

## Healthy Water, Healthy People

### Activity

#### **HITTING THE MARK** – page 49

STUDENTS INVESTIGATE THE CONCEPTS OF ACCURACY AND PRECISION IN DATA COLLECTION, AND LEARN THE IMPORTANCE OF WRITING DETAILED PROCEDURES.

#### **H TO OH!** - page 15

STUDENTS SIMULATE THE CREATION OF ACIDS AND BASES; MANIPULATE ACIDIC AND BASIC SOLUTIONS; AND IDENTIFY COMMON ACIDS AND BASES FOUND AT HOME.

### Maryland Department of Natural Resources

#### **MDNR Data Sources**

Maryland Education @ DNR (Recommended for teachers).

<http://www.dnr.state.md.us/education/environmental.html>

Specific data include:

Bay Conditions – “Eyes on the Bay”

<http://www.eyesonthebay.net>

Bay Grasses in Classes (students should be guided to “on-line data”)

[http://www.dnr.state.md.us/bay/sav/bgic/grass\\_class.html](http://www.dnr.state.md.us/bay/sav/bgic/grass_class.html)

Bay Monitoring

<http://www.dnr.state.md.us/bay/monitoring/index.html>

#### **Acids in Maryland**

Acid Deposition

<http://www.dnr.state.md.us/streams/acid/index.html>

### Other Maryland Resources

Chesapeake Bay Program – Data

<http://www.chesapeakebay.net/about.htm>

#### **Acid Sources**

Reduce Power Plant Pollution — “Pass the Four Pollutants Bill” (This site recommended for high school students; Chesapeake Bay Foundation).

<http://www.cbf.org/site/PageServer?pagename=4Pfactsheet>

Airshed. (This site is good for all students; Chesapeake Bay Foundation).

[http://www.cbf.org/site/PageServer?pagename=ttt\\_state\\_pollution\\_air](http://www.cbf.org/site/PageServer?pagename=ttt_state_pollution_air)

Maryland Treatment of Acid Mine Drainage. (Recommended for older students; Maryland Dept. of the Environment).

<http://www.mde.state.md.us/Programs/WaterPrograms/MiningInMaryland/MDAcidDrainage/index.asp>

Chesapeake Bay Ecological Foundation (Great resource for all students – see State of the Bay annual reports).

<http://www.chesbay.org/acidRain/>

## **WATER QUALITY WINDOWS – page 164**

STUDENTS EXPLORE THE DIFFERENT WATER QUALITY RANGES REQUIRED BY ORGANISMS BY INTERPRETING DATA; SORTING AND CLASSIFYING ORGANISMS ACCORDING TO THEIR REQUIREMENTS; AND APPLYING THEIR KNOWLEDGE TO DETERMINE HOW CHANGES IN WATER QUALITY AFFECT ORGANISMS.

**Adaptation Suggestion:** Substitute Maryland species with those provided in the HWHP book. See sources in adjacent columns.

## **WASH IT AWAY – page 121**

STUDENTS EXPLORE HOW DISEASES CAN BE TRANSMITTED EASILY BY USING GLITTER TO REPRESENT COMMON PATHOGENS; AND THEN INVESTIGATE HAND-WASHING AS A METHOD OF DISEASE PREVENTION.

### **Adaptation Suggestion:**

Relate this activity to students' local environment and current events by having them research diseases and viruses that are of current or ongoing concern in Maryland (see Sources in adjacent columns).

Elena has these -

### **MDNR Water Quality Data & Fact Sheets on MD Species**

Maryland Education @ DNR. (Recommended for teachers).

<http://www.dnr.state.md.us/education/environmental.html>

### **Water quality data sources & monitoring projects include:**

Bay Conditions – “Eyes on the Bay” (Real-time data. Also includes: Monitoring Stories & Highlights [supporting articles useful in Language Arts]; Lesson Plans; Additional Bay Data & Info. )

<http://mddnr.chesapeakebay.net/eyesonthebay/index.cfm>

Bay Monitoring - Steam Waders

<http://mddnr.chesapeakebay.net/mbss/streamwaders.cfm>

Bay Life Guide

<http://www.dnr.state.md.us/bay/cblife/index.html>

Fish Facts

<http://www.dnr.state.md.us/fisheries/education/fishfaqs.html>

Aquatic Insects

<http://www.dnr.state.md.us/bay/cblife/insects/index.html>

Maryland Stream: An Undiscovered Realm (free video)

(410) 260-8611 or [www.dnr.md.us](http://www.dnr.md.us) or

Chesapeake Bay Trust, (410) 974-2941 or

[www.ari.net/home/cbt](http://www.ari.net/home/cbt)

### **Sources of water-related Diseases/Toxins:**

Harmful Algae

<http://www.dnr.state.md.us/bay/hab/index.html>

Maryland Beach Closures Due to “Swimmer’s Itch”

<http://www.dnr.state.md.us/bay/hab/microcystis.html>

An Introduction to an Ecosystem – Habitats (Chesapeake Bay Program. Includes downloadable resource in “Intro to an Ecosystem”)

<http://www.chesapeakebay.net/about.htm>

About the Bay (Chesapeake Bay Program -tons of resources from “Habitats to People”)

<http://www.chesapeakebay.net/about.htm>

Maryland Sea Grant – Life in the Bay (lots of info. on bay critters & habitat)

[http://www.mdsg.umd.edu/CB/ecology\\_life.html](http://www.mdsg.umd.edu/CB/ecology_life.html)

Habitat Requirements for Chesapeake Bay Living Resources, 2<sup>nd</sup> Edition, Chesapeake Bay Program – (out of print).

Chesapeake Bay Program – Data

<http://www.chesapeakebay.net/about.htm>

Maryland Drinking Water (A searchable website on regional water sources includes a list of water systems & water quality reports. Don’t be intimidated by the format, have students scan the data for contaminants you have discussed).

<http://www.epa.gov/safewater/dwinfo/md.htm>

West Nile Virus (MD Cooperative Extension):

[http://edcp.org/factsheets/wnv\\_fact.html](http://edcp.org/factsheets/wnv_fact.html)

## **WATER QUALITY MONITORING FROM DESIGN TO DATA - page 70**

STUDENTS CREATE A STUDY DESIGN, THEN ANALYZE AND INTERPRET WATER QUALITY DATA TO MODEL THE PROCESS OF WATER QUALITY MONITORING.

### **Adaptation Suggestion:**

Use a topographical map of your local stream/river and watershed data sets in place of Gallatin materials. A quick internet search will provide different watershed overviews and data (sources for watershed and data information are listed in adjacent columns).

### **How to take Action:**

Participate in a local monitoring project (see Be a Part of Something Big; Stream Waders, Stream T.E.A.M).

### **Maryland Watershed Overview Info.**

Surf Your Watershed (indicators)

<http://www.dnr.state.md.us/watersheds/surf/>

### **MDNR Data Sources**

Maryland Education @ DNR (Recommended for teachers).

<http://www.dnr.state.md.us/education/environmental.html>

Specific data include:

Bay Conditions – “Eyes on the Bay”

<http://www.eyesonthebay.net>

Bay Grasses in Classes (students should be guided to “on-line data”)

[http://www.dnr.state.md.us/bay/sav/bgic/grass\\_class.html](http://www.dnr.state.md.us/bay/sav/bgic/grass_class.html)

Bay Monitoring

<http://www.dnr.state.md.us/bay/monitoring/index.html>

### **Maryland Water Quality Monitoring Projects & Data Sources**

Stream Waders

<http://mddnr.chesapeakebay.net/mbss/streamwaders.cfm>

Be a Part of Something Big

<http://www.dnr.state.md.us/education/are/big/big.html>

Team DNR (Teaching Environmental Awareness in Maryland)

<http://www.dnr.state.md.us/education/teamdnr>

Maryland Biological Stream Survey

<http://www.dnr.maryland.gov/streams/mbss>

### **Watershed Overview Sources**

State of the Bay: Chesapeake Bay Foundation

[http://www.cbf.org/site/PageServer?pagename=sotb\\_2004\\_index](http://www.cbf.org/site/PageServer?pagename=sotb_2004_index)

### **Data Sources**

Chesapeake Bay Program – Data

<http://www.chesapeakebay.net/about.htm>

### **Sources for Topographic Maps of Maryland**

Maryland Mapping Resources Guide (topographical maps of Maryland; Recommended for teachers and high school students).

<http://www.mdmerlin.net/>

Topozone (Free, online topographic maps that all students can access).

<http://www.topozone.com>

USGS Ecosystem History & Change: (Great maps & images on: Geologic Framework; Land-Use; Climate Variability; Sediment Sources; Remote Sensing)

<http://geology.er.usgs.gov/eespteam/Atlantic/>

### **Interactive Macroinvertebrate Sampling Activity**

Alice Ferguson Foundation’s interactive on-line activity, “Let’s Take a Dip” (Illustrates sampling procedures & macroinvertebrate identification typically found in a Maryland stream).

<http://www.fergusonfoundation.org/kidsmainframe.html>

### **Sources for Topographic Maps of Maryland**

Maryland Mapping Resources Guide (Topographical maps of Maryland, recommended for teachers & high school students).

<http://www.mdmerlin.net/>

Topozone: (Free, online topographic maps for all students).

<http://www.topozone.com>

## **STONE SOUP – page 35**

STUDENTS WILL MODEL AND OBSERVE THE ACID NEUTRALIZATION CAPACITY OF ALKALINE WATERS, AND COMPARE IT WITH NON-ALKALINE WATERS.

### **Adaptation Suggestion:**

Ask students to collect water samples from around their home and community (be sure that they use a clean container & label the sample with the location). Conduct the acid tests on their samples and plot the results on a map of the region. Discuss the results.

## **THERE IS NO POINT TO THIS POLLUTION – page 136**

STUDENTS ANALYZE DATA TO SOLVE A MYSTERY, INTERPRET A TOPOGRAPHICAL MAP, AND ANALYZE AND COMPARE WATER QUALITY DATA TO LEARN ABOUT THE CUMULATIVE IMPACTS OF NONPOINT SOURCE POLLUTION.

### **Suggested adaptation:**

Download a topographic map of your local area (school or community) and apply the Water Quality Data to this source. You can either draw in a similar community onto your map & use the Water Quality Data provided, or substitute your own local community landmarks and edit the Data titles accordingly.

**Note:** The parameters and data on cards listed on p. 144 do not need to change, e.g., Trailer Park can remain the same as can all data listed for this card. If, however, the teacher wishes to include specific Chesapeake data, this is readily available from the “Eyes on the Bay” website. More sources are listed in adjacent columns.

### **How to take action:**

Storm Drain Stenciling

<http://www.dnr.maryland.gov/education/projectwet.html>

Alliance for the Chesapeake Bay

- Project Clean Stream  
<http://www.acb-online.org/project.cfm?vid=220>
- Restore Corp  
<http://www.acb-online.org/project.cfm?vid=77>

Annual Potomac River Watershed Cleanup (Alice Ferguson Foundation)

<http://fergusonfoundation.org/cleanupmainframe/html>

Chesapeake Bay Foundation

[http://www.cbf.org/site/PageServer?pagename=action\\_index](http://www.cbf.org/site/PageServer?pagename=action_index)

## **TURBIDITY OR NOT TURBIDITY: THAT IS THE QUESTION – page 83**

STUDENTS EXPLORE THE EFFECTS OF SEDIMENT ON TURBIDITY; COMPARE THE TURBIDITY OF MUDDY AND CLEAR WATER; SIMULATE ENVIRONMENTAL CONDITIONS THAT CAUSE EROSION; AND INVESTIGATE WAYS TO REDUCE EROSION THAT LEADS TO TURBIDITY.

## **Maryland Watershed Maps & Pollution Info.**

Surf Your Watershed (indicators)

<http://www.dnr.state.md.us/watersheds/surf/>

Nonpoint Source Management Program (Recommended for high school students and teachers)

<http://www.dnr.state.md.us/bay/czm/nps/index.html>

What you can do to protect your waterways?

<http://www.dnr.state.md.us/bay/tripstrat/protect.html>

Bay Conditions – “Eyes on the Bay”

<http://www.eyesonthebay.net>

Rivers and Streams

[http://www.dnr.state.md.us/streams/status\\_trend/turb.html](http://www.dnr.state.md.us/streams/status_trend/turb.html)

TEAM DNR Stream Sampling Worksheet

<http://www.dnr.state.md.us/education/teamdnr/dataworksheet04.pdf>

Wade-Ins Evolves into Popular Community Events

[http://www.dnr.state.md.us/bay/tribstrat/wadein\\_schedule.html](http://www.dnr.state.md.us/bay/tribstrat/wadein_schedule.html)

How to take action: Rainbarrel

<http://www.dnr.state.md.us/ed/rainbarrel.html>

Chesapeake Bay Foundation – State of the Bay: Pollution  
[http://www.cbf.org/site/PageServer?pagename=sotb\\_2004\\_pollution](http://www.cbf.org/site/PageServer?pagename=sotb_2004_pollution)

Chesapeake Bay Program – Pollutants

<http://www.chesapeakebay.net/stressor1.htm>

## **Sources for Topographic Maps of Maryland**

Maryland Mapping Resources Guide (topographical maps of Maryland; recommended for teachers and high school students).

<http://www.mdmerlin.net/>

Topozone (Free, online topographic maps that all students can access).

<http://www.topozone.com>

USGS Ecosystem History & Change: (Great maps & images on: Geologic Framework; Land-Use; Climate Variability; Sediment Sources; Remote Sensing).

<http://geology.er.usgs.gov/eespteam/Atlantic/>

Chesapeake Bay: Introduction to an Ecosystem – Erosion & Sedimentation (etc.) (Chesapeake Bay Program)

<http://www.chesapeakebay.net/about.htm>

Bernie’s Toes (Maryland Sea Grant)

<http://www.vims.edu/adv/ed/bt/toes1.html>

The Bay Journal reports on the Annual Bernie Fowler

**[Turbidity or Not Turbidity, cont'd]**

**Adaptation Suggestion:**

As an extension, conduct Bernie’s Toes, an activity based on Senator Bernie Fowler’s childhood investigation of water clarity on the Patuxent River (see Sources in adjacent column).

**How to Take Action:**

Learn about how to prevent erosion and sedimentation (MD Soil Conservation District); build a raingarden or rainbarrel to prevent runoff and erosion at your school.

**BENTHIC BUGS AND BIO ASSESSMENT-** page 154  
STUDENTS INVESTIGATE THE RELATIVE WATER QUALITY OF A STREAM BY CONDUCTING A SIMULATED BIOASSESSMENT BY SAMPLING AQUATIC MACROINVERTEBRATES (REPRESENTED BY ORDINARY MATERIALS).

**Adaptation Suggestion:** Conduct the “Extension as recommended: conduct an actual rapid bioassessment on a local stream. This is not as complicated as it may sound, and there are volunteers available to assist you (MDNR Stream T.E.A.M). The rewards for conducting such an investigation are boundless. There are several resources available to help guide you, including Stream Waders or Be a Part of Something Big. Additionally, the MDNR can loan stream study equipment and there are several sources for funding to assist your school in acquiring equipment of your own. See “Grants and Funding” listed at the end of this document.

**LOOKS AREN’T EVERYTHING –** page 99

STUDENTS STUDY MAPS AND CLUES FROM HYPOTHETICAL CAMPING TRIP TO DETERMINE HOW AND WHY SOME OF THE CAMPERS BECAME ILL. THEY THEN INVESTIGATE THE ROLE OF WATER QUALITY IN HUMAN ILLNESS.

**Suggested adaptation:**

Download a local topographic map and apply this resource to the activity to make it more locally relevant.

**Maryland Sources for Macroinvertebrate Assessments & Data**

Stream Waders

<http://mddnr.chesapeakebay.net/mbss/streamwaders.cfm>

Be a Part of Something Big

<http://www.dnr.state.md.us/education/are/big/big.html>

Team DNR (Teaching Environmental Awareness in Maryland)

<http://www.dnr.state.md.us/education/teamdnr>

**See Maryland parks for giardia**

Wade In (Bernie’s Toes). For current wade in data, “search” the Bay Journal website (Patuxent River Wade In) or contact the Bay Journal at:  
<http://www.bayjournal.com/contact.cfm>

Maryland Soil Conservation District

<http://www.mascd.net/scds/MDSCDweb.htm>

Schoolyard Habitats

<http://www.fws.gov/chesapeakebay/schoolyd.htm>

Bayscapes

<http://www.fws.gov/chesapeakebay/Bayscapes.htm>

Maryland Sea Grant – Bay Science Gateway (resources & fact sheets)

<http://www.mdsg.umd.edu/CB/nodes.html>

Alice Ferguson Foundation’s interactive on-line activity, “Let’s Take a Dip” (Illustrates sampling procedures & macroinvertebrate identification typically found in a Maryland stream).

<http://www.fergusonfoundation.org/kidsmainframe.html>

**Sources for Topographic Maps of Maryland**

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<http://www.mdmerlin.net/>

Topozone (Free, online topographic maps for all students).

<http://www.topozone.com>

USGS Ecosystem History & Change: (Great maps & images on: Geologic Framework; Land-Use; Climate Variability; Sediment Sources; Remote Sensing)

<http://geology.er.usgs.gov/eespteam/Atlantic/>

## **LIFE AND DEATH SITUATION – page 125**

STUDENTS LEARN ABOUT DIVERSITY AND GLOBAL LOCATIONS OF WATERBORNE DISEASES AND THE ROLE OF EPIDEMIOLOGY IN DISEASE CONTROL BY SEARCHING FOR STUDENTS “INFECTED” WITH A WATERBORNE ILLNESS. THEN, THEY CREATE NEWSPAPER ARTICLES THAT SUMMARIZE THEIR DISEASE.

### **Adaptation Suggestion:**

Relate this activity to students’ local environment and current events by having them research diseases and viruses that are of current or ongoing concern in Maryland (see Sources in adjacent columns).

## **Sources of water-related Diseases/Toxins:**

Harmful Algae

<http://www.dnr.state.md.us/bay/hab/index.html>

Maryland Beach Closures Due to “Swimmer’s Itch”

<http://www.dnr.state.md.us/bay/hab/microcystis.html>

Maryland Drinking Water (A searchable website on regional water sources & water quality reports. Format can be intimidating. Scan the data for contaminants).

<http://www.epa.gov/safewater/dwinfo/md.htm>

West Nile Virus (MD Cooperative Extension):

[http://edcp.org/factsheets/wnv\\_fact.html](http://edcp.org/factsheets/wnv_fact.html)

Annual drinking water quality reports across America (Searchable by state).

<http://yosemite1.epa.gov/ogwdw/ccr.nsf/America?OpenView&Count=700>

Legionnaires Disease - Ocean City, Maryland, October 2003--February 2004 (Teachers)

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5407a1.htm>

An Outbreak of Cholera in Maryland – 1991 (Teachers)

[http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list\\_uids=8501322&dopt=Abstract](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=8501322&dopt=Abstract)

Giardia in Maryland - 1998 (Teachers)

[http://www.epa.gov/enviro/html/icr/state/report/giardia/MD\\_7.html](http://www.epa.gov/enviro/html/icr/state/report/giardia/MD_7.html)

Contaminants & Toxins in the Bay (Maryland Sea Grant; Good for all students).

<http://www.mdsg.umd.edu/CB/toxics/index.html>

## **A SNAPSHOT IN TIME – page 61**

STUDENTS USE A TOPOGRAPHIC MAP TO EXPLORE A WATERSHED THEN APPLY THAT KNOWLEDGE TO WATERSHED MONITORING. STUDENTS ANALYZE DIFFERENCES BETWEEN AN INDIVIDUAL DATA SET COLLECTED AT ONE PLACE AND TIME VERSUS A SERIES OF DATA SETS COLLECTED AT VARIOUS POINTS ALONG A WATERSHED OVER TIME. STUDENTS WILL FIRST GRAPH DATA THEN ANALYZE, COMPARE AND SUMMARIZE TRENDS IN WATER QUALITY.

[continued on following page]

Eyes on the Bay (real-time watershed data & archived data available on the following parameters: dissolved oxygen; temperature; turbidity; salinity; pH; chlorophyll; and depth.)

<http://mddnr.chesapeakebay.net/eyesonthebay/index.cfm>

Rivers and Streams

[http://www.dnr.state.md.us/streams/status\\_trend/turb.html](http://www.dnr.state.md.us/streams/status_trend/turb.html)

Surf Your Watershed (includes: Watershed Indicators; Watershed Profiles; Watershed Bibliography; Watershed Planning & Strategies; & Watershed Organizations)

<http://www.dnr.state.md.us/watersheds/surf/>

### **Monitoring Projects**

Stream Waders

<http://mddnr.chesapeakebay.net/mbss/streamwaders.cfm>

## **Sources for Topographic Maps of Maryland**

Maryland Mapping Resources Guide (topographical maps of Maryland)

<http://www.mdmerlin.net/>

Topozone (Free, online topographic maps for all students).

<http://www.topozone.com>

USGS Ecosystem History & Change: (Great maps & images on: Geologic Framework; Land-Use; Climate Variability; Sediment Sources; Remote Sensing)

<http://geology.er.usgs.gov/eespteam/Atlantic/>

## **Maryland Water Quality Data Sources**

Chesapeake Bay Program – Water Quality

<http://www.chesapeakebay.net/wquality.htm>

[A Snapshot in Time, cont'd]

**Suggested adaptations:**

Make this activity more locally relevant by selecting a river or stream nearest to your school from the Eyes on the Bay or Rivers website. Use the data provided from Eyes on the Bay in place of the Cooper River Data.

Download a corresponding topographic map and apply this resource to the activity to make it more locally relevant.

**How to take Action:**

Participate in a local monitoring project (see Be a Part of Something Big; Stream Waders, Stream T.E.A.M).

Be a Part of Something Big

<http://www.dnr.state.md.us/education/are/big/big.html>

Team DNR (Teaching Environmental Awareness in Maryland)

<http://www.dnr.state.md.us/education/teamdnr>