

Your Opinion Counts!

Mail your completed survey and receive a FREE packet of native seeds!
Make sure to include your return address. Thank you!

1. Does your school currently implement any of the practices listed in the brochure? Yes No
If so, which ones? (Please list here)

2. Do you think the practices in this booklet could be implemented on your school's campus? Yes No
If so, which ones do you think would be best? (Please list here.)

3. Do you think this information would fit in with your current curriculum? Yes No
If so, what grade do you teach? _____

4. What kind of incentives/support would you need to pursue stormwater solutions on your campus? (Please list here.)

5. Would you be interested in attending a workshop to learn more about how you could implement the techniques listed in this booklet? Yes No
If so, please provide your name and telephone number or e-mail address here:

Thank You for Participating!

You can make a difference!



A Guide to Stormwater Management on School Campuses



Tools that your school can use to improve the health of your watershed.





The **Schuylkill Action Network (SAN)** is a voluntary network dedicated to improving the water resources of the Schuylkill River Watershed. SAN works in partnership with state agencies, local watershed organizations and land conservation organizations, businesses, academics, water suppliers, local and governments, regional agencies, and the federal government to transcend regulatory and jurisdictional boundaries in the strategic implementation of protection measures. The SAN seeks to achieve this mission through enhanced communication and collaboration.



Philadelphia Water Department (PWD) supplies drinking water, wastewater and storm-water treatment services to the City and many suburban communities. The Department actively promotes good stewardship for the Delaware Estuary through its day-to-day drinking water and wastewater operations, its nationally recognized Office of Watershed's programs, and its award winning public education programs. In addition, PWD practices conservation landscaping at many of its facilities and works to share the lessons learned from these projects with partnerships across the region.



Partnership for the Delaware Estuary — A National Estuary Program

The Partnership is a non-profit organization that was established in 1996 to take a leadership role in promoting and coordinating the protection and enhancement of the Delaware Estuary. The Estuary, where fresh water and salt water mix, also known as the tidal portion of the Delaware River, includes parts of Pennsylvania, New Jersey and Delaware. The Delaware Estuary is one of twenty-eight Congressionally designated National Estuary Programs in the country working to improve the environmental health of these important ecosystems. The Partnership works to advance the science of the Estuary and to increase the awareness and understanding of the region's most important natural, recreational, cultural, and economic resource.

For more information about how you can further incorporate stormwater management into your curriculum, please visit www.DelawareEstuary.org.

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- University of Delaware Sea Grant Program
- Delaware Nature Society
- Delaware Department of Transportation
- Philadelphia Water Department

This brochure was brought to you by:



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Please be sure to include your mailing address in order to receive your free seed packet!

PLEASE PLACE STAMP HERE

Partnership for the Delaware Estuary
One Riverwalk Plaza
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Wilmington, DE 19801

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Separate from booklet along perforation, fold in half, moisten glue strip, and then mail.



Students help plant a native garden at an area school.

A Guide to Stormwater Management on School Campuses

Why are there still waterways that are too dirty for swimming, fishing or drinking? Why are native species of plants and animals disappearing from many rivers, lakes, and coastal waters?

Since passage of the Clean Water Act in 1977, the United States has made tremendous advances to clean up the aquatic environment by controlling pollution from industries and sewage treatment plants. Unfortunately, we are not doing enough to control pollution from nonpoint sources. Today, nonpoint source pollution (NPS) remains the Nation's largest source of water quality problems. It's the main reason that approximately 40 percent of our surveyed rivers, lakes, and estuaries are not clean enough to meet basic uses such as fishing or swimming.

NPS pollution occurs when rainfall, snowmelt, or water used for irrigation runs over land or through the ground, picking up pollutants, and depositing them into rivers, lakes, and coastal waters or introducing them into groundwater. Imagine the path taken by a drop of rain from the time it hits the ground to when it reaches a river, ground water, or the ocean. Any pollutant it picks up along its journey can become part of the NPS problem. NPS pollution also results in adverse changes to the vegetation, shape, and flow of streams and other aquatic systems.

NPS pollution is so widespread because it can occur any time activities disturb the land or water. Agriculture, silviculture, grazing, septic systems, recreational boating, urban runoff, construction, physical changes to stream channels, and habitat degradation are potential sources of NPS pollution. Careless or uninformed homeowners and facility managers also contribute to NPS pollution problems.

In order to achieve the goal of clean water, schools, businesses, local residents, homeowner associations, and municipalities must work together to manage stormwater in a manner that will restore our watersheds. We can all play a part in taking an active role in converting our streams, creeks and surrounding green spaces into healthy systems that people, along with native fish and wildlife, can use as amenities, sanctuaries and habitats.

This guide provides schools with steps and actions for improving stormwater management on campuses and in the surrounding community. These stormwater management projects will not only help protect our critical drinking water sources, but they will provide “green space”, restore our waterways, and improve quality of life for all residents. They can also provide your school with new opportunities for using your campus as an outdoor classroom.



A container garden is easy to maintain.

Planters (Container Gardens)

Planters reduce impervious cover (impenetrable surfaces, such as concrete sidewalks, parking lots, etc.) by retaining stormwater runoff rather than allowing it to directly drain into nearby sewers and creeks. Planters offer “green space” in tightly confined urban areas by providing a soil/plant mixture suitable for stormwater capture and treatment. They can be used on sidewalks, parking areas, court yards, rooftops, and other impervious areas.

Contained Planters

Contained planters can be used for planting trees, shrubs, and ground cover. Planters are either prefabricated or permanently constructed and come in a variety of shapes and sizes. Planters can range from large concrete containers to potted plants arranged on an impervious surface such as a roof garden. Planters can be placed on impervious surfaces like sidewalks, back yards, rooftops, or along the perimeter of a building in order to catch stormwater runoff from the roof. Contained planters drain through holes in their base or by an overflow structure so the plants do not drown during larger rain events. Plants should be hardy and self-sustaining native species with little need for fertilizers or pesticides. (See chart on page 14 for more information on native plant species.)

Planters can be made of stone, concrete, brick, wood, or any other suitable material. However, treated wood should be avoided as it can leach toxic chemicals. Planters can be permanently fixed in place or easily moved around to enable you to change the look of the planter garden that you have created. Numerous manufactured pots and planters are available at your local hardware or landscaping store. You can create a “do-it-yourself” planter or use recycled items to create planters. Homemade planters can be constructed by stacking and fastening wood beams or laying and mortaring stones.



A container garden helps to filter stormwater runoff.

Creating a Contained Planter

- Purchase planters at a hardware or landscaping store, if you are not building your own planter box.
- Drill holes in the bottom of the planter if they are not already there.
- Fill the planter with soil and leave a 12 inch area from the soil to the top of the planter.
- Choose native drought and saturation tolerant plants and trees for your planter.
- Occasionally turn or till the soil to improve infiltration.

Rain Barrels

A rain barrel collects and stores stormwater runoff from rooftops. By temporarily holding runoff during a rain event a rain barrel prevents water from running directly into storm drains, rivers, or streams where it can cause erosion and pollute drinking water. In areas where there is a combined sewer system, like the City of Philadelphia, temporarily holding this runoff can also help add capacity to the sewer system and reduce sewer overflows to creeks and rivers. Collected rain water can also be reused for irrigation to water lawns, gardens, window boxes or street trees. Rain barrels can be purchased online or they can be built. Whether you buy or build a rain barrel, the most important thing to remember is that they are only effective as a stormwater management tool when the stored water is emptied in between storms, thereby making room in the barrel for the next storm.

Rain barrels can catch extra runoff and help reduce potential sewer overflows.





Rain Gardens

A rain garden uses native plants and landscaping to soak up rain water (stormwater) that flows from downspouts or simply flows over land during a rain event. The center of the rain garden holds several inches of water, allowing the stormwater to slowly seep into the ground instead of flowing directly from a roof, yard or parking area into the nearest storm drain, creek or river.

There are many benefits to rain gardens. A rain garden allows 30% more water to seep into the ground than a conventional lawn (South River Federation & Center for Watershed Protection, 2002). This seepage increase helps replenish the groundwater supply (especially important during a drought), and also helps hold back stormwater from contributing to stormwater and sewage overflows into nearby creeks and rivers. A rain garden also reduces the amount of water pollution that would otherwise eventually reach the streams and rivers through stormwater runoff. Scientific studies have demonstrated that the first inch of rainfall is responsible for the bulk of the pollutants in stormwater runoff. A rain garden is designed to temporarily hold back this one-inch of rainfall and to slowly filter out many of the common pollutants in the water, such as oil, grease, and animal waste, that would otherwise flow into waterways via the nearest stormdrain or stormwater runoff. The native plants used in rain gardens require less water and less fertilizer than conventional lawns. They also require less maintenance and provide habitat for birds and other wildlife. (See chart on page 14 for more information on native plant species.)

Instructions for Creating a Rain Garden

Step 1. Conduct an Infiltration Test:

It is important to know how your soil infiltrates water before building a dry well, rain garden or any other stormwater management structure. An infiltration test will help you determine if the soil on your property is suitable for such structures by measuring how quickly water can soak into and flow through the soil. It also makes a good outdoor classroom activity. (For instructions on how to conduct an infiltration test, visit www.DelawareEstuary.org.)

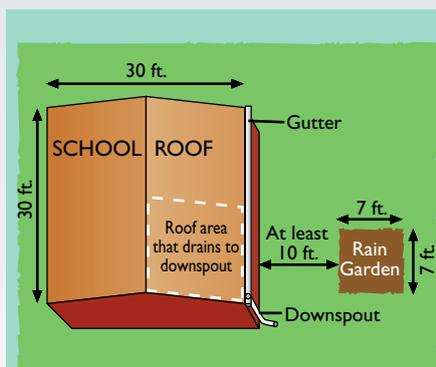
Step 2. Size and Locate your Rain Garden:

■ First, measure the footprint of your building by getting the area (length x width) of your building and then determine how much of your rooftop area drains to the downspout you are disconnecting to your garden (for gutters with a downspout at each end, assume that half the water goes to each downspout). Refer to the sizing example below for guidance. The surface area of your rain garden should be between 20% and 30% of the roof area that will drain into the rain garden.

■ Locate the garden at least 10 feet away from the building and create the garden in the lowest point of this section of the lawn, maintaining a minimum 1% slope from the building down to the rain garden. If you have an existing lawn drain located in this section of the yard, you can build the rain garden around the drain. The bottom of the rain garden should be a few inches lower than the drain, which should be in the middle of the rain garden so that water that overflows from the garden will be conveyed safely to the lawn drain. Make sure the drain is in a suitable location in relation to the rain garden in order to effectively manage the garden's overflow.

■ When finding the right spot for your rain garden, keep in mind that you will want to create a shallow ditch or swale that carries the stormwater runoff from the disconnected downspout to the rain garden. The swale will help slow the runoff before it reaches the rain garden.

■ Finally, define the boundary of the garden by using rope.



SIZING EXAMPLE

If the area of the school building is 30 ft. x 30 ft. and 1/4 of this area drains into one downspout:

$$15 \text{ ft.} \times 15 \text{ ft.} = 225 \text{ ft.}^2$$

$$20\% \text{ of } 225 \text{ ft.}^2 = 45 \text{ ft.}^2$$

$$30\% \text{ of } 225 \text{ ft.}^2 = 67.5 \text{ ft.}^2$$

The rain garden area should be between 45 and 67.5 square feet, depending upon the soil type (use 20% for sandier soils).



Step 3. Dig the Rain Garden:

- To enable the rain garden to hold several inches of water during a storm, you'll have to dig a hole 3 to 4 inches deep across the entire surface of the rain garden. If the soil lacks organic material, you can improve it by digging the hole 5 to 6 inches deep and adding 2 to 3 inches of humus or other organic material. Make sure the bottom is level, but gently slopes from the bottom to the ground level around the edges to avoid erosion.
- Next, test how the garden will hold water during a storm by letting water flow into the rain garden from a hose placed at the downspout. Based on this test, make any necessary adjustments (e.g., create a berm on the lower side of the garden using the soil that was excavated).

Step 4. Add Plants to the Rain Garden:

- Choose native plants that won't require much watering, but make sure they can withstand wet soils for up to 24 hours. (See chart on page 14 for more information on native plant species.)
- Also, take into account how much sun your garden receives and choose plants accordingly.
- It's often helpful to draw out a planting plan before you start. Once you have a plan, mark where the planting area will be by using string.

Step 5. Maintenance:

- After planting, weeding may be required until the plants become established. You may also need to periodically prune some of the plants to let others grow. In the winter, leave dead or dormant plants standing and cut them back in the spring.
- Your garden may need a bit more maintenance than a lawn in the beginning, but in the long run it will be easier to care for and provide many other benefits!

Tree Planting

Trees provide a host of benefits to local communities beyond the beauty they add to the landscape. They reduce heat by cooling and shading buildings during the hot summer months, lowering the amount of energy required to cool a building, which will result in lower electric bills. Mature trees can actually cut summer cooling costs by 40% and tree-lined streets can even decrease local temperatures. Trees naturally clean the air of pollutants and create a neighborhood noise buffer. Trees also improve stormwater management, reducing the amount of polluted stormwater that normally would go directly into storm drains, rivers, and streams. Tree roots also allow rainwater to filter back into the soil, helping to recharge groundwater.

Planting a Tree

The ease of tree-planting can range widely depending upon site characteristics, tree size and species. The most common mistake when planting a tree is digging a hole that is both too deep and too narrow. Too deep and the roots don't have access to sufficient oxygen to ensure proper growth. Too narrow and the root structure can't expand sufficiently to nourish and properly anchor the tree.

As a general rule, trees should be transplanted no deeper than the soil in which they were originally grown. The width of the hole should be at least 3 times the diameter of the root ball or container or the spread of the roots in the case of bare root trees. This will provide the tree with enough worked earth for its root structure to establish itself.

(See chart on next page for more information on native tree species.)

The Pennsylvania Horticultural Society's Tree Tenders Program offers a basic training course designed to teach general tree-care skills to community groups and individuals in Pennsylvania. If you are interested in the course or a free copy of the *Tree Tenders Handbook* or *Mini-Guide to Tree Planting*, visit www.pennsylvaniahorticulturalsociety.org/phlgreen/tree-training.html.

Before getting started, you may also want to learn more about the *TreeVitalize* rebate program whereby you could be eligible to receive up to a \$25 rebate on the purchase of a tree. For more information, visit www.pennsylvaniahorticulturalsociety.org/phlgreen/TVrebate.html and www.treevitalize.net.

*Trees being planted
at a local school.*

Native Street Trees Chart

Small to Medium Trees (mature height under 30')

American hornbeam – *Carpinus caroliniana*

American red bud – *Cercis canadensis*

Common chokecherry – *Prunus virginiana*

Flowering dogwood – *Cornus florida*

Fringetree – *Chionanthus virginicus* (tree form)

Serviceberry – *Amelanchier x grandiflora*

Thornless cockspur hawthorn – *Crataegus crusgalli* var. *inermis*

Washington hawthorn – *Crataegus phaenopyrum* (tree form)

Large Trees (mature height over 45')

Autumn flame red maple – *Acer rubrum* “Autumn Flame”

Autumn purple white ash – *Fraxinus americana* “Autumn Purple”

Green ash – *Fraxinus pennsylvanica* “Marshall’s Seedless”

Green mountain sugar maple – *Acer saccharum* “Green Mountain”

Patmore ash – *Fraxinus pennsylvanica* “Patmore”

Red oak – *Quercus rubra*

Red sunset red maple – *Acer rubrum* “Red Sunset”

Shingle oak – *Quercus imbricaria*

Summit ash – *Fraxinus pennsylvanica* “Summit”

NOTES:

Every tree selected for this list has its own benefits and/or limitations when growing under urban conditions. The trees listed here are all tolerant of harsh urban conditions.

Matching the best suited tree for the planting site will enhance the characteristics of a particular tree.



Campus Streams

Establishing a streamside (riparian) buffer — a vegetated area along the edge of the stream — can help protect the stream from pollution and erosion. These buffer zones absorb pollutants and nutrients that would otherwise end up running directly into the stream. Plant material slows runoff and filters out pollutants and sediments. Well-planted streamside buffers are also a great low-cost way to control erosion. While plants slow runoff, filter pollutants, and help control erosion, trees cast shade on the stream, cooling the water, reducing algae growth and improving fish habitat. A buffer with trees and shrubs also provides habitat for birds, butterflies and other creatures. Trees and plants that grow in the buffer play a critical role in keeping streams healthy.

Caring for Your Stream

- Begin with a “no mow” or “no graze” zone along your stream bank. Make your buffer as wide as possible, try for at least 10 ft. (A buffer 10 feet wide will provide some stormwater control and water quality benefits, but an even wider buffer — up to 100 feet wide or more — is better for maximizing water quality and wildlife habitat benefits.)
- Plant native trees and shrubs in your buffer zone. They provide many long-lasting benefits and can be quite inexpensive to establish and maintain. Using shrubs will give your buffer a quick start; many reach full size in just a few years. (See chart on next page for more information on native plant species.) Use hay bales or a special silt fence to prevent soil from washing off your site and into the stream while establishing your stream buffer.
- Outside the buffer zone, set your mower blades at least three inches high. Taller grass slows runoff, resists drought and requires less fertilizer.
- Cover piles of soil with tarps to protect them from rain.
- Contact your local PA Department of Environmental Protection office or County Conservation District if you see soil runoff in the stream from a nearby construction site.
- Limit your overall use of pesticides and herbicides, and use extreme caution when using them near streams.
- If your school has grazing and other farm animals, keep them out of and away from the stream. Contact your County Conservation District or the U.S. Fish and Wildlife Service to find out about farm fencing programs.
- Compost yard waste. Don't bag lawn trimmings or throw them into the stream; leave them in place for effective recycling of nutrients.
- Store firewood, trash and other materials well away from streams.

Wildflower Meadows

Wildflower meadows present excellent opportunities for stormwater management, promoting groundwater infiltration, water quality treatment, and even flood control. When using native plants in a meadow you are not only providing an aesthetically pleasing landscape, but also preserving native species and biodiversity, and creating habitat for wildlife. Meadows allow you to spend less time mowing, less time applying fertilizers and lawn chemicals, and less time watering in the summer months. These low maintenance structures help reduce the impact of pollutants in nearby streams, thereby helping to protect our drinking water.

A wildflower meadow is easy to maintain once it is established.



Creating a Wildflower Meadow

Step 1. Site Selection:

First, choose a suitable location, preferably an open sunny site that gets at least six hours of sun every day and is not used by school sports teams, etc. The site should have good air movement, which will help keep plant diseases down, and the movement caused by wind will make plants sturdier, and stems stronger. The site should have few weeds. An already cultivated site such as a field or garden plot is ideal. A lawn can work too. The hardest sites to transform are overgrown garden beds, or old field full of aggressive weeds and grasses, or sites next to these areas. A site next to a formal landscape also might not be ideal because it may require an informal transition area for aesthetic purposes.

Creating a Wildflower Meadow, continued

Step 2. Plant Selection:

Choose plants that will survive over time and are appropriate for the conditions present in your site. Soil type is not as important as whether the site is dry or moist. The key to longevity is to have a diversity of species, as found in nature, with a mix of grasses and flowering perennials. You can create your own mixture or buy a good quality mix from a reputable supplier. Look for a mix that contains few to no annuals and no non-native species. (See chart on page 14 for more information on native plant species.)

Step 3. Site Preparation:

This is the step most often overlooked, yet is the key to success or failure. Since these wildflowers are usually less competitive than weeds, the site should contain no weeds or weed seeds. Unless the site has been cultivated already, with few to no weeds, you will need to rid it of weeds before establishing wildflowers. There are several methods you may use to do this, including:

- Smothering vegetation with black plastic for a whole growing season;
- Smothering existing growth with thick layers of leaves, grass clippings, or newspapers;
- Planting a summer buckwheat crop, cut and tilled in before going to seed, followed by fall planting of winter wheat, cut and tilled in late winter (you may need to repeat this a second season); or
- Repeating deep soil tillage every three weeks for a full growing season. If it's a lawn with no weeds, remove the sod using a sod-cutter that can be rented from an equipment rental firm. You can also use a systemic herbicide, but avoid those that are residual (last in the soil).

Step 4. Sowing or Planting:

Sow in spring or early summer for best results, keeping the meadow watered as you would a newly seeded lawn, often for a month or two. Sowing can also be successful in early fall, in which case excessive watering should be avoided to help prevent rot. Since many seeds will either not germinate until the following spring, or will germinate and not grow until then, you should also use annual rye as a winter cover crop with fall sowings. Avoid sowing in mid to late summer when there may be droughts or conditions that will dry out seeds before they have germinated. For sowing, aim for about 12 lbs. – 15 lbs. per acre. For fall sowing, use a higher proportion of grass seeds. For small areas (for instance under 1,000 square feet), consider using already-germinated small plants you can buy in trays called “plugs.” These are more costly than seeds, but will establish themselves more quickly. You can find these at specialty plant suppliers, either locally, through mail-order or online.

Step 5. Post-planting Management:

In the first two years, weed seeds still in the soil or blown in will grow faster than your wildflowers. Don't allow such weeds the first year to get above one foot tall before cutting them back to four to six inches high. During the first year, the wildflowers will, for the most part, remain short and below this height. The second year, cut weeds back to about one foot high since the wildflowers will be larger. A weed or string trimmer works well for this. Don't pull weeds, as this may also disturb wildflower seedlings. Don't use herbicides as these may drift, killing large patches of both weeds and wildflowers. In the third and future years, mow the meadow close to the ground in late fall or early spring and remove the debris from mowing. This exposes the soil to the rapid warmth from the sun in the spring, encouraging your wildflowers over cool season weeds. Learn your wildflowers, and over the years you can selectively weed out any weeds or woody plant seedlings.

Examples of native wildflowers.



Blue flag iris
Iris versicolor



Butterfly weed
Asclepias tuberosa



Black-eyed Susan
Rudbeckia hirta

Native Plant Chart

Perennials

- Bee-balm – *Monarda didyma*
- Black-eyed Susan – *Rudbeckia hirta*
- Blazing star – *Liatris spicata*
- Blue flag iris – *Iris versicolor*
- Boneset – *Eupatorium perfoliatum*
- Butterfly weed – *Asclepias tuberosa*
- Cardinal flower – *Lobelia cardinalis*
- Early goldenrod – *Solidago bicolor*
- Joe-pye weed – *Eupatorium purpureum*
- New England aster – *Aster novae-angliae*
- New York ironweed – *Vernonia noveboracensis*
- Ox-eye – *Heliopsis helianthoides*
- Solomon's seal – *Polygonatum biflorum*

Grasses

- Big bluestem – *Andropogon gerardii*
- Canada wild rye – *Elymus virginicus*

Ferns

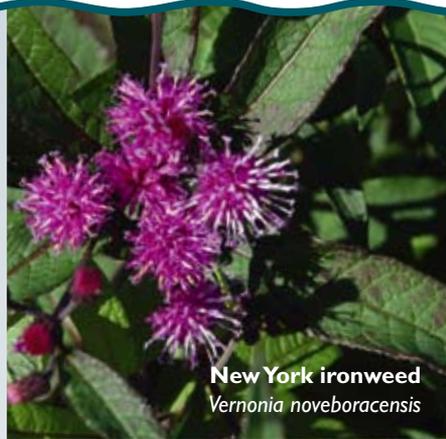
- Christmas fern – *Polystichum acrostichoides*
- Sensitive fern – *Onoclea sensibilis*

Shrubs

- Gray dogwood – *Cornus racemosa*
- Highbush blueberry – *Vaccinium corymbosum*
- Mountain laurel – *Kalmia latifolia*
- Red osier dogwood – *Cornus sericea*
- Spicebush – *Lindera benzoin*

While all of these plants are great for the garden, not all of them have the same growing requirements. Please make sure that you use the correct plants for your site's conditions.

More examples of native plants.



New York ironweed
Vernonia noveboracensis



Joe-pye weed
Eupatorium purpureum



Cardinal flower
Lobelia cardinalis

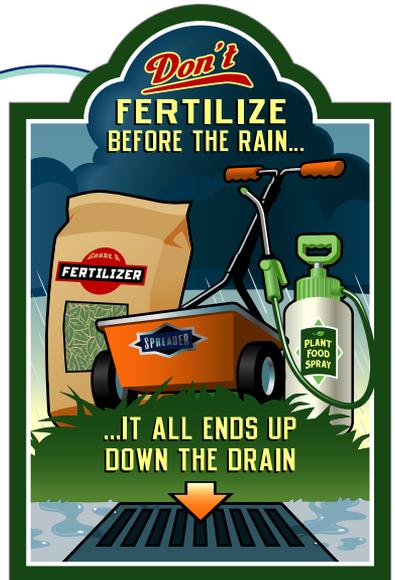
Maintenance

At your school there are certain responsibilities that fall under the care of the campus maintenance facilities staff. It is important for teachers, administrators, and maintenance staff to establish good relationships around the many important tasks that affect stormwater runoff on your campus. Here are some areas where maintenance activities can make a big difference in preventing stormwater runoff pollution.

Lawn & Garden Care

When fertilizing lawns and using other common chemicals, such as pesticides and herbicides, remember you're not just spraying the lawn. When it rains, the rain washes the fertilizers, pesticides and herbicides along the curb and into storm drains, which ultimately carry runoff into the Schuylkill and Delaware Rivers, major sources of drinking water. In addition to degrading the water quality of our streams and rivers, pesticides can kill critters in the stream and fertilizers can cause algal blooms, which rob our waterways of oxygen that fish need to survive. If you have to use fertilizers, pesticides, and herbicides, carefully read all labels and apply these products sparingly. Many people are unaware of the actual nutrient needs of their lawns. According to surveys conducted by the Center for Watershed Protection, over 50%

of lawns are over fertilized, yet only 10% to 20% of lawn owners take the trouble to perform soil tests to determine whether fertilization is even needed (CWP, 1999). Organic lawn care practices (no chemical pesticides and fertilizers) can also be a wise environmental choice and will save you money. Conduct a soil test on your lawn and follow the practices below to reduce the need to fertilize lawns and gardens.



Caring for Lawns and Gardens

- Use fertilizers sparingly. Lawns and many plants do not need as much fertilizer or need it as often as you might think. Test your soil to be sure!
- Never fertilize before a rain storm (pollutants are picked up by stormwater during rain events).
- Consider using organic fertilizers which release nutrients more slowly.

Caring for Lawns and Gardens, continued



- Keep fertilizer off of paved surfaces — including sidewalks, driveways, etc. If granular fertilizer gets onto paved surfaces, collect it for later use or sweep it onto the lawn.
- Use commercially available compost or make your own using garden waste. Mixing compost with soil means your plants will need less chemical fertilizer and puts waste to good use.
- Let grass clippings lay! Don't bag the grass. Use a mulching lawn mower to cut one-third of the blade length each week, which will naturally fertilize your lawn in the process.
- Wash spreader equipment on a pervious (penetrable) vegetated areas, like the lawn, to allow for the natural absorption of excess fertilizer.
- Never apply fertilizer to frozen ground or dormant lawns.
- Maintain a buffer strip of unmowed natural vegetation bordering waterways and ponds to trap excess fertilizers and sediment from lawns/gardens. Start with at least a 10 ft. buffer and try to increase it over time.

A mowed lawn with a buffer strip of vegetation bordering a stream.



Vehicle Washing

Where is the equipment at your school cleaned? Are the mowers, buses and trucks washed in a driveway or parking lot? Equipment washed in driveways and parking lots allows wash water (dirty water) to find its way to the nearest storm drain, ultimately washing into our drinking water sources, the Delaware and Schuylkill Rivers. Wash water often contains pollutants, such as oils and grease, phosphates (from the soap), and heavy metals — all of which are unhealthy for people and fish.

Washing Vehicles Properly

The best action is to take vehicles to a commercial car wash, especially if you plan to clean the engine or the bottom of the car. Most car washes reuse water several times before sending it for treatment at a sewage treatment plant. If equipment needs to be washed on site, use the following practices to protect streams and rivers:

- Wash it on gravel, grass or another permeable surface, so the ground can filter the water naturally.
- Use soap sparingly and try to use non-phosphate detergents. Phosphates are nutrients that can cause problems for nearby waterways.
- Use a hose that is high pressure and low volume. Fit your hose with a nozzle that automatically turns off when left unattended or one that has a pistol grip or trigger nozzle to save water. Wash one section of the car at a time and rinse it quickly.
- When you're done, empty your bucket of soapy water down the sink, not in the street.
- Block off the storm drain during charity car wash events or use an insert with a vacuum pump to catch wash water so that it can be emptied into a sink.



Be sure to recycle
used motor oil.

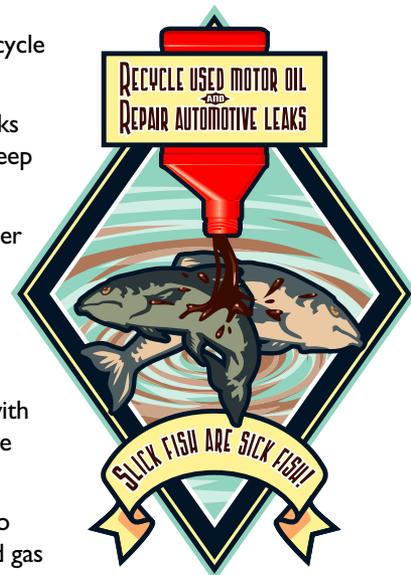


Vehicle Maintenance

By maintaining school vehicles properly, schools and other vehicle owners can prevent oil leaks, heavy metals and toxic materials from traveling onto parking lots and streets. Rain washes oil and other hazardous chemicals from these paved areas into the nearest storm drain, which ultimately drain into the Delaware and Schuylkill Rivers. Just imagine the number of vehicles in our region and the amount of oil that finds its way into our local waterways! It has been estimated that each year over 180 million gallons of used oil is disposed of improperly (Alameda CCWP, 1992), and that a single quart of oil can pollute 250,000 gallons of drinking water (NDRC, 1994). Much of this pollution can be prevented by following proper automotive maintenance.

Maintaining School Vehicles

- Maintain all vehicles and always recycle used motor oil.
- Check vehicles for drips and oil leaks regularly and fix them promptly. Keep vehicles tuned to reduce oil use.
- Use ground cloths or drip pans under vehicles if there are leaks or if you are doing engine work. Clean up spills immediately and properly dispose of clean-up materials.
- Collect all used oil in containers with tight-fitting lids. Old plastic jugs are excellent for this purpose.
- Recycle used motor oil. Many auto supply stores, car care centers, and gas stations will accept used oil. Do not pour liquid waste down floor drains, sinks or storm drains.



- Do not mix waste oil with gasoline, solvents, or other engine fluids. This contaminates the oil which may be reused, increases the volume of the waste, and may form a more hazardous chemical.
- Never dump motor oil, antifreeze, transmission fluid or other engine fluids into road gutters, down the storm drain or catch basin, onto the ground, or into a ditch.
- Many communities have hazardous waste collection days where used oil can be brought in for proper disposal. Find out about your program. Recycling just one gallon of used oil can generate enough electricity to run the average household for almost 24 hours.
- Use drain mats to cover drains in case of a spill.
- Store cracked batteries in leak proof secondary containers.

Winter Deicing



As snow piles up in the winter, schools often turn to salt to melt snow and ice. Salt, however, causes adverse environmental impacts, especially on streams and rivers, which are our drinking water sources. In addition, excess salt can saturate and destroy a soil's natural structure and result in more erosion entering our waterways. High concentrations of salt can damage and kill vegetation, posing the greatest danger to fresh water ecosystems and fish. Studies in New York have shown that as salt concentrations increase in a stream, biodiversity decreases. Excess salt can seep into groundwater and stormwater runoff. Effective ice control can help prevent excess salt runoff to our waterways.

- The first line of defense is to shovel sidewalks and pathways to keep them clear and prevent ice from forming. Salt and deicers are not effective when more than 3 inches of snow have accumulated.
- Consider the temperature. Salt and calcium magnesium acetate (CMA) are much more effective at melting snow and ice at temperatures above 25° Fahrenheit.
- Reduce salt and other chemicals by adding sand for traction.
- Track winter weather and only use salt and deicers when a storm is about to come through. If a winter storm does not occur, sweep up any unused material, store, and reuse for the next big storm.

Winter Deicing, continued

- Focus application of deicing products on high use areas and slopes where traction is critical and apply the least amount necessary to get the job done. This will save money in product costs and will also help minimize property damage to paved surfaces, vehicles, and vegetation.
- If you observe ongoing issues of ineffective ice management or examples of poor application, such as excess piles of road salt left to disperse, share your concerns with the relevant property manager or your local municipal streets department. (In the City of Philadelphia, the Streets Department Hotline is 215-686-5560 and their website is www.phila.gov/streets.)
- Plant salt-tolerant native vegetation in stormwater drainage swales and ponds that may receive salt-laden runoff. Not only will these native species have a greater chance for survival, but they will continue to act as an effective buffer for local waterways. (See chart on page 14 for more information on native plant species.)
- Store salt and other products on an impervious (impenetrable) surface, such as a basement floor, to prevent groundwater contamination. Also, store products in a dry, covered area to prevent stormwater runoff.

