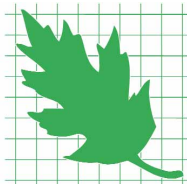
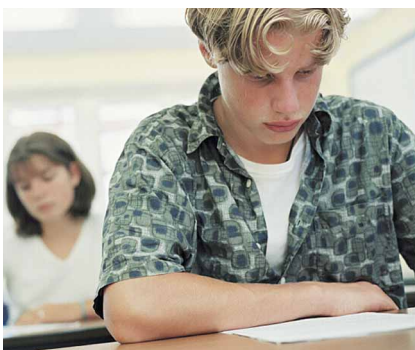




Check Up

Teacher's Guide for Assessing
Natural Resources in Maryland Schools



ENVIRONMENTAL
DESIGN

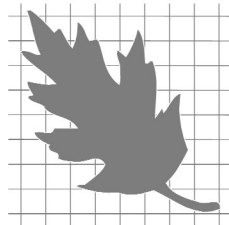
**Maryland Environmental
Design Program**

Watershed Services

Maryland Department of
Natural Resources

Check Up

**Teacher's Guide
for Assessing Natural Resources
in Maryland Schools**



ENVIRONMENTAL
DESIGN

Maryland Environmental Design Program
Maryland Department of Natural Resources



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Annapolis, Maryland 21401



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www.dnr.maryland.gov

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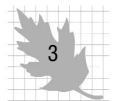
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This guide was written by Narjes Soliman, Elena Takaki, and Donna Fahres in the Watershed Services Program at the Maryland Department of Natural Resources. Special thanks to Sean McGuire, Matt Fleming, Amy Banowetz, Dr. Mark Bundy, and Jeanne Armacost.

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INTRODUCTION

Check Up is a teacher's guide provided by the Environmental Design Program of the Maryland Department of Natural Resources. This teacher's guide is designed for grades 6-12 and provides an opportunity for teachers and students to participate in implementing the following commitment of the Chesapeake Bay Agreement: *Provide students and teachers alike with opportunities to directly participate in local restoration and protection projects, and to support stewardship efforts in schools and on school property.*

Check Up provides teachers and students with information to enable them to identify and implement natural resources planning and management strategies that are both environmentally sensitive and economically sound. Students conduct natural resource assessments at their school and learn first hand how to better live in harmony with the natural environment by conserving energy and water, and reducing waste. Schools that participate in **Check Up** also have the unique opportunity to serve as models by demonstrating sound land use practices on site.

In addition, **Check Up** participation can be applied toward the certification requirements for receiving the **Governor's Green School Award** through the **Maryland Association for Environmental and Outdoor Education**.

The Check Ups

The **Energy Check Up** teaches students to identify the ways that energy is used at their school, read and understand an electric meter and electric bill, and calculate the amount of energy used by and the cost of running specific appliances. Students then devise a plan to reduce energy consumption, and calculate potential monetary and energy savings from their plan. Finally, students prepare a presentation to bring before their principal or school board to suggest implementing changes based on the savings.

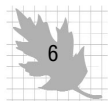
The **Water Check Up** teaches students to identify the ways that water is used at their school, read and understand a water meter and water bill, calculate the amount of water used by specific fixtures, and calculate the amount of water wasted by leaky fixtures. Students then devise a plan to reduce water waste, and calculate potential monetary and water savings from their plan. Finally, students prepare a presentation to bring before their principal or school board to suggest implementing changes based on the savings.

The **Waste Check Up** teaches students to identify types of waste produced at their school, and calculate the volume of waste produced each day, month and year. Students then devise a plan for waste reduction, and calculate potential monetary savings from their plan. Finally, students prepare a presentation to bring before their principal or school board to suggest implementing changes based on the savings.



The **Schoolyard Habitat Check Up** teaches students to identify various types of habitat on their school grounds and evaluate them for suitable habitat for mammals, birds, reptiles and insects and other invertebrates. Students devise a long-term plan for their school grounds and incrementally work towards improving habitat.

The **Site Design Check Up** teaches students about the problems caused by impervious surfaces. Students examine their school grounds for impervious surfaces, calculate runoff for various situations, and make suggestions for reducing impervious surface on their school grounds.





ENERGY CHECK UP

Lesson Goal:

Students will learn to:

- Identify the ways that energy is used at their school.
- Read and understand an electric meter and electric bill.
- Calculate the amount of energy used by specific appliances.
- Calculate the cost of running specific appliances.
- Devise a plan to reduce energy consumption.
- Calculate potential monetary and energy savings from their plan.

Voluntary State Curriculum:

Grades 6-8, Science 1A1, 1A5, 1A7, 1C2

Grades 5-8, Environmental Science 6C1, 6D1

Grades 7-8, Social Studies 2A1, 2A4

Materials Needed:

- School electric bills
- School electric meter readings
- Student handouts

Lesson Value:

Electric power plants are one of the largest sources of air pollution in the United States. In 1999, these power plants emitted approximately 2.2 billion tons of carbon dioxide, 12 million tons of sulfur dioxide, and 7 million tons of nitrogen oxides into the earth's atmosphere. The release of these greenhouse gases into our atmosphere is the primary cause of global warming.

Air pollution from power plants also contributes to water quality problems. For example, in the Chesapeake Bay nitrogen from air pollution accounts for approximately one third of the nitrogen pollution in the Bay.

Air pollution created by power plants also contributes to human health problems such as asthma, bronchitis, cancer and other lung diseases.

Reducing the amount of energy that we use in our homes, work and schools can significantly reduce the amount of air pollution that we create. Saving energy also reduces our use of nonrenewable, natural resources such as coal, petroleum, and natural gas.



Pre-Assessment Checklist:

This checklist can be done by the teacher and/or the students.

1. Identify administrative offices and individuals responsible for energy use at your school (for example: the custodial/maintenance director).
2. Obtain copies of electric bills and electric meter readings for the past year . (Check with your custodial/maintenance director and your school district of fice.)
3. Identify and list major energy users at the school (heating, cooling, lights, computers).
4. Interview key individuals to learn top energy consuming activities and possible measures to conserve energy.

Introduction:

Begin the lesson with a discussion about energy. Questions to cover:

- What is energy?
- Where does energy come from?
- How do we make energy?
- How does energy production affect the environment?
- How do we use energy?
- How does energy use affect the environment?
- Why should we conserve energy?
- How can we conserve energy?
- What is an energy assessment?
- Why should we do an energy assessment?

Energy Curriculum Resources:

The resources below are examples of curricula that can be used in combination with the energy assessment.

GREEN SCHOOLS

Alliance to Save Energy

Download K-12 energy curriculum from the Alliance to Save Energy website.

Contact: www.ase.org
 202-857-0666
 info@ase.org

GET SMART ABOUT ENERGY

The U.S. Department of Energy

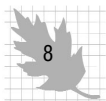
A CD-ROM with over 250 energy activities aligned with National Science Education Standards. This CD-ROM is specifically designed to help teachers quickly find and print reproducible science education lessons and activities about energy.

Contact: 800-363-3732

POWER UP! MARYLAND POWER PLANT CURRICULUM WRITING PROJECT

Anne Arundel County Public Schools and MD DNR

Energy production curriculum for grades 4 through 8. The curriculum covers five topics:



- 1) What is Electricity?; 2) How is Electricity Produced? Power Plants in Maryland;
 3) Using Electrical Energy; 4) Environmental Impacts; and 5) Energy Conservation.

Contact: 410-260-8809
 Joann Wheeler

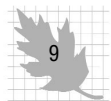
Energy Assessment:

Take a school tour to determine school energy usage.

1. Take an inventory of appliances that use electricity and document approximately how much electricity each appliance uses.

	A	B	C	D	E
Electrical Appliance	Wattage	# hours used per month	Watts used per month (A x B)	KWH used per month (C/1000)	Cost to run per month (D x electric company cost per KWH)
Incandescent lights					
Fluorescent lights					
Computers					
Air conditioner					
Electric Heater					
Electric Space Heater					
Other					

2. Calculate the cost per month to run each appliance
 - a. Determine wattage of an item (if wattage is not available, multiply amperage times voltage to get an estimate)
 - b. Wattage x the number of hours an item is used each month = watts used per month
 - c. Watts used per month divided by 1,000 = number of kilowatt hours (KWH) the item consumed in that month
 - d. KWH x electric company's rate per KWH = the amount you pay to run the item in a month
3. Measure Natural Gas usage and cost
 - BTU = how much gas an item uses in an hour
 - Multiply BTU times hourly usage for each month
 - Multiply BTU usage times the rate paid per hour (If your gas company charges per therm, first divide the BTU by 100,000, and then multiply it by the gas company's rate per therm.)



4. Identify places in the school where energy is wasted using the school energy checklist.

	Yes	No	Notes
Lighting			
Are lights off in unoccupied rooms?			
Are lights off in unoccupied common areas (cafeterias, gymnasiums, meeting areas, choral or band rooms)?			
Are outside lights turned off late at night (from 11:30 PM to 5:30 AM)?			
Are outside lights turned off during the day?			
Does your school use energy efficient light bulbs?			
HVAC Settings			
Air-conditioning set between 74 and 78 degrees?			
Heating set between 68 and 72 degrees?			
HVAC set back after school (78 degrees in summer, 66 in winter)?			
Exhaust fans turned off after school?			
Occupant Operations			
Is equipment off in unoccupied rooms?			
Are computers off in unoccupied areas (PC monitors turned off when not needed)?			
Are blinds closed after school?			
Are doors and windows closed when A/C or heating is in operation?			
Is there heat or cooling loss at the windows (do you feel cool air leaking inside on cold days)?			
Maintenance/Custodial Operations			
Are coils clean?			
Are timers set properly (lights, hot water heaters, etc.)?			
Other Energy Uses			
What other ways is energy used at your school?			



5. Based on the energy checklist, propose ways to reduce energy usage.
6. Calculate potential energy savings for each proposed change.
For example:
 - Calculate new amount of energy used per month if classroom lights are turned on for fewer hours each day.
7. Calculate potential monetary savings for each proposed change.
For example:
 - Calculate new cost per month if classroom lights are turned on for fewer hours each day.
8. Implement energy saving ideas and compare overall energy costs to the same month in the previous year .
To calculate overall school energy savings:
 - Use the school's electric meter to record daily, weekly or monthly energy use.
 - Compute total electric energy used by school each week or month and compare this amount to the same month of the previous year.
9. Graph potential and real energy savings based on the results of your calculations.
 - Plot week, month, or year on X axis and savings on Y axis.
10. Graph potential and real cost savings based on the results of your calculations.
 - Plot week, month, or year on X axis and savings on Y axis.



DID YOU KNOW?

Replacing one incandescent light bulb with a compact florescent bulb will reduce the same amount of CO₂ in the atmosphere as planting 34 trees.

How many light bulbs can you replace? This is the same as planting how many trees?

Summarize Results:

Prepare a presentation to bring before your principal or school board. Describe your plan to save energy at your school and document your estimates of energy savings and monetary savings. Include reasons for saving energy and how it helps the health of students, school staff, community residents and the environment.

Next Steps:

Tell your parents about your energy assessment assignment and conduct an energy assessment at your home. How much can you reduce energy usage at home and how much can you save on your parent's energy bill?

Energy Assessment Resources:

GREEN SCHOOLS

Alliance to Save Energy

This program combines installation of energy-efficient technology with implementation of management techniques and student learning/direct involvement and focuses on environmental and cost benefits of the changes.

Contact: www.ase.org
202-857-0666
info@ase.org

MARYLAND ENERGY ADMINISTRATION

The Maryland Energy Administration advises Maryland government on directions, policies and changes in the various segments of the energy market. Its mission is to maximize energy efficiency while promoting economic development, reducing reliance on foreign energy supplies, and improving the environment.

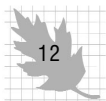
Contact: www.energy.state.md.us
800-72-ENERGY
mea@energy.state.md.us

PROJECT GREEN MACHINE

Marion County Public Schools, Florida

This program is an environmental resource conservation program and includes classroom curricula and extra-curricular activities about energy, water, recycling and land. The program also supports the school district in meeting local community environmental compliance requirements and offers monetary incentives to participate.

Contact: www.projectgreenmachine.org
352-671-6907
Rob Van Der Like
vanderlr@marion.k12.fl.us





WATER CHECK UP

Lesson Goal:

Students will learn to:

- Identify the ways that water is used at their school.
- Read and understand a water meter and water bill.
- Calculate the amount of water used by specific fixtures.
- Calculate the amount of water wasted by leaky fixtures.
- Devise a plan to reduce water waste.
- Calculate potential monetary and water savings from their plan.

Voluntary State Curriculum:

Grades 6-8, Science 1A1, 1A5, 1A7, 1C2

Grades 5-8, Environmental Science 6C1, 6D1

Grades 7-8, Social Studies 2A1, 2A4

Materials Needed:

- School water bills
- Student handouts
- Cups, buckets and /or beakers to collect and measure water

Lesson Value:

Although the world is covered by 70 percent water, only 2.5 percent of the water is freshwater. Of this, less than one percent is accessible for human use. And while water has the characteristics of a renewable resource, water appropriate for human use can become scarce if it is not used and managed sustainably. According to the United States Geological Survey (1995), the United States consumes 261 billion gallons of water a day for domestic use. Domestic use includes water for normal household purposes, such as drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, and watering lawns and gardens.

The buildings that we live and work in are not as water efficient as they could be. According to a study conducted by the American Water Works Association Research Foundation, a typical single family home uses 72.5 gallons of water per person a day. By installing readily available water efficient fixtures and appliances and taking measures to minimize leaks, the use of water can be reduced to under 40 gallons per person a day.

Pre-Assessment Checklist:

This checklist can be done by the teacher and/or the students.

1. Identify administrative offices and individuals responsible for water use at your school (for example: the custodial/maintenance director).
2. Obtain copies of water bills and water meter readings for the past year . (Check with your custodial/maintenance director and your school district of fice.)
3. Identify and list major water users at the school (sprinklers, bathrooms, gym showers).
4. Interview key individuals to learn top water consuming activities and possible measures to conserve water.

Introduction:

Begin the lesson with a discussion about water . Questions to cover:

- How much of the Earth is covered by water?
- How much of this is salt water?
- How much of this is fresh water?
- How much of the fresh water is accessible for human use?
- Is water distributed equally throughout the world?
- What are some ways that we use water?
- Why should we conserve water?
- What is a water assessment?
- Why should we do a water assessment?

Water Curriculum Resources:

The resources below are examples of curricula that can be used in combination with the water assessment.

MAGNIFICENT GROUND WATER CONNECTION

New England Interstate Water Pollution Control Commission

This ground water curriculum includes the basic concepts of the water cycle, water distribu tion, treatment and stewardship.

Contact: 978-323-7929
mail@neiwpc.org
www.neiwpc.org



PROJECT WET, WATER EDUCATION FOR TEACHERS

Montana State University

The goal of Project WET is to facilitate and promote the awareness, appreciation, knowledge, and stewardship of water resources through the development and dissemination of classroom ready teaching aids and through the establishment of state and internationally sponsored Project WET programs.

Contact: Project WET
PO Box 170575, Montana State University, Bozeman, MT 59717-0575
www.projectwet.org
projectwet@montana.edu
406-994-5392

In Maryland: Cindy Etgen
cetgen@dnr.state.md.us
410-260-8716

THE WATER SOURCEBOOK SERIES

LEGACY - Partners in Environmental Education

The Water Sourcebooks contain 324 activities for grades K-12 divided into four sections: K-2, 3-5, 6-8, and 9-12. Each section is divided into five chapters: Introduction to Water, Drinking Water and Wastewater Treatment, Surface Water Resources, Ground Water Resources, and Wetlands and Coastal Waters. The sourcebooks can be downloaded from the EPA website.

Contact: 334- 270-5921
www.epa.gov/safewater/kids/wsb/

Water Assessment:

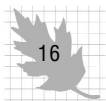
INDOOR WATER USE

Take a school tour to determine school water usage.

1. Take an inventory of water consuming fixtures, and document approximately how much water each fixture uses.

	A	B	C	D	E
Water Fixture	# of uses per day	# of gallons per use	# of gallons used per day (A x B)	Cost per gallon from water bill	Cost per day (C x D)
Bathroom sink faucets					
Toilets					
Urinals					
Drinking fountains					
Showers					
Indoor swimming pool					
Hot water heating pipes/AC					
Boiler					
Utility closets					
Indoor sprinkler system					
Cooling towers					
Other					

2. Calculate the cost per day for use of the fixtures.
 - a. Calculate number of gallons used per day by each fixture
 - # of uses per day x # of gallons per use = # of gallons used per day
 - b. Find out the cost per gallon of water from the school water bill
 - c. Determine the cost per day for use of the fixtures
 - # of gallons used per day x cost per gallon = cost per day
3. Measure wasted water from leaky faucets.
 - a. Put a cup or bucket under the leak and time it for five minutes.
 - b. Measure the amount of water collected.



- c. Multiply:
- Amount of water collected $\times 12 =$ water wasted in one hour
 - Water wasted in one hour $\times 24 =$ water wasted per day from that faucet
 - Add water wasted from all leaks to get total water wasted per day

	A	B	C
Water Fixture	Amount of water wasted in 5 minutes	Amount of water wasted in 1 hour (A x 12)	Water wasted per day (B x 24)
Bathroom sink faucets			
Drinking fountains			
Other			

- Identify and list fixtures that could be replaced.
- Calculate daily water savings that would result from basic renovations.
Example calculations:
 - Calculate how much water would be saved by repairing leaky faucets.
 - Amount of water wasted per faucet per day \times number of faucets repaired = amount of water saved per day
 - Calculate how much water would be saved by replacing hi-flow toilets.
 - Amount of water used per flush of current toilet – amount used per flush by low-flow toilet = amount of water saved per flush
 - Amount saved per flush \times number of flushes per day = amount of water saved per day by each toilet replacement
 - Amount of water saved per day by each toilet replacement \times number of toilets replaced = total water saved per day
- Calculate yearly monetary savings that would result from basic renovations.
 - Determine cost per gallon of water from water bill
 - Cost per gallon \times gallons of water saved = monetary savings on water bill
 - Monetary savings on water bill – cost per repair = actual monetary savings



DID YOU KNOW?

Repairing a leaky toilet can save 200 gallons of water per day or 73,000 gallons of water per year.

How many gallons of water can you save?

7. Graph potential and real indoor water savings based on the results of your calculations.
 - Plot week, month, or year on X axis and savings on Y axis.
8. Graph potential and real cost savings based on the results of your calculations.
 - Plot week, month, or year on X axis and savings on Y axis.

OUTDOOR WATER USE

Tour school grounds to determine outdoor water usage.

1. Take an inventory of water consuming fixtures, and document approximately how much water each fixture uses.

	A	B	C	D	E
Water Fixture	# of uses per day	# of gallons per use	# of gallons used per day (A x B)	Cost per gallon from water bill	Cost per day (C x D)
Outside faucets					
Sprinkler system					
Outdoor pool					
Fountain					
Pond					
Other					

2. Calculate the cost per day for use of the fixtures using the same technique as for indoor faucets.
3. Measure any leaks from outdoor faucets using the same technique as for indoor faucets.

	A	B	C
Water Fixture	Amount of water wasted in 5 minutes	Amount of water wasted in 1 hour (A x 12)	Water wasted per day (B x 24)
Outside faucets			
Other			

4. Identify fixtures that could be made more efficient.

For example:

 - Drip irrigation
 - Timers on sprinklers
 - Covers on pools to reduce evaporation

5. Consider other avenues for outdoor water conservation.
For example:
 - Roof water catchment (rain barrels) for watering lawns or landscaping
 - Water lawns at the time of day that will minimize evaporative loss (early morning)
 - Adjust sprinkler heads to reduce water that is wasted by watering asphalt
 - Plant an eco-lawn (grass that requires minimal watering, fertilizer and mowing)
 - Plant native, drought-resistant plants and trees
 - Make a list of other ideas that you think of

6. Calculate (or estimate) potential water savings from repairs, replacements, or other water conservation techniques.
For example:
 - Measure the number of gallons collected in barrels from roof water catchment
 - Estimate the number of gallons saved by adjusting sprinkler heads away from asphalt
 - Research how much less watering an eco-lawn requires compared to conventional lawns

7. Calculate monetary savings from reducing outdoor water usage with the same equations as for indoor water use.

8. Graph potential and real outdoor water savings based on the results of your calculations.
 - Plot week, month, or year on X axis and savings on Y axis.

9. Graph potential and real cost savings based on the results of your calculations.
 - Plot week, month, or year on X axis and savings on Y axis.

INDOOR AND OUTDOOR WATER USE

Calculate monetary savings from reducing indoor and outdoor water usage by adding the two together.

Summarize Results:

Prepare a presentation to bring before your principal or school board. Describe your plan to save water at your school and document your estimates of water savings and monetary savings. Include reasons for saving water and how it helps people and the environment.

Next Steps:

Tell your parents about your water audit assignment and conduct a water assessment at your home. How much can you reduce your water usage at home and how much can you save on your parent's water bill?

Water Assessment Resources:

CONSERVE WATER! EDUCATORS' GUIDE

The Watercourse/International Project WET Programs

This educators' guide provides a detailed school water audit for teachers and students.

Contact: The Watercourse
PO Box 170575, Montana State University, Bozeman, MT 59717-0575
www.projectwet.org/watercourse
conservewater@montana.edu
406-994-1916

In Maryland: Cindy Grove
cgrove@dnr.state.md.us
410-260-8716

WATERWISER

American Water Works Association

This program is a resource for water efficiency and water conservation information.

Contact: www.waterwiser.org
800-926-7337
bewiser@waterwiser.org





WASTE CHECK UP

Lesson Goal:

Students will learn to:

- Identify types of waste produced at their school.
- Calculate the volume of waste produced each day, month and year.
- Devise a plan for waste reduction.
- Calculate potential monetary savings from their plan.

Voluntary State Curriculum:

Grades 6-8, Science 1A1, 1A5, 1A7, 1C2

Grades 5-8, Environmental Science 6C1, 6D1

Grades 7-8, Social Studies 2A1, 2A4

Materials Needed:

- Waste bills
- Recycling bills
- Large trash cans
- Large trash bags
- Large scale for weighing the trash
- Student handouts

Safety – Please note that there may be sharp or other dangerous objects in the trash. For this reason, the following protective gear should be worn when handling the trash or trash bags:

- Leather gloves
- Goggles
- Lab coat

Lesson Value:

In 1999, U.S. residents, businesses, and institutions produced more than 230 million tons of municipal solid waste. This adds up to approximately 4.6 pounds of waste per person per day, up from 2.7 pounds per person per day in 1960. All of this waste ends up in landfills, which are costly to construct and maintain and adversely affect our environment.

Reducing waste and recycling saves energy, conserves natural resources, helps protect the environment, slows the filling of landfills, and saves money. Energy is saved because recycling requires less energy than producing new products like aluminum cans or paper. For example,

recycling aluminum saves 95 percent of the energy needed to produce the aluminum from ore and recycling paper saves 64 percent of the energy needed to produce it from trees. Natural resources are conserved, especially when we recycle metal and paper. Using recycled office paper saves 24 trees for every ton of paper used and using recycled newsprint saves 12 trees for every ton of newsprint used. In addition, by reducing the amount of waste we generate, we help minimize the threat posed by harmful substances within the waste stream. Recycling also reduces the volume of waste that must be incinerated or land filled. Finally, money is saved because prolonging the life of landfills reduces the cost of capping old and constructing new landfills. The cost of capping a landfill at capacity is \$80,000-\$500,000 per acre and the cost of constructing a new landfill is up to approximately \$1 million per acre.

Pre-Assessment Checklist:

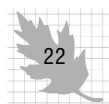
This checklist can be done by the teacher and/or the students.

1. Identify administrative offices and individuals responsible for waste management at your school (for example: the custodial/maintenance director).
2. Gather information on how much money is spent for waste management at your school. (Check with your custodial/maintenance director and your school district office.)
3. Obtain copies of waste bills for the past year.
4. Find out if there is a school recycling program. If so, obtain copies of recycling bills for the past year.
5. Find out how often waste is picked up from the school.
6. What has been done so far to reduce, reuse and recycle waste?
7. If possible, find out how much solid waste was land filled, incinerated, recycled, or composted.
8. Where is the most waste generated in the school? Where is waste being reduced, reused or recycled in the school?

Introduction:

Begin the lesson with a discussion about waste. Questions to cover:

- What is waste?
- What are the different kinds of waste generated at school?
- What are the different kinds of waste generated at home?
- What happens to waste?
- What is a landfill?
- Why should we reduce waste going into landfills?
- How can we reduce waste going into landfills?
- What are the three Rs – Reuse, Reduce, Recycle?
- Why are the three Rs important?
- What is recycling?
- How does recycling help the environment?
- What is a waste assessment?
- Why should we do a waste assessment?



Waste Curriculum Resources:

The resources below are examples of curricula that can be used in combination with the waste assessment.

LETS REDUCE AND RECYCLE: CURRICULUM FOR SOLID WASTE AWARENESS

Environmental Protection Agency

This curriculum can be ordered from the RCRA hotline.

Contact: 800-424-9346

THE WISE PROJECT: WASTE INFORMATION SERIES FOR EDUCATION

Michigan United Conservation Clubs

Curriculum designed to teach sound waste management and pollution prevention.

Contact: 800-777-6720

www.mucc.org

Waste Assessment:

1. Tour the school to study and record the types of solid waste generated.
2. Plan a waste assessment day at school.
3. Determine what equipment and space will be needed for the assessment.
4. Set up containers for lunchtime separation and collection of trash.
5. Measure other trash from classrooms.
6. Create a chart to record the types and amounts/weight collected (see below).
7. Display the trash the next day so that students and school staff can visually see how much is generated each day.

	A	B	C
Type of waste	Weight collected on waste assessment day	Number of school days per month	Weight per month (A x B)
Office paper			
Cardboard			
Newspaper			
Telephone books			
Ink-jet cartridges			
Laser-jet cartridges			
Plastic			
Aluminum cans			
Non-recyclables			
Other			

8. Create a list of suggested waste reduction or recycling activities for your school.

For example:

- Washable dishes instead of disposable
- Reusable mug program
- Double-sided copying policies

9. Calculate the potential waste reduction from implementing these activities.

For example:

- a. How many pounds of waste would be eliminated from the lunchroom trash if washable dishes were used instead of disposable?
 - Weight of plastic utensils collected on waste audit day + weight of disposable dishes collected on waste audit day = total pounds of waste eliminated
- b. How many pounds of waste would be eliminated if a reusable mug program were implemented?
 - Total weight of soda cans + plastic bottles + paper cups and other drinking containers collected on waste audit day.
- c. How many pounds of waste would be eliminated if double-sided copying policies were implemented?
 - Weight of single-sided copies collected on waste audit day divided by 2.

10. Calculate potential savings based on the proposed activities.

For example:

- Recycling companies will provide monetary compensation for paper, plastic and aluminum waste that has been separated.
- Research the current value for the different types of recyclable materials.
- Value x weight of material = amount earned for the material

11. Graph potential and real waste reduction based on the results of your calculations.

- Plot week, month, or year on X axis and amount reduced on Y axis.



DID YOU KNOW?

Recycling one person's paper and cardboard waste can reduce 2.8 pounds of landfill waste per day or 1,022 pounds of landfill waste per year.

How many pounds of waste can you reduce?

12. Graph potential and real cost savings based on the results of your calculations.
- Plot week, month, or year on X axis and savings on Y axis.

Summarize Results:

Prepare a presentation to bring before your principal or school board. Describe your plan to reduce waste at your school and document your estimates of waste reduction and monetary savings. Include reasons for reducing waste and how it helps people and the environment.

Next Steps:

Tell your parents about your waste audit assignment and conduct a waste assessment at your home. How much waste can you reduce at home and how would this reduction save money?

Waste Assessment Resources:

WASTE AUDIT MANUAL

Ijams Nature Center

Nature Center in Knoxville, Tennessee. The Ijams Nature Center website provides a detailed manual of how to conduct a school waste audit.

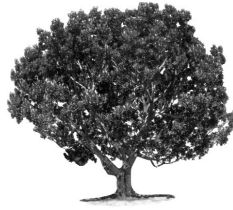
Contact: www.ijams.org/Pages/ef_audit.htm
 865-577-4717
 jlane@ijams.org

WASTE AUDITS FOR SCHOOLS

The Recycling Council of Ontario

This organization promotes environmental sustainability through waste minimization and resource conservation, and provides waste reduction information for home, work, and schools.

Contact: www.rco.on.ca/factsheet/fs_d01.html
 rco@rco.on.ca



SCHOOLYARD HABITAT CHECK UP ¹

Lesson Goal:

Students will learn to:

- Connect land use and land cover to wildlife found on school property .
- Determine opportunities to enhance schoolyard habitat.
- Identify projects that will make the school grounds more suitable for wildlife.

Maryland Learning Outcomes:

Grade 6-8, Science 1A1, 1A5, 1A7, 1C2

Grade 5-8, Environmental Science 6C1, 6D1

Grade 7-8, Social Studies 2A1, 2A4

Materials Needed:

- Schoolyard assessment sheet
- Measuring tape
- Map of school property boundaries (blueprints, aerial photos, or maps drawn by students)
- Sweep net
- Jar with holes to count insects

Lesson Value:

The creation, enhancement and restoration of schoolyard habitats are becoming very popular educational activities. These natural areas not only provide important educational opportunities, but also support wildlife and improve water quality .

There are three main benefits of conserving and enhancing the natural environment on school grounds²: educational, environmental and financial. Enhancing schoolyards directly supports the environmental education bylaw, which requires a multidisciplinary environmental education program for students. Students have the opportunity to use real-world authentic problem-solving skills; hands-on experiences are tied to science, social studies, reading and math lessons. Additionally, the entire school community feels a sense of pride and uniqueness when their local school grounds are aesthetically pleasing.

Having un-mowed areas, a diversity of trees, wetlands, forested areas, and feeders/houses for birds are attributes every schoolyard can have – no matter how small or urban the site may be. Plants that filter rainwater and reduce soil compaction improve water quality by reducing nutrient run-off and erosion – two of the Chesapeake Bay’s most pressing problems.

Lastly, there are financial benefits of creating schoolyard habitats. Construction of on-site educational ponds creates habitats that will attract insects, larvae, and animals. This reduces the need for transportation and substitute teacher funds; it also reduces the cost of purchasing study specimens from a catalog.

The most critical component of enhancing schoolyard habitat is encouraging student participation. Students can be a part of the on-going projects that enhance their schoolyard and improve the environment. This Schoolyard Habitat Check-Up is designed to help students take a critical look at the school grounds, and then decide on an action project that they can achieve in a given time period. Once you perform this check-up, utilize some of the curriculum and human resources listed in the Resources section. They will help you and your students plan, enact, and analyze your action project.

Some key questions to think about are:

- Is your school property a place that animals would visit?
- Is there enough food and shelter to support a wide variety of animal life?
- Is water available?
- Are there adequate places for animals to hide from predators?
- What do we want to accomplish? In what time frame?
- What community resources do we need to help us?
- How can we involve other classes, teachers, school staff, and community members?
- What resources do we already have?

Pre-Assessment Checklist:

This checklist can be done by the teacher and/or the students.

1. Map of the school grounds.
2. Contact information for the grounds maintenance staff.

Introduction:

Begin the lesson with a discussion about habitat. Questions to cover:

- What do all animals need in order to survive?
- What is your habitat?
- What is a squirrel's habitat?
- How could habitat be improved for squirrels (or other biota for which you would like to provide habitat)?



Schoolyard Assessment:

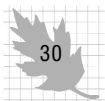
Tour the school grounds to determine what types of habitats already exist and where they are located. Sketch a map of the school grounds and different habitat areas.

Date _____

Trees and Forest	Calculation			Comments
How much of the property is forested (in acres)?				
How many different types of trees are on the property?				
Of the different types of trees on the property, how many produce edible nuts and fruit?				
Are there short, medium, and tall trees on the property?				
Are there dead trees on the property? If so, how many?				
How many trees and plants are native, non-native, or invasive? List them.				
How many young seedlings and saplings are there (understory)?				
How much (in acres) is mowed turf?				
Wildlife and Wildlife Evidence				
Were tracks found for at least two types of animals? (If so, try to identify the tracks and list them in the comments column). See Forest Stewardship guide for information on setting up an Animal Tracking Plot.				
Was scat found on the school grounds? (If so, try to identify the types of scat and list them in the comments column).				
How many different types of bird species can be found at a feeder or on the school grounds? (Try to list the types of species found).				
Insect Index*				
Are any rotten logs lying on the ground? How many are there?				
Interview several people who frequently visit the property. Circle the animals they have seen:	Rabbit	Deer	Fox	
	Bat	Squirrel	Hummingbird	
	Bluebird	Hawk or owl	Woodpecker	
	Turtle	Mice	Other birds	

Schoolyard Assessment – page 2

Fields and Meadows		
How much of your school property is covered with vegetation (grass, trees, flowers)?		
How much of the area is mowed regularly?		
How many different species of wildflowers are growing in fields?		
Find the tallest area of grass (at least the size of a classroom). Measure the height of the grass.		
How much of the school property, that is covered in vegetation, not used for athletic fields, parking, walkways, etc.?		
Edge and Animal Cover		
Are there bushes where birds can be heard but not seen?		
Is there a brush pile or overgrown area?		
If there are ditches, are the sides overgrowing with vegetation?		
Is there an area of brush and bushes that is at least 10 feet deep?		
Are there signs of reptiles, amphibians, or fish?		
Water and Wetland		
Look for an area on the property where water can be found throughout the year (you may have to ask someone what happens to the area over the summer). How long does the water stay there? (all year, several months, during rainy periods, there is never any standing water on the property).		
Is there a wetland on your property? Look for signs of a wetland such as aquatic plants or hydric soils.		
Other		
Is there evidence of fungi or moss?		



*** Insect Index**

Use a sweep net to make 3 separate sweeps of 2 different areas. One of the areas should be a mowed area, and the other area should be “wild.” Do this during late spring through fall. In your total count, count no higher than 25 for any single species (i.e., don’t count more than 25 ladybugs). Include any insects such as butterflies that you see while sweeping but do not catch. Use the formula below to calculate an Insect Index:

$$\begin{array}{rcl} \text{Total number of all insects} & & \text{_____} \\ \text{Total number of species x 10} & + & \text{_____} \\ \text{Insect index} & = & \text{_____} \end{array}$$

Example:

$$\begin{array}{rcl} \text{Total number of all insects} & & 55 \\ 5 \text{ species x 10} & + & 50 \\ \text{Insect index} & = & 105 \end{array}$$

Summarize Results:

Prepare a presentation to bring before your principal or grounds maintenance staff. Discuss existing habitat areas and also ways that habitat for wildlife can be improved.

Next Steps:

There are many projects that can improve habitat for wildlife on your school grounds. Work with the grounds staff, school principal, community groups, local watershed organizations and local merchants to review and assist with the project.

- Build birdhouses and feeders.
- Plant native plants to provide food and cover.
- Construct a rain garden or butterfly garden.
- Build a small wetland. Have younger students at your school grow wetland plants that will be a part of your new wetland.
- Design a brochure that highlights existing habitat areas on your school grounds.
- Take younger classes on a "Habitat Tour" of your school, explaining the importance of each habitat and what types of animals or insects may be found in that habitat.
- Apply for Aquatic Resource Education and Chesapeake Bay Trust grants to assist with costs of projects.
- Map the natural and restored habitats on your school property.
- Conduct the re-assessment of your school grounds in the fall and late spring each year.



DID YOU KNOW?

That by creating a rain garden you can reduce stormwater runoff, help recharge ground water, and provide great wildlife habitat.

Extensions:

- Take “before” and “after” photos of your school grounds so you can visually measure your progress throughout the years.
- Set up Projects WET, WILD, and Learning Tree professional development days for all teachers in your school to participate.
- Contact your local Forestry Board (there is one in every county) and work with them on improving your schoolyard habitat.
- Identify alien plant invaders that reduce biodiversity and threaten native plants.
- Identify and label native plants on your school grounds.

Schoolyard Habitat Resources:

Maryland Department of Natural Resources

Aquatic Resource Education Grants. Apply for funding for aquatic restoration or enhancement projects.

Contact: Cindy Etgen
cetgen@dnr.state.md.us
410-260-8716
<http://www.dnr.maryland.gov/education/are>

Tree-Mendous Maryland

Contact: Terry Galloway
tgalloway@dnr.state.md.us
410-260-8510
<http://www.dnr.maryland.gov/forests/tremendous/>

Wild Acres

Contact: Patricia Allen
pallen@dnr.state.md.us
410-260-8537
<http://www.dnr.maryland.gov/wildlife/Habitat/WildAcres/index.asp>

Chesapeake Bay Trust

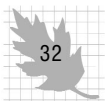
Grants to Schools and Youth Groups. Apply for funding for schoolyard improvement projects.

Contact: Kerri Bentkowski
kbentkowski@cbtrust.org
410-974-2941 x3
<http://www.chesapeakebaytrust.org>

U.S. Fish & Wildlife Service

Schoolyard Habitat Project Guide

This teacher handbook provides the basic steps needed to restore or create wildlife habitat. Includes chapters on: Getting Started, Creating Forest Habitats, Creating Wetland Habitats, and Creating Meadow Habitats.



Contact: Karen Kelly
habitatkelly@yahoo.com
410-271-2481

Native Plants for Wildlife Habitat

This guide helps in the selection of native plants for habitat restoration and natural landscaping projects.

Contact: U.S. Fish & Wildlife Service
Chesapeake Bay Field Office
177 Admiral Cochrane Dr.
Annapolis, MD 21401
410-573-4500
<http://www.fws.gov/r5cbfo>

Maryland Forest Conservancy District Board for Baltimore County

Schoolyard Reforestation Wildlife Habitat Program

Forest Stewardship: An Environmental Handbook for Teachers

This handbook allows a project leader to develop a long-range site plan. It addresses the following topics: Investigating the site, determining and prioritizing goals, identifying special consideration, developing the site plan, and implementing the plan.

Contact: The Forestry Conservancy District Board for Baltimore County
9405 Old Harford Road
Baltimore, Maryland 21234
410-665-5820 or 410-592-2400

Maryland State Department of Education

Conserving and Enhancing the Natural Environment: A Guide for Planning, Design, Construction, and Maintenance on New and Existing School sites

This guidebook provides guidance for developing the site requirements in educational specifications and designs for new building construction and major renovation and/or addition projects for existing schools.

Contact: Division of Business Services
School Facilities Branch
200 W. Baltimore Street
Baltimore, MD 21201
410-767-0098

Division of Instruction and Staff Development
Arts and Sciences Branch
200 W. Baltimore Street
Baltimore, MD 21201
410-767-0342

Irvine Nature Center

Habitat Stewards

Contact: Matt Yurko
410-484-2413

Baltimore County Department of Environmental Protection and Resource Management

“Getting Greener Schools” GREEN AUDIT

Use this as a first step by checking off the landscape elements that you discover as you walk the school grounds, then use the information as a planning tool.

Contact: Jeanne Armacost
410-887-4488 x251
jarmacost@co.ba.md.us

Maryland Association of Environmental and Outdoor Educators

Schoolyard Habitat Partnership

Contact: Kerri Bentkowski
410-974-2941

OTHER CURRICULUM RESOURCES

Greening School Grounds: Creating Habitats for Learning

Step-by-step instructions for numerous schoolyard projects, from tree nurseries to school composting to native plant gardens. US\$16.95 each or \$10.95 for 2-10 copies.

Contact: Green Teacher
<http://www.greenteacher.com>

Homes for Wildlife: A Planning Guide for Habitat Enhancement on School Grounds

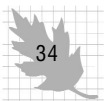
The process outlined in this guide provides students and teachers the means for hands-on education in their schoolyards. ISBN #: 0-9652156-2-8

Contact: New Hampshire Fish and Game Department

Landscaping for a Healthy Planet

This site has worksheets available to make environmental landscaping easier for school groups.

Contact: Audubon Pennsylvania
<http://www.audubon.org/chapter/pa/pa/envirolandscaping/worksheets.htm>



Schoolyard Re-Assessment:

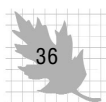
After you have implemented some action plans, tour school grounds to recalculate some of your figures.

Date _____

Trees and Forest	Previous Calculation	Action Taken	New Calculation
How much of the property is forested (in acres)?			
How many different types of trees are on the property?			
Of the different types of trees on the property, how many produce edible nuts and fruit?			
Are there short, medium, and tall trees on the property?			
Are there dead trees on the property? If so, how many?			
How many trees and plants are native, non-native, or invasive? List them.			
How many young seedlings and saplings are there (understory)?			
How much (in acres) is mowed turf?			
Wildlife and Wildlife Evidence			
Were tracks found for at least two types of animals? (If so, try to identify the tracks and list them in the comments column). See Forest Stewardship guide for information on setting up an Animal Tracking Plot.			
Was scat found on the school grounds? (If so, try to identify the types of scat and list them in the comments column).			
How many different types of bird species can be found at a feeder or on the school grounds? (Try to list the types of species found).			
Insect Index*			
Are any rotten logs lying on the ground? How many are there?			
Interview several people who frequently visit the property. Circle the animals they have seen:	Rabbit	Deer	Fox
	Bat	Squirrel	Hummingbird
	Bluebird	Hawk or owl	Woodpecker
	Turtle	Mice	Other birds

Schoolyard Re-Assessment – page 2

Fields and Meadows	Previous Calculation	Action Taken	New Calculation
How much of your school property is covered with vegetation (grass, trees, flowers)?			
How much of the area is mowed regularly?			
How many different species of wildflowers are growing in fields?			
Find the tallest area of grass (at least the size of a classroom). Measure the height of the grass.			
How much of the school property, that is covered in vegetation, not used for athletic fields, parking, walkways, etc.?			
Edge and Animal Cover			
Are there bushes where birds can be heard but not seen?			
Is there a brush pile or overgrown area?			
If there are ditches, are the sides overgrowing with vegetation?			
Is there an area of brush and bushes that is at least 10 feet deep?			
Are there signs of reptiles, amphibians, or fish?			
Water and Wetland			
Look for an area on the property where water can be found throughout the year (you may have to ask someone what happens to the area over the summer). How long does the water stay there? (all year, several months, during rainy periods, there is never any standing water on the property).			
Is there a wetland on your property? Look for signs of a wetland such as aquatic plants or hydric soils.			
Other			
Is there evidence of fungi or moss?			



Reassess the school property twice a year.

- Does the potential for wildlife habitat increase through time?
- Are there plans to continue to increase wildlife habitat areas?
- How is schoolyard maintenance affected by the increase of natural habitat on school property? You may need to interview the facilities and grounds staff.

1 This assessment has been adapted from *Forest Stewardship: An Environmental Handbook for Teachers*. See resources section for more information.

2 Maryland State Department of Education. *Conserving and Enhancing the Natural Environment: A Guide for Planning, Design, Construction, and Maintenance of New & Existing School Sites*. See Resources for full citation.



DID YOU KNOW?

Many native plants have deep and extensive root systems that help loosen the soil so water can quickly infiltrate.



S I T E D E S I G N C H E C K U P

Lesson Goal:

Students will learn to:

- Identify impervious surfaces on their school grounds.
- Assess stormwater runoff from their school.
- Calculate percentages of impervious surfaces.
- Devise a plan to reduce impervious surfaces.
- Work with school staff, local merchants, and community organizations to implement their plans.

Voluntary State Curriculum:

Grade 6-8, Science 1A1, 1A5, 1A7, 1C2

Grade 5-8, Environmental Science 6C1, 6D1

Grade 7-8, Social Studies 2A1, 2A4

Materials Needed:

- Chalk
- Measuring tapes
- Clipboard with pencils
- Assessment worksheets
- Calculator

Lesson Value:

The Earth is covered with approximately 25% land, but more of it is becoming impervious to water infiltration as we construct concrete sidewalks, asphalt roads, driveways and rooftops, and create compacted soil. This alters the way water moves through the watershed. When rain falls on a forest, the leaves, twigs and branches of the trees slow the water down. Raindrops reach the forest floor, which is covered with dead leaves, twigs, and decomposing organic matter. The water soaks in and slowly seeps into the ground. Once in the ground, it becomes part of the groundwater system and eventually enters a stream. Forests act as a filter and a storage area for the stormwater.

In Maryland, areas once forested are being replaced with paved impervious surfaces. As rain falls on impervious surfaces, rather than soaking in the ground, it flows across these sun-heated surfaces warming up the rain and carrying pollution such as pesticides, fertilizers, animal waste, trash, oil, bits of tires, and sediment into streams and rivers. This warmed water will increase the

temperature of the streams and rivers altering conditions for some animals to live there. According to the Maryland Biological Stream Survey, Maryland has more than 9,900 miles of non-tidal streams where approximately 9,429 miles drain into the Chesapeake Bay .

Within Maryland, approximately 30,226 miles of roadways cover the state. According to the Maryland Department of Natural Resources¹, as the percentage of impervious cover increases, the diversity of animals decreases. An area having more than 25% impervious surface (urbanized area) will only sustain the hardiest reptiles and amphibians. According to the study, only 7 of the 45 species were found in these areas. At 2% impervious cover, pollution-sensitive brook trout disappear from local streams.

As impervious land increases, less rainfall is absorbed into the ground to recharge the groundwater supply. The rate of runoff increases, therefore increasing stream velocity and erosion. According to the Maryland Department of the Environment,² one acre of parking lot can produce sixteen times more runoff than one acre of meadow .

Pre-Assessment Checklist:

This checklist can be done by the teacher and/or the students.

- Examine buildings to see if the downspouts are concealed within the exterior or if are they exposed.
- Consult with the building's maintenance staff to determine where the stormwater goes after it exits the pipes. Does it drain onto a grassy area, onto pavement, loose gravel, or into a culvert underground and into a stream?
- Review any updated blue prints of the property to measurement downspouts, distance to the streams, square footage of roofs, etc.
- If possible, obtain a map of the school property from the maintenance staff.

Introduction:

Begin the lesson with a discussion about impervious surfaces. Questions to cover:

- How much of the Earth is covered in land?
- What is an impervious surface and give some examples?
- What ecological problems are caused by impervious surface?
- What can be done to help this situation?
- Go outside to view the movement of water during a rain event.

Impervious Land Assessment:

Tour school grounds to determine the number of square feet that are impervious. Sketch a map of the school grounds and highlight the structures below .

Date _____ Total square feet of school property _____

Total square feet of impervious surface _____

Structures	# of square feet	% of school property	Comments	Visible sheet flow* into storm drains when raining?
Rooftops				
Sidewalks				
Roads/Driveways				
Paved parking lots–with curbs				
Paved parking lots–without curbs				
Compacted or poorly drained soil				
Other impervious surfaces such as outdoor tennis courts, athletic tracks, etc.				
Total impervious surface				Not Applicable
Downspouts**	# connected _____	Not Applicable		
	# disconnected _____			
Mowed grass				
Flower beds				
Retention ponds				
Buffer zones along waterways				
Plants on rooftops				
Porous parking lots/ driveways/roads				
Rain Gardens				
Rain Barrels	# of barrels	Not Applicable		
Other				
Total pervious surface				

* Sheet Flow–Water moves across a surface as a uniform sheet instead of concentrated into a channelized flow.

** Downspouts–Connected means the spout empties into a culvert then into a waterway. Disconnected means the piping is disrupted and the water flow can be redirected to the lawn or garden.

Summarize Results:

Prepare a presentation to bring before your principal or grounds maintenance staff. Discuss ways that impervious surface can be reduced. Explain the environmental factors affected by stormwater runoff and how students can help with the projects.

Next Steps:

There are many projects that can reduce impervious surfaces and redirect stormwater so it can be absorbed into the ground and recharge the local water table. Work with the grounds staff, school principal, community groups, local watershed organizations, and local merchants to review and assist with the project.

- Alter the low-traffic areas of your parking lot to include more porous surface area by using block pavers, grid pavers, porous pavement, or soil pavement (information can be found at www.nemo.uconn.edu/reducing_runoff/index.htm).
- Develop a stormwater management plan for your school, if there isn't already one. Incorporate rain gardens, green roofs, retention ponds, or other porous surface areas that work with your site to absorb stormwater runoff.
- Make "cuts" out of the curb or remove the curb completely that borders the parking lot, driveway, or road. This will allow the rainwater to escape and get absorbed by the surrounding vegetation. This will work best where the vegetation is at a lower elevation than the pavement.
- Restore compacted soils. Test soil for pH and nutrients. Spread compost over the field and plow the land using an agricultural chisel plow. Rototill to a maximum depth of six inches (6") in two directions before dragging and grading the field in preparation for planting. Create habitat areas, windbreaks, noise reduction and aesthetic enhancements using native vegetation along the perimeter of the field.
- If you can cut the exposed downspout, place a rain barrel underneath to capture the water. This water can be used to water flowerbeds and trees.
- If the downspout drains onto pavement, add an extra expandable hose to redirect the water over a grassy area, to a flowerbed, or towards a retention pond.



DID YOU KNOW?

Most of the impervious surfaces within the Chesapeake Bay watershed and the coastal bays of Maryland are associated with transportation.

- Create depressed vegetated islands, instead of raised ones, in parking lots.
- Apply for Aquatic Resource Education and Chesapeake Bay Trust grants to assist with costs of projects.

Extensions:

- Complete the Impervious Land Reassessment worksheet to determine if your school has decreased the amount of impervious land.
- Complete soil permeability and infiltration tests to determine how quickly water drains through different soil types on the school grounds.
- Conduct experiments to determine the runoff rates for different impervious surfaces and other land cover.
- Construct groundwater models to demonstrate how water travels through different soil types and enters the water table.
- Invite a professional to give a lecture about the benefits of a Green Building. Invite the principal, grounds staff, school board, parents, and students.

Impervious Assessment Resources:

MARYLAND DEPARTMENT OF NATURAL RESOURCES

Rainfall and Runoff – a guide with background information and activities to connect rain to groundwater and how runoff affects streams.

Contact: Elena Takaki
410-260-8715
etakaki@dnr.state.md.us

Aquatic Resource Education Grants. Apply for funding for schoolyard improvement projects

Contact: Cindy Etgen
cetgen@dnr.state.md.us
410-260-8716
<http://www.dnr.maryland.gov/education/are>

Environmental Design. Learn how to build rain barrels, construct rain gardens, and find out more about green buildings and rooftop gardens.

Contact: Matt Fleming
mfleming@dnr.state.md.us
410-260-8827
<http://www.dnr.maryland.gov/ed/rainbarrel.html>
<http://www.dnr.maryland.gov/ed/editorials/RainGarden-Final.pdf>

Maryland Biological Stream Survey

Find water quality data for your local stream.

Contact: Paul Kazyak
pkazyak@dnr.state.md.us
410-260-8607
<http://www.dnr.maryland.gov/streams/index.html>

CHESAPEAKE BAY FROM SPACE

Impervious surface activities for middle and high school students. Also includes map resources and an interactive mapping feature.

<http://chesapeake.towson.edu/landscape/impervious/default.asp>

SHODOR EDUCATION FOUNDATION

Surface water runoff modeling.

www.shodor.org/succeedhi/succeedhi/runoff/teacher/notes.html

CHESAPEAKE BAY TRUST

Grants to Schools and Youth Groups. Apply for funding for schoolyard improvement projects

Contact: Kerri Bentkowski
kbentkowski@cbtrust.org
410-974-2941 x3

FRIENDS OF THE PATUXENT

Assists schools with schoolyard habitats

Contact: Karen Kelly
habitatkelly@yahoo.com
410-271-2481

MARYLAND DEPARTMENT OF THE ENVIRONMENT

For more information about Maryland's stormwater program, including how to build rain barrels, construct rain gardens, or to find out more about sustainable site design.

Contact: Stewart Comstock
scomstock@mde.state.md.us
410-537-3543



DID YOU KNOW?

That impervious surfaces inhibit the recharge of groundwater.

**DEPARTMENT OF ENVIRONMENTAL PROTECTION AND RESOURCE
MANAGEMENT, BALTIMORE COUNTY**

Obtain maps impervious surfaces in Baltimore County.

Contact: 410-887-3776
<http://www.co.ba.md.us/Agencies/environment>

SANTA BARBARA COUNTY WATER EDUCATION

The purpose of this lesson is for students to identify one to three storm drains around their school and answer a series of questions about the pollution they can and cannot see.

Contact: Santa Barbara County Regional Water Efficiency Program
<http://www.sbwater.org/WSCurriculum.htm#Lesson11>

Also, contact your local County Department of Environmental Protection or Public Works, Storm water Management Division.

Impervious Land Re-Assessment:

Tour school grounds to determine the number of square feet that are impervious. Sketch a map of the school grounds and highlight the structures below .

Date _____ Total square feet of school property _____

Total square feet of impervious surface _____

Structures	# of square feet	% of school property	Increase, Decrease, or Same amount from prior assessment	Action taken to alter structure
Rooftops				
Sidewalks				
Roads/Driveways				
Paved parking lots–with curbs				
Paved parking lots–without curbs				
Compacted or poorly drains soil				
Other impervious surfaces such as outdoor tennis courts, athletic tracks, etc.				
Total impervious surface				
Downspouts	# connected ____	Not Applicable		
	# disconnected ____			
Grass				
Flower beds				
Retention ponds				
Buffer zones along waterways				
Plants on rooftops				
Porous parking lots/ driveways/roads				
Rain Gardens				
Rain Barrels	# of barrels	Not Applicable		
Other				
Total pervious surface				

Reassess the school property every 4 months.

- Does the number of square feet of impervious surface decrease through time?
- Are there plans to continue to decrease the impervious surface?
- How have changes to impervious surfaces affected the maintenance of the school property?
- How have the changes to impervious surfaces affected the amount of stormwater runoff that your school produces?

1 “From the Mountains to the Sea: The State of Maryland’s Freshwater Streams” by Daniel Boward, Paul Kazzyak, Scott Stranko, Martin Hurd, and Anthony Prochaska. Published by the Maryland Department of Natural Resources with support from United States Environmental Protection Agency National Health and Environmental Effect Research Laboratory Atlantic Ecology Division. December 1999.

2 “The Three S’s: Stormwater, Sustainability, and Schools” presentation at the Schoolyard Habitat Provider’s Summit, October 31, 2003, Millersville, MD.

ACTION PROJECTS/ SERVICE LEARNING

Below are some suggestions for extending these lessons by taking action at school or at home.

Stormwater Management:

Bayscape your yard or school grounds by planting native drought tolerant plants and trees.

For more information: www.fws.gov/r5cbfo/Bayscapes.htm

Wildlife Habitat:

Organize a schoolyard habitat project to create or restore local wildlife habitat.

For more information: www.fws.gov/r5cbfo/Schoolyd.htm or 410-573-4500

Energy Conservation:

Install Energy Star appliances to reduce energy consumption and compare energy use before and after installation.

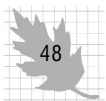
For more information: www.energy.state.md.us

Waste Reduction:

Build a compost to reduce yard and food scrap waste in landfills.

For more information: www.epa.gov/epaoswer/non-hw/reduce/catbook/compost.htm

***What else can you do
to help the environment?***



ADDITIONAL RESOURCES

MARYLAND DEPARTMENT OF NATURAL RESOURCES

Maryland DNR has resource biologists, service learning opportunities, professional development opportunities for educators, and aquatic education grants to help you improve your school inside and out.

Contact: Elena S. Takaki
410-260-8715
www.dnr.maryland.gov/education

BALTIMORE GAS & ELECTRIC

The BGE website provides information on gas and electric energy, how it is generated, how to calculate costs of running appliances, how to read bills, how to save energy, and other topics.

Contact: www.bge.com

ENVIRONMENTAL EDUCATION CENTER

Environmental Protection Agency

This section of the EPA website offers curriculum resources for air, ecosystems, waste and recycling, conservation, human health, and water.

Contact: www.epa.gov/teachers

GREEN SCHOOLS PROGRAM

Maryland Association for Environmental and Outdoor Education

Maryland public and non-public schools are encouraged to become “Green Schools” by meeting specific environmental education criteria. Criteria include integrating environmental studies into school curricula, using best environmental practices in operation and design of school buildings, and reaching out to the community through projects that address local environmental issues. Schools that meet the criteria receive the Governor’s Green School Award flag at an awards ceremony and recognition on the MAEOE website.

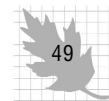
Contact: www.maeoe.org
410-260-8713

GREEN SCHOOLS

Alliance to Save Energy

This program combines installation of energy-efficient technology with implementation of management techniques and student learning/direct involvement. Focuses on environmental and cost benefits of the changes.

Contact: www.ase.org
202-857-0666
info@ase.org



MARYLAND DEPARTMENT OF THE ENVIRONMENT

The Maryland Department of the Environment provides environmental education materials for both students and the general public.

Contact: www.mde.state.md.us
410-631-3314

MARYLAND ENVIRONMENTAL DESIGN PROGRAM

Maryland Department of Natural Resources

The Environmental Design Program was created to assist the development community and local governments to find innovative ways to reduce nutrient input from development activities. The Environmental Design Program works directly with building industry professionals, local governments, and citizens to provide the information and on-site technical assistance they need to identify and implement environmentally sensitive and cost-effective building and site design techniques with the goal of preventing pollution and damage to Maryland's living resources.

Contact: www.dnr.maryland.gov/smartgrowth/greenbuilding/index.html
410-260-8827
Matthew Fleming
Program Manager
Environmental Design Program
mfeming@dnr.state.md.us

PROJECT GREEN MACHINE

Marion County Public Schools, Florida

This program is an environmental resource conservation program and includes classroom curricula and extra-curricular activities about energy, water, recycling and land. The program also supports the school district in meeting local community environmental compliance requirements and offers monetary incentives to participate.

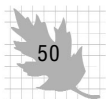
Contact: www.eemaf.org/PGM1/pgm-pag1.html
352-671-6900
Rob Van Der Like
vanderlr@marion.k12.fl.us

SCHOOLYARD HABITAT PROJECT GUIDE

U.S. Fish and Wildlife Service

This guide provides the basic steps needed to restore or create wildlife habitat. It is designed so that students can establish a forest, meadow or wetland on school grounds.

Contact: www.fws.gov/r5cbfo/
410-573-4593
410-573-4500



APPENDIX

Sample Electric Bill:

Obtained from www.bge.com

BGE
A Member of the Constellation Energy Group

John Q Customer
123 Anywhere Street
Baltimore MD 21201-1234

2193563890915 7715920586 7737800

Post Office Box 1431
Baltimore, MD 21203-1234

Account number 12345-67890

Amount due by May 25, 2001
\$119.12

After May 25, 2001, pay \$120.91

Amount Paid
\$

Please make check payable to BGE and include account number.

Thank You

Please detach here and return this stub with your payment.

Name John Q Customer
Service address 123 Anywhere Street Baltimore MD 21203
Account number 12345-67890

Next reading date
May 26, 2001

Electric Details 1 **Non-Summer rates in effect**

Residential—Schedule R
Billing period: Mar 29, 2001 – Apr 27, 2001 Days billed: 29
Meter read on Apr 27 Meter # S04274318

Current reading	Previous reading	kWh used
21298	19653	1645

2 **BGE Electric Supply** 1645 kWh x .03514000 57.81

3 **BGE Electric Delivery Service**

Customer Charge 7.50

4 **Distribution Charge** 1645 kWh x .03169000 52.13

5 **State / Local Taxes & Surcharges**

MD Universal Svc Program	.41
Franchise Tax 1645 kWh x .00062000	1.02
State Surcharge 1645 kWh x .00015000	.25
Total BGE Electric Amount	\$119.12

6 **Electric Usage Profile**

Month/year	Type	Days	kWh	Avg daily use	Avg Temp
Apr 01	Actual	29	1645	56.7	53F
Mar 01	Actual	30	2310	77.0	41F
Apr 00	Actual	31	1990	64.2	58F

7

8 **Summary** Date Billed: Apr 29, 2001

Payments Received: Apr 26, 2001 \$130.18

BGE outstanding balance 0.00

Charges this period:

BGE Electric 119.12

Total charges this period 119.12

Total amount due by May 25, 2001 \$119.12

Late charge after May 25, 2001, add \$1.79 \$120.91

9 **Messages**

Your Price to Compare is 4.28 cents (\$.04280) per kWh - When shopping for electric suppliers, compare this price to those proposed by other companies. This price reflects the average annual amount a customer on this schedule pays per kilowatt-hour for BGE Electric Supply.

10 The CTC (competitive transition charge) is \$0.008 per kWh and is included in the Distribution Charge.

11 **Electric Supplier Charges**

XYZ Company

Outstanding Balance 0.00

Billing period: Mar 29, 2001 – Apr 27, 2001 Days billed: 29

Generation Charge 1645 kWh x .05665000 93.19

Total Supplier Amount \$93.19

All inquiries on above supplier billing should be directed to XYZ Company at 1-800-000-0000.

Emergency Service /
idential Customer Service
1-800-685-0123

Emerg
Residential
1-800

Annual Usage Est: 31,553 kWh

12

13

BGE

1. Electric Details

Electric Details include your rate schedule, the billing period covered by this bill, the date of your last meter reading, your meter number, and how much electricity you used this billing period.

2. BGE Electric Supply

BGE Electric Supply will appear if you choose to continue buying your electric supply from us. The charge includes the cost of generating and transmitting electricity to BGE's distribution system.

BGE Electric Delivery Service includes (3 & 4):

3. Customer Charge

Customer Charge covers expenses not directly associated with the generation or delivery of energy, such as billing, metering, and meter reading. This charge is the same each month.

4. Distribution Charge

Distribution Charge covers the cost of delivering the electricity you use each month through BGE's distribution system to your home.

5. State/Local Taxes & Surcharges

State/Local Taxes & Surcharges are required by the State of Maryland to be collected, then passed on to the State. Some surcharges and assessments are used to fund environmental, social, and other governmental programs.

6. Electric Usage Profile

Electric Usage Profile shows your electric use during the current period compared to the same periods last year and last month.

7. Electric Supplier Charges

Electric Supplier Charges will appear here if you have chosen a supplier other than BGE. The charge includes the cost of generating and transmitting electricity to BGE's distribution system, the billing period, and outstanding and current balance. Also listed is your supplier's telephone number.

8. Summary Box

Summary Box lets you know the bottom line of what you owe to BGE. It shows the latest BGE and Supplier payment(s), BGE outstanding balance(s), charges for the current billing period, and late charges that will be added if the bill is not paid on time.

9. Your Price to Compare

Your Price to Compare is the price per kilowatt-hour you can use to compare prices among electric suppliers. This price reflects the average amount a customer on your rate schedule pays per kilowatt-hour on an annual basis. The price has been averaged over a year since summer and non-summer rates differ. For Time of Use customers, energy costs in the various time periods were also factored.

10. Messages

Messages concerning your account will be shown in the lower right hand portion of your bill.

11. Gas Details

Gas Details will appear here for natural gas customers. It provides the same sort of information found under Electric Details.

12. Competitive Transition Charge

Competitive Transition Charge is included on every customer's bill and is designed to recover investments in assets such as power plants that were built to ensure customers would have a reliable and adequate supply of electricity. This is not a new charge but is now stated separately on the bill.

13. Telephone numbers and a glossary of terms

Telephone numbers and a glossary of terms can still be found on the back of the bill.

Sample Water Bill:

Obtained from www.co.ha.md.us

HARFORD COUNTY GOVERNMENT
WATER/SEWER USAGE BILL
 TREASURY DEPARTMENT
 220 S. MAIN STREET
 BEL AIR, MARYLAND 21014 0609
 PHONE: 410-638-3311; 410-638-3451; 410-879-2000

951

(A) ACCOUNT NUMBER
12345678901

SERVICE ADDRESS
999 MAIN ST. **(B)**

(D) AMOUNT DUE NOW
76.00
(E) AMOUNT DUE AFTER
05/25/98
79.80
(F)

RETAIN THIS PORTION FOR YOUR RECORDS.

(C) JOHN DOE
999 MAIN ST.
BEL AIR MD 21014

PREVIOUS READING DATE	PRESENT READING DATE	NUMBER OF DAYS	TOTAL (100 CUBIC FEET)	AVG. DAILY CONS. (CUBIC FEET)	TOTAL (THOU. GALS)	AVG. DAILY CONS. (GALLONS)
(H) 01/22/98	(I) 04/16/98	(J) 84			(K) 16	(L) 190
TYPE OF BILL		PREVIOUS READING	PRESENT READING	CONSUMPTION DAYS	LATE	AMOUNT CHARGED
(M) ACT. REGULAR BILL DIAL 1		(N) 102	(O) 118			
WATER CHARGES				16 (P)	1.750 (Q)	28.00 (S)
CONSUMPTION X RATE						
SEWER CHARGES				16 (P)	2.220 (R)	35.52 (T)
CONSUMPTION X RATE						.75 (U)
PURCHASED WATER CHARGE						4.34 (V)
BASE WATER CHARGE						4.03 (W)
BASE SEWER CHARGE				16 (P)	.210 (X)	3.36 (Z)
BIOLOGICAL NUTRIENT REMOVAL FEE						
						AMOUNT DUE NOW 76.00 (D)
						AMOUNT DUE AFTER 05/25/98 79.80 (F)

PLEASE DETACH AND RETURN THE BOTTOM PORTION OF THE BILL WITH YOUR PAYMENT. FOR PROMPT PROCESSING, USE THE RETURN PAYMENT ENVELOPE.

HARFORD COUNTY GOVERNMENT
WATER/SEWER USAGE BILL

(A) ACCOUNT NUMBER
12345678901

PLEASE RETURN THIS PART WITH YOUR PAYMENT

SERVICE ADDRESS
999 MAIN ST. **(B)**

(D) AMOUNT DUE NOW
76.00
(E) AMOUNT DUE AFTER
05/25/98
79.80

PLEASE MAKE CHECK OR MONEY ORDER PAYABLE TO HARFORD COUNTY AND WRITE YOUR ACCOUNT NUMBER ON YOUR CHECK TO ENSURE PROPER CREDIT

(C) JOHN DOE
999 MAIN ST.
BEL AIR MD. 21014

(G) 123456789123456789012345678900123456

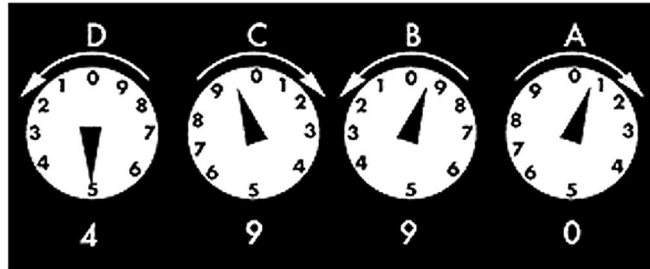
Information Contained on the Water-Sewer Bill Statement

- A. Account Number** - This number identifies your account. Always refer to this number in your communications to the Water & Sewer Billing Department.
- B. Service Address** - Where the meter is located.
- C. Mailing Address** - Bills will be mailed to this address. Property owners or agents should notify the Water & Sewer Accounting Department if bills are to be forwarded to another address.
- D. Amount Due Now** - The bill amount if payment is made promptly. This amount includes current water-sewer charges plus any previous charges that have not been paid.

- E. Penalty Date** - This account will be penalized if payment is not received by this date. A five percent (5%) penalty is applied to the unpaid amount of your bill.
- F. Amount Due After** - The bill amount if payment is made after the penalty date. This amount includes current water-sewer charges plus any previous charges which have not been paid plus a five percent (5%) penalty applied to the unpaid amount of your bill.
- G. Scan Line** - This line contains numbers that are used to process your payment.
- H. Previous Reading Date** - The meter reading date of your previous water-sewer bill.
- I. Present Reading Date** - The meter reading date for your current water-sewer bill.
- J. Number of Days** - The time in days between meter readings.
- K. Water Total 1000s Gallons** - The total quantity of water service provided during the current billing period measured in gallons.
- L. Average Daily Consumption** - The average daily consumption of water service during the current billing period measured in gallons.
- M. Type of Bill** - The type of reading used to produce this bill:
ACT - Actual Reading EST - Estimated Reading
- N. Previous Reading** - The meter setting for the previous meter reading.
- O. Present Reading** - The meter setting at the time of the current meter reading.
- P. Consumption** - The volume of water furnished in 1,000's of gallons.
- Q. Water Rate** - The rate charged for each 1,000 gallons of water furnished.
- R. Sewer Rate** - The rate charged for each 1,000 gallons of wastewater processed.
- S. Water Amount Charge** - The amount charged for current water service
- T. Sewer Amount Charge** - The amount charged for current sewer service.
- U. Purchased Water Charge** - The amount charged for the purchase of water from sources other than Harford County.
- V. Base Water Charge** - The amount charged each customer to pay for the service of 24-hour on-call water maintenance and billing services.
- W. Base Sewer Charge** - The amount charged each customer to pay for the service of 24-hour on-call sewer maintenance and billing services.
- X. Biological Nutrient Removal Rate** - The rate charged for each 1,000 gallons of wastewater processed.
- Z. Biological Nutrient Removal Rate Fee** - The amount charged is to recover the capital construction costs of installing biological nutrient removal process at the Sod Run Wastewater Treatment Plant.

How to read an electric meter:

Read the meter dials from right to left. Note that alternate dials move in opposite directions. This is important in taking an accurate reading. In the example below, start with Dial A on the right and read to Dial D on the left. If a pointer is clearly between numbers, the smaller number (as in Dial A) is recorded, unless the dial is between 9 and 0; in this case (as in Dial B and Dial C), 9 was recorded. If a pointer is close to or exactly on a number (as in Dial D), look at the dial to the right (dial C). If that pointer has not yet reached zero, the smaller number is recorded (see the reading on Dial D). Notice that the pointer on Dial C has not reached zero. So the reading for Dial D is recorded as 4, not 5.



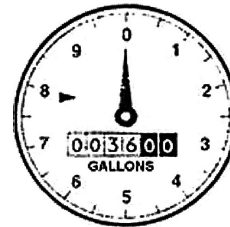
Obtained from www.pepco.com

How to read a water meter:

To read the meter, start from the left side and read only the first four digits.



The first meter reads 28 units of water (one unit equals 1000 gallons).



The second meter shows 36 units of water.

The difference, or water consumed for the measuring period, is eight units or 8,000 gallons.

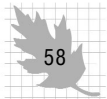
Obtained from www.cityofparsons.com

Energy Check Up – Amount of Electricity Used Before Proposed Changes

Take an inventory of appliances that use electricity and calculate the cost per month to run each appliance.

- Determine wattage of an item (if wattage is not available, multiply amperage times voltage to get an estimate)
- Wattage x the number of hours an item is used each month = watts used per month
- Watts used per month divided by 1,000 = number of kilowatt hours (KWH) the item consumed in that month
- KWH x electric company's rate per KWH = the amount you pay to run the item in a month

	A1	B1	C1	D1	E1
Electrical Appliance	Wattage	# hours used per month	Watts used per month (A1 x B1)	KWH used per month (C1/1000)	Cost to run per month (D1 x electric company cost per KWH)
Incandescent lights					
Fluorescent lights					
Computers					
Air conditioner					
Electric heater					
Electric space heater					
Other					



Energy Check Up – School Energy Checklist Part 1

Identify places in the school where energy is wasted using the school energy checklist.

Lighting	Yes	No	Notes
Are lights off in unoccupied rooms?			
Are lights off in unoccupied common areas (cafeterias, gymnasiums, meeting areas, choral or band rooms)?			
Are outside lights turned off late at night (from 11:30 PM to 5:30 AM)?			
Are outside lights turned off during the day?			
Does your school use energy efficient light bulbs?			
HVAC Settings			
Air-conditioning set between 74 and 78 degrees?			
Heating set between 68 and 72 degrees?			
HVAC set back after school (78 degrees in summer, 66 in winter)?			
Exhaust fans turned off after school?			

Energy Check Up – School Checklist Part 2

Identify places in the school where energy is wasted using the school energy checklist.

Occupant Operations	Yes	No	Notes
Is equipment off in unoccupied rooms?			
Are computers off in unoccupied areas (PC monitors turned off when not needed)?			
Are blinds closed after school?			
Are doors and windows closed when A/C or heating is in operation?			
Is there heat or cooling loss at the windows (do you feel cool air leaking inside on cold days)?			
Maintenance/Custodial Operations			
Are coils clean?			
Are timers set properly (lights, hot water heaters, etc.)?			
Other Energy Uses			
What other ways is energy used at your school?			

Energy Check Up – Amount of Electricity Used After Proposed Changes

Propose changes, such as turning lights on for fewer hours, and calculate the new cost per month to run each appliance.

- Determine wattage of an item (if wattage is not available, multiply amperage times voltage to get an estimate)
- Wattage x the number of hours an item is used each month = watts used per month
- Watts used per month divided by 1,000 = number of kilowatt hours (KWH) the item consumed in that month
- KWH x electric company's rate per KWH = the amount you pay to run the item in a month

	A2	B2	C2	D2	E2
Electrical Appliance	Wattage	# hours used per month	Watts used per month (A2 x B2)	KWH used per month (C2/1000)	Cost to run per month (D2 x electric company cost per KWH)
Incandescent lights					
Fluorescent lights					
Computers					
Air conditioner					
Electric heater					
Electric space heater					
Other					

Energy Check Up – Potential Energy and Monetary Savings

Calculate potential monetary savings for each proposed change.

For example: Calculate new cost per month if classroom lights are turned on for fewer hours each day.

- a. List the electrical appliances below
- b. Subtract: D1 (from chart 1) minus D2 (from chart 2) = Potential KWH saved per month
- c. Subtract: E1 (from chart 1) minus E2 (from chart 2) = Potential money saved per month

Electrical Appliance	Potential KWH saved per month (D1–D2)	Potential \$ saved per month (E1–E2)

Indoor Water Check Up - Amount of Indoor Water Used Before Proposed Changes

Take an inventory of water consuming fixtures, document approximately how much water each fixture uses and calculate the cost per day for use of the fixtures.

- a. Calculate number of gallons used per day by each fixture (# of uses per day x # of gallons per use = # of gallons used per day)
- b. Find out the cost per gallon of water from the school water bill
- c. Determine the cost per day for use of the fixtures (# of gallons used per day x cost per gallon = cost per day)

Water Fixture	A1 # of uses per day	B1 # of gallons per use	C1 # of gallons used per day (A1 x B1)	D1 Cost per gallon from water bill	E1 Cost per day (C1 x D1)
Bathroom sink faucets					
Toilets					
Urinals					
Drinking fountains					
Showers					
Indoor swimming pool					
Hot water heating pipes/AC					
Boiler					
Utility closets					
Indoor sprinkler system					
Cooling towers					
Other					

Indoor Water Check Up – Water Wasted from Leaks

Measure wasted water from leaky fixtures.

- Put a cup or bucket under the leak and time it for five minutes
- Measure the amount of water collected
- Multiply:
 - Amount of water collected x 12 = water wasted in one hour
 - Water wasted in one hour x 24 = water wasted per day from that faucet
- Add water wasted from all leaks to get total water wasted per day

	A	B	C
Water Fixture	Amount of water wasted in 5 minutes	Amount of water wasted in 1 hour (A x 12)	Water wasted per day (B x 24)
Bathroom sink faucets			
Drinking fountains			
Other			

Indoor Water Check Up – Amount of Indoor Water Used After Proposed Changes

Propose changes, such as fixing leaky faucets or replacing hi-flow toilets. Then document approximately how much water each fixture uses and calculate the new cost per day for use of the fixtures.

- a. Calculate number of gallons used per day by each fixture (# of uses per day x # of gallons per use = # of gallons used per day)
- b. Find out the cost per gallon of water from the school water bill
- c. Determine the cost per day for use of the fixtures (# of gallons used per day x cost per gallon = cost per day)

	A2	B2	C2	D2	E2
Water Fixture	# of uses per day	# of gallons per use	# of gallons used per day (A2 x B2)	Cost per gallon from water bill	Cost per day (C2 x D2)
Bathroom sink faucets					
Toilets					
Urinals					
Drinking fountains					
Showers					
Indoor swimming pool					
Hot water heating pipes/AC					
Boiler					
Utility closets					
Indoor sprinkler system					
Cooling towers					
Other					

Indoor Water Check Up – Potential Indoor Water and Monetary Savings

Calculate yearly monetary savings that would result from basic renovations.

- List water fixtures below
- Calculate: $D1$ (from chart 1) minus $D2$ (from chart 2) $\times 30$ = Potential water saved per month
- Calculate: $E1$ (from chart 1) minus $E2$ (from chart 2) $\times 30$ = Potential money saved per month

Water Fixture	Water saved per month $(D1 - D2) \times 30$	Potential \$ saved per month $(E1 - E2) \times 30$

Outdoor Water Check Up – Amount of Outdoor Water Used Before Proposed Changes

Take an inventory of water consuming fixtures, document approximately how much water each fixture uses and calculate the cost per day for use of the fixtures.

- a. Calculate number of gallons used per day by each fixture (# of uses per day x # of gallons per use = # of gallons used per day)
- b. Find out the cost per gallon of water from the school water bill
- c. Determine the cost per day for use of the fixtures (# of gallons used per day x cost per gallon = cost per day)

	A1	B1	C1	D1	E1
Water Fixture	# of uses per day	# of gallons per use	# of gallons used per day (A1 x B1)	Cost per gallon from water bill	Cost per day (C1 x D1)
Outside faucets					
Sprinkler system					
Outdoor pool					
Fountain					
Pond					
Other					

Outdoor Water Check Up – Water Wasted from Leaks

Measure wasted water from leaky fixtures.

- Put a cup or bucket under the leak and time it for five minutes
- Measure the amount of water collected
- Multiply:
 - Amount of water collected x 12 = water wasted in one hour
 - Water wasted in one hour x 24 = water wasted per day from that faucet
- Add water wasted from all leaks to get total water wasted per day

	A	B	C
Water Fixture	Amount of water wasted in 5 minutes	Amount of water wasted in 1 hour (A x 12)	Water wasted per day (B x 24)
Outside faucets			
Other			

Outdoor Water Check Up – Amount of Outdoor Water Used After Proposed Changes

Propose changes, such as putting timers on sprinklers, collecting water in rain barrels for watering plants, or putting covers on pools to reduce evaporation. Then document approximately how much water each fixture uses and calculate the new cost per day for use of the fixtures.

- a. Calculate number of gallons used per day by each fixture (# of uses per day x # of gallons per use = # of gallons used per day)
- b. Find out the cost per gallon of water from the school water bill
- c. Determine the cost per day for use of the fixtures (# of gallons used per day x cost per gallon = cost per day)

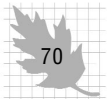
	A2	B2	C2	D2	E2
Water Fixture	# of uses per day	# of gallons per use	# of gallons used per day (A2 x B2)	Cost per gallon from water bill	Cost per day (C2 x D2)
Outside faucets					
Sprinkler system					
Outdoor pool					
Fountain					
Pond					
Other					

Outdoor Water Check Up – Potential Indoor Water and Monetary Savings

Calculate yearly monetary savings that would result from basic renovations.

- a. List water fixtures below
- b. Calculate: $D1$ (from chart 1) minus $D2$ (from chart 2) $\times 30$ = Potential water saved per month
- c. Calculate: $E1$ (from chart 1) minus $E2$ (from chart 2) $\times 30$ = Potential money saved per month

Water Fixture	Water saved per month $(D1 - D2) \times 30$	Potential \$ saved per month $(E1 - E2) \times 30$



Waste Check Up – Amount of Waste Generated Before Proposed Changes

Use the chart below to record the amount of waste collected on waste audit day.

- a. Set up containers for lunchtime separation and collection of trash
- b. Collect other trash from classrooms
- c. Using a scale, weigh the different types of trash collected and record in column A1
- d. Determine the number of school days in each month and record in column B1
- e. Multiply: $A1 \times B1 =$ total weight of trash generated each month

	A1	B1	C1
Type of Waste	Weight collected on waste assessment day	Number of school days per month	Weight per month (A1 x B1)
Office paper			
Cardboard			
Newspaper			
Telephone books			
Ink-jet cartridges			
Laser-jet cartridges			
Plastic			
Aluminum cans			
Non-recyclables			
Other			

Waste Check Up – Ways to Reduce, Reuse, and Recycle

List suggested waste reduction or recycling activities for your school. For example: washable dishes instead of disposable, reusable mug program, or double-sided copying policies. Think of some of your own ideas.

Type of Waste	How to Reduce	How to Reuse	How to Recycle

On the back of this page, calculate the potential waste reduction from implementing these and your own activities.

For example:

- a. How many pounds of waste would be eliminated from the lunchroom trash if washable dishes were used instead of disposable?
 - Weight of plastic utensils collected on waste audit day + weight of disposable dishes collected on waste audit day = total pounds of waste eliminated
- b. How many pounds of waste would be eliminated if a reusable mug program were implemented?
 - Total weight of soda cans + plastic bottles + paper cups and other drinking containers collected on waste audit day = total pounds of waste eliminated
- c. How many pounds of waste would be eliminated if double-sided copying policies were implemented?
 - Weight of single-sided copies collected on waste audit day divided by 2 = total pounds of waste eliminated

Waste Check Up – Amount of Waste Generated After Proposed Changes

Use the chart below to determine potential waste reduction based on your proposed changes.

- Record how much less trash would be collected after your changes are made in column A2.
- Record the number of school days per month in column B2.
- Calculate the new weight generated each month in column C2.

	A2	B2	C2
Type of Waste	Weight collected on waste assessment day	Number of school days per month	Weight per month (A2 x B2)
Office paper			
Cardboard			
Newspaper			
Telephone books			
Ink-jet cartridges			
Laser-jet cartridges			
Plastic			
Aluminum cans			
Non-recyclables			
Other			

Waste Check Up – Potential Waste Reduction and Monetary Savings

Calculate potential waste reduction and monetary savings based on the proposed activities.

- a. List type of waste below
- b. Subtract: C1 (from chart 1) minus C2 (from chart 2) = Potential waste reduced per month
- c. Research recycling companies to determine potential monetary savings.
 - Recycling companies will provide monetary compensation for paper, plastic and aluminum waste that has been separated.
 - Research the current value for the different types of recyclable materials.
 - Value x weight of material = amount earned for the material

Type of Waste	Potential waste reduced per month (C1-C2)	Potential \$ saved per month



APPLICATION

GOVERNOR'S GREEN SCHOOLS AWARD PROGRAM

ELIGIBILITY

1. See web site (www.maeoe.org) for application deadline. Application can be sent to:
Maryland Association for Environmental and Outdoor Education
Post Office Box 2104
Annapolis, Maryland 21401
2. All public and private preK–12 schools within the State of Maryland are eligible.
3. All activities described in this application should reflect activities that have occurred or will occur during the past two school years.
4. Applications must include three parts:
Part I - Cover Sheet
Part II - Green School Summary
Part III - Documentation of Green School requirements for your school.

REVIEW AND RECOGNITION PROCESS

1. Questions about the application or the review process should be referred to:
MAEOE
Web site: www.maeoe.org
2. Your application must be postmarked by the deadline indicated on the web site.
3. Once the application is received, the Review Panel meets to evaluate the application. All schools that meet all three criteria will be recommended for the award. If the review panel has any questions about the application, the panel may conduct a site visit or interview with the school.
4. All schools will be notified of their status by late March.
5. A recognition ceremony for recipients of the award will be held in the spring.

PREPARING THE APPLICATION

The application that you will complete should provide the Review Panel with information that will help them to understand why your school is a unique and successful Green School. Please visit the MAEOE website for a description of the goal of the Governor's Green School Award Program. To be considered for review, your application package must contain the following information:

Part 1 - Cover Sheet

The School Cover Sheet must be completed and signed by the principal.

Part II - A Summary of Your School's Green School Activities

This **one page summary** should provide a concise and coherent "snapshot" of your school that describes how your school is representative of a Green School.

Part III -Documentation of Required Criteria for Green School Recognition

To be eligible for the Green School Award, your school **must** demonstrate that it has met at least the required criteria for each of the three Green School objectives. **Your application will not be reviewed if the application does not support the minimum requirements.**

The requirements for Green School Recognition include the following:

Objective 1: Curriculum and Instruction - achieve all 3 criteria

Objective 2: Operation and Design of School Building - achieve 4 of the 8 criteria

Objective 3: School Community - achieve one of the 2 criteria

The documentation section of the application includes a written description that details how your school has accomplished the requirements for a Green School. Limit your descriptions to no more than one page per criteria. Supporting materials that will verify these achievements must also be attached. Refer to the Meeting the Requirements of a Green School for examples of accepted documentation.

The Review Panel will give special attention to applications that demonstrate students have been actively involved in preparing the application.

PART II

SUMMARY OF YOUR SCHOOL'S GREEN SCHOOL ACTIVITIES

This **one page summary** should provide a concise and coherent "snapshot" of your school that describes how your school is representative of a Green School. Summarize your strengths and accomplishments. Focus on what makes your school a unique and successful Green School worthy of State recognition. Highlight accomplishments using the three objectives of a Green School as a general guide.

The Summary section will provide the Review Panel with an introduction to your Green School activities and will also be used for public information if the school receives the distinction of the Governor's Green School Award. This information will be shared with other recognized schools, candidates for next year, and the press. It should be written as a stand-alone section

PART III

REQUIREMENTS FOR GREEN SCHOOL RECOGNITION

Objective 1 – Curriculum And Instruction

The school has developed a philosophy and approach to the development and implementation of curriculum and instruction that uses the environment as an integral part of the school's instructional program. The Green School Review Panel is interested in how your school has involved students in environmental issues instruction beyond what is required by the County curriculum.

Requirements for Objective 1

To be a Green School, your school must demonstrate that it meets all 3 of the following criteria.

Criteria – Curriculum and Instruction

- 1. Environmental Issue Instruction**
Students have opportunities at all grade levels and within multiple curricula to learn about, study, and address environmental issues in the classroom, on the school site, and in the local and regional community.
- 2. Professional Development**
Members of the school staff are involved in professional development or other training activities that enhance environmental awareness, literacy and knowledge and/or related instructional strategies.
- 3. Celebration**
The school recognizes and celebrates student and staff achievement in the implementation of best environmental practices in the operation and design of the school building and grounds and in developing active partnerships with the community.

Objective 2 – Operation and Design of School Building And Grounds

Best environmental practices are modeled in the operation and design of the school building and grounds — the school models what it teaches.

Requirements for Objective 2

To be a Green School, your school must demonstrate that it meets at least 4 of the 8 criteria.

Criteria – Operation and Design of School Building and Grounds

- 1. Water Conservation and Water Pollution**
The school and/or students practice water conservation and water pollution prevention.
- 2. Energy Conservation**
The school and/or students practice energy conservation.
- 3. Solid Waste**
The school and/or students practice solid waste reduction, reuse and recycling.
- 4. Safe Use of Chemicals**
The school purchases chemical products that are environmentally safe, uses the chemicals in ways that pose no environmental or human health risks, and ensures their proper disposal. The school uses Integrated Pest Management.

5. Habitat Restoration

The school and/or students have designed and implemented natural habitat restoration areas on the school grounds or in the community.

6. Building Structure for Learning about the Environment

The school has designed or implemented a variety of school or community structures that may enhance learning in the outdoors or improve habitat.

7. Responsible Transportation

The school and/or students promote and provide responsible transportation.

8. Healthy School Environment

The school buildings and grounds are managed and maintained to ensure that every student and staff member enjoys the benefits of clean air, clean water and a healthy learning environment.

Objective 3 – School Community

The school and students extend their learning into the community through a variety of projects that address local environmental issues.

Requirements for Objective 3

To be a Green School, your school must demonstrate that it meets one of the following criteria.

Criteria - School and Community

1. Community Partners in the Local Community

The school encourages and supports student, staff, and community partnerships that address environmental issues in the local community.

2. Community Partners at the School Level

Community partners encourage and support students and staff to develop and implement solutions to environmental issues at the school level.

For more information and assistance visit the Maryland Association of Environmental and Outdoor Education website at: <http://www.maeoe.org>

- State and local resources
- Funding opportunities
- Professional Development opportunities
- Mentoring opportunities
- Application Tips
- Recognized Governor’s Green Schools for 1999, 2000, 2001 and 2002
- Green School Information Update



The Maryland Association for Environmental and Outdoor Education

TIPS FOR A SUCCESSFUL APPLICATION

Before you mail your application, review the following checklist to ensure that you have a successful application.

- Completed all information on the Cover Sheet.
- Completed a one page summary of your School's Green School Activities
- Objective 1 – Curriculum and Instruction includes:
 - a maximum 1 page description for each of the three required criteria
 - documentation is included for each criterion
 - labeled documentation identifies which criteria it supports
- Objective 2 – Operation and Design includes:
 - a maximum 1 page description for each of the four required criteria
 - documentation is included for each criterion
 - labeled documentation identifies which criteria it supports
- Objective 3 – School Community includes:
 - a maximum 1 page description for the one required criteria
 - documentation is included for each criterion
 - labeled documentation identifies which criteria it supports
- Documentation has been selected that best exemplifies how your school meets each criterion. Documents may include, but are not limited to photographs, student work, data, program or meeting agendas, certificates, specific lesson plans, calendars, maps, blue prints and newspaper articles. Do not include videos, computer discs, large posters or audio tapes as your documentation.
- Each section of the application is identified (index tabs work great!).
- Supporting documentation, labeled for each criterion, is placed immediately following the written description.
- The application reflects two years of environmental education in your school.
- Involve students in the writing and compiling the application
- The application is postmarked by the deadline indicated on the MAEOE web site.

PART I
COVER SHEET
APPLICATION
GOVERNOR'S GREEN SCHOOLS AWARDS PROGRAM

School Name: _____

School Address: _____

School System: _____

Name of Contact Person: _____ Email: _____

Phone: _____ Fax: _____

I have reviewed the information in this application and certify that to the best of my knowledge it is accurate.

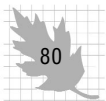
Principal's signature

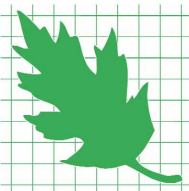
Date

Preparation of the Application:

An Award Nominations Committee should be involved in the preparation of the application. The committee should include at least one member from the following list: student, teacher, administrator, parent, community partner and maintenance staff. We encourage the active involvement of students in the development of your application. Please list all individuals involved in the preparation of your application.

Name	Position or Title
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ENVIRONMENTAL
DESIGN

**Maryland Department
of Natural Resources**
Tawes State Office Building
580 Taylor Avenue
Annapolis, Maryland 21401
1-(877)-620-8DNR
www.dnr.maryland.gov

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