

*Lessons from the Bay*  
**Part 3: Projects**

## Build Your Own Rain Garden

*This project was developed by the Student Baysavers Projects, Chesapeake Bay Foundation, Save the Bay (<http://www.cbf.org>) and is used with their permission.*

### Goals

- To help students see the connection between runoff in their community and the health of the whole Chesapeake Bay watershed
- To help students restore a wildlife habitat in their community
- To help students learn to appreciate and care for the natural environment

### Materials

- 3 sections of 2-inch x 12-inch #1 treated pine (lengths depend on the size of the rain garden to be built)
- 10 2-foot sections of steel reinforcing bar (rebar)
- 2 stainless steel elbow brackets with 4 -1/2-inch stainless steel wood screws
- Screwdrivers and a hammer
- Shovels and rakes
- Topsoil (number of bags depends on the size of the rain garden)
- Mulch or straw
- Sand
- Plants

### Directions

#### Understanding the project

*During the instructional planning stages, the teacher may wish to read **About the Watershed: Instructional Framework**, especially parts IV, V, VI, and VII.*

*What is a rain garden?*

To begin this project, the teacher may wish to introduce students to the concept of a rain garden, including its purposes, forms, potential locations, and importance.

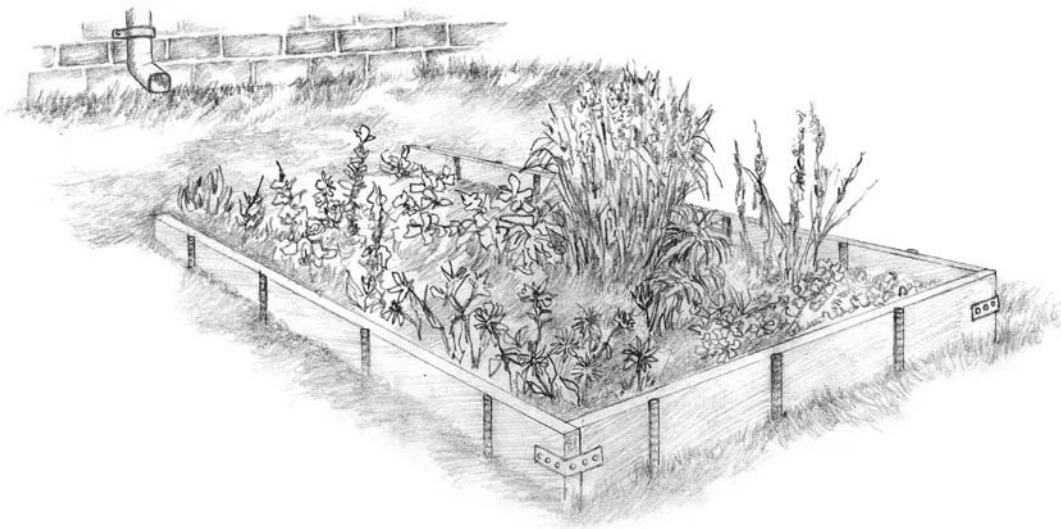
A rain garden is designed to catch rainwater and slow, decrease, and improve the quality of storm water runoff. A rain garden can take many different forms and, for the most part, is limited only by the resources and time a group has to put into it. It can be large, complicated, and expensive or small and relatively simple. Chesapeake Bay Foundation's rain garden design, described here step-by-step, is inexpensive and easy enough for most students to complete with minimal help from adults. And while this rain garden project is specifically written with the schoolyard in mind, it would work just as well at a home, community center, religious center, or any other private property.

Scientists have found that nutrient and sediment pollution are the largest threats to water quality in the Chesapeake Bay watershed. Here is something students can do about it.

*Why create a rain garden?*

Virtually every school has a substantial amount of impervious surface (area that rainwater cannot soak into) that affects the quality of storm water runoff. When rain lands on an impervious surface, it cannot soak into the ground and eventually enters a storm drain or a nearby creek. This excess water, called runoff, causes the soil in its path to erode more rapidly than it would naturally. Gravity then causes this runoff to flow downhill and into the closest stream or other waterway, carrying with it the sediment, pesticides, fertilizers, and other pollutants it encounters along the way.

Rain gardens contain plants that intercept and slow down the storm water runoff and absorb or trap much of what it contains. Rain gardens also restore wildlife habitat by attracting creatures such as insects, butterflies, toads, and predators like hawks. Creating a rain garden also helps build environmental stewardship in students.



### Making initial plans

Getting started is not as difficult as one might think. Just follow these steps:

- First, get a teacher or adult leader involved. Ask if he or she would be interested in providing advice, supervision, and support to students as they create a rain garden.
- Before anything is built on the school grounds, the permission of the school administrators, such as your principal, will need to be secured. It is also important to discuss the plans with the school's custodial staff. They will probably want to approve the exact location of the rain garden—and they may even be able to help with the project. Some schools have PTA members that are involved in making decisions about the schoolyard; if there are any such school groups, it would be a good idea to speak with them as well.
- Next, choose a location. This might be partly determined by the principal and/or maintenance staff. The most important aspect in choosing a good spot, however, is figuring out where the rain garden is needed most.

#### *Where should the garden be?*

Deciding where to put the rain garden can be almost as much fun as building the rain garden itself. There are some excellent activities in the Chesapeake Bay Foundation's curriculum materials that can help you do this. (Copies of two activities, *Schoolyard Report Card* and *The Bay Starts Here*, are included in the resource list on p. 17. You might find it useful to complete one of these before you begin.)

The goal is to find places in the schoolyard where rainwater regularly runs off of an impervious surface, such as a parking lot, a downspout from the roof, a hardened footpath, or a basketball court. Where does that water go? The rain garden should be positioned between the source of the rainwater runoff and the nearest waterway or storm drain. A very good way to really see what happens to runoff on the school campus is to walk the school grounds while it is raining—just remember to wear a raincoat!

#### *What plants should be in the garden?*

One factor that will determine how much money is going to be needed is the plants you choose to put in the rain garden. Depending on the time of year the rain garden is going to be built, potted plants or seeds may be used. The rain garden may be seeded any time after the last frost in the spring or before the first frost in the fall. Normally, potted plants should be used only if the rain garden is going to be built in the summer, when seeds would have trouble growing. The U.S. Fish and Wildlife Service booklet *Native Plants for Wildlife Habitat* is an excellent resource for choosing which plants to put in your rain garden. (See "Resources for Building a Rain Garden," p. 17.)

Whatever plants the group chooses, they should be able to withstand periods of heavy water along with times when there is very little moisture. Because native plants are accustomed to the conditions around the school, using native plants will greatly increase the chance of the garden's survival. Native plants are also very good for attracting local wildlife.

*How should the garden be paid for?*

Materials, like lumber, tools, soil, and plants are needed to complete the rain garden, and these materials cost money. There are many ways to get funding for materials. For example, a fundraiser could be held at school, a grant may be obtained, or the principal may be able to allot money from the school's budget.

However the money is raised for the rain garden, students will need to have a good idea of how much the supplies will cost. Actual costs will depend on the size of the rain garden and the plants chosen. Using a materials chart similar to the one below will help students estimate how much money they will need. (Note: The prices in the chart are estimates. Actual costs may vary.)



### Build Your Own Rain Garden Sample Materials Budget

Material	Quantity	Price Each	Total Price	Source
2-inch x 12-inch #1 treated pine board	3	\$15.00	\$45.00	Hardware store
2-foot steel rebar	10	\$.96	\$9.60	Hardware store
Stainless steel elbow brackets w/screws	2	\$7.00	\$14.00	Hardware store
40-lb. bag topsoil	4	\$3.00	\$12.00	Donated by Nice Guy Landscaping Co.
20-lb. bag sand	1	\$5.00	\$5.00	Donated by Nice Guy Landscaping
40-lb. bag mulch	1	\$3.00	\$3.00	Donated by Nice Guy Landscaping
Straw bale	1	\$5.00	\$5.00	Donated by Sally's Dad
Screwdriver	1	\$4.00	\$4.00	Borrow from maintenance
Hammer	1	\$12.00	\$12.00	Borrow from maintenance
Shovels	3	\$20.00	\$60.00	Borrow from home
Rakes	2	\$10.00	\$20.00	Borrow from home
Plants	30	\$3.00	\$90.00	Donated by Hometown Nursery
		Total =	\$279.60	\$279.60 – 214.00 = \$68.60

Prices will vary, depending on where the items are purchased. Not everything on this list will be needed, and some items not listed may be needed. The budget will also depend on what kinds of plants are used, how many are used, and what size garden is designed. Remember, if materials can be borrowed or donated, they can be subtracted from the actual cost of the project. In other words, the total cost of materials in this sample budget is \$279.60, but the group only needs to raise \$68.60

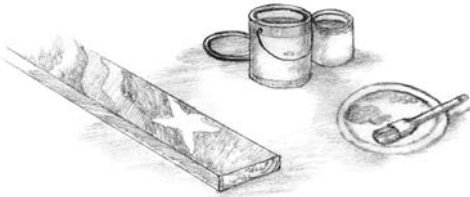
because many of the items have been donated or borrowed. Remember also that parents and neighbors may be willing to donate plants and flowers from their own gardens.

#### Constructing the rain garden

Once permission is received, plants are selected, a site is chosen, and materials are collected, the building and planting of the rain garden may begin. Students should follow the instructions below:

1. *Decorate the boards.*

Before building begins, you may want to decorate the sides of the 2-inch x 12-inch boards. You can paint pictures of the plants you will grow, pictures of the animals that might use the rain garden for habitat, or maybe even a picture story showing how a rain garden helps to keep streams and rivers clean. If you decide to paint on your 2 x 12 boards, make sure the boards dry completely before proceeding any further.



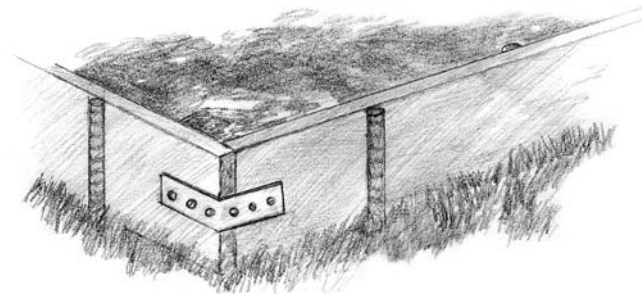
2. *Dig the rain garden.*

To determine how large an area to dig, outline the area that you want your rain garden to cover with the 2 x 12 boards to get an idea of the garden's size. Use shovels to dig up the top layer of dirt and grass inside the outline made with the 2 x 12 boards. Turn the soil over so that the grass is completely covered up—this is a very important step. If you do not turn the grass over, it may grow up through the rain garden and compete with your native plants for water and nutrients. Use shovels to break the big clumps of dirt apart. This will make it easier for the native plants to take root. If runoff is heavily focused into the rain garden, you may want to place some gravel at the source of the runoff so young plants do not wash away.



3. *Build the frame.*

The frame, built with the 2 x 12 boards, will provide a wall to keep your soil and plants in the rain garden. The bottoms of the boards should be buried about 1 or 2 inches in the ground to keep the soil inside the rain garden from coming out underneath. The frame needs to be fairly level, so you will have to adjust how deep the boards are buried in the ground depending on the slope of the earth where you build the rain garden. Use the stainless steel elbow brackets and screws to fasten the corners of the boards together. Then



use the 2-foot long sections of steel reinforcing bar (rebar) to stabilize the boards. Have an adult help you hammer the rebar pieces into the ground up against the boards of the frame. Alternate the pieces of bar on the inside and then the outside of the frame every 2 to 3 feet. Hammer them down so they are below the top of the frame. Then fill in the hole with topsoil up to a few inches from the top of

4. *Plant the rain garden.*

Now you are ready to put your plants or your seed in the rain garden. If you are using potted plants, you will need to dig holes in the rain garden deep and wide enough to hold the roots of your plants around so that they cover the whole rain garden. Be careful not to compact the soil in your rain garden when spreading your plants. If the soil gets too packed down, plants will have trouble rooting. If you are using seed, mix the seed with an equal amount of sand first and then distribute it evenly around the whole rain garden. Whether you use potted plants or seed in your rain garden, be sure to put down a layer of mulch, like pine bark strips or straw. The mulch will keep in moisture and protect your plants/seeds from weeds. Finally, water the rain garden thoroughly.

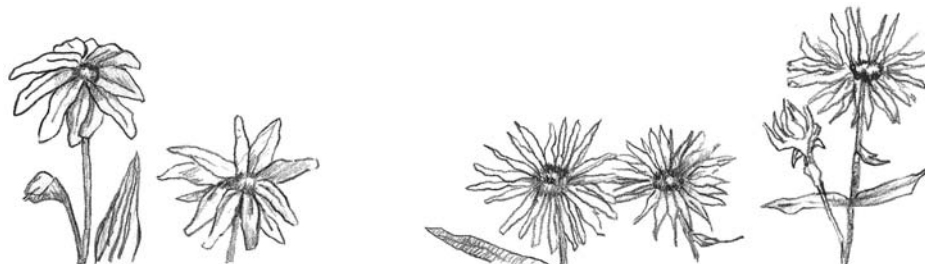


5. *Maintain and care for the rain garden.*

Now that you have successfully planted your rain garden, all you have to do is take care of it so that it will do what it is supposed to do. Because the native plants you chose can tolerate periods of dry weather, you will not need to water your rain garden unless it does not rain for a long time (2–3 weeks). Weeds will probably grow in your rain garden and you will need to pull them out so that they do not compete with your plants. This can be done about once a month.

6. *Congratulate yourself.*

You've just built your very own rain garden and you know how it will help protect our streams and rivers from storm water runoff and restore wildlife habitat. So if someone asks you, "What is a rain garden?" you can tell them and show them.




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## Resources for Building a Rain Garden

Mason, Rich, and Hitchcock, Jason. *Native Plants for Wildlife Habitat*. Annapolis: U.S. Fish and Wildlife Service, 1995. (See <http://www.fws.gov>, or call the U.S. Fish and Wildlife Service at 410-573-4500.) *This publication is an abridged guide to common native plants of the mid-Atlantic states that are available through nurseries. It is an excellent resource for choosing which plants to put in your rain garden.*

*Native Plant Nurseries in the Chesapeake Bay Region*. U.S. Fish and Wildlife Service. <http://www.fws.gov/r5cbfo/Nursery.htm>. *This site contains a list of some of the many nurseries nationwide that specialize in native plants. Most offer plants and/or seeds of species native to the Chesapeake Bay area. Inclusion on this list is not an endorsement by the U.S. Fish and Wildlife Service or the Virginia Department of Education.*

*Save the Bay*. Chesapeake Bay Foundation. <http://www.cbf.org>. *For questions about how to build a rain garden, call the education staff at the Chesapeake Bay Foundation's Clagett Farm: 301-627-4393. Two activities from the Chesapeake Bay Foundation's curriculum materials that can help students decide where to put their rain garden are "Schoolyard*

*Report Card" and "The Bay Starts Here."* (See [http://www.cbf.org/site/PageServer?pagename=edu\\_students\\_gettogether\\_gettingstarted](http://www.cbf.org/site/PageServer?pagename=edu_students_gettogether_gettingstarted)).

*Watershed Radio*. Smithsonian Environmental Research Center. <http://www.watershedradio.org/march2002/032702raing.htm>. *Thirteen radio stations spread out over the Chesapeake Bay watershed are currently broadcasting Watershed Radio. Watershed Radio is a one-minute program that can be heard on some Virginia radio stations and through this Web site. The site also contains links and information related to rain gardens.*

*What Is a Rain Garden?* Virginia Department of Forestry. <http://www.dof.state.va.us/rfb/rain-gardens.shtml>. *This site explains what a rain garden is, who should have one, and what the components of a rain garden are.*



## Conducting a Stream Quality Survey

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Instructions for this stream quality survey are based on the *Virginia Save Our Streams Modified Method* (<http://www.vasos.org/fieldSheetsNewMethod.pdf>).

### Goals

- To collect and record data on the water quality of local streams
- To submit the data to an agency or other group for the purpose of assisting with water quality improvement

### Materials

- Kick-seine (1/32-inch mesh net with supporting pole on each end); available through Virginia Save Our Streams for \$15.00 without poles
- Plastic container (preferably one with divisions like a white ice-cube tray)
- Tweezers
- Magnifying glass or magnifying cubes
- Pencils
- Notebooks or other means of recording data
- Rubber boots or other stream shoes
- Rubber gloves (required for impaired streams)

### Directions (Standard Operating Procedures for Macroinvertebrate Population Surveys)

During the instructional planning stages, the teacher may wish to read *About the Watershed: Instructional Framework*, especially parts III, V, VI, and VII.

#### Understanding the project

The stream quality survey, originally designed by the Izaak Walton League of America and revised and updated by the Virginia Save Our Streams Program (VA SOS), allows volunteer monitors to collect data on the health of their local streams. This data, if collected and recorded properly, assists state agencies, local governments, and concerned citizens in improving local environmental conditions related to water quality. This project provides comprehensive instructions for doing a stream survey that contributes to the state effort to manage and protect Virginia's waterways.

Conducting a survey of the macroinvertebrates, organisms large enough to be seen by the unaided

eye, allows one to assess the health of the stream. Many stream-dwelling organisms are sensitive to changes in water quality. Their presence, absence, or population changes through time serves as an indicator of environmental conditions.

#### Conducting the survey

Macroinvertebrates are easy to find, collect, and identify. By following the instructions below (a summary of the VA SOS Training Session) and filling out the VA SOS Stream Survey (available at <http://www.vasos.org/fieldSheetsNewMethod.pdf>), one can diagnose a stream's water quality. Remember, the data is most useful when a certified VA SOS monitor is collecting the data.

#### Monitoring the stream

Monitoring should be done at one station, defined as a single stretch of stream not more than 100 yards long. If you wish to assess a longer section of a stream, select two monitoring stations at the top and bottom of the stretch, or multiple sites along the length of the stretch at quarter-mile or greater intervals. Be sure to revisit the same station each time so that your results will be comparable. Carefully record the location of your monitoring station on your VA SOS Stream Survey form. If you do not know the latitude and longitude coordinates when you monitor, use an accurate description of the site (e.g., "Site located on north side of Route 660, 1 mile east of Route 607") that enables you or another monitor to return to the same location. The regional coordinator or VA SOS staff will help you identify the coordinates at a later date.

Monitoring should be conducted four times a year for each station you monitor. VA SOS suggests a schedule of January, April, July, and October, though consistency is more important than a specific month. In addition, you may choose to monitor after a significant event that may have a significant impact on the stream, such as a chemical or oil spill, a heavy rain following the spreading of manure or fertilizer on lands nearby, or a flood. Do this no more than twice, for an annual maximum of six surveys. The survey itself is a stream disturbance and too heavy a monitoring cycle can negatively impact macroinvertebrate populations.

If you are monitoring more than one station on a stream, you should begin monitoring at the station furthest downstream and work upstream. This will prevent macroinvertebrates disturbed from your first test from washing downstream and getting caught in your net a second time. Each station should include only the organisms present at that location and not those disturbed from previous tests.

*Catching the macroinvertebrates (Modified Rocky Bottom Sampling).*

Gather the required equipment detailed above (kick-seine, plastic container, tweezers, magnifying glass or magnifying cubes, pencils, notebooks, rubber boots or other stream shoes, and rubber gloves).

Select a riffle typical of the stream—that is, a shallow, fast-moving area with a depth of 3–12 inches (8–30 centimeters) and stones which are cobble-sized (2–12 inches) or larger. Stone size is important since the macroinvertebrates surveyed prefer these stones for protection and food supply. In addition, the bubbling of the water over the rocks provides needed oxygen for healthy growth.

1. Place the kick seine perpendicular to the flow of water immediately downstream of the square-foot area in the riffle you have selected to sample. The bottom, weighted edge of the net should fit tightly against the stream bottom. You may wish to use cleaned rocks from outside your sampling area to hold the net firmly to the bottom. This will prevent insects from escaping under the net. Tilt the net back, so the water flowing through the net covers a large portion of the net; however, take care not to tilt the net so much that water flows over the top, allowing organisms to escape.
2. Quickly sample the targeted area for 20 seconds. To sample, lift and rub underwater all large rocks in the sample area to dislodge any clinging organisms. Rub all exposed surfaces of rocks in the sampling area that are too large to lift. Dig around in the small rocks and sediments on the streambed in order to dislodge any burrowing macroinvertebrates.
3. After sampling for 20 seconds, carefully rub off any rocks used to anchor the net. Then remove the seine with an upstream scooping motion to keep all the macroinvertebrates in the net.
4. Place the net on a flat, light colored surface, such as a white sheet, table, or piece of plastic. This makes the organisms easier to see. Using

tweezers or fingers, gently pick all the macroinvertebrates from the net and place them in your collecting container. Carefully look on both sides of any debris in the sample, as many insects will cling to any available litter. Any moving creature is considered a part of the sample. Look closely for very small organisms and take your time. It is important to thoroughly pick all the organisms from the net. Once you have sorted all the organisms off the net, lift the net and examine the underlying area. Collect any organisms that have crawled through the net. Again, it is important to collect all these organisms to have an accurate sample.

5. Once all the macroinvertebrates are removed from the seine, count the number of organisms in the sample. If at least 200 organisms have not been sampled, you must collect another net from a different area in the same riffle. Add the organisms from the second net to the first. You may adjust the length of sampling time depending on the number of organisms collected in the first, with the maximum sampling time per net being 90 seconds. Sort the second net and area beneath again in their entirety. Again count the organisms, and collect a third net if 200 organisms have not been obtained. Repeat this process until at least 200 organisms are found or 4 nets are collected, whichever is first. Each net collected must be sorted in its entirety, even if that leads to a sample of well over 200 organisms.
6. Once you have obtained at least 200 organisms, separate the organisms into look-alike groups. Use primarily body shape and number of legs and tails, since the same family or order can vary considerably in size and color. Use the tally sheet and macroinvertebrate key to aid in the identification process. Record on the tally sheet the number of individuals you find in each taxonomic group. Include the total number of organisms in the sample on the lower right corner of the tally sheet. Follow the tables attached to the tally sheet to calculate the individual metrics and the final ecological condition score.

*Studying the find.*

In your survey you are recording two important pieces of information: (1) the diversity of orders or families of macroinvertebrates and (2) the population within each of these groups. Diversity is a strong sign of health, especially if the orders are



diverse in those families that are pollution-sensitive. Populations tell us something about the trend in stream health. Increases in numbers of sensitive species may indicate an improved food supply or better water quality. Decreases could be due to seasonal variations or lowering water quality. In tolerant species, a population increase could indicate poor water quality or a change in stream bottom conditions due to sediments. The chart below, “Assessing Impairment,” clarifies these distinctions.

Streams can suffer from a variety of problems that may be discovered by consistent stream quality surveys through time. These usually fall into three categories:

- *Physical problems.* Physical problems may include excessive sedimentation from erosion, street runoff, or a discharge pipe. Sediment may create poor riffle characteristics, contribute to excessive flooding, reduce flow rates, change temperature of the water (which decreases oxygen levels), and smother aquatic life. The result is usually a reduction in the number of all animals in the study area.

Sometimes the physical problems are not in the stream itself but result from changes in the structure of the stream bank. Reduced shading from the riparian vegetation increases water temperature and lowers oxygen levels in the stream. This has an adverse effect on fish

populations and sensitive macroinvertebrates. Any substantive change to the stream bank can have an effect on stream health.

- *Organic pollution.* Organic pollution normally comes from excessive human or livestock wastes or high algal populations due to an increased nutrient load in the stream. Sources of organic pollution include runoff from farms, treated sludge from sewage treatment plants, runoff from impervious surfaces like streets, parking lots, and roofs, leaking septic systems, and excessive fertilizer from lawns or golf courses.

The result of organic pollution is usually a reduction in the number of different kinds of macroinvertebrates in the stream. The organism populations most commonly reduced are shredders like stoneflies or some mayflies, leaving more collectors/scrapers such as net-spinning caddis flies, scuds, or lunged snails.

- *Toxicity.* Toxicity includes chemical pollutants such as chlorine, acids, metals, pesticides, herbicides, and oil. One of the most serious examples is acid mine drainage from old coalmines. This condition leaves the stream clear, clean, and dead. A low level of toxicity generally lowers the variety and numbers of all macroinvertebrates.

### Assessing Impairment

<i>In the case of:</i>	<i>Look for:</i>
Increases in diversity and or population of intolerant groups	Improved stream health
Decreases in diversity and/or population of intolerant groups	Upstream degradation Increased sediment loads Less stream shading New pollution sources
Little variety of insects but high numbers of each kind, normally of tolerant groups	Enrichment of water with organic material, commonly from effluent, manure spreading, or increased runoff
Only one or two kinds of tolerant groups in great abundance (commonly worms or blackflies)	Severe organic pollution (manure or other nutrient pollution) or severe sedimentation
A variety of macroinvertebrates but only a few of each kind	Toxic pollution at low levels
No macroinvertebrates, but a clean stream	Severe toxic pollution

*Describing the immediate environment (habitat assessment).*

The final portion of the monitoring session is to evaluate the habitat of the stream. This is an important portion of the monitoring because it can help identify sources of pollution and stressors to the macroinvertebrate population.

- *Fish water quality indicators.* Some fish, like trout, are sensitive to pollution. Bass are somewhat sensitive. Others, like carp and catfish, are relatively tolerant. Unless a fish happens to end up in your net, you may find it difficult to determine the fish's species without experience. However, certain general clues may help in identification (e.g., are the fish seen individually or in schools?). If you are relatively certain of the type, you can note which fish you see.
- *Barriers to fish movement.* You should specifically note barriers within a short distance of your monitoring site, not those more than a mile off. If you have a barrier not listed, please check "other," and write in the barrier type present at your site.
- *Surface water appearance.* You should indicate the color of the water itself, apart from the substrates. This may indicate runoff problems. Most streams are clear in periods of low flow. At high flow, runoff is more likely and may change the color and/or clarity of the water. A tea color often indicates the presence of tannins in the water from decaying leaf matter. A colored sheen may indicate an oil spill of some kind. Otherwise discolored water indicates erosion or other types of runoff upstream from your site that could lead to lower or changed macroinvertebrate populations.
- *Streambed deposit (bottom).* You should indicate the color/type of material in the substrate in the riffle you sample. In most riffle monitoring the bottom will consist of gravel, cobbles, and boulders. In some cases there is a layer of muddy material between the cobbles that may increase or decrease through time. This is an indicator of the stream's sediment load and type of sediment. Noting the color and/or consistency of this sediment helps keep track of changes in the environment for macroinvertebrates.
- *Odor.* You should record any odors, because, although invisible, odors may indicate significant pollution.
- *Stability of the streambed.* Like the color or consistency of the streambed deposit, this is an indicator of sediment load and changes through time. Monitoring streambed stability also helps keep track of the quality of the riffle.
- *Algae color and location.* You should note first the color of the algae (make sure that you are looking at the algae themselves and not any sediment on them), then estimate the area covered by algae. Algae growth, color, and consistency are responsive to nutrient loads. Matted or hairy algae are a sign of low stream quality. Light or dark green algae in spots indicate a healthy stream. Brown algae often indicate episodic increases in sediment loads. It is important to indicate the stream channel shade present on the day you monitor. Shading is an important determinant of water temperature and oxygen concentration in the stream. Oxygen levels are higher in colder water. Sensitive fish and macroinvertebrates do better with higher oxygen levels. Shade quantity should be determined by estimating the overhead cover at the monitoring site. Only five choices are given: *full, high, moderate, low, or none.*
- *Stream bank composition.* You should estimate the percentages of each vegetation type based on the immediate bank (not the entire riparian area). All herbaceous plants and mosses should be included in grasses. The long-term stability of a stream bank is often determined by the makeup of its plant population. Bare banks are eroding. Heavily wooded banks seldom erode even in heavy flooding. By noting the percentage of cover provided by various components of the stream bank, you can keep track of changes through time that could affect stream health.
- *Stream bank erosion potential.* Erosion potential is a subjective estimate of damage to the stream bank through time. It is often comparable to the amount of bare soil, but not exclusively. If the height of the stream bank is greater than the rooting depth of the plants on it, erosion is a distinct possibility. This category is your estimate of the potential amount of the stream bank that could

- experience erosion during high rainfall or a flood event.
- *Riffle composition (=100%)*. Please be sure to note all the substrate within the riffle, not just the rocks lying on top. Stream bottoms are not static; they do change through time. Riffle composition affects macroinvertebrates. The ideal habitat for many of the creatures is cobbles—stones between 2 and 10 inches in diameter. This estimate of composition percentage indicates the quality of macroinvertebrate habitat. Silt or mud is determined by feel. If the streambed bottom has a smooth feeling like mud, it is probably made up of silt and clay particles. When it feels gritty or has visible grains, then it is sand. In streams, sand grains are those particles 1/64 inch or smaller in size. Gravel consists of all rock up to 2 inches in size. Boulders are rocks greater than 10 inches in diameter. At times some riffles may have exposed bedrock. Because this is a poor habitat for macroinvertebrates, you should note any exposed bedrock in the comments at the bottom of the survey.
  - *Land uses in the watershed*. The SOS Habitat Survey form asks if land use impacts are high (H), moderate (M), or slight (S). Although these questions are somewhat subjective, record the impacts the following ways: Note “H” for a land use if it comprises the majority of land in the watershed and is polluting the stream. Or, note “H” if the land use has a severe impact on stream quality even though the land use does not use a great deal of land, as in the case of a construction site that has caused the stream to be full of silt and muddy water. Note “M” for a land use if the land use is definitely contributing to stream degradation but is not the major cause for degradation or is one of many causes. For example, parking lot runoff and trash from a shopping mall may contribute significantly to stream pollution but may not be the only cause of stream degradation. Note “S” for a land use if its impacts are minimal in polluting the stream. For example, although a farm may be present, good farming practices and conservation measures may mean the pollution impact is negligible. If the land use is present, but causing no pollution, write “N” for none. Finally, leave the entry blank if you notice no forms of this land use upstream from your monitoring site.
  - *Litter*. Many streams downstream of urban areas are dumping grounds for refuse. While not necessarily pollutants, these refused-filled streams can degrade, causing pollution or simply creating an aesthetic nuisance. Noting which types of litter and other refuse are present and how much of the stream area is affected may contribute to actions that reduce refuse disposal in the streams.
  - *Comments*. Often the information given above needs further clarification. Use this last section to add briefly any thoughts, opinions, or observations you have made about stream health that are not included in the form.
- 
- ### Resources for Conducting Stream Quality Surveys
- Biological Indicators of Watershed Health*. U.S. Environmental Protection Agency. <<http://www.epa.gov/bioindicators/>>. *This site explains biological indicators, their importance, and ways to identify indicators.*
- Environmental Contaminants Encyclopedia*. National Park Service, Water Resources Divisions, Water Operations Branch. <<http://www1.nature.nps.gov/toxic/index.html>>.
- Green Hands-on Center*. Global Rivers Environmental Education Network. <<http://www.earthforce.org/green/handson.cfm>>.
- Healthy Water, Healthy People*. <<http://www.healthywater.org/>>. *An innovative water quality education program sponsored by Project WET and the Hach Scientific Foundation*, Healthy Water, Healthy People offers hands-on activity guides, testing kits, training, and much more. Healthy Water, Healthy People is for anyone interested in learning and teaching about contemporary water quality education topics. *Test your water quality knowledge by taking the Healthy Water, Healthy People Water Quality Quiz.*
- Streamkeepers Ecology*. Pacific Streamkeepers Federation. <<http://www.pskf.ca/ecology/>>.
- Stream Corridor Restoration: Principles, Processes, and Practices*. U.S. Department of Agriculture. <[http://www.usda.gov/stream\\_restoration/newtofc.htm](http://www.usda.gov/stream_restoration/newtofc.htm)>.

### Part 3: Projects

Teel, Wayne S. "Non-Point Source Pollution: Types, Sources and Impacts on Virginia's Waters." Harrisonburg: James Madison University, 1998. (See also <http://www.vasos.org/npessay.htm>.)

*Virginia Save Our Streams (SOS).*

<http://www.vasos.org>.

*The VA SOS site contains several links to Virginia-related information about stream quality monitoring, including survey forms and instructions for Conducting a Stream Quality Survey as well as an illustrated Macroinvertebrate Tally Sheet at <http://www.vasos.org/fieldSheetsNewMethod.pdf>. (Scroll to page 4 for the tally sheet.)*

## Recycling to Protect the Watershed

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### Goals

- To engage students in a project that involves recycling
- To help students see how recycling contributes to an improved natural environment

### Materials

- Containers for recycled materials (if project involves collection of recyclable items)
- Gloves (depending on the nature of the project)
- Vehicle or other means of transporting materials

### Directions

During the instructional planning stages, the teacher may wish to read *About the Watershed: Instructional Framework*, especially parts VI and VII.

#### Understanding the project

Many students today recognize the three-arrow symbol that means a container can be recycled, and most are already familiar with the idea of recycling. Therefore, the teacher may not need to spend much time introducing the concept. Instead, the class may devote initial time to deciding whether to opt for collection materials for recycling, encouraging use of products made of recycled materials, or reusing recycled materials themselves. Each option is explained below.

#### Selecting an option

*Collecting materials for recycling.*

Collecting materials for recycling is a popular project. County or city litter control, clean community, or Department of Sanitation offices often can provide valuable advice about planning a recycling program.

Most recycling centers accept aluminum cans, glass bottles, newspapers, and some kinds of plastics. Some will also accept office paper or writing paper. To initiate a recycling project at your school, you and your students should first decide what items to collect and from whom they will be collected. Start small: your students can always expand their collection area later.

The students should deal with basic planning questions:

- *What type of collection containers should we use?*
- *Where should the containers be placed?*
- *Are we going to locate them in the classrooms, the hallway, or the cafeteria?*
- *Whose permission will we need to have? How do we get that permission?*
- *Who will collect the containers?*
- *What will be done with the collected materials?*

Sometimes school recycling projects falter because students expect the maintenance staff to take care of all the problems. Most maintenance crews are happy to work with recycling projects, if they are part of planning from the beginning. A recycling project should help the maintenance crew rather than cause extra work. Adult volunteers (parents or teachers) may be needed to drive collected materials to a recycling center.

*Using products made from recycled materials.* Many people think recycling is over when they drop off cans and bottles at the recycling center. Teachers can help students learn about the entire recycling process. What happens to recycled material? Students may know the importance of collecting materials for recycling, but they also need to know the importance of choosing products that companies make from recycled materials.

A project about using recycled materials in the community could be a possibility. For example, many school systems are using recycled paper in offices, classrooms, cafeterias, or even bathrooms. If their school is not using recycled paper, a class could follow the steps below to prepare a report for the principal and the purchasing office:

- Interview the purchasing office to find out what kinds of paper they are now using. *Why did they choose those brands? How much do they cost?*
- Find out about other school systems or other schools that use recycled paper. *Why did they switch? How did they switch?*
- Prepare a list of companies that sell recycled paper goods. Compare their prices to the amounts your school now spends on non-recycled items. *Does paper made from*

### Part 3: Projects

*recycled material cost more or less than other paper? Why? Why is cost an important factor for the school to consider?*

- If students do a thorough job, they may show that recycled materials are comparable in quality and cost to non-recycled items. The class report may convince the purchasing office to switch to recycled materials.

*Reusing recycled materials.*

Reusing is part of recycling. Reusing can mean using something again for the same purpose or finding a new use for it. For example, an empty juice bottle could be refilled with juice made from concentrate or used as a vase for flowers. A class project might sponsor a contest for the most inventive reuse of an item or have a sale of items students collected and made into new and useful objects. Reusing can also mean finding a new owner for an item. The class could collect clothes they no longer wear for donation to a charity that they choose after researching several in the locality.

*and Recycling Coordinators and Local Program Contacts.*

*Recycling Projects.* Mrs. Townsley's Fifth Grade, Wilburn Elementary School, Raleigh, NC. <<http://wilburnes.wcpss.net/townsley/recycle/recycleindex.html>>.

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### Resources for Recycling Projects

*Earth Day Groceries Project.*

<<http://www.earthdaybags.org>>.

*The Earth Day Groceries Project is an Internet-based project in which students decorate paper grocery bags with environmental messages for Earth Day. The Web site provides an introductory presentation, step-by-step instructions, and lots of ideas for becoming involved in this cost-free project.*

*EPA Recycling Links.* U.S. Environmental Protection Agency. <<http://www.epa.gov/epaoswer/non-hw/muncpl/recycle.htm>>.

*Innovative Uses of Compost: Erosion Control, Turf Remediation, and Landscaping.* U.S. Environmental Protection Agency. <<http://www.epa.gov/compost/erosion.pdf>>.

*Innovative Uses of Compost: Reforestation, Wetlands Restoration, and Habitat Revitalization.* U.S. Environmental Protection Agency. <<http://www.epa.gov/compost/reforest.pdf>>.

*Litter Prevention and Recycling.* Virginia Department of Environmental Quality. <<http://www.deq.state.va.us/recycle/coord.html>>. *List of Virginia Litter Prevention*

## Precycling to Prevent Environmental Clutter

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*Precycling is concerned with a person's thinking before buying. It involves making environmentally responsible choices among different products. Sometimes it means deciding to buy nothing. Recycling is doing something with trash; precycling reduces the amount of trash produced in the first place.*

### Goals

- To help students understand the meaning and importance of precycling
- To provide students with an organized experience that involves precycling choices and behavior

### Materials

Materials depend on the nature of the project. Surveys would require little more than a means for recording data and a means for analyzing it. Promotion could involve pencil and paper, a computer, a camera (digital, perhaps), and other material for communicating to a widespread audience. If students are to create a product, the materials would be unique to that product.

### Directions

*During the instructional planning stages, the teacher may wish to read **About the Watershed: Instructional Framework**, especially parts VI and VII.*

#### Understanding the basics

Precyclers do not have to throw away or recycle as much because they create less trash. Becoming an active precycler means considering purchases carefully. It means making choices between brands or sizes for environmental reasons, instead of buying the most popular or least expensive product. For example, a precycler might choose to buy one 20-ounce box of cereal instead of two 10-ounce boxes. Instead of two boxes to throw away, there will only be one. Some products have recyclable packaging. This can be as simple as checking for a recyclable symbol on each plastic container before buying peanut butter or soda. Some people choose to use china dishes and cloth napkins instead of paper plates and paper napkins.

These appear to be easy choices, but they involve many considerations. Cloth napkins can be washed and reused many times, but paper napkins are thrown away at the end of each meal. Suppose a cloth napkin lasts for 5 years. At the end of 5 years, one napkin would be discarded, or it could be reused as a dishrag or as stuffing for a pillow. (See "Recycling to Protect the Watershed," p. 25, for more ideas about reusing.) If a person used paper

napkins at every meal for 5 years, he or she would throw away 5,475 napkins. That seems like a lot of trash! But who is going to wash the cloth napkin? How much water must be used? How much soap? Suddenly the decision is not so easy.

#### Surveying buying habits

Precycling often includes making individual choices. How might this lead to a project for your class or school? First you need to investigate and practice precycling. Next, you can inform others about precycling. You might start by finding out why people do or do not precycle. People often have good reasons for making the choices they make. For example, they consider convenience and cost. One project idea is to survey people's buying habits. You could ask people what they buy and why they buy it. You should keep your survey (and survey questions) short and simple. You could design questions such as the following:

- *Do you buy products with little or no disposable packaging?*
- *Do you buy products in reusable or recyclable packages? Why or why not?*
- *Do you buy economy sizes or bulk products? Why or why not?*

Students could target various groups such as classmates, parents, teachers, or others in your community for your survey.

#### *Recognizing precyclers.*

You may find that the survey group is already making the choice to precycle. If so, they deserve recognition. The conclusion of the project might be to award or publicize precyclers. See "Obtaining project recognition through awards and contests" (p. 42) for ideas about setting up an environmental awards program.

#### *Promoting precycling.*

If the results of the survey show that people are not choosing to precycle, a project might be to try to encourage precycling. One approach might be to start an advertising campaign. You could design a series of posters for the hallways in your school or write a series of articles or advertisements for the school or local paper. See "Obtaining project

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recognition through promotion” (p. 41). Also see “Writing Publications to Promote a Project” (p. 67) and “Preparing a Press Release” (p. 73).

### **Inventing a recyclable product**

Another project might be to invent a product people could use and reuse, such as a cloth lunch sack, instead of something they now use and throwaway. Think of other items thrown away after each use. Then create a durable and reusable substitute for the item.

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## **Resources for Precycling Projects**

*Holiday Tips for Saving Money and the Environment.* U.S. Environmental Protection Agency. <[http://www.epa.gov/epahome/headline\\_121202.htm](http://www.epa.gov/epahome/headline_121202.htm)>. *This EPA site provides lots of ideas for conserving (as well as reusing and recycling) that could provide inspiration for a student project spanning the winter holiday vacation.*

*Precycling.* Halifax Regional Authority, Nova Scotia, Canada. <<http://www.region.halifax.ns.ca/wrms/precycling.html>>. *This Web site lists lots of ideas for precycling, including special precycling tips for spring and winter. It also includes a model survey titled “Are you a Precycler?”*

*Precycling.* Monroe County Solid Waste Management District, Bloomington, IN. <<http://www.mcswmd.org/precycle.html>>. *Precycling in the home is the theme of this local government Web site that could spark some ideas for student groups interested in a precycling project.*



## Restoring the Environment through Land Cleanups

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### Goals

- To help students eliminate trash that can make land unsafe for people to live in or grow food on
- To help students restore the natural habitat of plants and animals
- To help students remove litter before it can pollute waterways
- To give students the opportunity to help people take more pride in their community

### Materials

- Permission forms
- Protective clothing (see “Protective clothing,” below)
- Large bags and/or other containers for trash and recyclable items
- Rakes and shovels
- Tarpaulin (not essential, but handy for dragging trash and debris)
- Scales for weighing trash and recyclables
- Pencils
- Notepad
- Camera (ideally a digital camera if a project Web page is anticipated)
- Drinking water (and food, if snack or lunch is to be provided)
- First aid kit
- Vehicles for transporting trash containers

### Directions

*During the instructional planning stages, the teacher may wish to read **About the Watershed: Instructional Framework**, especially parts VI and VII.*

#### Understanding the project

Many streets and other land sites are more litter-free now than they were 20 years ago. People have been conducting more cleanups, but areas remain that need to be cleaned. Cleanups remove litter from our land and dispose of it properly. Some litter should be put in the dump, and some should be recycled. This project description offers some suggestions for planning a safe, successful cleanup.

#### Choosing a site

An outdoor cleanup usually is a big job, requiring lots of help. Some trashy areas or other polluted places can be dangerous. Make sure that any area the group chooses to work in is free of hazards and that you have appropriate plans to protect the health and safety of students before beginning the project. This is one type of project where you might be wise to work with an experienced, qualified organization.

If students decide to clean up a section of a road, contact the Virginia Department of Transportation “Adopt-a-Highway” program for assistance. (See <http://www.virginiadot.org/infoservice/prog-aah-default.asp>.) If students have decided to clean up a specific spot, contact local city or county offices to inquire about “Adopt-a-Spot” programs. The group may find other local programs to work with, such as spring or beach cleanups.

If students will not be working with an established program, help them identify a site on the school grounds or in the community that needs to be cleaned up. Make a list of all potential sites. Consider the size of each site and how dirty each is. Also consider whether the site is convenient enough. If the students pick a site that has little trash, they may not notice much difference after the cleanup day. But this kind of site might be a good choice for cleaning up an area regularly, perhaps every month. If they pick a site that is too large, they may be frustrated by not having enough people or time to clean it up very well.

#### Developing a plan of action

After you have selected a site, you must develop a plan of action. School systems and other authorities may not approve the cleanup until a complete action plan is available. The following should be considered in development of an action plan:

- *Safety and legal issues.* Before anyone picks up any trash on the site, qualified adults must conduct a safety inspection to look for harmful items, the landowner must approve the activity, and the school must approve it. Get written permission from landowners, and ask the school what administrative requirements pertain to the project.

Medical wastes and explosives are dangerous. Large containers, such as 55-gallon drums,

may contain toxic chemicals. If the adult inspectors find these items or others they cannot identify, report these findings to the local fire department. Maybe students can safely clean up these areas after professionals have removed the hazardous materials, but student cleanup must wait until authorities give permission. Safety is essential.

Well ahead of the cleanup, hand out permission forms, and give students instructions and a deadline for completion.

- *First aid precautions.* Each cleanup site should have a first aid kit. A responsible adult at the site must know how to use the first aid supplies and what to do in case of emergencies. As with any fieldwork involving students, an extra vehicle and an extra driver should be available for emergencies.
- *Schedule considerations.* Planning includes scheduling days for cleanups. There might not be time on a school day to get everyone to a site and to clean up the site. A weekend day may allow more time for the project, but it may be hard to get all the students together then.
- *Transportation.* If the cleanup is during a school day, either the class will walk to the site or the school bus driver will be needed to drive them and take care of parking. If the cleanup is on a weekend, make arrangements for parking places for the cars that come and stay.
- *Project helpers.* Early on, identify and enlist helpers in the project. Be sure to include people in the planning group who have had experience conducting a cleanup.
- *Job assignments and permission forms.* Just before cleanup day, meet with all workers to go over a map of the cleanup area and see that everyone knows his or her job assignments. Be sure that all signed permission forms are in order.
- *Protective clothing.* Inform all workers about proper clothing for safety. Work gloves are essential. Each person should wear long pants, sturdy shoes, work gloves, and sun protection. Even if the cleanup day is warm, everyone needs to wear a long-sleeved shirt for protection from scratches or insects. If the cleanup is near a road, each person should wear a brightly colored vest (available from the “Adopt-a-Highway” program at

<http://www.virginiadot.org/infoservice/prog-aah-default.asp>).

- *Disposal arrangements and fees.* Most public works departments close on weekends. This means scheduling special pickup times for some materials. Decisions will be necessary about who will take heavy items (e.g., stoves, refrigerators, furniture) to the dump or recycling center. If there is a fee for disposing of trash, the school group might ask to be excused from paying it.
- *Recycling options.* Locate recycling buy-back centers and recycling drop-off locations near the cleanup site. Choose locations for sorting trash into recyclables. The class may be able to sell aluminum cans to a buy-back center. Separate the recyclables out of all the trash after collecting it, or put each piece into separate containers for aluminum, glass, or plastic as it is picked up.
- *Rain date.* Advertise a rain date, so that rain will not cancel the entire project.
- *Trash bags and tools.* Get plenty of trash bags. Some established cleanup programs provide them, and sometimes local businesses will donate them. A few yard rakes and shovels could be helpful at some sites.
- *Refreshments.* Consider providing drinks and food for the cleanup workers. Sometimes restaurants, grocery stores, or drink bottling companies will donate refreshments. At a minimum, water should be available for workers.

### Coordinating cleanup day

#### *Make a checklist.*

If proper planning has been done, the rest should be easy and even fun. Make a cleanup-day checklist in order to remember these important rules and assignments:

- Workers and helpers are dressed properly for their own safety.
- All necessary permission forms are signed.
- Someone is responsible for handing out the trash bags.
- Each team knows its assigned work area.
- People are working together in teams of at least three people.
- Each person has instructions about avoiding dangers like snakes and bees.

- Each person knows to watch out for sharp objects like broken glass.
- Everyone knows break times and quitting time.
- Each person knows what he or she should do if someone gets hurt.
- A responsible adult is prepared for emergencies.

#### *Keep records.*

During or at the end of the cleanup, record how many bags of trash have been collected and what kinds of trash are found where. Using the scale you have brought to the site, weigh the collected material. These numbers can later be graphed and analyzed in class. Some established programs ask for this and other information such as the following:

- *How large an area was cleaned?*
- *How many people helped?*
- *How many pounds of trash were collected?*
- *How many pounds of recyclables were collected?*

If you choose to work with an established program, someone will tell you what kind of records to keep.

### **Conducting follow-up**

#### *Analyze data.*

Analyze the cleanup data in class and/or submit data about your cleanup if you are working with an established group.

#### *Thank participants and sponsors.*

Finally, write thank-you letters to everyone who helped with the cleanup or gave food, drinks, or materials. Remember to reward yourself and your class too for all of the hard work.

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## **Resources for Land Cleanups**

The organizations listed below have helpful information about managing a cleanup project:

*Adopt-A-Stream.* Virginia Department of Conservation and Recreation.  
<<http://www.dcr.state.va.us/sw/adopt.htm>>.  
*This site provides step-by-step information on adopting a stream or watershed; materials for successful cleanup; and classroom handouts, posters, and activity guides to increase student motivation.*

*Chesapeake Bay Restoration Projects.* Chesapeake Bay Trust. <<http://www.cbtrust.org/projectresources.html#stream>>. *Chesapeake Bay Trust provides online suggestions for students and teachers, outlining steps and ideas for organizing and implementing clean up projects. Contact information is provided for helpful resources.*

*Clean Virginia Waterways.* Department of Natural Sciences, Longwood University, Farmville, VA. <<http://web.longwood.edu/cleanva/>>. *Clean Virginia Waterways encourages citizen stewardship and involvement in statewide programs, such as The International Coastal Cleanup and Fall River Renaissance. Contact information at the local level is provided.*

#### *Give Water a Hand.*

<<http://www.uwex.edu/erc/gwah>>. *Based in Wisconsin, Give Water a Hand is a national watershed education program designed to involve young people in their wetland and watershed environments through local service projects. The Web site offers a downloadable teacher guide outlining how to carry out specific action-oriented projects.*

*Virginia Adopt-a-Highway Program.* Virginia Department of Transportation.  
<<http://www.virginiadot.org/infoservice/prog-aah-default.asp>>. *If your group agrees to pick up litter four times a year for two years, VDOT will provide trash bags, safety vests, safety information, and highway signs that recognize your group's effort.*



## Improving Streams through Waterway Cleanups

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### Goals

- To establish a connection between students and a waterway that runs through their community
- To help students see firsthand the impact of their cleanup efforts on the condition of the stream and quality of the water
- To encourage and empower students to participate in other activities aimed at improving water quality in Virginia

### Materials

- Large trash bags
- Boxes for recyclable items
- Work gloves
- Rakes, shovels, and/or litter poles
- Flagging tape
- Maps. Each team will need two maps: (1) a map of the stream section, showing major litter accumulations; and (2) a road map showing starting points and the route between the team's stream section and the central meeting place.
- First aid kits

### Directions

During the instructional planning stages, the teacher may wish to read *About the Watershed: Instructional Framework*, especially parts IV, V, VI, and VII.

The success of a cleanup event will depend on the organization and implementation of a waterway cleanup project plan. The Virginia Department of Conservation and Recreation's "*Adopt-A-Stream*" Manual (<http://www.dcr.state.va.us/sw/docs/aasmanul.pdf>) will provide information for organizing and implementing a waterway cleanup from beginning to end. The agency encourages groups to use the information as needed and to modify the information to suit site-specific circumstances. Basic information includes the following:

#### Establishing a core committee

A waterway cleanup committee is a core group of people dedicated to organizing and implementing cleanup of a stream or other waterway. The group may consist of the principal, the teacher(s), parents,

and student representatives. Taking the steps below will allow the committee to get the project organized:

1. Determine location and date of cleanup. Remember to choose a rain date. In determining location, make note of accessibility and safety issues.
2. Conduct a site visit, arrange for trash disposal, recruit volunteers, gather materials and supplies, contact property owners, secure any necessary permissions, and solicit project support.
3. Meet regularly before the project date to share successes and troubleshoot potential problems. Use a waterway cleanup checklist (available from the Department of Conservation and Recreation's "*Adopt-A-Stream*" Manual) to monitor planning progress.
4. Involve the other students in the class in some of the organizing tasks. Remember, the cleanup is a group effort, and it is important that everyone contributes.

Each of the committee's responsibilities is detailed below.

#### Selecting a site

Site selection involves determining which waterway the group will clean. Many possibilities exist, including

- a stream
- a creek
- a pond
- a lake
- a river
- the Bay
- any other body of water where litter has accumulated.

Projects can be on public lands, such as parks, community property, and open space. Projects can also be on private property, in which case the group might consider including the landowners on the organizing committee.

*Note: Whether the site is public or private property, the organizing committee must receive*

*permission to be on the land prior to the project date.*

### **Scouting a site**

A member of the organizing committee, with at least one adult present, should walk the selected waterway *8–10 weeks* before the cleanup. A scouting survey of the waterway section to be cleaned will give a better idea about the amount and types of litter to which volunteers will be exposed. A member of the organizing committee should also walk the site *two weeks* prior to the project date. During this walk, the committee member should create a series of maps that will help cleanup crews locate accumulations of litter. Survey information might include sizes, types, and abundance of objects. The person surveying the area should also note whether objects can be hauled out on foot or whether a vehicle is necessary.

When scouting the area for a cleanup site, the appointed committee member(s) should consider the following questions:

- *Is the site safe? (Consider steep slopes and class of rapids)?*
- *Is the site accessible to students? (Consider ease of entry and exit)?*
- *What was the site used for in the past?*
- *Is the site too large for a single cleanup day or will several cleanups be required?*
- *What types of trash or debris are present?*
- *Are there any sensitive areas that should be treated with care?*
- *Are there hazardous substances present that make a stream unsuitable for a cleanup by the class? (If there are questions or concerns, contact the Department of Health, Division of Health Hazards Control at 804-786-1763.)*

### **Scheduling the cleanup**

The committee should select the project date and time *8–10 weeks* before the event.

Cleanups may be set for weekdays or weekends. It is important to avoid a holiday weekend or a weekend when the switch is made to or from Daylight Savings Time. The organizing committee should also allow adequate time for project planning. If equipment will be borrowed, the organizing committee should make these arrangements first, and select a day when the equipment is available. Remember to establish a rain date.

A stream cleanup typically lasts about 4 hours. The organizing committee should allow an additional half-hour before the event for setup and a half-hour afterwards for wrap-up activities. Additional time may be required after the event if a picnic or barbecue is planned.

### **Disposing of litter**

The committee should arrange for the disposal and/or recycling of collected litter. They should first contact local officials (the local Litter Control and Recycling coordinator or the Department of Public Works is a good place to begin) to determine what services government can provide, including

- removal of trash bags after the cleanup is complete
- removal of recyclables
- removal of large items from the site, such as cars, appliances, tires (students should not attempt to dislodge or remove large items; volunteers should mark the location of such items on their map for removal at a later date)
- transportation for disposing of trash and recyclables.

If local officials are unable to help, the organizing committee should perform the following tasks:

- Contact the closest recycling center and confirm the days and hours of operation, acceptable items, limits on quantity of materials delivered, and specifications for advance preparation. Call and confirm this information a few days prior to the project date.
- If the recycling center will not be open on the project date, secure a place to store recyclables until they can be delivered at a later date.
- Contact the closest landfill and confirm the days and hours of operation. It may be necessary to schedule the cleanup earlier in the day to allow enough time for delivery to the landfill.
- Consult local private companies that may be able to provide assistance.

### **Arranging for transportation**

The organizing committee should distribute a map showing starting points as well as routes between the central meeting place to pickup point(s). Cleanup crews should be instructed to deposit all filled trash bags at their assigned starting point. If volunteers with pickup trucks can be secured as

shuttle vehicles, they should be assigned to visit specific starting points and collect any trash bags at these locations.

Volunteers will transport these bags from pickup points to the central meeting location, where they can be transferred to dump or trash trucks. The number of trucks needed depends on the amount of litter and size of the items (determined in the site survey). If there are not enough pickup trucks volunteered prior to the project date, the organizing committee should explore other options, such as the local Litter Control and Recycling coordinator or the local Department of Public Works/Utilities.

### **Obtaining permissions**

Obtain written permission from owners of property in the proposed cleanup section. Venturing onto private property without permission is trespassing. The organizing committee should invite the property owner to participate in the cleanup. If you are unsure of the landowner, county tax maps, located in county planning offices, can provide property ownership information. The organizing committee can also determine the property owner by talking to people who live close by.

*Note: Before sending the cleanup teams out, the organizing committee should emphasize the importance of staying off private property, except where expressed permission has been given by the property owner.*

### **Arranging for equipment and materials**

Gather cleanup equipment and materials. Cleanup groups can often borrow equipment from state or local government offices and/or local environmental organizations. The organizing committee should make arrangements to have borrowed equipment delivered or picked up and then returned. Any equipment that cannot be borrowed should be purchased 2–3 weeks prior to the project date.

To conduct a successful cleanup, you will need to provide site captains and cleanup crews with the materials listed at the beginning of this project.

### **Providing refreshments and other rewards**

Refreshments are one way to thank volunteers for their valuable time and hard work. If beverages are not provided, the organizing committee should encourage participants to bring their own.

*Participants should be reminded to avoid drinking water from any stream and should be encouraged to take breaks and drink fluids to avoid overexertion.* Simple refreshments (coffee and doughnuts, cookies and punch) may be offered during registration or at day's end as a time for

volunteers to celebrate a job well done. A picnic or barbecue is another good way to thank volunteers. Local businesses and/or the volunteers themselves may be willing to donate food/drink, coolers, cups, ice, paper goods, utensils, and other items.

The organizing committee could also consider providing rewards, such as certificates, bumper stickers, tote bags, caps, or T-shirts. The committee may solicit contributions, both monetary and in-kind services, from local businesses.

### **Preparing site captains and participants**

Provide training for site captains, conduct a safety meeting, and complete the site preparation. A representative of the organizing committee should make arrangements to meet with site captains *prior* to the project day or, if necessary, immediately before the start time on the project day. Site captains should be prepared to

- answer volunteers' questions
- direct volunteers to cleanup and disposal sites
- if required, make sure data sheets are completed correctly and turned in
- help organize and distribute the refreshments and rewards.

Everyone participating in the cleanup must have attended at least one Adopt-A-Stream safety meeting in the previous 12 months. This safety meeting may be conducted immediately before the cleanup at the central meeting location. A member of the organizing committee or site captain must review the Adopt-A-Stream safety guidelines with all volunteers.

All volunteers must complete a liability release form. Immediately before the cleanup is also a good time to deliver any educational messages.

For stream cleanups, little site preparation is required. Sensitive areas should be cordoned off with flagging. Private property boundaries should also be identified with flagging to avoid inadvertent trespassing. Larger waterways may need more site preparation.

### **Coordinating cleanup day**

Even with extensive advance preparation, many activities must take place on cleanup day itself. The day begins with organization of volunteers and initiation of the waterway cleanup. All participants play important roles in the success of the day:

*Volunteer registrars.*

Volunteers in charge of registration have several important responsibilities:

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- Provide a sign-in sheet for volunteers at the central meeting place on the day of the cleanup. The sheet should include spaces for the volunteer's name, address, and phone number. (Remember to provide pencils or pens.)
- Volunteers who have not completed and signed a safety liability release form must do so before participating in any cleanup activity.
- Nametags help volunteers get to know each other.

#### *Supervisor.*

The project supervisor must orient the workers to the day's plan:

- Introduce each of the site captains, and explain their role.
- Brief volunteers on whether the litter collected is to be separated into recyclable and non-recyclable materials.
- Brief volunteers on where to place filled bags.
- Brief volunteers on the boundary of the project site.
- List the project supervisors in case of emergency.
- Inform volunteers about the availability of refreshments and location of restroom facilities.
- Help site-captains form cleanup teams.

#### *Work teams.*

Nobody should work alone. All group members, whether students or adults, should always work in teams of two or more. Considerations for team participation include the following:

- Teams should be formed in part according to who has a car, canoe, or boat.
- Each team needs transportation to and from the team's assigned section.
- Teams should be assigned a maximum of one-mile waterway section.
- Each team should receive trash bags and a set of maps.
- Teams should get from the project supervisor a specific time to return to the central meeting area, even if their work is unfinished.

- Volunteers should call if they will be coming or returning late or not at all, so that all are accounted for and there is no cause for worry.
- Volunteers should follow the eight safety rules:

#### **Safety Rules for Volunteers**

1. Team up. Use the buddy system. *Never work alone.*
2. If you get lost, find the nearest stream and follow it downstream. You will eventually reach a road crossing.
3. Never drink from a stream or other waterway.
4. Always watch where you are going. Never put your hands or feet in places where you cannot see.
5. Do not trespass.
6. Do not handle sharp metal objects or broken glass.
7. Do not touch anything that looks toxic. Report the item to the Department of Health by calling 804-786-1763.
8. Leave downed trees alone, unless they are causing flooding or erosion.

#### *Site captain.*

The site captain has responsibilities related to cleanup practicalities for *each* team:

- Help the team identify a starting point in the middle of their assigned section. (Generally, the amount of litter declines dramatically the further you get from the access point.)
- Instruct the team to walk, canoe, or boat a half-mile upstream from the starting point (distance traveled upstream and downstream should be half of the total distance to be covered) and collect trash on their return trip to the access point (if necessary, separating recyclables and non-recyclables).

This collection method helps volunteers avoid transporting full bags of trash great distances. After dropping off any full trash bags at the access point or other previously identified location, the team should then walk, canoe, or boat a half-mile downstream, again collecting trash as they return to the starting point. If there is a question of how to judge when they have traveled far enough, the site-captain may suggest that volunteers should travel until they encounter the team cleaning the neighboring section.



*Transporters and drivers.*

Deposit and collection of trash involves the participation of drivers and other transporters:

- Teams should leave all filled trash bags at their starting point. Approximately 1–2 hours later, volunteers with pickup trucks should begin visiting starting points to collect any trash bags.
- Drivers should return all collected bags to the central meeting place, where trash can be sorted and recycled.
- For larger cleanup events, outboard boat assistance provided by the Virginia Department of Game and Inland Fisheries, the Virginia Marine Resources Commission (VMRC), the U.S. Coast Guard, local fishing groups, or individual citizens may be used to transport trash from canoes or boats to the central meeting place.
- If there are no pickup arrangements with the local government, volunteers should haul trash to the landfill and recyclables to the recycling center as needed.

**Gathering at day’s end**

Coming together as a group at the end of the day is important:

- Cleanup crews should reconvene at the central meeting place by the assigned time.
- Project organizers should provide refreshments and rewards to help volunteers celebrate their accomplishments.

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**Following Up (Project Manager)**

The project manager is generally the person involved in the major follow-up responsibilities:

- After the cleanup, send copies of the sign-in sheets and all completed and signed safety liability release forms to the Virginia Adopt-A-Stream Program Coordinator at the Virginia Department of Conservation and Recreation (see address below). This information is vital to gauge volunteer activity and project events. During times of certain statewide campaigns, certificates of appreciation for each volunteer and organization involved in the cleanup are also provided. The department also compiles the information into a community database of individuals and organizations to facilitate networking among groups and individuals interested in water quality issues. It also helps in monitoring activities across the state.

- The project supervisor is responsible for sending in a completed stream/waterway cleanup data form. The information on this form will allow the department to monitor and evaluate the progress of the Virginia Adopt-A-Stream Program. All materials should be sent *within two weeks of the project date* to:

Virginia Department of Conservation and Recreation  
 Attn: Virginia Adopt-A-Stream Program Coordinator  
 203 Governor Street, Suite 206  
 Richmond, Virginia 23219-2094  
 Fax: 804-786-1798

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**Earning Recognition Signs**

All adopting organizations will be awarded a round, metal Adopt-A-Stream sign, which includes the organization’s name, to place at a location of their choice. The adopting organization will be responsible for posting and maintaining the Adopt-A-Stream sign. Permission must be secured before posting the sign on public or private property.

Once the sign-in sheets, safety liability release forms, and the stream cleanup data form have been submitted to the Department of Conservation and Recreation, the program coordinator will work with the project sponsor(s) to facilitate the exchange and installation of the official Adopt-A-Stream sign.

Any other questions or concerns regarding the Virginia Adopt-A-Stream Program should be directed to the program coordinator at 804-692-0148.

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**Resources for Stream Cleanups**

*U.S. Coast Guard.*

<<http://www.uscg.mil/uscg.shtm>>.

*Virginia Adopt-A-Stream Program.* Virginia

Department of Conservation and Recreation.

<<http://www.dcr.state.va.us/sw/adopt.htm>>.

*Virginia “Adopt-A-Stream” is a statewide litter education and cleanup campaign aimed at promoting citizen-based stewardship of the commonwealth’s water resources. The agency’s “Adopt-A-Stream” Manual can be an invaluable tool for organizing a waterway cleanup (<http://www.dcr.state.va.us/sw/docs/aasmanul.pdf>).*

*Division of Health Hazards Control.* Virginia Department of Health.

<<http://www.vdh.state.va.us/HHControl>>.



## Building an Outdoor Classroom

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*Most of the time when students are at school, they are sitting inside a classroom at a desk, working on assignments. Sometimes they might look out the window and wish they could be outdoors. Teachers wish this sometimes too. What if the school had an outdoor area for special learning activities?*

### Goals

- To provide an effective outdoor place for students to learn about weather, plants, animals, geology, history, and many other subjects
- To make the schoolyard a better habitat for plants and animals
- To reduce soil erosion that contributes to waterway obstruction
- To improve an unattractive view
- *What are the special features (e.g., rocky area, hillside, big trees, pretty view, stream, sunny field)?*
- *Are there places with safety hazards that must be avoided, or can these safety problems be solved?*

### Considering themes for an outdoor classroom

- Gardens for native plants, such as grasses and wildflowers
- Nature trail
- Weather study area with equipment to measure weather changes
- Bird feeding station
- Flower or vegetable garden

Focusing on one such idea is good if the area is small.

### Writing a proposal for permission

Permission and support from the principal and the grounds staff are essential. Develop a written proposal with a description of the plan for the outdoor classroom. Include the answers to the following questions:

- *Why is this study area important for our school?*
- *How will it enhance student learning?*
- *What supplies do we need to construct it?*
- *Where will we get them?*
- *If we need money to purchase supplies, how will it be raised?*
- *What people in the community will help us?*
- *Who will take care of the area after it is built?*
- *How will we make sure that the area is safe during construction and after it is open?*

The proposal should define a primary goal and purpose for the project. For example, if students are creating a nature trail behind the school, the written statement might read as follows:

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### Materials

Design, purposes, and construction decisions will dictate the types of supplies needed. The list below indicates basic materials if students are to do the construction:

- Site plan
- Mulch and topsoil
- Landscape timbers
- Rakes, shovels, trowels
- Work gloves
- Watering hose or other means of watering plants
- Plants

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### Directions

*During the instructional planning stages, the teacher may wish to read **About the Watershed: Instructional Framework**, especially parts II, IV, V, VI, and VII.*

### Selecting a location

Where should the outdoor classroom be? Consider the following questions:

- *What kinds of activities will be conducted there?*
- *What kinds of learning activities are important to us?*
- *How much space is available?*
- *What areas are accessible to all students?*

## Part 3: Projects

“The goal of our outdoor classroom project is to construct a .25 acre nature study area in the woods behind the school playground. The purpose of the area is to provide a place for students at all grade levels to observe plants, animals, and other natural features, topics that are covered in our curriculum. The trail will be safe and accessible to all students in our school. We will plan the construction of the trail so that we do as little harm as possible to the natural area.”

### Getting assistance from local sources

Whatever project idea you choose, there are many resources available to help you plan and carry it out. Some of the places you might contact for help are listed below:

- Local libraries
- City and county parks and recreation offices
- Forestry, biology, horticulture, and science education departments at a local university or college
- County agriculture extension service
- National or state parks, forests, wildlife refuges
- Science centers, science museums, botanical gardens
- Gardening and landscape centers, greenhouses, and garden clubs
- State wildlife department

### Implementing phases of project development

Developing an outdoor classroom will probably take most of at least one school year. Different types of sites will require different plans, but most plans can be approached in phases.

- *Phase 1 (one month)*. Survey site and prepare map showing location and special features. Develop budget and fund-raising plan. Review plans with principal and grounds maintenance supervisor; revise as necessary.
- *Phase 2 (two months)*. Present final plan to principal (and to the school board, if required). Write a press release about the project and

send it, with principal’s approval, to local newspaper, television, and other media. (See “Preparing a Press Release,” p. 73.) Begin contacting people who will help with construction. Begin fund raising. Work with group to draft the site study guide. Design explanatory signs.

- *Phase 3 (one month)*. Continue fund raising and work on study guide. Schedule construction date. Make explanatory signs.
- *Phase 4 (one month)*. Acquire materials for construction, such as mulch or landscape timbers. Draft interpretive material.
- *Phase 5 (one month)*. Construct site. Complete plantings. Plan dedication ceremony (including speakers, guest list, press coverage). Establish schedule for routine maintenance. Check site at least weekly and correct problems. Complete interpretive materials and print.
- *Phase 6*. Hold dedication ceremony. Enjoy the new outdoor classroom.

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### Resources for Outdoor Classrooms

*BayScapes*. Alliance for the Chesapeake Bay. <<http://www.alliancechesbay.org/bayscapes.cfm>>. *BayScapes provides online information about the development of environmentally sound landscapes on parks, schoolyards, backyards, and other areas.*

*POW! The Planning of Wetlands: An Educator’s Guide*. <<http://www.wetland.org/ecpubs.htm>>. *This publication is an educator’s guide to planning, developing, and monitoring wetlands on schoolyards.*

*Schoolyard Habitat Project Guide*. Chesapeake Bay Field Office, U.S. Fish and Wildlife Service. <<http://www.fws.gov/r5cbfo/schoolyd.htm>>. *The Schoolyard Habitat Program helps teachers and students develop a wildlife habitat on school grounds. A downloadable project guide is available for teachers.*