STORMWATER EDUCATION MODULE

Lesson Plan to accompany EnviroScape model available on loan through the URI Outreach Center. Module created for RI Stormwater Solutions.

Purpose

- Understand the importance of water
- Explain the parts of the water cycle
- Introduce the concepts of watersheds and stormwater pollution
- Illustrate sources of stormwater pollution
- Brainstorm ways to reduce water pollution

Materials

- Water cycle diagram
- Water
- Water pitcher
- EnviroScape model, carrying case and associated pieces
- 3 spray bottles for rainmakers
- Laminated story board depicting the path of storm drains and consequences of pollution
- Pollution sources
    - Chocolate sprinkles – dog poop, cow waste
    - Colored sprinkles or kool aid and water – fertilizers
    - Grass clippings (from lawn)
    - Food coloring and water – pesticides
    - Paper towel – litter
    - Hand soap – car wash soap
    - Instant coffee – motor oil and sewage sludge
    - Sand and kosher salt– road salt and sand
    - Cocoa powder- dirt from erosion

Troubleshooting and Care of Model

- **Slide the open container under the drainage hole in the bottom of the "bay." *Important* Make sure that hole in cover of model <u>does not</u> line up with hole in base. Put the plug in the bay's drainage hole. Do not press too hard on the plug.**
- **Rinse off all pieces, cover and base of model after use.**
- **Please replace all materials that have been used (i.e. sprinkles, soap, etc.).**
- **Please return the model no later than a week after it was borrowed.**
- **Be careful washing the trees. Rinse them delicately.**
- **If necessary, houses, cars, bridges, etc. can be soaked in a mild bleach solution.**
- **Dry all pieces before returning to plastic carrying case.**

Planning

- This module will take approx. 20 minutes minimum and can be extended.
- This lesson is recommended for students in grades 3-5 to meet R.I. Grade Span Expectation: ESS 1 "Water interactions and the water cycle," but can be adapted for K – adult.
- See the "Additional Resources folder" and *Enviroscape: User's Guide* for additional activities, handouts and worksheets.
- We suggest using the model with groups of 15-20 students to allow each student an opportunity for hands-on interaction.
- Inform your town's stormwater manager about your program, which helps the town meet stormwater requirements. A list of R.I. stormwater managers is available at: http://www.ristormwatersolutions.org/docs/LocalCommitteeList07-15-08.pdf

To begin:

- Ask students why water is important.
    - What did you eat for breakfast? Connect what they ate for breakfast to the need for water to grow plants, and for animals and people to drink.
    - Brainstorm about how we depend on water; plants need water to grow, animals eat the plants, and people eat the animals and plants.
- Encourage each student to name one way they use water.

Water Cycle Activity

- Does anyone know how old this water is? (Hold up water pitcher.) The water from the shower you took this morning may have fallen as rain in the Amazon rainforest last year or could have been a drink for a dinosaur 100 million years ago.
- There is no "new" water. The water on Earth moves constantly through a process called the **water cycle** (show water cycle diagram). The water cycle has a few different parts. If we pretend this model (EnviroScape) is Rhode Island, we can demonstrate how the water cycle works.
- Water falls to the earth as **precipitation**. This comes down from the clouds as rain, snow or sleet.
    - Have 3 students demonstrate rainfall by spraying the model. Involve the other students by having them pat their knees to make a sound like a thunderstorm.
- Observe the water **collecting** on the model. The water collects in rivers, lakes, ponds, Narragansett Bay and the ocean.

- There are also a few parts of the water cycle that are not so easy to see. Water turns from liquid to gas in a process called **evaporation**. The water that is in the air is called water vapor. Think about a humid day in the middle of the summer, when you feel sticky. Those are days when there is a lot of water in the air.

- There is a special word to use when plants release water vapor into the air, called **transpiration**.

- When water vapor is then transformed into water droplets in the air (usually in the form of clouds and fog), this is called **condensation**. The mirror getting fogged up in the bathroom after a shower is an example of condensation in action.

- When the precipitation hits the ground, it can follow a few paths:

    - The rain can **infiltrate** into the ground. Once the water infiltrates into the ground, through the soil, it follows different paths, but generally becomes groundwater. This water then flows underground and eventually reaches the rivers and streams.
    - If the rain does not infiltrate, it runs off. Water runs off for a lot of reasons. First, the water can't get into the ground because whatever is on the surface is impermeable. Second, the ground has become saturated and all the puddles and lakes, etc. are full.
    - Ask students if they have seen runoff. Mention water running down roads during a rainstorm.

Human Alterations to the Water Cycle Activity

Explain that people have altered the water cycle once we started building houses and paving roads; thereby creating hard surfaces that make it impossible for the water to soak into the ground.

- In a natural setting, rain will typically fall in a field or forest. Have a student demonstrate this by pouring some of the water from the pitcher onto the soil or grass. Ask them to observe where the water goes. It **infiltrates** into the ground and forms groundwater, replenishing our drinking water sources and streams. The rain water could also be taken up by plants or simply evaporate.

- When people built houses, driveways and streets, they created many more hard (impervious) surfaces than were here naturally. Have a student demonstrate by pouring water onto a paved surface. Where does the water go? It runs off in sheets, flowing over the pavement. Have the students point out all of the impervious surfaces represented on the model.

    - Note: If indoors, have the students imagine rain falling in a forest and ask where it goes. Use a sponge to represent pervious surfaces like the ground and the roads on the model to represent impervious surfaces.

- As this water travels over the roof tops, streets and driveways it mixes with what's there and picks up all sorts of pollution (oil from cars, fertilizer and lawn

clippings, bacteria from animal waste) on its way to the storm drain. We call this **stormwater runoff**.

  - List all types of stormwater pollution:
    - Nutrients
    - Pesticides and fertilizers
    - Suspended sediments
    - Metals and other chemicals
    - Thermal stress

- In addition to adding pollution, the addition of impervious surfaces to the landscape also causes the water to reach waterways much more quickly, resulting in erosion of streambanks, etc.

- Ask students if there are any other ways that people have changed the water cycle. (Wells, sewers, ice caps melting due to global climate change are a few suggestions.)

Know Where it Goes Activity
Use the laminated story board to explain the path of a storm drain.

- Have you ever looked down into the storm drains (gutter) in the street and wondered where the water goes? While many people think that it enters a sewer system, that's almost never the case. Once water enters a storm drain it empties directly into the nearest pond, river or bay without being cleaned.

- This stormwater pollution can create a lot of problems for the environment, and also for people who want to use the water bodies. Have you ever wanted to go to the beach and it was closed? Have you ever wanted to fish in an area that had a fishing ban in place? Sometimes stormwater pollution can even lead to a loss of biodiversity, like the fish kill in Greenwich Bay in 2003.

  - Additional Activity: Pass out articles about recent stormwater-related news events such as beach and shellfishing closures.

- The Clean Water Act was established in 1972 by the federal government to protect water quality. More specifically, section 319 of the CWA attempts to reduce stormwater (or nonpoint source) pollution. State agencies like the Department of Environmental Management and the Department of Transportation work to reduce stormwater pollution, as well as local city and town government. Despite these efforts, stormwater remains the #1 source of water pollution in the United States. So what can we do to make sure our water stays clean enough to enjoy?

What is a Watershed?
Before we look at the sources of water pollution in Rhode Island, we must first look at the way that water travels.

- This model represents a **watershed**, or all of the surrounding land area and waterways (like rivers and streams) that empty into a particular body of water. Our model, specifically, represents the Narragansett Bay watershed.
    - Note: Customize this section for your target watershed area.

- What types of things can you see in our watershed? (Houses, golf course, roads, rivers, etc.)

Stormwater Pollution Sources Activity
We can demonstrate the sources of stormwater pollution that result from our everyday activities, and how that pollution travels through the watershed to the Bay.

- Who here has a dog? Benny (any name) next door has a dog too and when he takes his dog for a walk he never cleans up his poop. Have a student sprinkle the *animal waste* near the dog. There are lots of dogs in this neighborhood (which is why the dog is not to scale) so make sure to sprinkle a lot.

    - Farmer Rob lets his cows wade right into the river near the farm. What do you think they do there? Make sure to add some *animal waste* to the farm area and the river.
    - Benny likes to walk down to the Bay to feed the ducks and geese. With so many geese concentrated in one area, comes more animal waste. Add some *animal waste* to the Bay.

- Can anyone guess why we shouldn't litter? Benny always throws his candy wrappers and soda bottles on the ground. Have a student rip small pieces of *paper towel* and place them on the street.

    - The people driving by in their cars throw their trash right out the window. Have the student throw the *paper towel* in the ditch near the road.

- Who has a lawn at home? Mrs. Pots has a lawn too and she thinks the more fertilizer she uses the, greener her grass will be. But really, when you use too much fertilizer you can damage your plants and the extra fertilizer washes into our water sources. Have a student sprinkle the *fertilizer* on the lawns near the houses.

    - The golf course and the Farmer Rob also use too much fertilizer to grow the grass and crops. Make sure to sprinkle your *fertilizers* on the golf course and farm.

- When Benny mows the lawn, he leaves all of the grass clippings on the street and in the driveway. When it rains these get washed into the storm drain. Have a student grab a small handful of *grass* from the lawns to put on the lawns near the houses.

**Note: With older students, this may be a good time to explain that when grass clippings, leaves and yard fertilizers are added to the Bay, they act as fertilizer and cause algae to bloom. This macroalgae, which looks like large sheets of green seaweed that you sometimes see washed up on the shoreline, then decomposes. As it breaks down, it robs the water of dissolved oxygen, causing marine organisms to leave the area or die. Examples of this are the Fish Kill in 2003 (pictured in the storyboard).

- Who has a garden at home? Mrs. Pots has a flower garden and she uses too many pesticides to get rid of the insects that eat her flowers. Squirt some of the *pesticides* on the lawns near the houses. Note: food coloring stains, so you may want to demonstrate this yourself.
    - The golf course and the farmer also use too many pesticides too. Make sure to sprinkle *pesticides* there as well.
- Does anyone help their family wash their car? Mrs. Pots washes her car in the street and all the suds from the car wash soap and dirt from the car go right into the storm drain. Have a student pump the *car wash soap* onto the car.
- Mrs. Pots also changes her own oil in her car. She is not very environmentally-friendly and she dumps the extra oil directly down the storm drain. Have a student squirt some *oil* into the storm drain and observe that it leads directly to the water body.
    - Wally World has lots of cars in their parking lot with leaking oil and automotive fluid. Have a student squirt some *oil* onto the parking lot near the "factory."
    - These cars are also leaking oil while they drive, so squirt some oil onto the roads as well.
- Do you have a septic system? Some houses are connected to sewers, and others have septic systems buried in their yards. Mrs. Potts' forgot to pump out her septic system and it overflowed. Have a student squirt some *motor oil* on the lawn of a house.
- Have you ever noticed all of the road salt and sand that ends up on the roads after the winter? That is left over from when it was put down to help cars drive on icy roads. This is another source of stormwater pollution. Have a student sprinkle *sand* on all of the roads.
- In order to make all the new houses in town, the builders needed wood. They cut down the forest. When the forest is cut down, the trees are gone, leaving the ground bare. If you have ever walked in a forest, you probably noticed there was very little grass under the trees. Once the trees are gone, the bare soil is open to the rain. Sprinkle *sand* on the deforested site.
    - What about the construction site? There is no vegetation or silt fencing on the construction site to hold soil in place, and therefore it erodes, or

wears away, and is carried by runoff into the water body. Sprinkle *sand* around the construction site.

- The farm area also exhibits erosion near the Bay. Sprinkle *sand* there.

- A big storm is coming! Have three students use the squirt bottles to simulate a rain storm on the model. You may pour additional water onto the model with the pitcher to pick up remaining pollutants.

- Observe with the students as all of the stormwater pollutants travel through the **watershed**, eventually into Narragansett Bay. Ask them where the pollution has travelled.

    - Emphasize that the things we use in this activity are colored for greater visibility. In real life, however, most of these pollutantas are invisible as they are added into the water.

- Ask the students: Would you want to swim or fish in that water? If that was a reservoir would you want to drink it?

Optional: Point Source Pollution Activity

Explain that in addition to stormwater, there are also point sources that contribute to water pollution. These are sources of pollution that flow from pipes; sources that you can point to.

- One example would be if an industrial plant were discharging waste and the water it uses to heat and cool its machines. To demonstrate: squirt sludge mixture in the top of the industrial plant and watch it run from the plant to the river.
    - Mention that since point source pollution is much easier to monitor, there are very strict regulations on this type of discharge.

- Another example is the sewage treatment plant. Squirt sludge mixture into each clarifier tank (the two round indentations in front of the treatment plant). Spray water into clarifier tanks to make them overflow. Sometimes, when there is excessive rainfall, tanks will overflow directly into the nearest water body.

    - Note: The Combined Sewer Overflow Abatement project in Providence, launched in 2008 by the Narragansett Bay Commission is one solution to this issue. Instead of wastewater discharging directly into the Bay during a storm, a large underground pipe will collect the overflow and then return the water to the plant to be treated. It is projected that areas previously closed to shellfishing will be closed 50% less in the upper Bay and 78% less in the lower Bay.

What's the Solution? Activity
What are some ways that we could have prevented our water from becoming polluted? These are all examples of steps that can be taken around the home by the students and/or their parents. Remind the students of specific examples:

- **Never dump anything in the storm drain!**
- Scoop your dog's poop, seal it in a bag and throw it in the trash.
- Don't be a litter bug! Throw you waste in the recycling bin, compost bin or trash can.
- Famer Rob could put a fence around his cows so they can't get in the river. Place the fence in front of the river on the farm. He could also compost his manure.
- Tell your parents to reduce the amount of fertilizers and pesticides used on the lawn and garden. Sweep up any spills.
- Sweep grass clippings back onto the lawn. They'll act as a natural fertilizer! Compost yard waste to keep it out of our waterways and the landfill.
- Tell your parents to wash your car at a commercial car wash (where they must dispose of soapy water properly) or on the lawn.
- Tell your parents to make sure your car isn't leaking oil. If they change their own oil, recycle the used oil.
- Conserve as much water as possible. Don't waste water and use less water in our daily activities like watering the lawn.
- There are also things that are done in your town and by the government to help reduce stormwater pollution, such as using different salt blends on the road that are environmentally friendly and educating people and kids about what they can do to help!

Optional: Best Management Practices Activity
Refer to p. 36 of the *EnviroScape User's Guide* for a demonstration of the best management practices (i.e. restore a wetland, plant vegetation, etc.) that can be implemented to control stormwater pollution.

- Visit the R.I. Low Impact Development Atlas for examples of stormwater reduction practices. http://www.ristormwatersolutions.org/SW_ri_lidtour.html

Conclusion
Now that we've learned about water pollution we can all do our part to make sure we have clean water to swim in, fish in and drink.

BACKGROUND INFORMATION: Water Cycle and Stormwater Pollution Prevention

The Water Cycle (http://ga.water.usgs.gov/edu/watercyclesummary.html):
The water cycle has no starting point. But, we'll begin in the oceans, since that is where most of Earth's water exists. The sun, which drives the water cycle, heats water in the oceans. Some of it evaporates as vapor into the air. Ice and snow can sublimate directly into water vapor. Rising air currents take the vapor up into the atmosphere, along with water from evapotranspiration, which is water transpired from plants and evaporated from the soil. The vapor rises into the air where cooler temperatures cause it to condense into clouds. Air currents move clouds around the globe, cloud particles collide, grow, and fall out of the sky as precipitation. Some precipitation falls as snow and can accumulate as ice caps and glaciers, which can store frozen water for thousands of years. Snowpacks in warmer climates often thaw and melt when spring arrives, and the melted water flows overland as snowmelt. Most precipitation falls back into the oceans or onto land, where, due to gravity, the precipitation flows over the ground as surface runoff. A portion of runoff enters rivers in valleys in the landscape, with streamflow moving water towards the oceans. Runoff, and ground-water seepage, accumulate and are stored as freshwater in lakes. Not all runoff flows into rivers, though. Much of it soaks into the ground as infiltration. Some water infiltrates deep into the ground and replenishes aquifers (saturated subsurface rock), which store huge amounts of freshwater for long periods of time. Some infiltration stays close to the land surface and can seep back into surface-water bodies (and the ocean) as ground-water discharge, and some ground water finds openings in the land surface and emerges as freshwater springs. Over time, though, all of this water keeps moving, some to reenter the ocean, where the water cycle "ends" ... oops - I mean, where it "begins."

Processes of the Water Cycle (www.usgs.gov)**:**

Precipitation is water released from clouds in the form of rain, freezing rain, sleet, snow, or hail. It is the primary connection in the water cycle that provides for the delivery of atmospheric water to the Earth. Most precipitation falls as rain.

Collection (storage): The water cycle sounds like it is describing how water moves above, on, and through the Earth ... and it does. But, in fact, much more water is "in storage" for long periods of time than is actually moving through the cycle. The storehouses for the vast majority of all water on Earth are the oceans.

Infiltration: The downward movement of water from the land surface into soil or porous rock

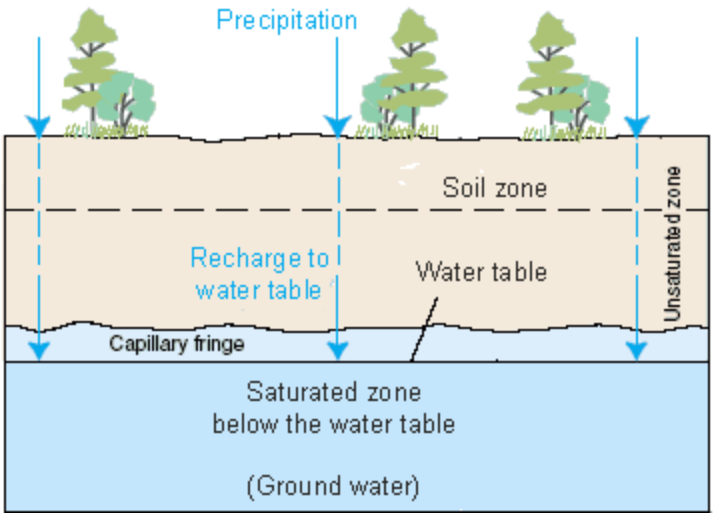
Evaporation is the process by which water changes from a liquid to a gas or vapor. Evaporation is the primary pathway that water moves from the liquid state back into the water cycle as atmospheric water vapor. Studies have shown that the oceans, seas, lakes, and rivers provide nearly 90 percent of the moisture in our atmosphere via evaporation, with the remaining 10 percent being contributed by plant transpiration.

Transpiration: The release of water from plant leaves

Transpiration is the process by which moisture is carried through plants from roots to small pores on the underside of leaves, where it changes to vapor and is released to the atmosphere. Transpiration is essentially evaporation of water from plant leaves. It is estimated that about 10 percent of the moisture found in the atmosphere is released by plants through transpiration.

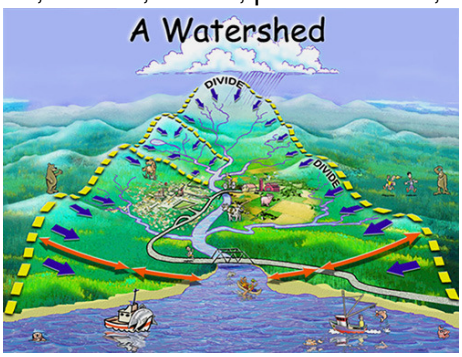
Condensation is the process in which water vapor in the air is changed into liquid water. Condensation is crucial to the water cycle because it is responsible for the formation of clouds. These clouds may produce precipitation, which is the primary route for water to return to the Earth's surface within the water cycle. Condensation is the opposite of evaporation.

Groundwater: Large amounts of water are stored in the ground. The water is still moving, possibly very slowly, and it is a part of the water cycle. Most of the water in the ground comes from precipitation that infiltrates downward from the land surface. The upper layer of the soil is the unsaturated zone, where water is present in varying amounts that change over time, but does not saturate the soil. Below this layer is the saturated zone, where all of the pores, cracks, and spaces between rock particles are saturated with water. The term ground water is used to describe this area. Another term for ground water is "aquifer," although this term is usually used to describe water-bearing formations capable of yielding enough water to supply peoples' uses. Aquifers are a huge storehouse of Earth's water and people all over the world depend on ground water in their daily lives.



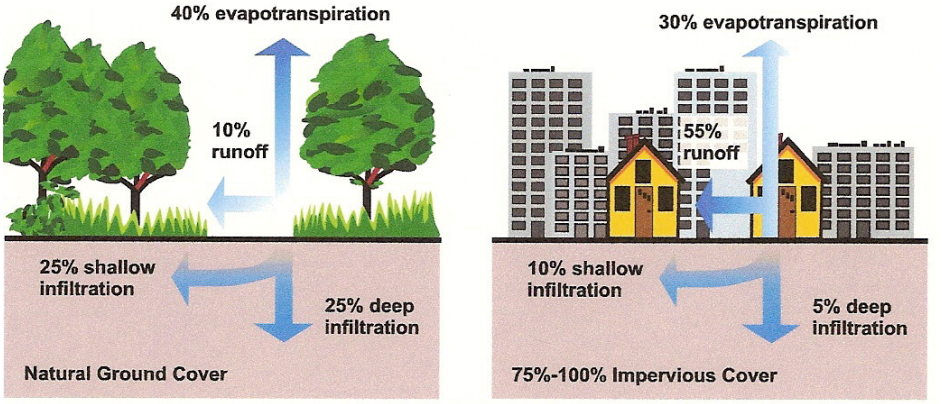
What is a Watershed?

A watershed, or drainage basin, is the area of land and all waterways that drain into a particular body of water. A water body is any river, lake, stream, ocean, pond or basin; water bodies receive stormwater runoff from a watershed.



Watersheds come in all shapes and sizes. They can be as small as a footprint or large enough to encompass multiple states. Everyone lives in a watershed, and most are interconnected, eventually draining to the ultimate water bodies – the bays or oceans. There are about 14 different watersheds in Rhode Island, each named for the body of water that they drain into (i.e. Narragansett Bay watershed).

Human Alterations to the Water Cycle (Northern RI Conservation District)
Stormwater is a problem because of 2 things: Increased runoff (due to increased development) and increased pollution loading (also due to increased development). Below are graphics that display how urbanization alters the natural water cycle.



The Problem with Increased Runoff
In a natural environment, like a forest or wetland, the ground is very porous. The topography varies with high and low areas. Precipitation falls and either infiltrates into the soil quickly, or becomes trapped in low areas. The portion of precipitation that is trapped in the low spots is then allowed time to soak into the ground slowly. In this setting, runoff moves slowly, which allows further infiltration, as well as a cleaning process. Although soil is also called dirt, the dirt has chemical compositions that pull various pollutants out of the water as it moves down through the soil. So, the dirt ends up significantly cleaning the water before it reaches the groundwater; which is why infiltration is so important.

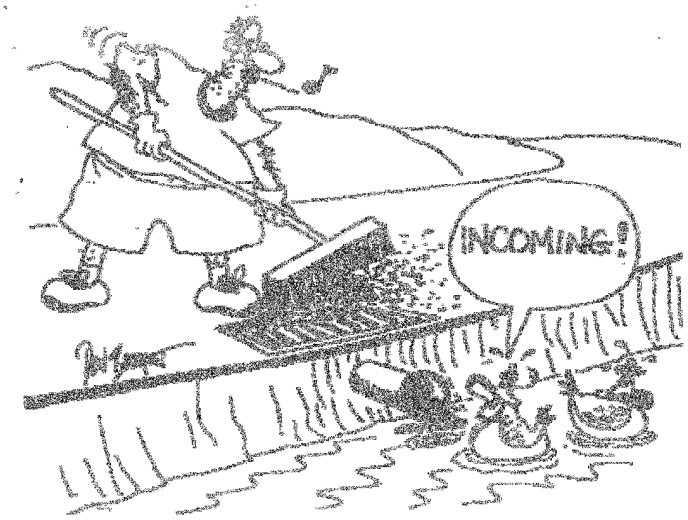
In developed areas, where there are substantial amounts of impervious areas, the precipitation remains above the surface. The graphic above shows a city scene, where 75%-100% of the land area is impenetrable. You can see that there is much more runoff in this setting than with natural ground cover. Although this may be extreme and not exactly how most areas in Rhode Island look, as the second most densely populated state, our towns do have developed areas—village centers, roads, parking lots, roofs. In these areas, rain is not allowed to soak into the ground. As the precipitation remains on top of surfaces, it begins to move rapidly and in unnaturally large amounts—creating increased runoff. In addition to increased amounts of runoff, stormwater from developed areas gains so much speed as it runs off surfaces through storm drains that it carries a severe erosion power. Groundwater recharge does not fully occur. Increased water temperature from this runoff is detrimental to the health and reproduction of fish. And the lack of infiltration causes increased pollution in water bodies

Stormwater Pollution (www.ristormwatersolutions.org):

Have you ever noticed water flowing down the street when it rains? Have you ever wondered where the water flows to? Have you thought about what's in the water? When it rains onto a forest or a field, some of that rain is absorbed by the ground, replenishing groundwater that is used by many for drinking water. Some of the rain is taken up by plants, and some of it simply evaporates. But very little of the rain flows over the ground. In a more developed setting, such as our cities and towns, rain falls onto pavement, or

other surfaces such as roofs, sidewalks, parking lots, and driveways that don't allow the water to be absorbed by the ground. The water that you see flowing down the street is called stormwater runoff

It's Not Just Rain?
Why Is It A Problem?
When stormwater hits the pavement, it picks up and mixes with what's there. That might include:
• oil, grease, and automotive fluids;
• fertilizer and pesticides from gardens and homes;
• bacteria from pet waste and improperly maintained septic systems;
• soil from poor construction site management;
• sand from wintertime snow removal;
• soap from car washing;
• debris and litter.



Storm drains lead directly to local waters. No filters. No treatment. Pollutants that enter storm drains wind up in the water we drink, fish, and swim. Many people assume that stormwater flows down storm drains and then to a treatment facility. Unfortunately, that is almost never the case. Stormwater either flows directly into local waters or down storm drains, which channel it into local water bodies. **The polluted runoff closes swimming beaches and fishing grounds, threatens water resources, harms natural areas, and contributes to flooding.**

How Water Pollution Occurs (*EnviroScape User's Guide*)

The invisible components of runoff may be damaging such as:

Nutrients, toxic substances and bacteria.

- **Let's take Nutrients first**

Though nutrients are essential to life, excessive nutrients can adversely affect the fish and plant life in the water. Nutrients that are found in some fertilizers, for example, nitrogen and phosphorous, can speed up the aging process of a lake (eutrophication) by causing sudden and excessive growth of algae and aquatic plants. Excessive growth of algae and plants can crowd the water body, suffocating plant life

And when these plants die and decay, they deplete the oxygen needed by the fish and other aquatic life. This lack of oxygen can kill the fish.

So, excess nutrients are potential pollutants; not the nutrients themselves.

*Note: In salt water like Narragansett Bay excess nutrients cause the growth of macroalgae, the large sheets of green seaweed that sometimes washes up on the

shoreline. As it decomposes, the aglae robs the water of dissolved oxygen, resulting in loss of biodiversity like the 2003 Grenwich Bay Fish Kill.

☞ **Then there's Bacteria**

Some bacteria are helpful, but certain species can cause diseases in humans who come in contact with them. Bacteria can also infect shellfish, making them inedible. Therefore, when a person eats raw oysters or fish that are infected with this bacteria, he or she could become ill. Salmonella is one example of fish poisoning. Bacteria can also harm other aquatic organisms. Health risks in water can close or restrict the use of shellfish beds and beach areas.

☞ **And Toxic Substances are also found in the runoff**

Toxins are poisonous substances including metal compounds and chemicals. They are found in substances such as household cleaners and pesticides. Other sources of toxic substances are chemicals such as sulfuric acid, nitric acid and carbonic acid emitted from burning fossil fuels such as coal. These chemicals fall to the earth as acid rain. Too many toxic substances in the water can cause allergic reactions and illness in humans who contact the water. Fish can also ingest these toxics, which can ultimately affect the food chain by affecting what other animals and humans eat.

☞ **Let's visit the cows for a moment**

When cows walk in the streams and lakes they stir up sediment, which is called turbidity. Turbidity creates a cloudy effect that decreases the light so plants can't get enough sunlight for growth; they die, depleting the oxygen level needed for fish to survive. Cows and other domestic animals can also enter the stream and deposit their waste in the waterbody. The action raises the nutrient and bacteria levels in the water. The animals can also cause erosion of the bank by trampling the vegetation.

☞ **Here are some examples of how we pollute at home**

- **Improper or careless use and disposal of household chemicals, oils, cleaning solutions.** Many of us unknowingly use toxic chemicals on yards, cars boats, lawn furniture and houses. One rainstorm can carry chemicals directly to a river, lake or bay where they can be harmful to all forms of wildlife.
- **Excessive use of water**. The water you use washing your car or watering your lawn adds to the runoff of water off the land.
- **Failure to maintain septic systems and overuse of systems.** Too often, homeowners with septic tanks forget that whatever goes down the drain or toilet ultimately finds its way into the soil (and groundwater) or remains in the septic tank until it is pumped out. A malfunctioning septic system may not be effective in removing disease-causing bacteria, some toxic chemicals or nutrients. What happens? The drinking water can become contaminated. Nutrients can fuel the growth of plant life and algae in lakes, rivers and estuaries, limiting recreation and affecting aquatic life.
- **Even pet wastes must be disposed of properly**. Pet wastes left on lawns, sidewalks or in street gutters can be washed into surface waters, causing significant bacterial contamination and boosting the nutrient level. It's not one, two or even three dogs that pose the greatest threat – it's the total number of pets, the accumulation of all pet waste, that we're concerned about.