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### Pet Waste

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### Planter Boxes

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### Rain Gardens

page 19-20 – Roger Bannerman, Wisconsin Department of Natural Resources

### Creating a Wildflower Meadow

Robin Sasek, CDM

### Dry Wells

Wissahickon Valley Watershed Association

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2. Washington State Puget Sound Action Team. Water Quality Tip Card. Vehicle Maintenance. [www.psat.wa.gov/Programs/Pie\\_Ed/Water\\_Ed\\_Materials.htm](http://www.psat.wa.gov/Programs/Pie_Ed/Water_Ed_Materials.htm)

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# reeVitalize

A partnership to restore tree cover in Southeast PA

To stop your rain from going down the drain, plant more trees. Trees catch rainfall on leaves, branches and trunks. A single London Plane tree will intercept over 130 gallons during a minor (1/4 inch) rainstorm.

Plus, trees help conserve water.



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## TreeVitalize Partners



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# KEEPING YOUR STREAMS AND CREEKS HEALTHY...

## 1. GET YOUR LAWN AND GARDEN OFF DRUGS!

- Limit the use of chemical pesticides, herbicides, and fertilizers — and avoid using chemicals entirely in wet weather.
- Pesticides, herbicides, and fertilizers run off into creeks and streams.
- Fertilizers add excessive nutrients to natural waters that lead to algae bloom, bad odors from lack of oxygen, and fish kills. Pesticides and herbicides kill fish and their food sources.
- Consider using compost instead of fertilizer and natural means to control pests and plant disease.

## 2. FEED YOUR STREAM RIGHT

- Never pour oil, grease, detergent from car washing, gasoline, antifreeze, paint products, carpet-cleaning chemicals, pesticides, herbicides, or other toxic substances down street storm drains.
- Storm drains flow directly into creeks and streams.
- All of these substances are toxic to fish and other stream-dwelling organisms. Grease and oil coat fish gills, deplete the oxygen supply, and smother bottom-dwelling organisms.

## 3. DON'T PLUG YOUR ARTERIES

- Dispose of garbage at your curbside pickup or landfill — not in creeks or streams.
- Some people think of creeks as garbage dumps. Look in our streams, and you'll find shopping carts, mattresses, car parts, plastic, cans, Styrofoam, yard debris, and paper litter. Debris creates dams that cause flooding and erosion. Litter is mistaken by wildlife for food and can be toxic or cause starvation. Backed-up water is a breeding place for rodents and mosquitoes. If you need help removing or disposing of debris, contact your Borough, Township, or Chamber of Commerce, who can direct you to local volunteer organizations.

This guide has been funded by the League of Women Voters of the Pennsylvania Citizens Education Fund through a Section 319 Federal Clean Water Act grant from the U.S. Environmental Protection Agency administered by the Pennsylvania Department of Environmental Protection.

For more information on stream health:  
<http://pa.leaguewv.org/>  
<http://www.epa.gov/>  
<http://dep.state.pa.us/>

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# YOU CAN Capture Rainwater in a Garden

## RAIN GARDEN



**DESCRIPTION:** A depressed landscape bed that uses mulch, soil mix, clean stone and deep rooted native plants to capture, absorb and infiltrate stormwater.

**HOW DOES IT WORK:** For more information read 'A Quick Look - Rain Garden Fact Sheet'.



**TIME/COMPLEXITY:** 2 to 3 days, moderate to complex



**COST:** variable, depending on rain garden size and plant choices



**TOOLS/MATERIALS:** shovel or small excavator, wheelbarrow, string and string level, measuring tape, saw, drill, 4" perforated and 4" and 6" solid PVC pipe, 4" cap, 4" tee, 4" to 6" adapter, 6" basket grate, clean gravel, straw, soil mix, plants, mulch

### STEPS:

- 1. LOCATION:** a rain garden should be located below a source of stormwater runoff like a downspout or a driveway, on level to gently sloping ground, at least 10 feet away from a foundation wall, and away from utility lines and septic fields. Perform a ONE CALL\* prior to digging and contact your municipality to see if any permits are required.

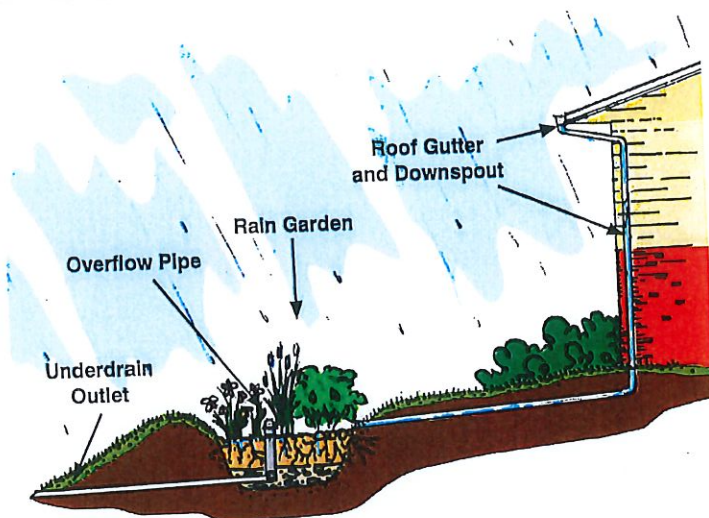


Perform a ONE CALL\* to locate underground utilities to avoid.

- 2. DRAINAGE AREA:** Determine where the stormwater runoff to feed the rain garden will be coming from: a roof, a driveway or other impermeable surface. Measure the square foot area that will be collected by the rain garden. From a roof downspout, measure the length (L) and width (W) of the part of the house that feeds the downspout. From a driveway or other hard surface, measure the average length (L) and width (W) of the area.

$$L \times W = A \text{ (area in square feet of runoff)}$$

- 3. DESIGN:** The rain garden should be at least  $\frac{1}{4}$  the size of the area (A) draining to it. For a 15' x 40', or 600 square foot roof, the rain garden should be about 150 square feet or 10' x 15'. The rain garden can be any shape, as long as the surface area measures the same square footage.



Try to fit the rain garden in and around your existing landscape so it complements the house. The depth of the rain garden should be 1' for the surface depression, at least 2' of soil and about 1' of stone for a total of 4'. These layers can vary a bit, depending on existing soil conditions and plant selection.

$$\text{Rain garden size} = \frac{1}{4} \times A$$

- 4. PLANT SELECTION:** There are many choices in size, color, texture, blooming or fruiting trees, shrubs, perennials and grasses that can be used in a rain garden. Plants should be chosen not only for their beauty, but for their ability to thrive in dry and wet conditions, and whether the rain garden will be in full sun or partial shade. Refer to the 'Rain Garden Plant Selection and Care' fact sheets.
- 5. LAYOUT:** Verify you are avoiding any underground utilities. Use a measuring tape, and string, flexible hose, or marking



Know what's below.  
Call before you dig.





Mark the rain garden location with paint or even a garden hose.

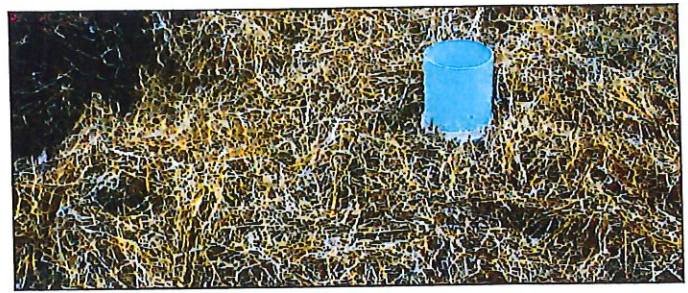
paint to layout the edges of the rain garden to meet your size requirement. Mark where the water will enter the garden and which direction an underdrain can safely outlet from the garden. Strip the grass sod or other surface material from the area.

- 6. EXCAVATION:** Begin digging by hand or with a small excavator to reach the required depth (about 4'). On sloping ground, the excavated material can be used to create a berm around the lower sides of the rain garden and placed level with the upper side where the ground is undisturbed. By building up the lower side of the rain garden, there will be less digging to meet the required depth needed.



Excavate the rain garden using the soil to create the downhill barrier.

- 7. DRAINAGE LAYERS:** An underdrain is always a good idea if you are not sure the soils surrounding the rain garden will be able to soak up the excess water. Many of our soils have a high clay content and take a long time to soak up water, and an underdrain with a perforated pipe allows the system to slowly drain down when the rain garden is over saturated.
- Cover the bottom of the excavated hole with a 4" layer of straw on the bottom to prevent the underlying soil from mixing with the stone layer. It will compact to an inch or so with the subsequent layers on top of it.
  - Place the clean stone drainage layer and the perforated pipe underdrain concurrently over the straw. Install a cap at the upper end, and a tee at the lower end of the pipe. A 6" solid pipe should extend above the surface of the rain garden for an emergency overflow with a basket grate, and a 4" solid pipe should extend from the tee to a safe outlet point. Make sure no dirt or debris gets into the pipes while you are working, and contact your municipality for an approved outlet location.
  - When the underdrain pipe is covered over with the clean stone layer, place another 4 inches of straw to keep the upper soil layer from filtering into the stone layer.



A straw layer is added over the stone to separate it from the soil.

- 8. SOIL MIX:** A soil mix that combines topsoil with sand and compost creates a mix that will promote water to soak into the rain garden, allow excess water to drain through, and provide the nutrients for healthy plants. Place 18-36" of 50-30-20 topsoil-sand-compost soil mix over the layer of straw and stone underdrain. This soil should be lightly compacted to prevent excessive settlement after the rain garden is completed. The surface of the soil should create a ponding area to capture the rain water.
- 9. PLANTING:** Layout the locations of the plants in the rain garden for the best view and space them to allow each plant sufficient room to grow to their mature size. Do not under-plant the garden as this may encourage weeds to grow. The plants should be removed from their containers or wrap-pings then placed in pre-dug holes in the garden so they are planted at the same level they were in their container.



Space rain garden plants to fill the rain garden.



Stone protects flow from the downspout to the overflow pipe.

## 10. FINISHING TOUCHES:

- Install a basket grate over the exposed end of the 6" riser pipe. The top of the pipe should be approximately 6" above the surface of the soil mix, and 6" below the berm of the rain garden. Secure the basket grate to the pipe with (2) 1-1/2" screws through pilot holes drilled into the side of each.
- Place large decorative gravel where water enters the garden and where water exits the underdrain outlet to slow the water down and spread it out to prevent erosion.
- The rain garden surface should be covered with a layer of mulch or seeded with a cover crop of low groundcover plants. This helps keep the weeds down and the soil moist and loose to encourage infiltration each time it rains.

## 11. MAINTENANCE:

For maintenance of your rain garden refer to the 'Rain Garden Maintenance' fact sheet.





# Rain Garden Maintenance

## First Season:

Caring for your garden the first season after planting is critical to its success. The most important tasks during the first year are watering and weeding. Young establishing plants need about an inch of rainfall or water per week.

## Long-term Watering:

By the second or third season, your plants should be fairly well established and most of the plants will be able to handle short periods of drought. During longer periods, you may need to water your garden, as you would any other landscape bed. Plants need moisture well into the fall, especially shrubs and trees.



## Watering Tips:

The best way to water is to use a hose to water around the base of each plant, preferably in the morning. This is a more time-consuming method of watering, but it is best for the plant (keeps foliage dry which helps prevent disease) and for the environment (wastes the least amount of water).

## Weeds and Mulch:

Plants compete with each other for nutrients, light, water and space.

Weeds, when given a chance, will almost always win. If weeds are rampant in your garden, your ornamental plants will suffer and your garden will look messy and unkempt. The easiest solution to control weeds is to maintain a 3 inch layer of mulch. Shredded bark mulch is the best mulch for rain gardens.



## Mulching Tips:

It is important to use a shredded bark mulch because it will knit together and stay in place when the garden fills with rainfall, whereas wood chips tend to float and clog the overflow drain.

Shredded bark mulch does break down and will need to be replaced every year or two, but as your plants grow and fill in, less mulch will be necessary to keep weeds down.

## Fertilizing and Compost:

The plants selected for your rain garden do not require rich, fertile soil or lots of fertilizer to grow. You may not need to fertilize, but if growth appears poor, or if plants are yellowing or discolored, you may want to consider fertilizing.

### To use a fertilizer:

1. Test the soil. Ideally, a fertilizer should be chosen to match whatever may be deficient in the soil. The Penn State Extension Service provides a testing kit for a minimal cost. Their phone number in Westmoreland County is 724-837-1402.
2. Select the right fertilizer. A soil test will tell you what nutrients need to be added and in what quantities.
  - a. Nitrogen rich fertilizers should be applied in the spring when plant growth starts for maximum effectiveness.
  - b. Phosphorus and potassium can be applied in the spring or fall.
  - c. Slow-release fertilizers, which release nutrients over a period of weeks

or months, are best for shrubs and perennials to reduce the risk of 'burning' your plants.

- d. Well-composted yard waste, applied regularly, can add nutrients and structure to soil, and may be adequate for fertilization.
3. Apply fertilizer properly. Always read and follow labels properly when using fertilizers to prevent over application. Using too much fertilizer or applying it incorrectly can damage plants and degrade the environment.

## Fertilizer Tips:

The nutrients plants need in the greatest quantities are nitrogen (N), phosphorus (P) and potassium (K). A bag of fertilizer will have 3 numbers on it which relate to the percentage of each nutrient in the mix. For instance, 20-10-15 indicates 20% nitrogen, 10% phosphorus and 15% potassium.



## Compost Tips:

There are a variety of methods that can be used to recycle your yard waste into healthy compost that can be used to add nutrients back into your garden. Westmoreland Cleanways, a non-profit corporation, provides programs and assistance with composting. They can be contacted by phone at 724-879-4020, or through their website [www.westmorelandcleanways.org](http://www.westmorelandcleanways.org).

## Leaf Litter:

Leaves are a natural mulch and are good for your rain garden in limited quantities. A 2 inch to 3 inch layer of leaves in the garden is plenty.

- Because the rain garden is a depressed garden, it tends to collect leaves and debris and should be cleaned out in the fall and spring.
- The rain garden should not be used as a place to dump leaves.
- The overflow outlet pipe with the basket grate should be kept clear of leaves and other debris.
- Shredded leaves (created by running a lawn mower over 2 inch to 4 inch thick piles) will decompose faster and are better as mulch than whole leaves, but care must be taken to keep them from floating and entering the outlet pipe.

## Annual Maintenance Schedule:

Tasks for early spring (before new growth is 3 inches high):

- Cut and remove dead stalks and seed heads remaining from previous season.
- Remove sticks and debris.
- Prune shrubs if necessary (see Shrub Pruning section).
- Divide and move perennials if they are too crowded (see Perennial Care section).
- Replenish mulch layer to maintain a 3 inch layer of shredded bark.

Tasks for late spring and summer:

- Remove weeds.
- Water as needed during periods of drought.

Tasks for fall:

- Remove weeds and diseased plants.
- Remove excess leaves.
- If fall is dry, continue to water trees and shrubs until the ground begins to freeze (late October). These woody plants need moisture entering winter to ensure survival.



# Rain Garden Plant Selection and Care

## Plant selection:

Plants, grasses, perennials, shrubs and trees, should be chosen by the amount of light they will receive (sun vs shade) and their ability to handle the periods of wet and dry they will experience throughout the year. Choose plants that have a nice natural form, have seasonal interest, are appropriate for the garden space that has to be filled, and are deep rooted to perform the uptake of water required in the rain garden. See the recommended list.



## Grass, Perennial Care:

**Dividing grasses and perennials:** As your garden matures, the plants will grow, fill in, and may become crowded. To keep the plants healthy, you may need to remove some plants or divide them. It is best to divide them in the

spring before they reach 4 inch height. Dig up the entire plant and use a knife, shovel or ax to break the clump into two or more pieces. Replant the pieces in the bed or elsewhere leaving enough space for them to grow.



**Pinching and deadheading:** Pinching and deadheading are not required for your rain garden, but they do benefit some species. Pinching means

to cut back or to pinch young stems a few inches above a leaf or bud.

This practice makes the plant bushier, more compact or delays blooming. Deadheading means to cut off dead flower heads to increase the duration of bloom time. Cut off the spent flower at the base of the flower stalk, and the plant will put its energy into more flowers instead of seed production.

**Removing dead stalks:** After grasses and perennials die back, dead stalks should be cut and removed from the garden. This can be done in fall or spring. Fall removal is recommended if the plants were diseased or had insects. Spring removal is beneficial to allow the plants to provide winter interest of attractive seed heads and dried foliage, as well as for food and shelter for birds.



## Perennials and Disease:

Most of the plants chosen for your rain garden are fairly disease resistant, but sometimes it is hard to distinguish between disease, nutrient deficiency, and insect damage. Prevention is an important strategy in handling disease.

### Disease prevention tips:

1. Remove dead and diseased material from the garden promptly.
2. Keep weeds to a minimum.
3. Minimize plant stress by making sure plants have adequate nutrients and water.
4. Keep foliage dry by watering early in the day without wetting the leaves.

## Shrub and Tree Selection:

Shrubs and trees should be selected for the size of the space to be filled. It is best to plant a variety that naturally fits the height and spread requirements of the space where it is planted rather than force the shape through repeated pruning.



## Shrub and Tree Care:

**Pruning:** The shrubs and trees selected for your rain garden should have a nice natural form and should not require much pruning to maintain this form. You may however need to occasionally remove dead or diseased branches, crossing or rubbing branches, an odd branch, or just to rejuvenate the plant.

It is best to let them grow to their natural height and form, but in some cases pruning is helpful to the health of the plant. The best time to prune most shrubs and trees is early in the spring before the shrub begins actively grow-

ing. To maintain a natural shape, cut the oldest and largest stems back to the ground using pruning shears, clippers, or a saw. Broken, damaged or odd stems or branches should be pruned back to the next growing point (leaf or bud) or to the main stem. Do not shear across the top of the shrub to make it shorter. This practice could harm the health of the plant and cause the bottom to lose foliage.



## Enhancing Your Rain Garden:

**Adding plants:** Plants can be added to your rain garden to fill in gaps or to replace some of the original plants in the event of damage or loss.

- Spring bulbs should be planted in the fall and can add a bright splash of color first thing in the growing season. Most bulbs need dry soil so they should be planted in the dry upper zone of the rain garden.
- Annuals, planted in late spring or early summer, can add continual summer color to your rain garden, especially during the first two years while the perennials and shrubs are filling out. Keep in mind that most annuals will need some type of fertilizer to thrive in the rain garden.
- Perennials can be added at any time to provide additional color and interest.
- Shrubs should be selected to fit the space. It is best to plant a variety of shrub that naturally fits the height and spread requirements of the space where it is planted rather than force the shape through repeated pruning. They should also be able to tolerate the amount of sun exposure and the changing conditions (wet to dry) of the rain garden.

## Adding other features:

Decorative rock, statues or other landscape features can be added to the rain garden to enhance the appearance, but should be carefully placed to avoid interference with the function of the rain garden.



# Rain Garden Plant Selection and Care

## PLANT SECTION

### Recommended Ornamental Native Plants for Rain Gardens

(100 sf device should have minimum 3 to 5 species, or more for larger devices)

Scientific Name	Common Name	Mature Height/ Tolerance
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Ribbon Grass



Perennial - Beebalm



Perennial - Black-eyed Susan



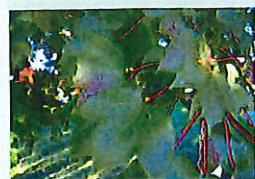
Small Shrub - New Jersey Tea



Large Shrub - Beautyberry



Small Tree - Serviceberry



Large Tree - Red Maple

#### Grasses

<i>Pennisetum alopecuroides</i> 'Hameln'	Dwarf Fountain Grass	2-4' ht., sun
<i>Phalaris arundinacea</i> 'Picta'	Ribbon Grass	1-2' ht., sun
<i>Schizachyrium scoparium</i>	Little Bluestem	2-4' ht., sun

#### Perennials (plant approx. 2' on center)

<i>Aster novae-angliae</i> 'Purple Dome'	Purple Dome Aster	2' ht., sun
<i>Echinacea purpurea</i>	Purple Coneflower	2-4' ht., sun
<i>Geranium maculatum</i>	Wood Geranium	1-2' ht., sun-shade
<i>Hemerocallis fulva</i>	Daylily	2-4' ht., sun
<i>Liriope muscari</i> 'Big Blue'	Big Blue Lilyturf	1' ht., sun-shade
<i>Lobelia cardinalis</i>	Red Cardinal Flower	2' ht., sun-shade
<i>Monarda fistulosa</i>	Bee-balm	2-5' ht., sun
<i>Rudbeckia hirta</i>	Black-eyed Susan	2-3' ht., sun-shade
<i>Salvia nemorosa</i> 'May Night'	Meadow Sage	1' ht., sun-shade

#### Small Shrubs (plant approx. 3' on center)

<i>Ceanothus americanus</i>	New Jersey Tea	1-3' ht., sun-shade
<i>Rhus aromatica</i> 'Gro-low'	Gro-low Fragrant Sumac	1-3' ht., sun

#### Large Shrubs (plant approx. 5' on center)

<i>Callicarpa bodinieri</i>	Beautyberry	6' ht., sun-shade
<i>Clethra alnifolia</i>	Summersweet	6' ht., sun-shade
<i>Cornus alba</i> 'Argenteo Marginata'	Silverblotch Dogwood	4-8' ht., sun-shade
<i>Cornus sericea</i>	Red Osier Dogwood	4-8' ht., sun-shade
<i>Ilex glabra</i>	Inkberry Holly	4'-8' ht., sun-shade
<i>Itea virginica</i>	Virginia Sweetspire	3-5' ht., sun-shade
<i>Myrica pennsylvanica</i>	Northern Bayberry	4-8' ht., sun-shade
<i>Salix cinerea</i> 'Variegata'	Tricolor Gray Willow	5-10' ht., sun
<i>Viburnum dentatum</i>	Arrow-wood Viburnum	3-15' ht., sun-shade
<i>Viburnum trilobum</i> 'Compactum'	Com. Am. Cranberrybush	5' ht., sun-shade

#### Small Trees (plant approx. 15'-20' on center)

<i>Acer ginnala</i>	Amur Maple	15-20'
<i>Amelanchier canadensis</i>	Shadblow serviceberry	20-25'
<i>Amelanchier laevis</i>	Alleghany Serviceberry	20-25'
<i>Crataegus viridis</i> 'Winter King'	Hawthorn	20'
<i>Magnolia virginiana</i>	Sweetbay Magnolia	15-20'
<i>Salix</i> 'Scarlet Curls'	Scarlet Curls Willow	30'

#### Large Trees (plant approx. 30' on center)

<i>Acer rubrum</i>	Red Maple	40-45'
<i>Betula nigra</i>	River Birch	40-50'
<i>Ostrya virginiana</i>	Hophornbeam	40'
<i>Platanus occidentalis</i>	American Sycamore	50'
<i>Quercus palustris</i>	Pin Oak	60-70'



# YOU CAN Capture Rainwater to Use Later

## RAIN BARREL



**DESCRIPTION:** A barrel or underground tank (cistern) can capture rainwater from a roof and store it for later use, such as watering plants or gardens.



**TIME/COMPLEXITY:** 4 hours, easy



**COST:** minimal



**TOOLS:**

Electric drill

3/4 inch spade bit

Jigsaw and blades for cutting plastic

Caulking gun

Flat blade screw driver (required for straight hose barb and clamp)

**MATERIALS:**

40 gal plastic food barrel (or other HEAVY duty plastic barrel from NON-toxic liquid transport)

3-4 feet of 1/2 inch interior diameter plastic hose

(1) spigot (brass preferred) OR (1) standard threaded boiler tap

(1) 6 inch square of fiberglass screen

(2) 1/2 inch conduit lock nuts (electrical box connectors)

(3) 3/4 to 1/2 inch reducing washers (electric)

(1) 1/2 to 1/2 inch nylon L-shaped hose barb adaptor OR

(1) straight hose barb adapter and (1) metal hose clamp  
Clear or white silicone caulking



### TEN EASY STEPS to make a Rain Barrel

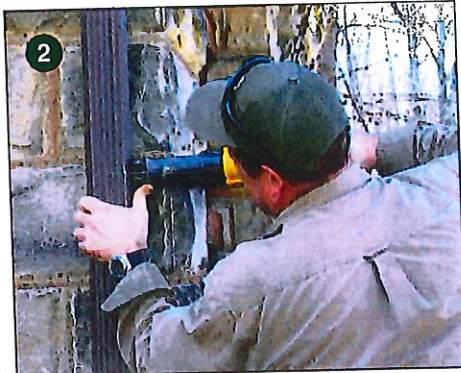
1. Buy or find a barrel, heavy duty, preferably one used to transport non-toxic liquids or buy an extra heavy duty plastic garbage can.
2. Wash used barrel with non-toxic soap or degreaser. A do-it-yourself car wash works well.
3. Using a 3/4 inch spade bit, drill one hole into the barrel for the spigot near the bottom of the barrel, if the barrel is to be set on a block, or 12 to 15 inches from the bottom, to allow for a bucket or water can to fit beneath it.
4. Place caulking on the inside and outside of the hole.
5. Place a washer on the spigot threads and insert through the hole on the outside of the barrel.
6. Tighten a washer and a locknut on the inside of the barrel, onto the threads of the spigot.
7. Drill another hole using the 3/4 inch spade bit into the side of the barrel near the top of the barrel (6 inches from the top rim is recommended). This will be an overflow.
8. Spread caulking around the inside and outside of this hole. Place the hose connector into the hole with the threads to the inside (the barbs will be to the outside). Place a washer and a locknut on the threads on the inside of the barrel and tighten. Add the overflow hose to the connector with a hose clamp.
9. Drill four holes in the lid of the barrel in a square pattern, and use the jigsaw to cut out the square.
10. Place caulking around the hole on the top of the barrel and press the piece of fiberglass screen firmly into place over the caulking. This will allow downspout water into the barrel, yet **keep mosquitoes out**. Allow caulking to dry 24 hours before using the rain barrel.



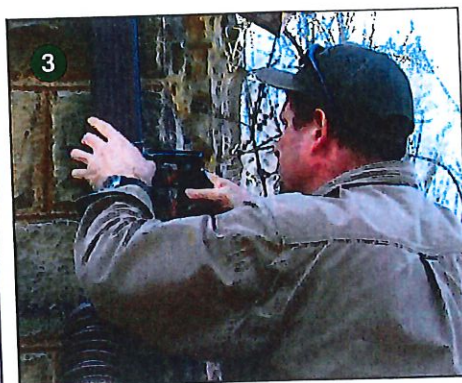
## How to Hook Up Your Rain Barrel



1 Prepare a solid base.



2 Cut off an existing downspout above the barrel.



3 Attach a flexible extender or elbow.



4 Direct the overflow hose to the landscape bed.



5 This set up allows the downspout to be re-attached, and the barrel stored in winter.

### FOUR Important Things To Remember

1. Water collected in this barrel is NOT suitable for human consumption, but great for watering gardens, washing cars, etc.
2. A full barrel can weigh more than 330 pounds! A barrel should be set on solid ground or on a well-supported structure.
3. **DO NOT** allow water to freeze in the rain barrel, or the barrel may split. Store it empty or inside during the winter.
4. **LOCATION:** a rain barrel should be located below a source of stormwater runoff like a down spout, slightly elevated on a level and solid base to allow gravity feed from the hose connection. The overflow hose should be connected to another barrel or to a drip line to a landscape bed.

Produced by

**Westmoreland  
Conservation  
District**

Phone: 724-837-5271  
www.wcdpa.com

With Funding from

**pennsylvania**  
DEPARTMENT OF ENVIRONMENTAL  
PROTECTION

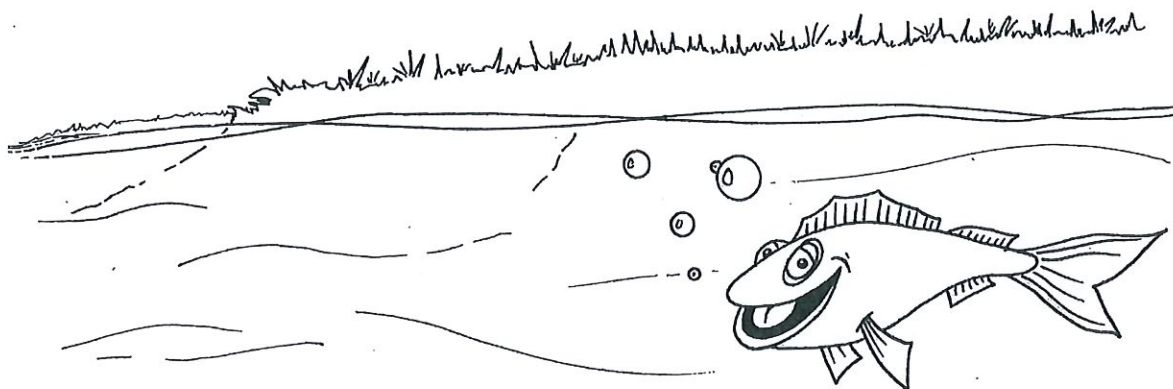






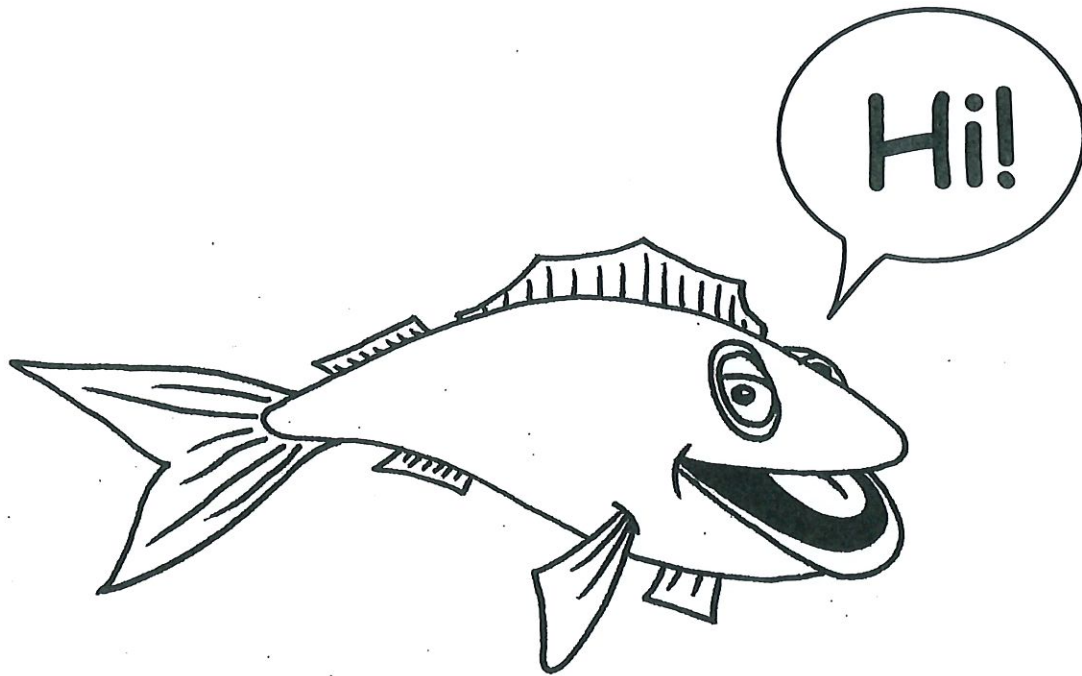
South Carolina Department of Health and Environmental Control

# a Fish's Wish



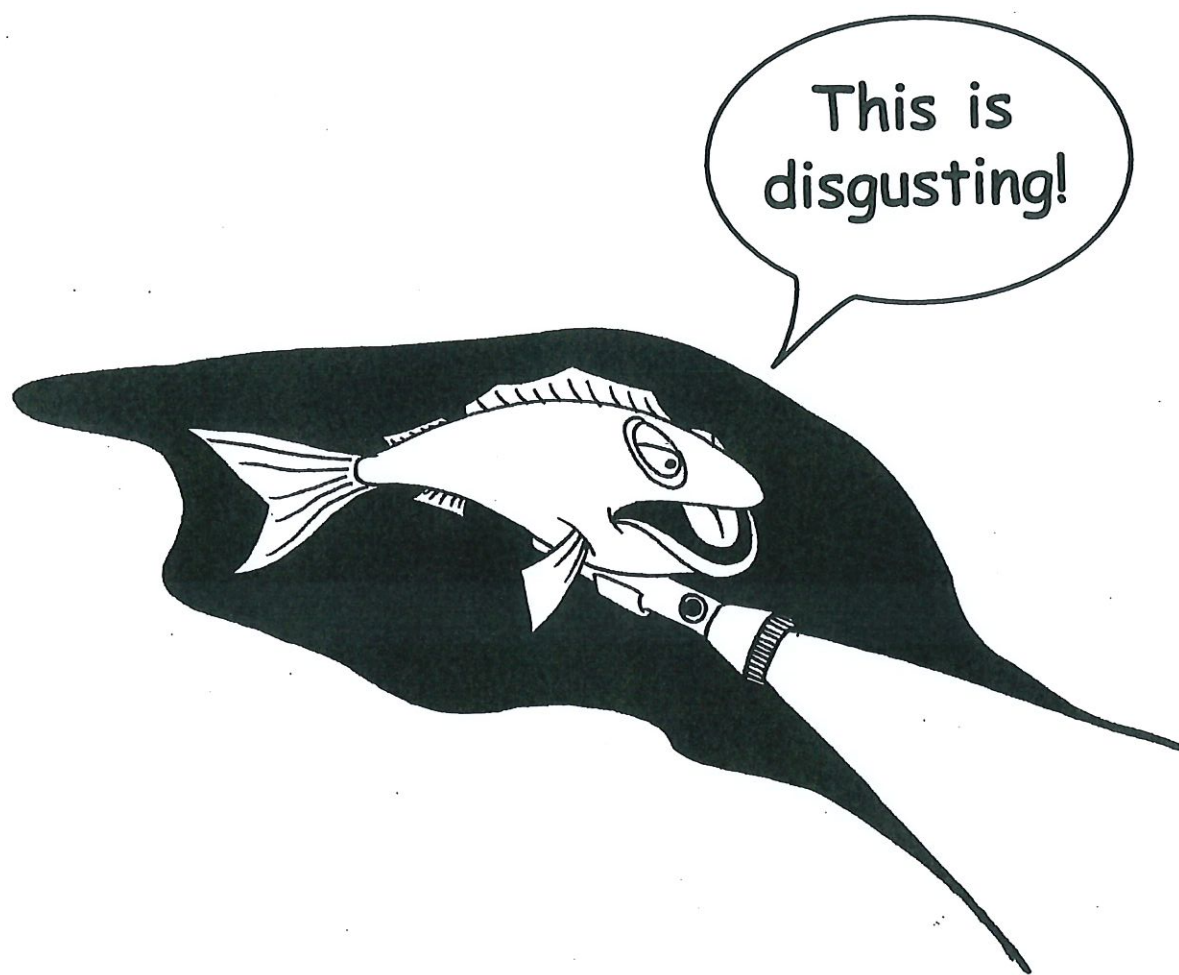
A tale of polluted runoff and how to prevent it.





I am a Fish. The water that I live in is very important to me. I breathe oxygen from it, find my food in it, and make my home in it. I can live only in clean water.





But sometimes humans do things that make my water dirty. They leave pollutants on the ground, and when it rains these pollutants wash downhill into my water. This is called **polluted runoff**.



x	d	l	k	y	e	r	t	u	n	d	h	p	m
z	t	w	o	i	l	h	i	k	w	c	t	o	l
r	t	g	u	i	b	s	o	a	p	s	u	d	s
c	h	e	m	i	c	a	l	s	y	j	o	p	o
p	e	t	w	a	s	t	e	e	t	h	v	i	x
n	a	l	j	k	m	l	i	t	t	e	r	a	l

All of these things can cause polluted runoff. Can you find them in the word search?

soapsuds

chemicals

pet waste

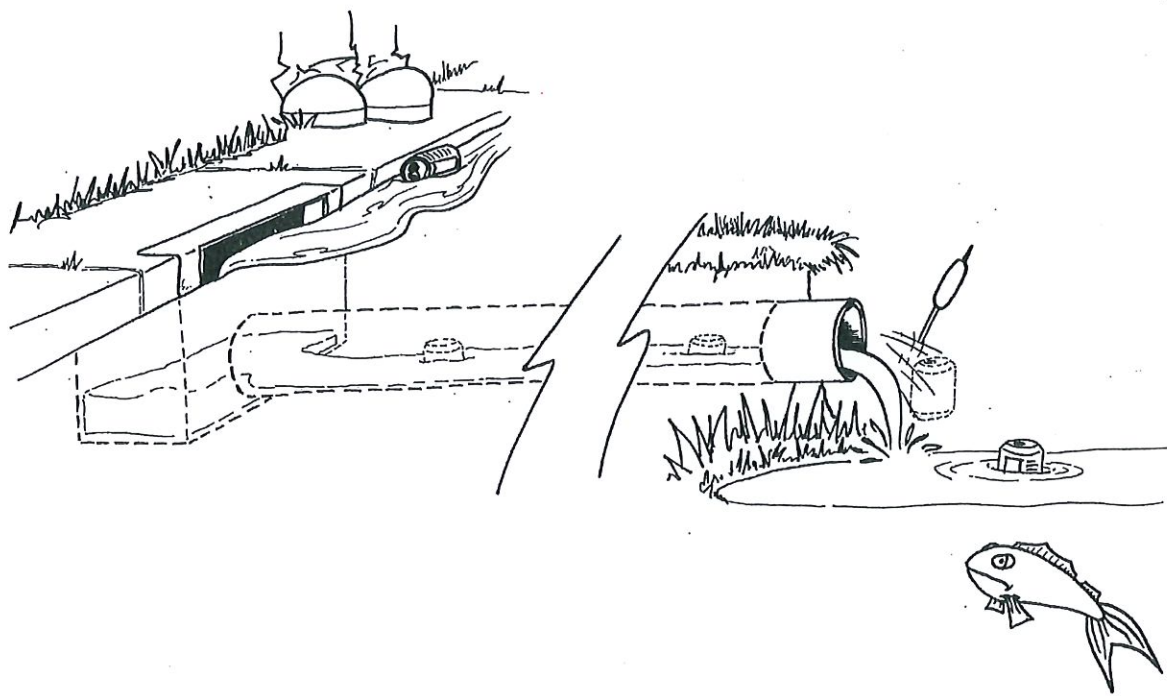
oil

litter

soil

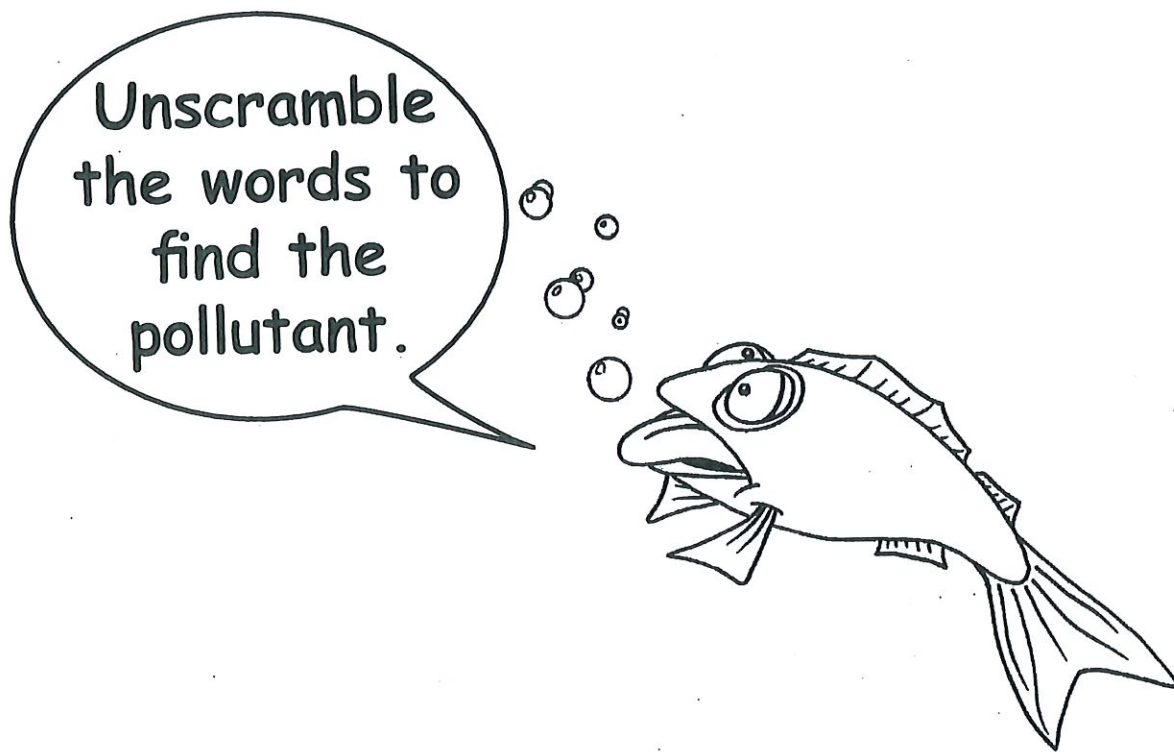


Sometimes, people pour pollutants right into my water! This happens everytime they put something down a storm drain.



A storm drain is a connection between the street and my water.





silo \_\_\_\_\_

This washes off of bare spots in your yard. It hurts my gills and covers my home with mud.

lio \_\_\_\_\_

This drips out of the bottom of your car. One quart of this can pollute one million gallons of my water.



**trilet** \_\_\_\_\_

If this is left lying on the ground, the rain can wash it into my water.

**tep stawe** \_\_\_\_\_

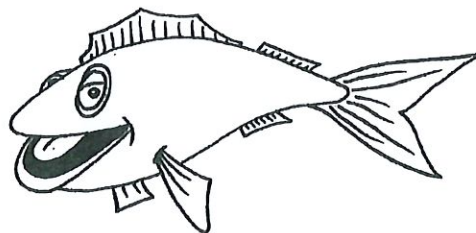
If you don't clean up after your pet, this can make my water unfit to live in!

**machicles** \_\_\_\_\_

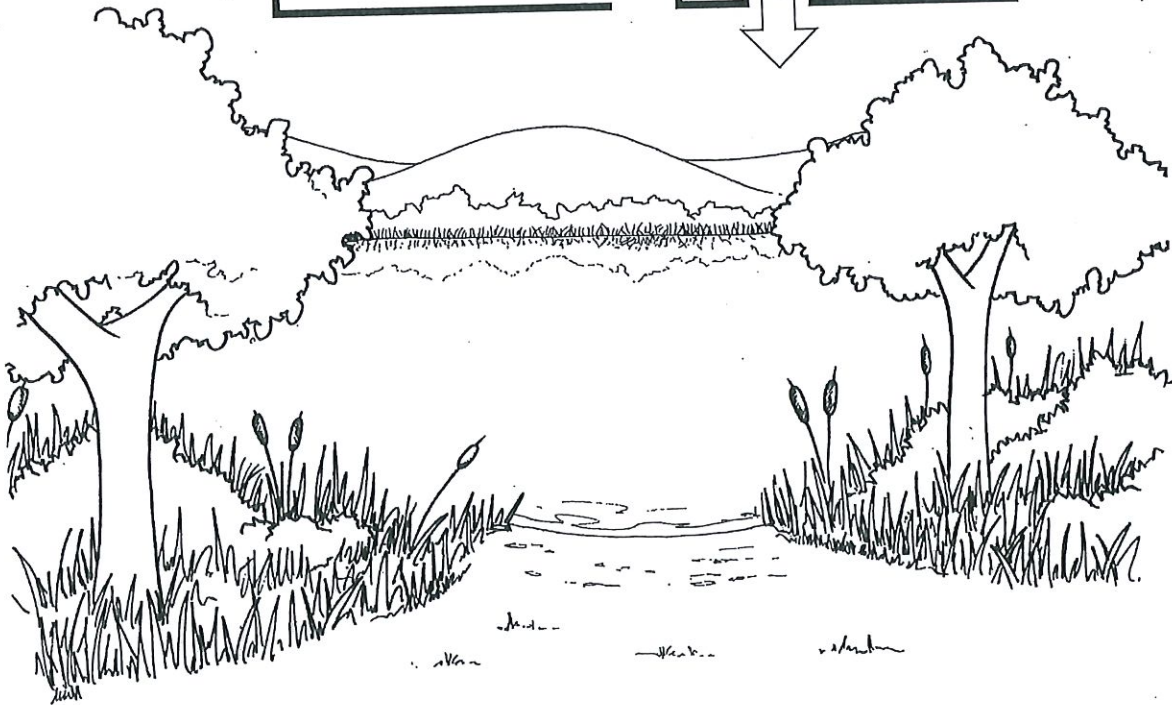
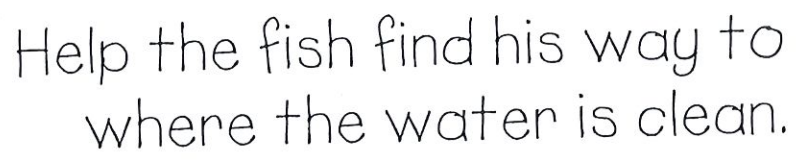
Using lots of these to kill insects in your yard lets them wash off and harm animals in the water - like me.

**spadosus** \_\_\_\_\_

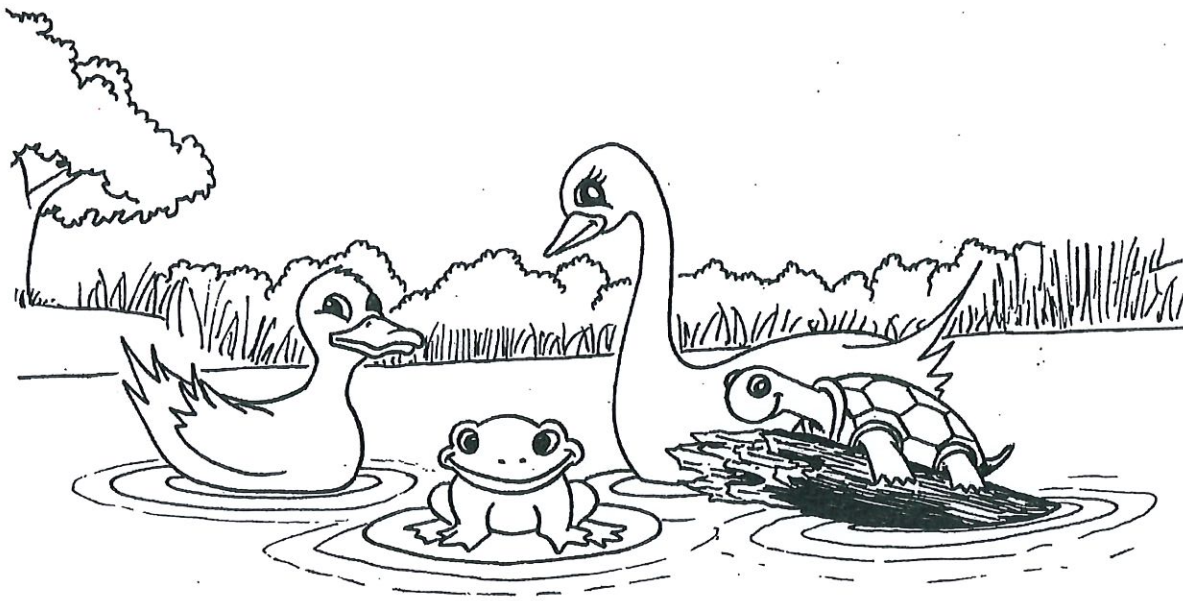
The car might be clean, but they pollute my water.











Because people were careless about polluting the ground, now the water is polluted. The fish has said "Good-bye" and moved away. Do you think any other animals might have to move away too?



The fish wishes people would help prevent polluted runoff. By doing this crossword, you'll learn what you can do to keep the fish's water clean.

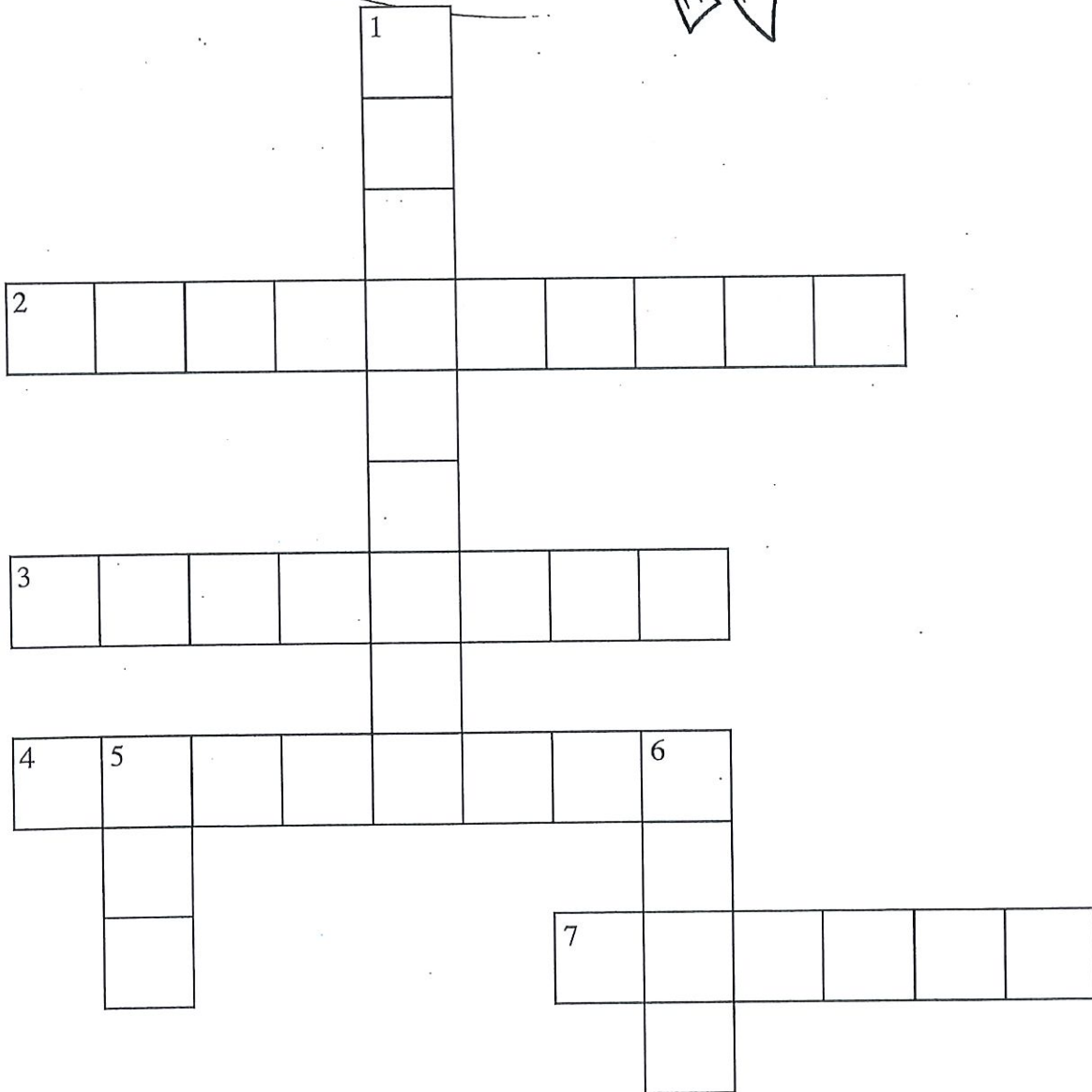
### ACROSS

2. Never pour anything down a \_\_\_\_\_.  
It goes right to my water.
3. Clean up \_\_\_\_\_ by burying or flushing it.
4. Wash your car on the grass. It will soak up \_\_\_\_\_ and keep them from running into my water.
7. Pick up \_\_\_\_\_. Put it in the trash or recycle it.

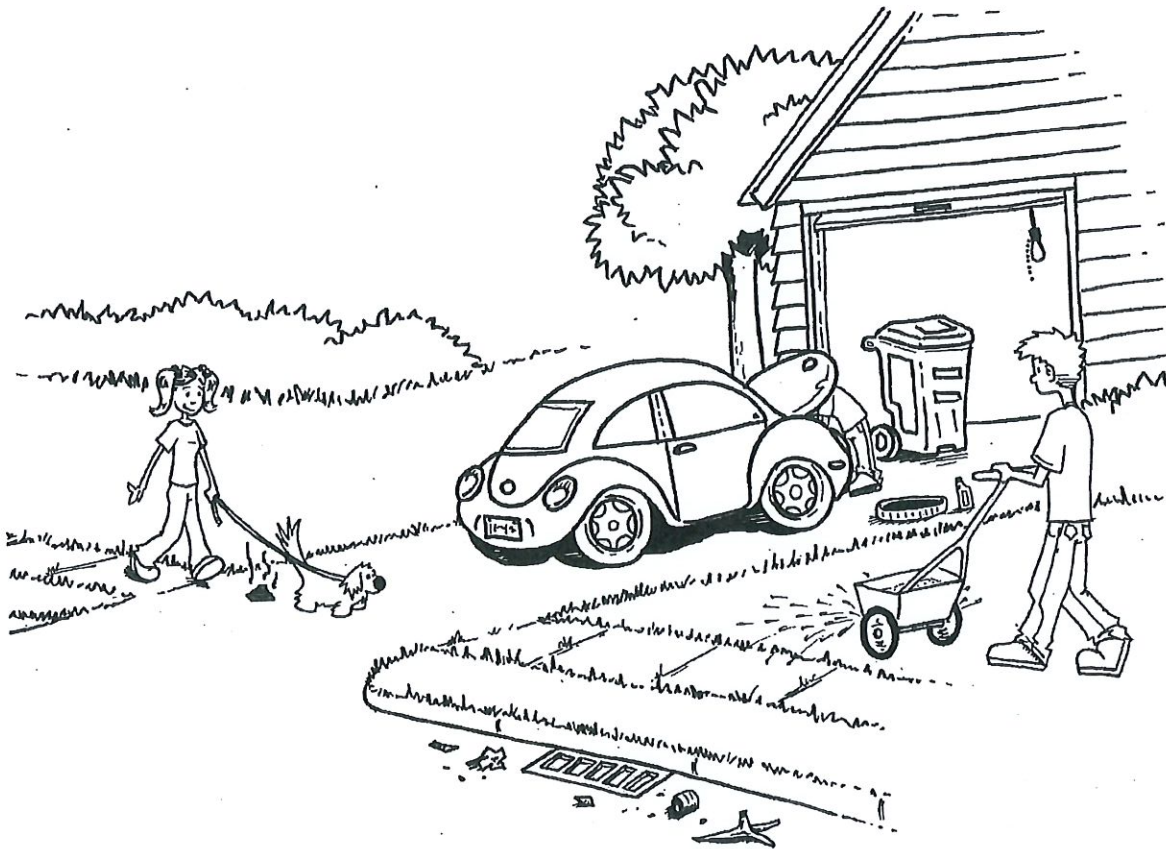
### DOWN

1. If you must use them, follow the instructions on the label of any \_\_\_\_\_ that you buy.
5. When you change the \_\_\_\_\_ in your car, take it to the recycling center. If you see a leak, have it fixed.
6. Keep bare \_\_\_\_\_ covered with grass or other plants.









Can you find and circle four things in this picture that could cause polluted runoff?

1. pet waste on the sidewalk
2. litter near the storm drain
3. too much fertilizer on the lawn
4. used oil from car on driveway

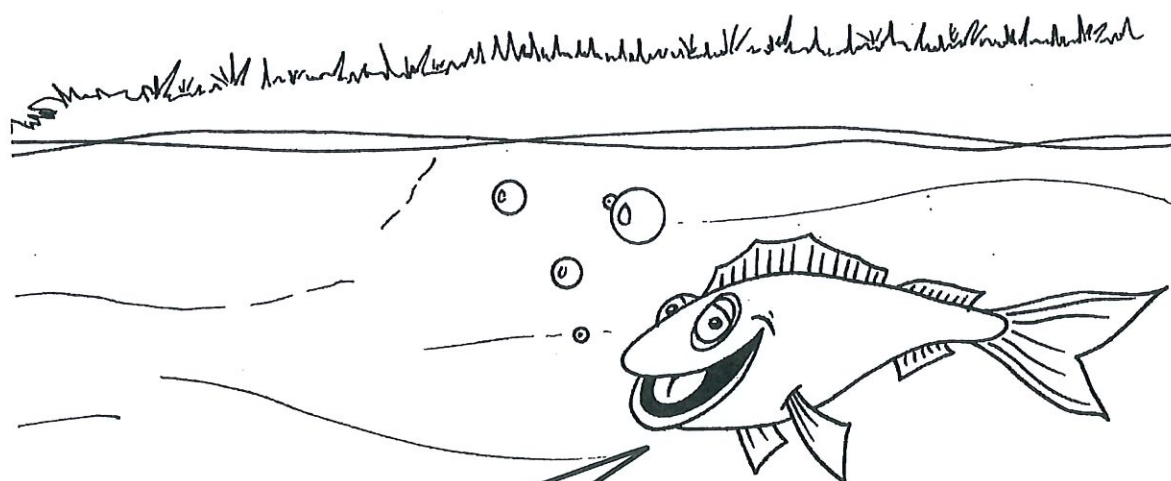




Now you know how to help the fish get his wish. Color this picture to learn how to prevent polluted runoff at your house.

- small lawn
- control pets
- bike to save energy
- compost
- well maintained energy efficient vehicle
- mulch to control weeds and conserve moisture
- recycle
- low maintenance ground covers
- natural buffers
- leave grass clippings on lawn
- porous driveway materials
- non-hazardous household products
- use native plants

I hope you've learned something about polluted runoff and how you can prevent it. If you'd like to do more, have your parent, teacher, or scout leader call to learn about **SC DHEC's Water Watch**.



**Call SC DHEC at  
(803) 898-4211**

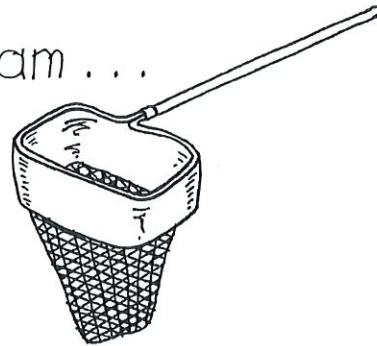


As a member of **Water Watch**, you can ...

... stencil storm drains ...



... survey your stream ...



... pick up litter ...



... teach others to prevent polluted runoff,  
and more!

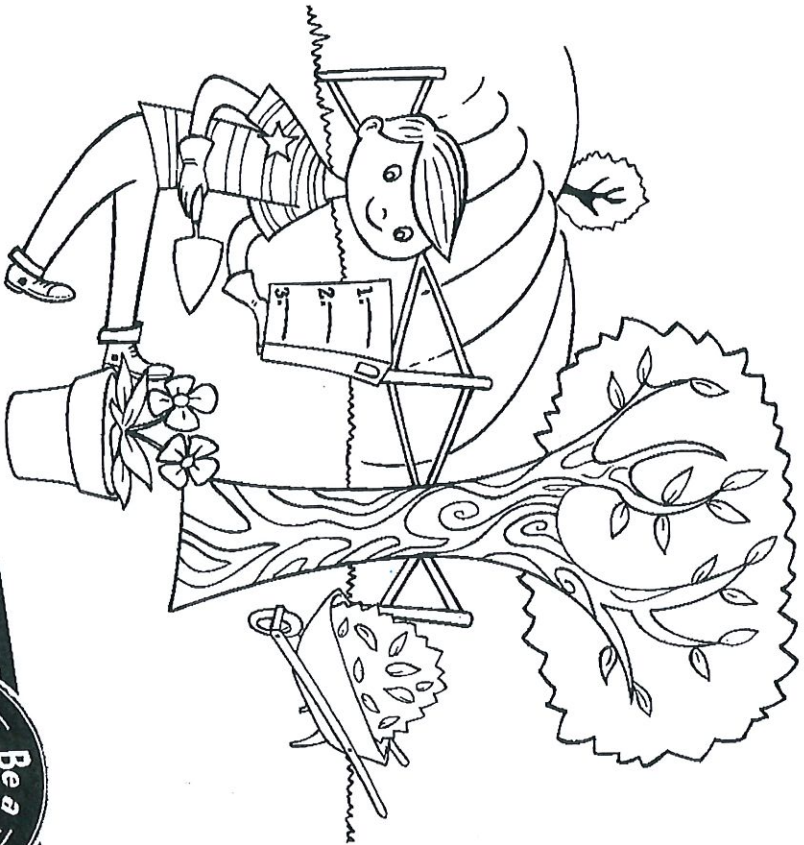


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Cost Per Unit - \$0.75

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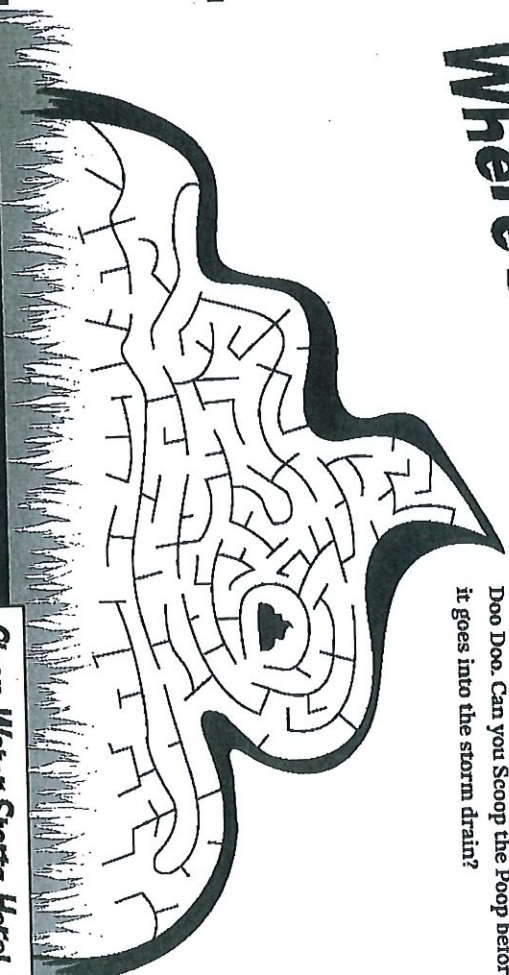
## Use Less Chemicals!

The chemicals we use to keep our yards perfect also find their way into the water we drink, swim in and the fish we eat. Everything that goes into our storm drains and groundwater goes untreated, straight into our rivers and streams.



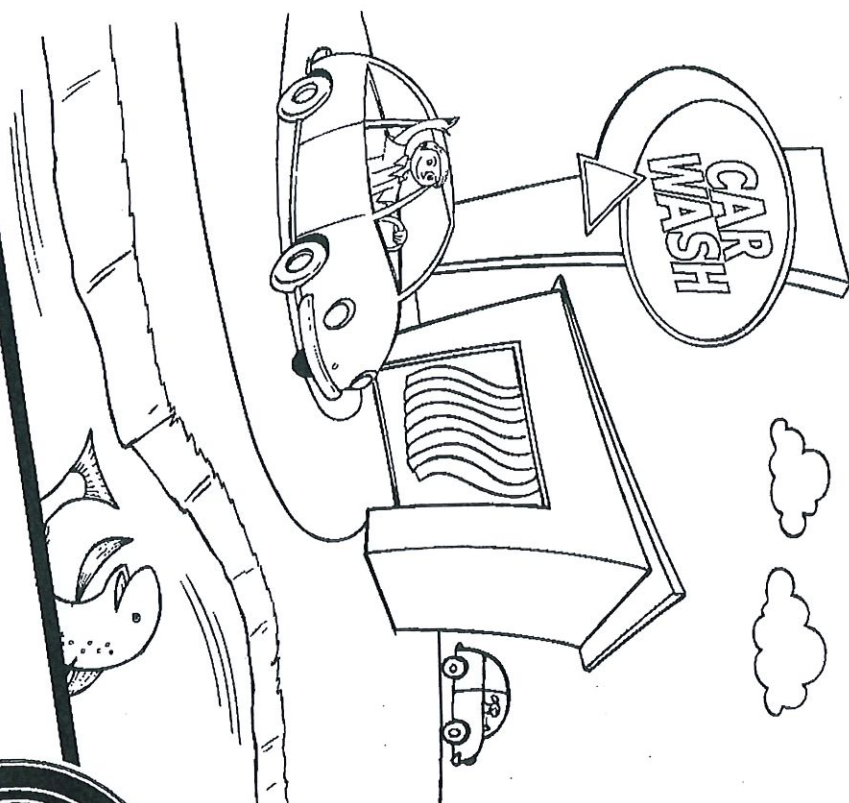
## Where's the Doggie Doo Doo?

Use the maze below to locate the Doggie Doo Doo. Can you Scoop the Poop before it goes into the storm drain?



Since Fido can't...  
do your part.  
**Scoop the Poop!**





# Use the Carwash!

It's not just soap from washing your car that goes down the storm drain. It's also the oils and dirt from your car that go directly into the drain and run into our lakes and rivers, untreated, harming the fish and our water.



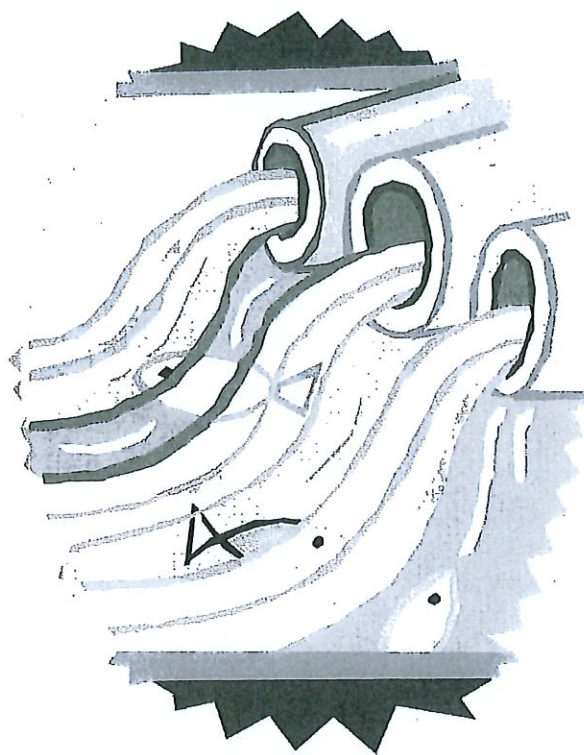
# Scoop the Poop!

Always, always, always scoop your dog's poop. It's left on the ground, the doo doo could end up on someone's shoe. Even worse, it carries disgusting bacteria that could wash into our rivers, streams and water supply.



This booklet belongs to: \_\_\_\_\_

# The Loyalhanna Creek Stormwater Activity Book



An activity booklet designed to teach children about water resources  
and stormwater pollution

Created by the MS4 Partners  
College, Ferguson, Harris, and Patton Townships;  
Penn State; and State College Borough

## What is Stormwater?

When rain falls or snow melts, where does the water go? Some is soaked into the ground, some sits in puddles, and some disappears. Water that flows over the land surface, downhill to the nearest stream or ditch; we call stormwater runoff.



When storm drains are free of debris, water can easily drain from roadways. When storm drains are clogged, this causes the potential of flooding on roadway surfaces, which can also cause contamination. Never put anything down a storm drain.

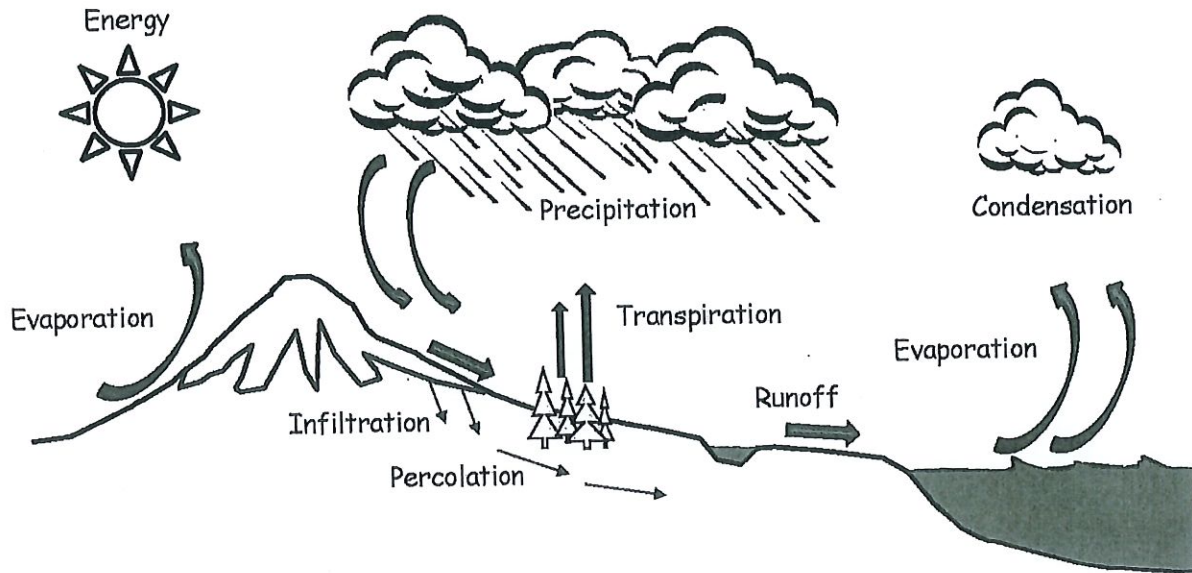
Solve the hidden message. Use the clues below.

A = B = C = D = E = F = G =   
H = I = J = K = L = M = N =   
O = P = Q = R = S = T = U =   
V = W = X = Y = Z =

Activity Challenge: What secret messages can you make using the above code letters or your own symbols?



# The Water Cycle



**Evaporation:** When water is heated by the sun, it causes the water to turn into vapor and rise into the air.

**Transpiration:** Water that plants give off as vapor.

**Condensation:** When water vapor cools, it turns into tiny drops of water. These combine to make clouds.

**Precipitation:** The water in the clouds falls to the earth as rain or snow.

**Runoff:** The water falling to the ground through precipitation runs back into the lakes, rivers and oceans over the surface of the ground.

**Infiltration:** When water enters the soil surface.

**Percolation:** What water's called after it's infiltrated into the ground and then moves through the soils.

**Hydrology:** The study of how water moves through the environment.

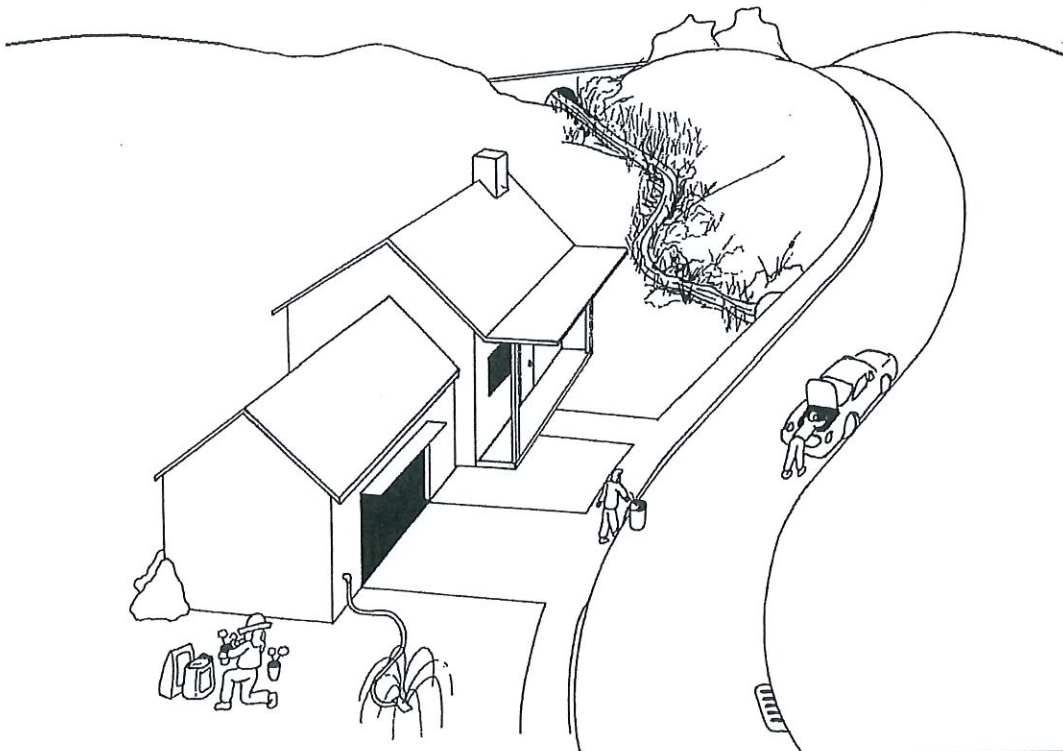
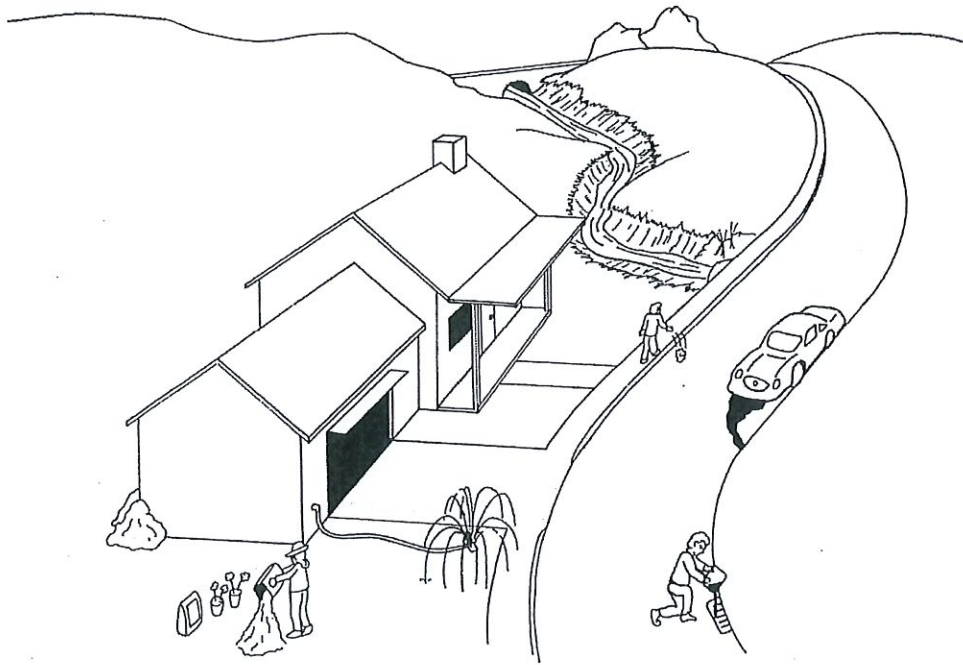
**Karst:** A landscape term in a carbonate watershed like Spring Creek where sinkholes, closed depressions and blind valleys (valley with an abrupt ending) have developed over geologic time. Water that enters sinkholes can move rapidly and potentially contaminate groundwater.

**Impervious Surfaces:** Are mainly artificial surfaces like roofs, roads, sidewalks, and parking lots that are impenetrable to water, which makes water runoff.

Did you know that the water you drink is as old as the earth itself? Dinosaurs may have swum in the water from your kitchen sink. The earth's water supply is about the same as it was millions of years ago. That's because every molecule of water is recycled over and over through the water cycle. More than 99% of the earth's water is salt water in the ocean or trapped in the ice caps or deep underground. That leaves only 1% of the earth's water available for us to use. Let's make sure we protect that water and keep it clean.

## Stormwater Pollution Picture Search

Cities and towns have more stormwater runoff than areas in the country because they have more concrete so the water can't soak into the ground. Impervious surfaces like roads and parking lots can contribute lots of pollutants to our streams. Compare the two pictures below. Circle all the differences between them that you can find that could result in polluted runoff. You should find 6 things.

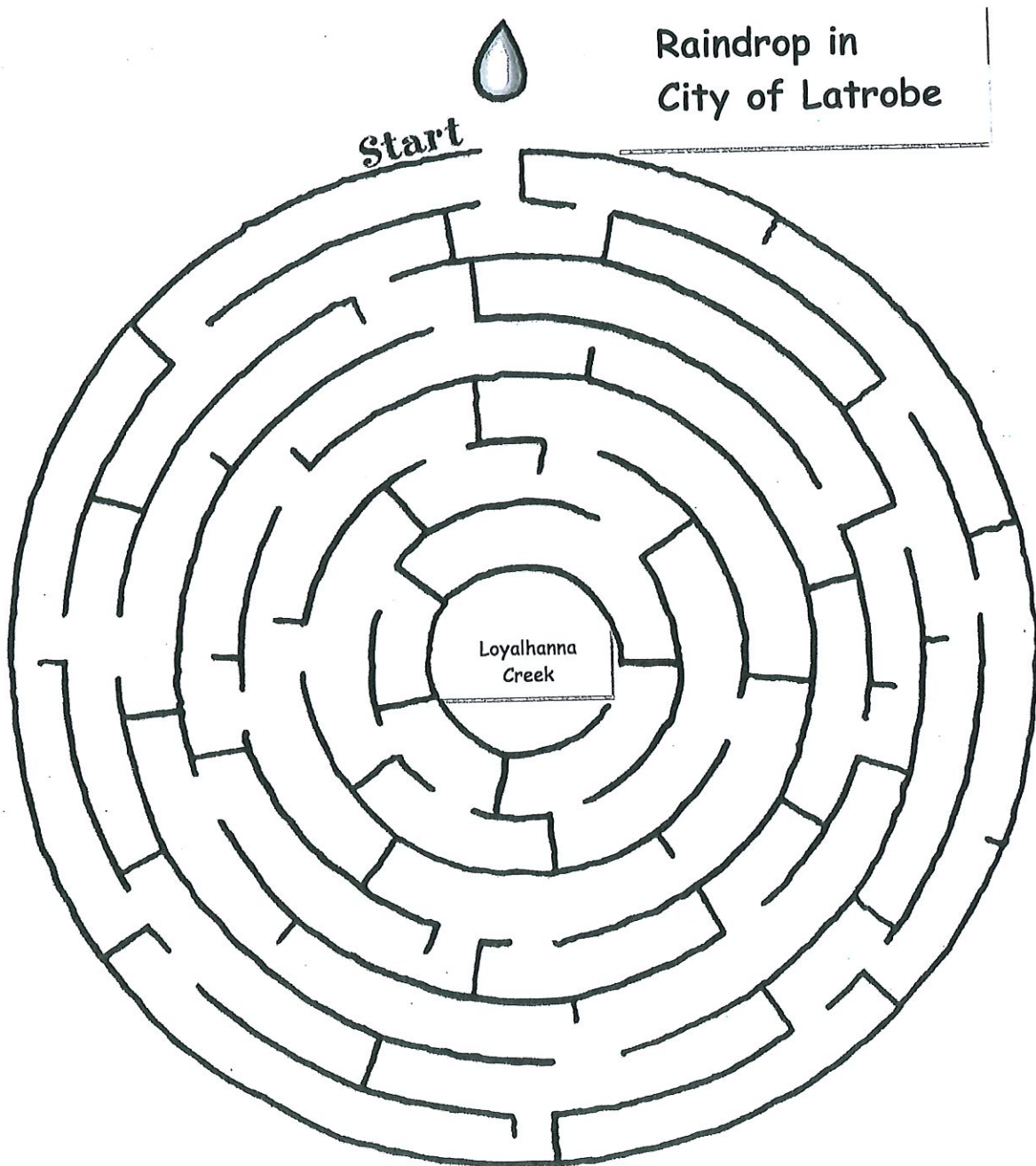


Activity Challenge: What do these differences have to do with protecting our water from stormwater runoff?



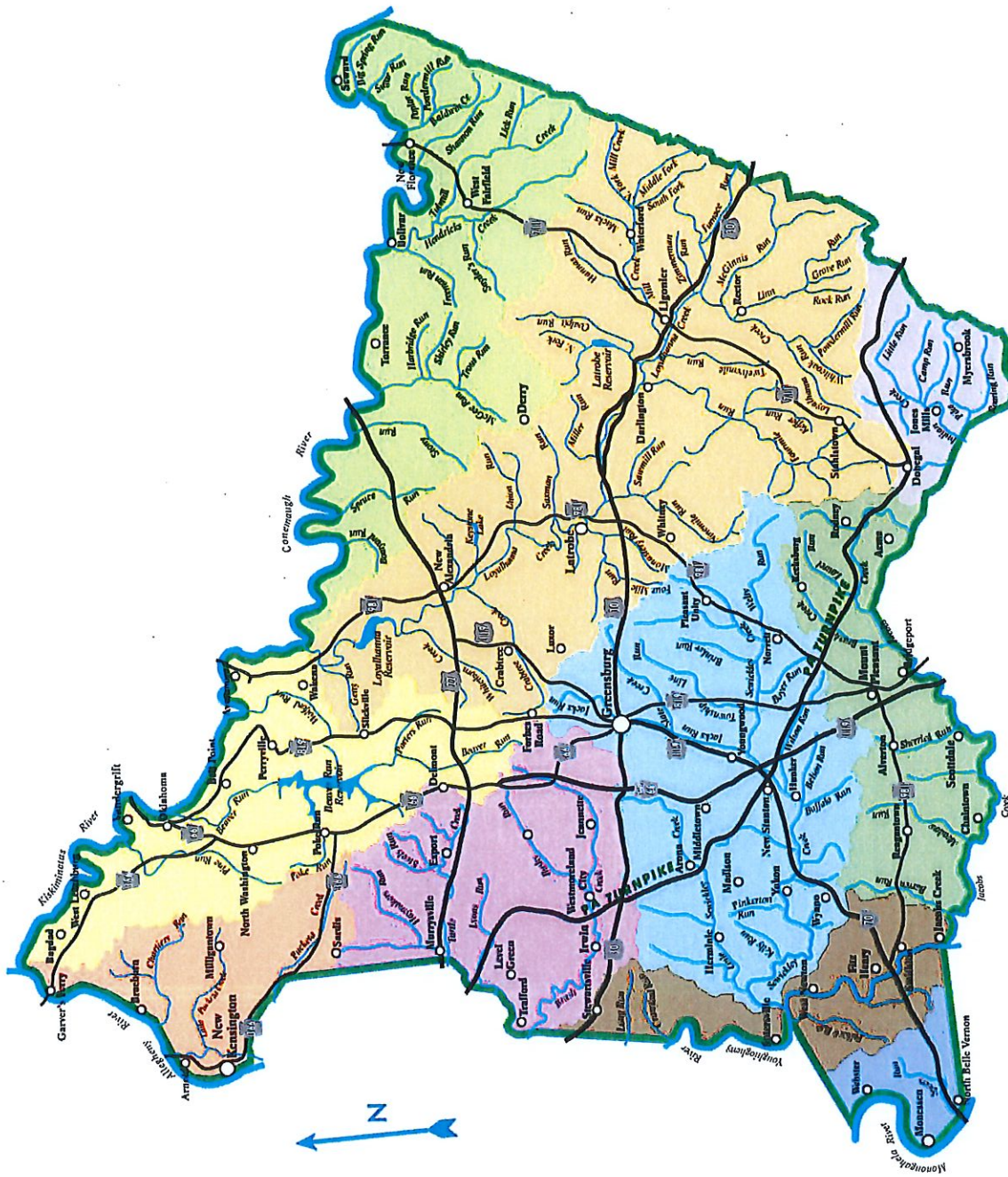
## Water Maze

How water moves in and around the Pucketa/Allegheny River Watershed can be very complex due to the carbonate geology. Lead the water droplet through the maze from where it landed in the City of Latrobe to the Loyahanna Creek.



Did you know that a cistern is a tank for storing rainwater and rain barrels are a type of cistern? Many older homes and farms in the region had cisterns.

**Activity Challenge:** Create your own maze with multiple exits. Is there any shape that works best?



Major Watersheds in Westmoreland County





Pucketa/Allegheny  
River Watershed



Loyalhanna Creek  
Watershed



Kiskiminetas River  
Watershed



Sewickley Creek  
Watershed



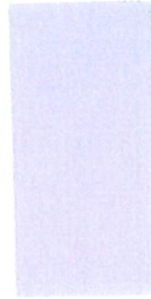
Jacobs Creek  
Watershed



Conemaugh River  
Watershed



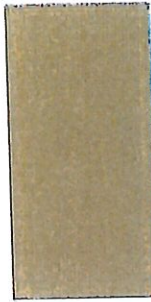
Monongahela River  
Watershed



Indian Creek  
Watershed



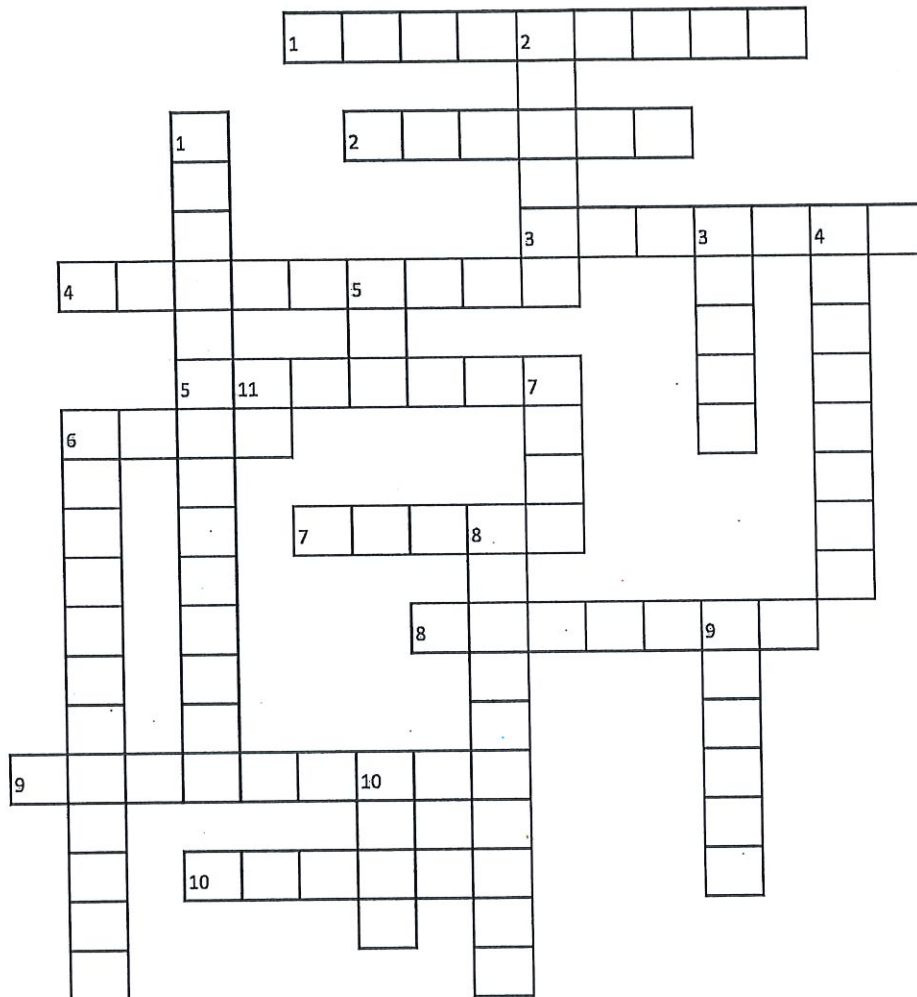
Turtle Creek  
Watershed



Youghiogheny  
River Watershed

## Crossword Puzzle

Everything we do is interconnected and can affect something else. Complete the crossword puzzle below. Hint, many of the words can be found in this activity book.



### Across

- 1) A local University
- 2) A rain \_\_\_\_\_, for storing water
- 3) A Spring Creek Mountain
- 4) A town at the mouth of the watershed
- 5) A practice that helps the environment
- 6) A form of precipitation
- 7) A landscape term describing sinkholes and closed depressions
- 8) A local municipality (2 will work)
- 9) An under drained valley of Spring Creek
- 10) A town at the base of 3 across

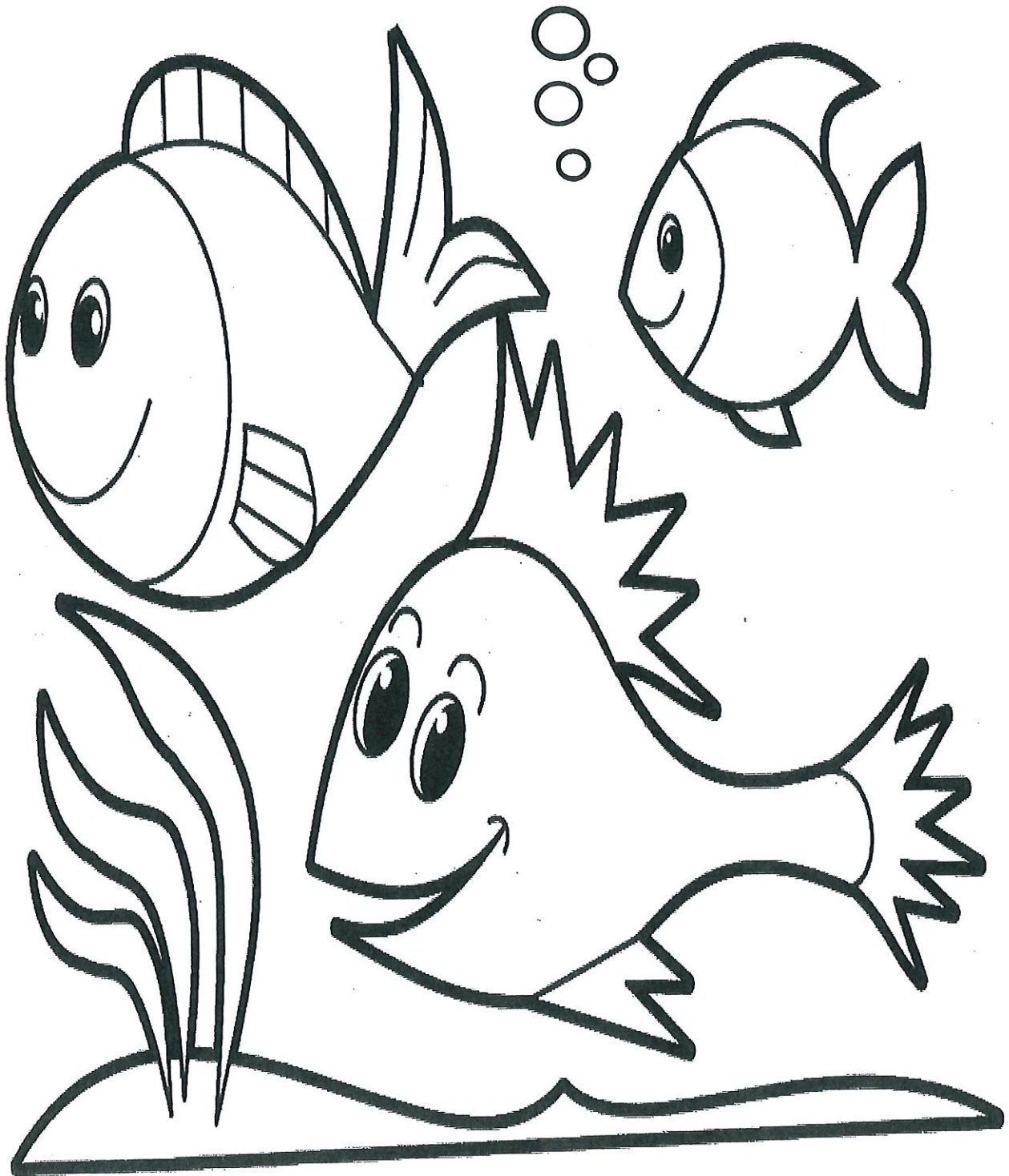
### Down

- 1) A large local wetland
- 2) Where water comes out of the ground
- 3) A Spring Creek fish
- 4) Pollution not from a single spot or "point"
- 5) Something you do at a store
- 6) A Spring Creek tributary
- 7) A compass direction
- 8) What this activity book is about
- 9) Where the community gets its drinking water
- 10) A type of bird found around marshes
- 11) Something you say when you touch something slimy



## Color the Fish

Did you know that Loyalhanna Creek is a world famous trout stream fishery?  
People love to fish here!



Activity Challenge: Draw your own picture of what you think is needed for a healthy watershed.

## Word Search

Pollution in our streams and groundwater can come from many sources (including nonpoint) and not just from big spills. See if you can find the pollutants listed below.



Agriculture

Animals

Cars

Chromium

Copper

Dirt

Driveway

Fertilizer

Garbage

Gasoline

Grass Clippings

Grease

Lead

Motor Oil

Mud

Nitrate

Pesticides

Phosphorous

Salt

Sediment

Sewage

Tar

Trash

Wastewater

Wildlife

Polluted water that goes down the drains in your house goes to a wastewater plant or septic system for treatment.

Activity Challenge: Make your own word search with words you think are important.



## Word Scramble

See if you can unscramble the following words. If you get stuck, look at the hints for suggestions. Another hint is that most of these words can be found somewhere in this activity book. Good Luck!

R I P N G S

K R E C E

H M F N R S I S E A

R E D P S I A A

N R U G A W T R E D O

S T A R W E D H E

E L G E L C O

N P D O

T N P S A L

A T S U E I S L B A N

D A N W E L T

T O P N T A

E R N T I C S

T L A I A C T

E G N R E

O F O R

I R N A

E R G D N A

S W E A T T R W A E

N T A P L

T O U T R

M E T U I L D I N

## Hints

Words on the cover

Great place to fish

Where our fresh water is located

Watershed

Township Millbrook Marsh is located

Stored water on the ground surface

Things that help clean the environment

A good practice that preserves resources

What Millbrook Marsh is

Buffalo Run municipality

Used for storing water

A type of wetland plant

An urban stormwater practice

Stormwater practice that's good for homes

Where polluted water should go

A fish conservation group

Activity Challenge: Create scrambled words you've learned about protecting our water for your friends to solve.

## Final Stream Facts

Perennial Stream - Are streams that flow year round like Loyahanna Creek.

Intermittent Streams - Are streams that flow part of the year or seasonally.

Many tributaries to Loyahanna Creek are intermittent.

Ephemeral Stream - Are streams that only flow in direct response to precipitation.

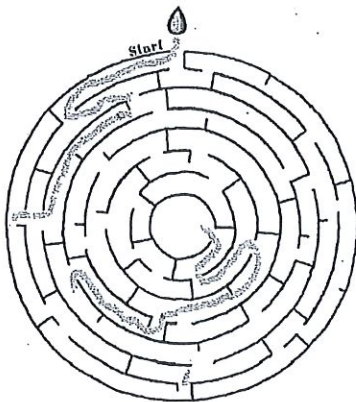
Many of the small drainage ways without any bed or banks in the watershed are some of the most important in protecting the watershed and are highly infiltrative. Help protect our streams no matter what size they are!

## Answer Key

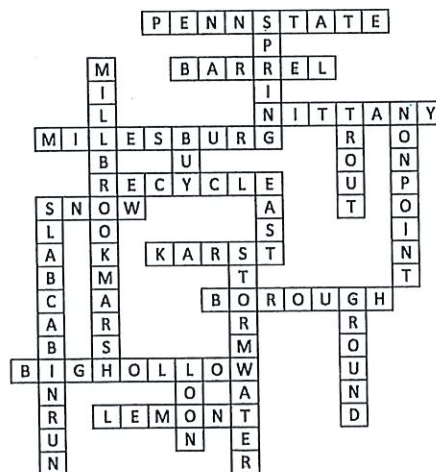
Hidden Message: Millbrook Marsh is a great place to visit and learn about wetlands.

Pollution Picture Search: 1) creek without vegetation, 2) car leaking fluid, 3) man dumping down a drain, 4) woman uses excess nutrients, 5) watering impervious areas like sidewalks, and 6) throwing trash on the street.

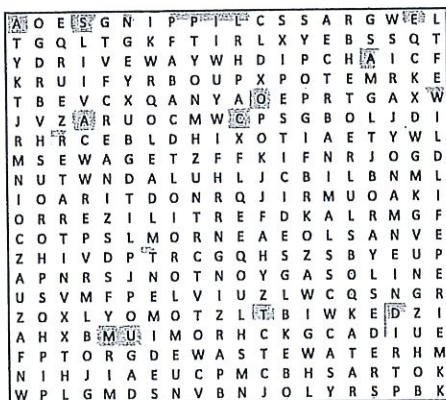
Maze:



Crossword Puzzle:



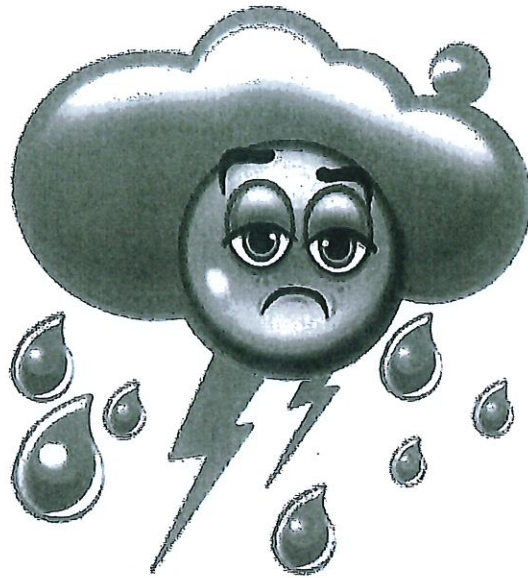
Word Search:



Word Scramble:

Spring Creek  
Fishermans Paradise  
Groundwater  
Watershed  
College  
Pond  
Plants  
Sustainable  
Wetland  
Patton  
Cistern  
Cattail  
Green Roof  
Rain Garden  
Wastewater Plant  
Trout Unlimited





## STORMY

The raincloud  
doesn't like  
getting blamed  
for polluted  
runoff, do your  
part to keep  
stormy happy.



[www.ms4partners.org](http://www.ms4partners.org)

The acronym MS4 is short for "Municipal Separate Storm Sewer System."  
All of the MS4 Partners have a MS4 stormwater permit that helps protect the environment.



# Take the Stormwater Runoff Challenge

## Across

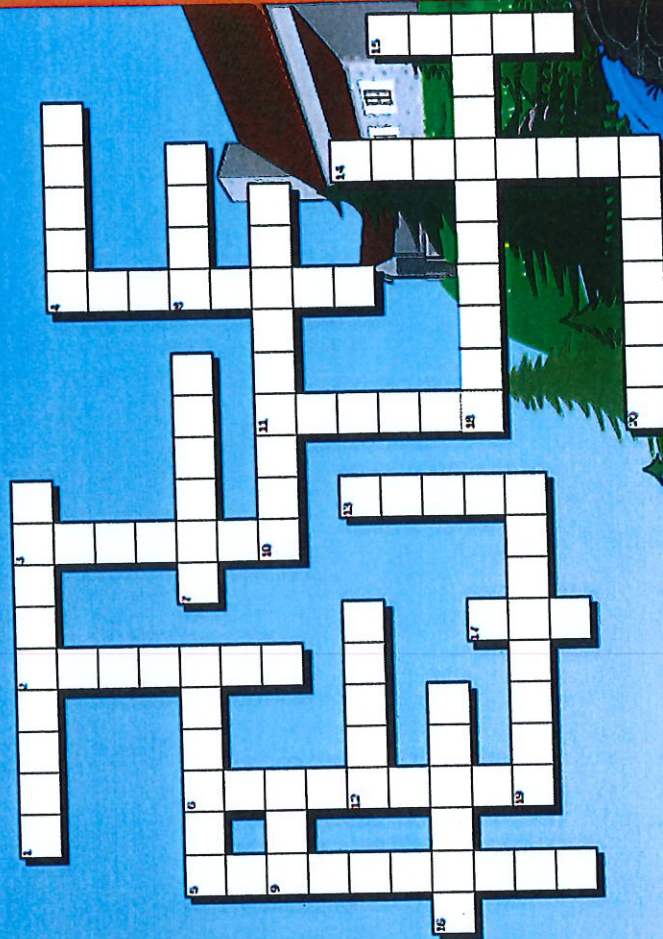
- 1) The area of land that drains into an estuary, lake, stream, or groundwater is known as a \_\_\_\_\_.
- 4) The \_\_\_\_\_ of speeding boats can erode shorelines.
- 5) Maintaining your \_\_\_\_\_ tank will help to prevent bacteria and nutrients from leaking into groundwater and surface waters.
- 7) Wetland plants act like a natural water \_\_\_\_\_, removing harmful pollutants from stormwater runoff.
- 8) Leave your grass clippings on your lawn to reduce the need for commercial fertilizers.
- 9) A single quart of motor oil \_\_\_\_\_ if disposed of improperly, can pollute 2 million gallons of water.
- 10) Fertilizers and animal wastes contain \_\_\_\_\_ that "feed" algae and other aquatic plants harmful to water quality.
- 12) Polluted runoff from both rural and urban sources has a significant impact on water quality.
- 16) Storm \_\_\_\_\_ don't always connect to sewage treatment plants, so runoff can flow directly to rivers, lakes, and coastal waters.
- 18) Follow directions carefully when applying \_\_\_\_\_ on your lawn—more isn't always better.
- 19) Polluted runoff (also called \_\_\_\_\_ source pollution) comes from so many places that it's hard to "pinpoint" a source.
- 20) Yard and vegetable food waste are suitable additions to a \_\_\_\_\_ pile.

## Down

- 2) Don't dump used motor oil into storm drains. \_\_\_\_\_ it!
- 3) \_\_\_\_\_ of soil from barren land can cloud nearby streams.
- 4) \_\_\_\_\_ prevent flooding, improve water quality, and provide habitat for waterfowl, fish, and wildlife.
- 5) Marking "Do Not Dump, Drains to Bay" on a \_\_\_\_\_ is one way to educate people about polluted runoff.
- 6) Excess sediment, nutrients, toxics, and pathogens are all types of runoff \_\_\_\_\_.
- 11) Polluted \_\_\_\_\_ is the nation's #1 water quality problem.
- 13) The cattail is one wetland \_\_\_\_\_ that helps purify polluted runoff.
- 14) Too much \_\_\_\_\_ in water can harm aquatic life.
- 15) Proper crop and animal management on \_\_\_\_\_ helps to control water pollution.
- 17) \_\_\_\_\_ impact development helps control stormwater pollution through conservation approaches and techniques.

## Choices:

compost	nonpoint	sediment
drains	nutrients	septic
erosion	oil	storm drain
farms	plant	urban
fertilizer	pollution	wakes
filter	recycle	watershed
lawn	runoff	wetlands
low		

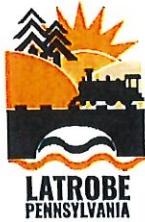


United States  
Environmental Protection  
Agency

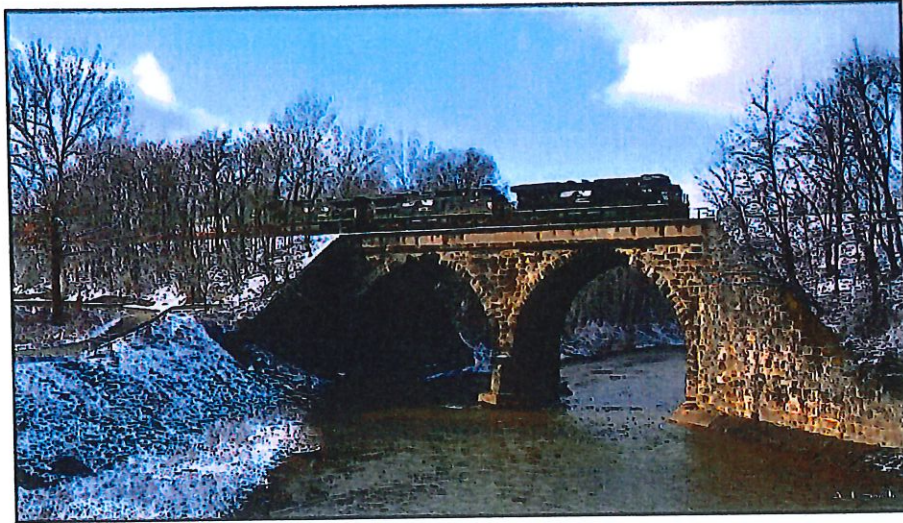
For more information, please visit EPA's  
Polluted Runoff web site at [www.epa.gov/nps](http://www.epa.gov/nps)

Printed with 50% recycled ink on recycled paper





# CITY OF LATROBE



## Effects of Stormwater Runoff

- Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.
- Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.
- Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.
- Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.

## Be the Solution to Runoff Pollution

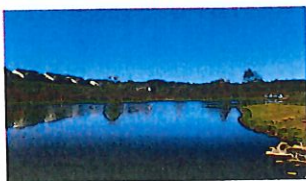
- Wash your car on the lawn (not the driveway), or take your car to a commercial car wash.
- Plant lots of trees, shrubs, and ground cover.
- Use a rain barrel to catch and store water for gardens.
- Redirect down spouts from paved areas to vegetated areas.
- Install gravel trenches along driveways and patios.
- Use porous materials (i.e. wooden planks and bricks) for walkways and patios.
- Grade driveway and walkways to direct water flow toward vegetated areas.
- Pick up your pet wastes.
- Do not dump any oils, fluids or other wastes into storm inlets.
- Follow the directions on application of lawn and garden fertilizers





## Stormwater Management Penn Township's Stormwater Program

In 2003, Penn Township became one of approximately 670 small urban communities within the Commonwealth of Pennsylvania required to have its municipal separate storm sewer system (MS4) regulated under the Pennsylvania Department of Environmental Protection's (PADEP's) National Pollution Discharge Elimination System (NPDES) Phase II permit program for storm water discharges from storm sewer systems within small- to medium-sized communities within urbanized areas as defined by the 2000 U.S. Census.



### What is an MS4?

MS4 is an acronym for a Municipal Separate Storm Sewer System. An MS4 is defined as a collection and conveyance system or a group of collection and conveyance systems owned, operated and maintained by a state, city, township, borough or other public entity that is dedicated solely for the handling of stormwater runoff and discharging it into tributaries, streams, rivers, lakes or other natural or man-made receiving waters within the Commonwealth of Pennsylvania. The MS4 system may include such structures as storm pipes, catch basins, trench drains, roadside swales and cross drains, conveyance channels, detention ponds, infiltration basins, rain gardens or other structures designated for the collection, storage and conveyance of stormwater runoff.



### What is Stormwater Runoff?

Stormwater runoff is water from rainfall, snowmelt, and/or ice melt that flows over ground or impervious surfaces (paved streets, parking lots and rooftops) and does not percolate into the ground. Stormwater runoff may flow directly into natural tributaries, streams, rivers, lakes or other waterways within the Township or it is intercepted and collected by the Township's municipal separate storm sewer system where it is then discharged at discrete locations (outfalls) into streams, rivers, lakes and other natural waterways.





## What is Non-Stormwater Discharge?

Non-stormwater discharge, or sometimes referred to as illicit discharge, is discharge into the Township's MS4 system or natural waterways that is not either rainfall runoff or snowmelt runoff. Non-stormwater discharge includes groundwater exfiltration, mine pool discharge, discharges from chlorinated water sources such as swimming pool drainage, fire hydrants or waterline blow-off valves, sanitary sewer discharges either from sanitary sewer collection systems or on-lot septic systems. Unless specifically listed as an exemption, most non-stormwater discharges are prohibited under the Township's Illicit Discharge and Connection subsection of its Stormwater Management and Land Disturbance Ordinance.

## Why can stormwater runoff be a problem in the Township?

As stormwater runoff flows over lawns, roadways, parking lots, or land disturbed by construction activities, it accumulates chemicals, oils and grease, debris and litter, sediment, heat or other pollutants that contaminate and adversely affect the water quality of our natural waterways. Also, as more impervious cover is constructed or as natural vegetation is cleared and the underlying soil is compacted, more stormwater runoff is generated.

Stormwater runoff pollution can lead to deterioration of the quality of our natural waterways which are used for fishing, swimming, boating, as well as sources of our potable water supply. Increases in stormwater volume due to urbanization within a waterway's watershed can lead to accelerated stream bank erosion and more frequent stream channel flooding which can result in damage to and loss of property as well as premature failure of roadway culverts and bridges.



## What is Penn Township doing about stormwater runoff?

As part of its MS4 permit program, the Township has implemented several actions or measures to ensure the proper handling and discharge of stormwater through its MS4 system. Such measures include the following:

- Provide and distribute educational materials concerning stormwater runoff through various outlets to residents, businesses, contractors and developers within the Township. Several links to additional information are also provided below in the ["Related links and more information"](#) section.
- Through its Illicit Discharge Detection and Elimination program, the Township has developed a Township-wide MS4 outfall map showing all natural waterways and roadways within the Township as well as all outfall locations of its MS4 system into the natural receiving waters. This map will serve as a tool for the Township to identify outfalls that are discharging pollutants as determined by visually screening each outfall during dry-weather periods. Any indications of non-stormwater discharge will prompt the Township to find and identify the source of these pollutants and take actions to eliminate the source(s).
- The Township has adopted an ordinance to prohibit illicit discharges and connections of non-stormwater into its MS4 system and enable the Township the authority to fine individuals caught illegally dumping pollutants into its MS4 system.
- The Township has adopted an ordinance for the regulation of stormwater management of land disturbance activities and the handling of post-construction stormwater runoff. The Township also provides educational material to developers and contractors who come to the Township office for building permit applications. The Township also utilizes the technical support services of the Westmoreland Conservation District to review land disturbance plans to ensure that these plans are sufficient in addressing construction site stormwater and post-construction stormwater and to conduct site inspections to ensure that the sites are being constructed in accordance with the approved plans.

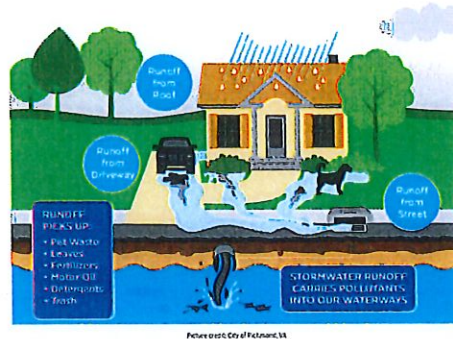
The Township is continuously maintaining and tracking its MS4 system through cleaning, repairing and improving the system to ensure that it is functioning correctly. The Township is also monitoring all other municipal operations such as fleet vehicle maintenance, municipal property maintenance, as well as salt and anti-skid material stockpiling to minimize any detrimental impacts that these operations may have on the MS4 system.



## What can residents of Penn Township do to improve stormwater quality in the Township?

It takes everyone to provide continual improvement to the waterways within Penn Township. We would hope that every person realizes that what is dumped into the Township's MS4 system, ultimately ends up in the streams, rivers and lakes that we all care about. Here are several things each of us can do to help keep our waterways clean.

- Do not dump any chemicals, oils or other automotive fluids, grease, pet waste, grass clippings or other yard debris, fertilizers, etc. into storm inlets, catch basins, roadside ditches or directly into stream channels. This can lead to endangerment of the health of fish and other aquatic life, decrease in recreational opportunities and impairment of drinking water.
- Have your car or truck serviced regularly and eliminate any leaks in your vehicle.
- Do not litter or illegally dump. Always dispose of any trash in its proper location and recycle whenever possible. Car batteries can be turned in at most automotive parts stores. Used motor oil and worn tires can be turned in at most service shops.
- Follow the instructions when applying fertilizers and pesticides to your lawn or garden and never apply these products immediately before a rain storm.
- Notify the Township's Code Enforcement Office at 724-744-2171 ext. 207 if you see or suspect any pollutants or non-stormwater discharges entering into the Township's MS4 system or natural waterways.



## Related Links and more information for the Township's Stormwater Program:

- To learn more about stormwater, go to [stormwaterpa.org](http://stormwaterpa.org) or visit the [Pennsylvania DEP's Stormwater Management Program Web Site](#)
- [Environmental Protection Agency's MS4 Web Site](#)
- [A Homeowner's Guide to Protecting Our Watershed](#) has been developed by the [3 Rivers Wet Weather Demonstration Program](#) for residents of the southwestern Pennsylvania communities.
- [A stormwater educational flyer prepared by PADEP](#)
- [Information on handling discharge from swimming pools](#)
- [Westmoreland Cleanways and Recycling](#) is a non-profit organization to help with litter prevention, recycling, education to benefit our community.
- [Turtle Creek Watershed Association](#) working within the community to restore and protect one of our most valuable assets – Clean Water.
- Contact the Township Manager Alex Graziani at the Township Supervisors office at (724) 744-2171 ext. 207 for more information or if you have any questions.