natural waters. In a river or stream, the water is influenced by gravity and flows downhill to reduce its potential energy. The movement of water in a stream is called the current and varies from place to place and time to time dependent upon the volume of water, the slope, and shape and other characteristics of the bed.

Water (hydrologic) cycle: The flow and distribution of water from the sky, to the Earth's surface, through various routes on or in the Earth, and back to the atmosphere. The main components are precipitation, infiltration, surface runoff, channel and depression storage, and

Water Quality: Water is essential to human life and to the health of the environment. As a valuable natural resource, it comprises marine, estuarine, freshwater (river and lakes) and groundwater environments, across coastal and inland areas. Water has two dimensions that are closely linked - quantity and quality. Water quality is commonly defined by its physical, chemical, biological and aesthetic (appearance and smell) characteristics. A healthy environment is one in which the water quality supports a rich and varied community of organisms and protects public health. Water quality in a body of water influences the way in which communities use the water for activities such as drinking, swimming or commercial purposes. More specifically, the water may be used by the community for:

1. supplying drinking water
2. recreation (swimming, boating)
3. irrigating crops and watering stock
4. industrial processes
5. navigation and shipping
6. production of edible fish, shellfish and crustaceans
7. protection of aquatic ecosystems
8. wildlife habitats
9. scientific study and education



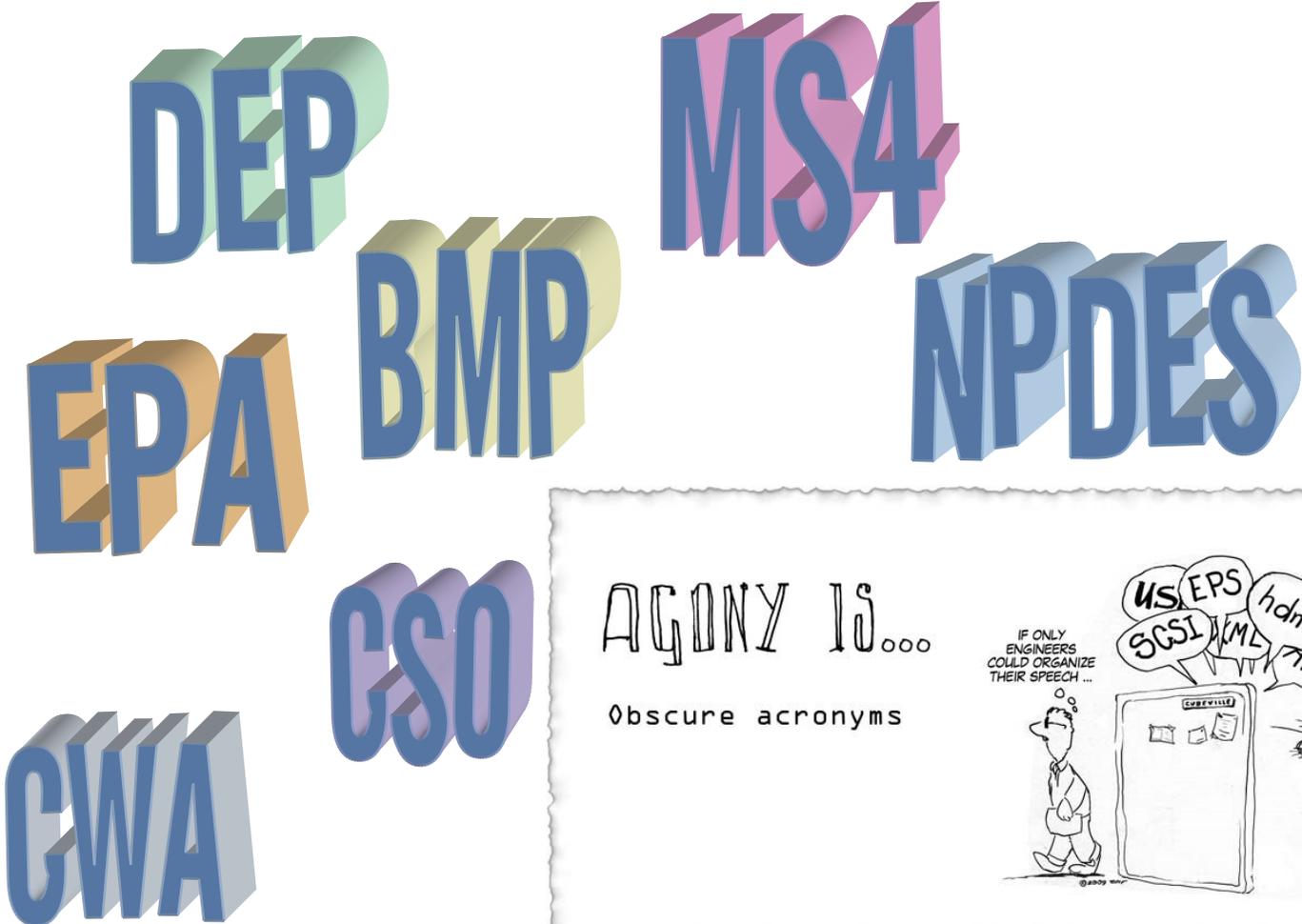
Watershed: Geographical area that drains to a specified point on a water course, usually a confluence of streams or rivers, can also be known as drainage area, catchments, or a river basin.

Wetland: An area that is inundated or saturated by surface water or groundwater at a frequency, duration, and depth sufficient to support a predominance of emergent plant species adapted to growth in saturated soil conditions.



It's a world of acronyms, Even in stormwater!

An **acronym** is an abbreviation, used as a word, which is formed from the initial components in a phrase or a word.





Haddad Riverfront Park
Charleston, WV

Charleston Stormwater Program



The City of Charleston Stormwater Department

would like to thank you for the opportunity to discuss stormwater and polluted runoff. The protection of our environment and our community relies on new ideas, education and interest.



LOST



*...your connection to the river.
Last seen playing in
streams when we were children.*

GET IT BACK!

www.charlestonstormwater.org

