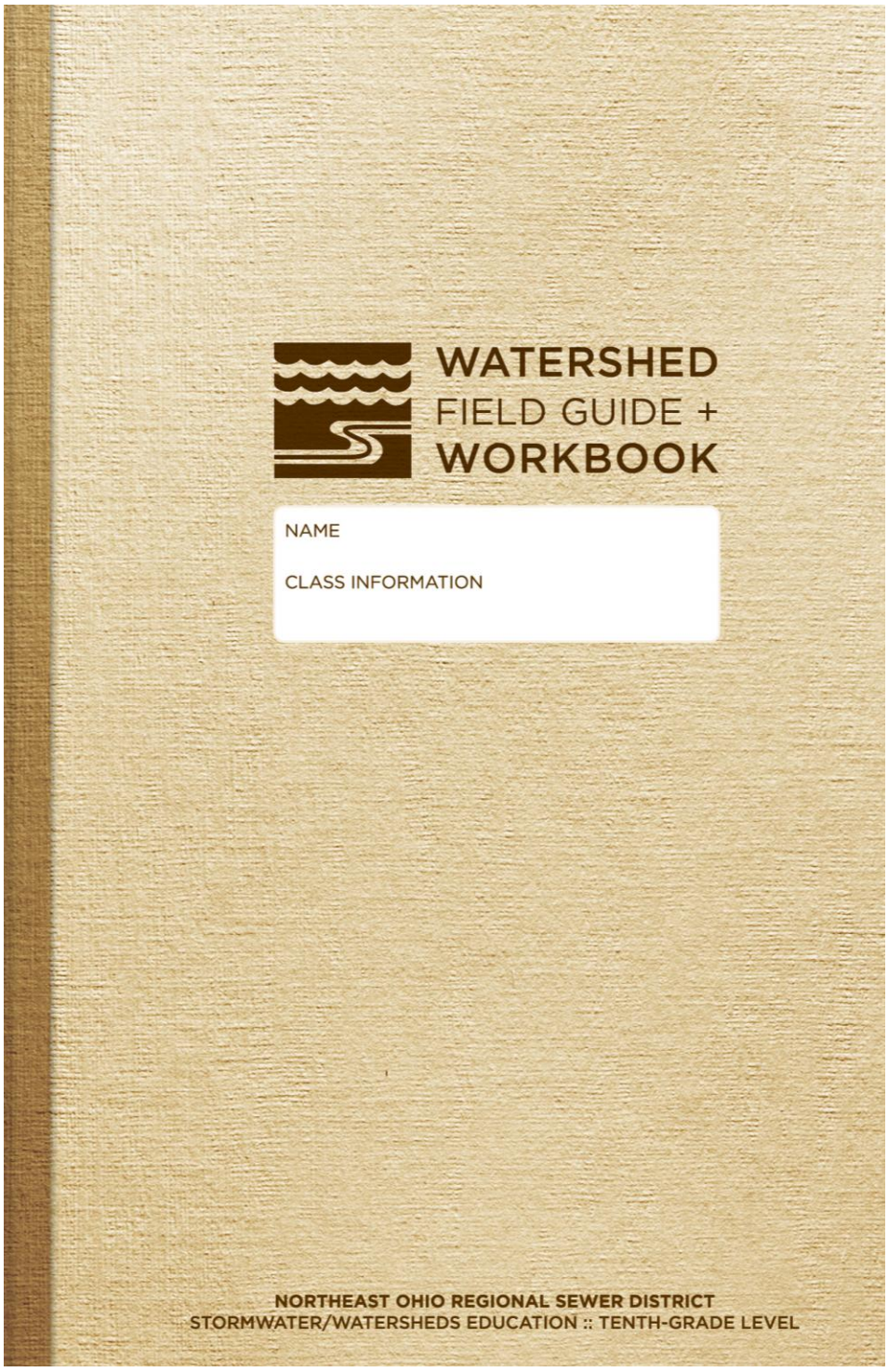

TEACHERS GUIDE

PRESENTED BY THE NORTHEAST OHIO REGIONAL SEWER DISTRICT

Northeast Ohio
Regional Sewer District

To our Northeast Ohio teachers and friends:

This curriculum was written by a group of practicing teachers with the hope that your students will gain a broader awareness of the watershed of northeast Ohio, the Northeast Ohio Regional Sewer District and how they impact our daily lives.

Each lesson can easily be modified to fit your classroom and meet the needs of your individual students. The time frames indicated are the minimum amount of time to complete each activity. You will need to use your own judgment about how many class periods or days you will need to complete the unit.

We recommend that you add in vocabulary builders based on the prior knowledge of your class. You may use a Word Wall, graphic organizers, foldables or have the students create their own glossary depending on the needs of your group. A glossary has already been included in the student Field Guide; however, the pages can be removed prior to distribution to students.

Please be sure to have students review and follow your classroom safety rules and requirements for all lab activities. Included in the appendix, as well as the student field guide, is a copy of a lab safety contract that you may use with your class.

If you have questions about the lessons, activities, or would like supplemental material, you may email us at community@neorsd.org or call (216) 881-6600 and ask to speak with our Watersheds department.

Thank you for helping us keep our Great Lake great.

The following lessons are designed to meet **Ohio's College and Career Readiness Standards in Science** seventh grade. The lessons also address components of the math and ELA standards.

Science Inquiry and Application

- Identify questions and concepts that guide scientific investigations;
- Design and conduct scientific investigations;
- Use technology and mathematics to improve investigations and communications;
- Formulate and revise explanations and models using logic and evidence (critical thinking);
- Recognize and analyze explanations and models; and
- Communicate and support a scientific argument.

Biology: This course investigates the composition, diversity, complexity and interconnectedness of life on Earth. Fundamental concepts of heredity and evolution provide a framework through inquiry-based instruction to explore the living world, the physical environment and the interactions within and between them.

Course Content: Diversity and Interdependence of Life
Building on knowledge from elementary school (interactions of organisms within their environment and the law of conservation of matter and energy, food webs) and from middle school (flow of energy through organisms, biomes and biogeochemical cycles), this topic focuses on the study of diversity and similarity at the molecular level of organisms. Additionally the effects of physical/chemical constraints on all biological relationships and systems are investigated… Like many complex systems, ecosystems tend to have cyclic fluctuations around a state of rough equilibrium. In the long run, however, ecosystems always change as geological or biological conditions vary.

- Ecosystems
    - Homeostasis
        - Carrying capacity
        - Equilibrium and disequilibrium

Although this curriculum is designed for the 10th grade class, it touches upon the concepts discussed in the advanced sciences classes.

Environmental Science:

Course Content: Earth Systems: Interconnected Spheres of Earth
This topic builds upon both the physical science and biology courses as they relate to energy transfer and transformation, conservation of energy and matter, evolution, adaptation, biodiversity, population studies, and ecosystem composition and dynamics. In grades 6-8, geologic processes, biogeochemical cycles, climate, the composition and properties of the atmosphere, lithosphere and hydrosphere (including the hydrologic cycle) are studied.

Course Content: Earth's Resources:

This topic explores the availability of Earth's resources, extraction of the resources, contamination problems, remediation techniques and the storage/disposal of the resources or by-products. Conservation, protection and sustainability of Earth's resources also are included. This builds upon grades 6-8 within the Earth and Space Science strand (sections pertaining to energy and Earth's resources) and the biology and physical science (in particular chemistry and energy topics) courses at the high school level.

- Water and water pollution
    - Potable water and water quality
    - Hypoxia, eutrophication
    - Clean Water Act
    - Point source and non-point source contamination

DAY 1

PREREQUISITE KNOWLEDGE:

The different components of the hydrologic cycle (e.g., properties of water, changes of state, relationships of water to weather, effects of water on Earth's surface)

STUDENTS WILL

1. Review the natural water cycle
2. Explore the urban water cycle
3. Compare the natural and urban cycles
4. Research & evaluate the role of the Sewer District

DAY 1 AT A GLANCE

ESSENTIAL QUESTIONS

1. What is the role of the sewer district as it relates to the natural and urban water cycles?

MATERIALS

- Field Notebook
- Video "So if you ever wondered…"

TIME FRAME

	Estimated
Anticipation guide	3 minutes
Exploration	40 minutes
Summary	7 minutes
TOTAL	50 minutes

VOCABULARY

- Condensation
- Distillation
- Evaporation
- Evapotranspiration
- Groundwater
- Infiltration
- Lake
- Pond
- Precipitation
- River
- Runoff
- Storm water
- Stream
- Surface water
- Transpiration
- Urban
- Urbanization
- Watershed

Anticipation guide

Explain to students that they are going to do a quick review of what they know about the natural water cycle. Students will review each statement on the Anticipation Guide Sheet (found on page 20 of this Teachers Guide). Remind students to put a plus sign if the statement is accurate, a minus sign if the statement is false or a zero if they are not sure. Have students keep the sheet until the end of the lesson at which time they will self-check their answers. The answer key can be found on page 23 of this Teachers Guide.

Exploration

Video

Students will learn about the urban water cycle through the video "So if you ever wondered…" located on the NEORSD website. The video is 7 minutes and 35 seconds long. Students should take notes as they watch. After students have watched the video, discuss the relationship between the urban water cycle and the natural water cycle. How do they compare? Do they overlap or intermingle?

Venn Diagram

Have students create a Venn diagram comparing and contrasting the natural water cycle and the urban water cycle in the student Field Notebook. Students may use the diagrams and notes from the video to assist.

Research Role of the Sewer District

Divide students into pairs or groups of 3. Using the NEORSD pamphlets or the neorsd.org website, students should identify the role of the sewer district and how it relates to the urban water cycle. Students should be evaluating why the sewer district exists and how it is important to our everyday lives.

Summary

Have students return to the anticipation guide. Give them a few minutes to review their own answers and make changes as necessary. Read aloud the correct answers so students can then double check their work. Answer any questions they have and use this opportunity to correct any misconceptions that still exist.

Extensions

- Model the cleansing of water through the natural water system by having the students make a solar water purification system.
- Repeat the solar water purification system activity using a variety of contaminants in the water. Kool-Aid may represent various contaminants- sugar, flavoring and color.

Modifications

- Stop the video to discuss information along the way.
- Have students work in pairs to complete the Venn diagram.

DAYS 2-3

PREREQUISITE KNOWLEDGE:

The different components of the hydrologic cycle (e.g., properties of water, changes of state, relationships of water to weather, effects of water on Earth's surface)

STUDENTS WILL

1. Develop a definition of watershed
2. Create a model of a watershed
3. Identify and observe contamination of a watershed

DAYS 2-3 AT A GLANCE

ESSENTIAL QUESTIONS

1. How does the Lake Erie watershed become contaminated?

2. What can be done to protect the Lake Erie watershed?

MATERIALS

- Student Field Notebook
- Food coloring
- Powdered drink mix-various colors
- Angel hair pasta (crushed)
- Foil
- Spray bottle
- Water
- Sponges
- Tape
- Paper towels
- Disposable cake pans or plastic dish bins
- Various kitchen or recycled items
- Styrofoam packaging
- Plastic animals, buildings, etc.-if available
- Tooth picks or craft sticks to create structures for watershed

TIME FRAME

	Estimated
Pre-Activity	15 min.
Activity	60 min.*
Post Activity	15 min.*
Guided Practice/Homework	10 min.*
TOTAL	100 min.

* These times are flexible and should be adjusted based on the needs of your class.

VOCABULARY

- Basin
- Contaminate
- Elevation
- Estuary
- Ground water
- Lake
- Pond
- River
- Runoff
- Storm water
- Stream
- Surface tension
- Surface water
- Watershed

Pre-Activity

Have students work individually to brainstorm some ideas about the difference between groundwater and surface water. Ask students to brainstorm the definition of watershed. Post their reflections on the board. Focus on the Cuyahoga River and Lake Erie watersheds.

Have the students examine the diagram of the Lake Erie watershed on pages 10-11 the student Field Guide. They should discuss the information in pairs or groups of 3. Allow a few minutes for students to edit their reflections and develop their own definition of a watershed. Discuss the major factors that play a role in the Lake Erie watershed and may affect the health of the water.

Model Watershed

Explain to the students that now that they have an idea of what a watershed is and its components, they are going to create their own models using the materials provided. Students should be sure to include in their model an area of elevation, a basin, streams, farm, buildings and factories. They may also include a park or other structures. The activity begins on page 12 of students' Field Guides.

Once the body of their watershed is complete, students will use food coloring and colored powders to simulate contaminants that may infiltrate the watershed. Fill your spray bottle with water and add a few drops of blue food coloring to make the water easy to see. Spray just enough rain over your model to see how the water interacts with your model landscape. The angel hair pasta can be crushed to simulate straw on the farm. Powders can be used as point source pollution. Sprinkle powder on one area of the model and sprinkle a different color on a different area of the model. Spray with clear water and observe what happens. Allow students to be creative!

Remind students to record their observations in the areas provided as they work through the activity.

Post-Activity

Students should answers the questions provided in their Field Guides about the activity they just completed. Discuss answers with students.

Guided Practice/Homework: Contaminant Scavenger Hunt

If time permits, the Contaminant Scavenger Hunt (located on page 22 of this Teachers Manual) can be completed individually or in pairs. Any unfinished portion should be completed as homework. Students should identify common house hold pollutants, identify if they are chemical contaminants or solid contaminants, safe alternatives and how they affect the watershed. Use this as an assessment of student understanding of the possible contaminations of the watershed and how human lifestyle is impacting the life of the rivers and lakes.

DAY 4

PREREQUISITE KNOWLEDGE:

The different components of the hydrologic cycle (e.g., properties of water, changes of state, relationships of water to weather, effects of water on Earth's surface)

STUDENTS WILL

1. Communicate the importance of pH and its effects on organisms.
2. Predict pH of water with various contaminants.
3. Evaluate the effects of pollution on water quality.

DAY 4 AT A GLANCE

ESSENTIAL QUESTIONS

- What happens to water's pH when pollutants are added?
- How does pH affect biotic and abiotic factors in an ecosystem?

MATERIALS

- Water
- Universal indicator, hydrion paper or pH paper
- Styrofoam cups
- Provide a variety of acids and bases such as:
  - Soap
  - Bleach
  - Vinegar
  - Toothpaste
  - Road salt
  - Fertilizer
  - Lemon juice

TIME FRAME

	Estimated
Pre-Activity	15 min.
Activity	25 min.
Clean up and post-activity	10 min.
TOTAL	50 min.

VOCABULARY

- Abiotic
- Acid
- Acid rain
- Acidic
- Alkaline
- Base
- Biotic
- Dry deposition
- Ecosystem
- Lake
- pH
- Pond
- Reactive
- River
- Solvent
- Storm water
- Stream
- Universal solvent
- Wet deposition

Pre-Activity

Review the Contaminant Scavenger Hunt assignment completed after day 3. Have students share what items they found and discuss their various answers.

Recall properties of water with students. Ask various questions about what they remember and correct any misconceptions.

Explain pH to the class using the following information.

Acidic and basic are two extremes that describe chemicals, just like hot and cold are two extremes that describe temperature. Mixing acids and bases can cancel out their extreme effects; much like mixing hot and cold water can even out the water temperature. A substance that is neither acidic nor basic is neutral.

The pH scale measures how acidic or basic a substance is. It ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic, and a pH greater than 7 is basic. Each whole pH value below 7 is ten times more acidic than the next higher value. For example, a pH of 4 is ten times more acidic than a pH of 5 and 100 times (10 times 10) more acidic than a pH of 6. The same holds true for pH values above 7, each of which is ten times more alkaline—another way to say basic—than the next lower whole value. For example, a pH of 10 is ten times more alkaline than a pH of 9.

Pure water is neutral, with a pH of 7.0. When chemicals are mixed with water, the mixture can become either acidic or basic. Vinegar and lemon juice are acidic substances, while laundry detergents and ammonia are basic.

Chemicals that are very basic or very acidic are called "reactive." These chemicals can cause severe burns. Automobile battery acid is an acidic chemical that is reactive. Automobile batteries contain a stronger form of some of the same acid that is in acid rain. Household drain cleaners often contain lye, a very alkaline chemical that is reactive.

The above information is from *http://www.epa.gov/acidrain/measure/ph.html*

Review lab safety precautions for working with chemicals.

Activity – pH lab

Have the students generate a list of chemical pollutants. Be sure to have them add the items you have for the lab. Students should then predict what the pH of the water will be once each item is added. Have them record their predictions in the Student Field Notebook.

Students will then test the items by dissolving them in the cups of water and checking the pH values. Remind students to label each cup with the name of the contaminant. They should continue to record their findings.

Post-Activity

Allow time for clean-up from the lab. Discuss what acid rain is and where it comes from using the following information.

"Acid rain" is a broad term referring to a mixture of wet and dry deposition (deposited material) from the atmosphere containing higher than normal amounts of nitric and sulfuric acids. The precursors, or chemical forerunners, of acid rain formation result from both natural sources, such as volcanoes and decaying vegetation, and man-made sources, primarily emissions of sulfur dioxide (SO_2) and nitrogen oxides (NO_2) resulting from fossil fuel combustion. In the United States, roughly 2/3 of all SO_2 and 1/4 of all NO_2 come from electric power generation that relies on burning fossil fuels, like coal. Acid rain occurs when these gases react in the atmosphere with water, oxygen, and other chemicals to form various acidic compounds. The result is a mild solution of sulfuric acid and nitric acid. When sulfur dioxide and nitrogen oxides are released from power plants and other sources, prevailing winds blow these compounds across state and national borders, sometimes over hundreds of miles.

Wet deposition refers to acidic rain, fog, and snow. If the acid chemicals in the air are blown into areas where the weather is wet, the acids can fall to the ground in the form of rain, snow, fog, or mist. As this acidic water flows over and through the ground, it affects a variety of plants and animals. The strength of the effects depends on several factors, including how acidic the water is; the chemistry and buffering capacity of the soils involved; and the types of fish, trees, and other living things that rely on the water.

In areas where the weather is dry, the acid chemicals may become incorporated into dust or smoke and fall to the ground through dry deposition, sticking to the ground, buildings, homes, cars, and trees. Dry deposited gases and particles can be washed from these surfaces by rainstorms, leading to increased runoff. This runoff water makes the resulting mixture more acidic. About half of the acidity in the atmosphere falls back to earth through dry deposition.

The above text is from http://www.epa.gov/acidrain/what/index.html

Extension

- Research pH/contamination issues from different perspectives (such as business owner, parent, government agency, etc.) and prepare a letter or debate.

DAY 5

PREREQUISITE KNOWLEDGE:

The different components of the hydrologic cycle (e.g., properties of water, changes of state, relationships of water to weather, effects of water on Earth's surface)

STUDENTS WILL

1. Read and discuss "Water Quality for different countries like Africa, India, Philippines and United States."
2. Students will Test Water Quality for the local area.
3. Develop a plan for improving the water quality of the area.

DAY 5 AT A GLANCE

ESSENTIAL QUESTIONS

1. Does the economic & educational status of a country affect the water quality?
2. What are the water quality challenges in our region?
3. What does it mean to Cleveland to have the largest source of fresh water?

MATERIALS

- Reading passage
- Water samples
- Motor Oil
- Rain Water
- Twigs
- Dirt
- Road salt
- Jars or clear plastic cups
- Medicine dropper
- Straw
- Spoon
- Water
- Paper towels
- Coffee filters

TIME FRAME

	Estimated
Hook and pre-activity	20 min.
Activity	15 min.
Plan	15 min.
TOTAL	50 min.

VOCABULARY

- Aeration
- Aquatic
- Aquifer
- Bacteria
- Clarity
- Data
- Discharge
- E-Coli
- Freshwater
- Lake
- Macro invertebrates
- Nonpoint source
- Oxygen
- PH
- Phosphate
- Point source
- Pond
- Rate of Flow
- River
- Secrete
- Sewage
- Sludge
- Storm water
- Stream
- Substrate
- Watershed

Hook

Students will look at these pictures of water sources. This is how they get their water. Teacher will lead the students to discuss what they know about the economic status of Africa, India, Philippines, and United States. Do they think that the social economic status affects water quality? Why/Why not?

Pre-Activity

Write the words "water quality" on the board and ask students what they think water quality means. The student Field Notebook contains three articles about Cleveland's water quality. Have students work in groups with each group being responsible for a different passage. The groups should then share a brief summary about their passage with the rest of the class. Discuss how has the water quality in Cleveland changed as we became more educated about pollution and water? Have students think back to the answers they gave earlier (Do they think that the social economic status affects water quality? Why/Why not?). Does the information support or refute their opinions?

Activity - cleaning point source pollution

Remind students of lab safety rules.

Advance preparation

A. Set up three stations consisting of three different procedures for removing oil from water. (**Note**: Oil may be added to each container by the teacher or by each group. The quantity of oil should be determined by the teacher. Each group must add the same amount of oil.)

B. Place the following materials at the designated station:

Station 1: spoon, two clear plastic cups, paper towels, motor oil

Station 2 : straw, two clear plastic cups, paper towels, motor oil

Station 3: medicine dropper, two clear plastic cups, paper towels, motor oil

Procedure

I. Setting the stage

A. Have students brainstorm the best ways to remove oil pollution from water. Have them research and discuss the oldest methods and compare them to newer methods used today.

B. Have students predict the most effective cleanup method of the three methods they will be using.

II. Activity

A. Station 1: You will have two minutes to perform the following activities:

1. Work with your group and estimate the pollution (oil) in each of the three samples. Enter your findings on the data table.
2. Have one member of the group use the spoon to try to remove all of the oil from the sample. Place the oil in an empty plastic cup.
3. Measure the amount of oil removed and calculate the percentage of pollutant removed from the sample with the spoon (old technology). Divide the amount of oil removed by the amount of water.
4. List any spills on the data chart.
5. Mark down any instances of habitat disturbance, such as water being removed with the cleanup.

B. Station 2: You will have two minutes to perform the following activities:

1. Have another member of your group use the straw and try to remove all of the oil from the sample. Save the oil in an empty plastic cup.
2. Measure the amount of oil removed and calculate the percentage of pollutants removed from the sample with this newer technology (straw). **Do not use your mouth!** Divide the amount of oil removed by the amount of water.
3. Mark down any spills on the data chart.
4. Mark down any instances of habitat disturbance, such as water being removed with the cleanup.

C. Station 3: You will have two minutes to perform the following activities:

1. Have another member of your group use the medicine dropper and try to remove all of the oil from the sample with the dropper (newer technology).
2. Measure the amount of oil removed and calculate the percentage of pollutant removed from the sample with the dropper. Divide the amount of oil removed by the amount of water.
3. Mark down any spills on the data chart.
4. Mark down any instances of habitat disturbance, such as water being removed with the cleanup.

D. Analyze the data collected from each group and discuss the most effective oil removal method. Brainstorm how cost-effective each method is on a global basis.

III. Follow-Up

A. Perform the same steps, but substitute various pollutants and cleaning methods.
B. Discussion – compare chemical and physical treatments. Which costs more? Think back to the solar water purification system. Which would be faster – that or chemical treatment? Which would be more cost effective? (the more time required = more money) Does this information change your thoughts about socio-economic status effecting water quality?

Problem situation

What can you do to help protect human health and the environment? Develop a one page outline of an idea such as: adopt a watershed, learn what to do if the water supply is compromised, be a Good Samaritan by encouraging voluntary cleanup by parties, etc. Remind students to focus on the Cuyahoga River and Lake Erie watersheds.

Name _____ Date _____

Anticipation Guide

For each statement below, place a plus sign (+) if it is accurate, a minus sign (-) if it is false or a zero (0) if you are not sure.

____ 1. Another term for the water cycle is the hydrologic cycle.
____ 2. During the process of condensation, water vapor turns into liquid water droplets which form clouds and fog.
____ 3. Deep groundwater can only be held for up to 50 years.
____ 4. The sun is the energy source for the water cycle.
____ 5. The process of rainwater seeping into the ground is called infiltration.
____ 6. Transpiration is the process in which runoff flows into a body of water.
____ 7. Snow or ice can change directly to a vapor through a process called sublimation.
____ 8. The area in which precipitation that reaches the land and drains into a common body of water is called a watershed.
____ 9. 97% of the Earth's water is salt water.
____ 10. The water cycle does not have an effect on erosion or sedimentation.

What is the urban water cycle?

Should we change our lifestyle to protect Lake Erie?

Name _____ Date _____

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Name _____ Date _____

Contaminant Scavenger Hunt

Source of Pollution	Chemical or solid?	Safe alternative	How does it enter the watershed and what is its significance?

Student Safety Contract

A copy of this contract is Page 1 of the students' Watershed Workbook.

I will

- ○ Read the lab investigation before coming to class.
- ○ Wear protective equipment as directed to protect my eyes, face, hands and body while conducting activities.
- ○ Follow all instructions given by the instructor.
- ○ Conduct myself in a responsible manner at all times.

I, _____,
(Print your name)
have read and agree to abide by the safety regulations as set forth above, as well as any printed instructions provided by my instructor or the school district.

I agree to follow all other written and oral instructions given in class.

Signature: _____

Date: _____

Answer Key

Anticipation Guide Worksheet

1. True
2. True
3. False
4. True
5. True
6. False
7. True
8. True
9. True
10. False

Page 13:

1. Bases are good cleaners because they break down organic chemicals (stains) but do not react with metals, glass and ceramics (the items to be cleaned); while acids react with metals, ceramics and can damage the surface to be cleaned.
2. It is important to maintain the pH of human blood because it regulates the functioning of many organs. An increase and decrease in pH leads to abnormal conditions known as acidosis and alkalosis.
3. Changing the pH of Lake Erie can affect the aquatic plants and fish and other aquatic animals. If the pH decreases it causes acid influx which effects the reproduction of fish and amphibians. Algal blooms can take place. With increased algal blooms, sunlight is prevented from reaching the bottom layers of the lake resulting in loss of plant life. Algal blooms also results in the decrease level of oxygen for bottom feeders and fish.
4. Acid.
5. Acid rain is a rain or any form of precipitation that is acidic. It is caused by Sulfur dioxide and nitrogen oxides present in the atmosphere. These gases dissolve in rain water and causes rain water to be acidic.

Field Notebook Rubric

Name _____

CATEGORY	4	3	2	1
Quality of Work	Provides work of the highest quality.	Provides high quality work.	Provides work that occasionally needs to be checked/redone by other group members to ensure quality.	Provides work that usually needs to be checked/redone by others to ensure quality.
Contributions	Routinely provides useful ideas when participating in the group and in classroom discussion. A definite leader who contributes a lot of effort.	Usually provides useful ideas when participating in the group and in classroom discussion. A strong group member who tries hard!	Sometimes provides useful ideas when participating in the group and in classroom discussion. A satisfactory group member who does what is required.	Rarely provides useful ideas when participating in the group and in classroom discussion. May refuse to participate.
Requirements	All of the required content was present.	Almost all the required content was present.	At least 75% of the required content was present.	Less than 75% of the required content was present.
Accurateness	Accurately completed all areas of Field Notebook. Used complete sentences.	Completed all areas of Field Notebook. Used complete sentences in most areas.	Completed at least 80% of Field Notebook. Used complete sentences rarely.	Completed less than 80% of the Field Notebook. Did not use complete sentences, answers were incomplete.

GLOSSARY

A

Abiotic - Not associated with or derived from living organisms. Abiotic factors in an environment include such items as sunlight, temperature, wind patterns, and precipitation

Acid - Compound that gives off H+ ions in solution

Acidic - Describes a solution with a high concentration of H+ ions.

Acid rain - A term used to describe rain that has an abnormally low pH (generally below pH 5.6)

Aeration - A process which promotes biological degradation of organic matter in water. The process may be passive (as when waste is exposed to air), or active (as when a mixing or bubbling device introduces the air).

Alkaline - The condition of water or soil which contains a sufficient amount of alkali substance to raise the pH above 7.0.

Aquatic - living or growing in or on water.

Aquifer - A formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

B

Bacteria - (Singular: bacterium) Microscopic living organisms that can aid in pollution control by metabolizing organic matter in sewage, oil spills or other pollutants. However, bacteria in soil, water or air can also cause human, animal and plant health problems.

Base - Substance which gives off hydroxide ions (OH-) in solution

Basin - A small enclosed or partly enclosed body of water. A large, bowl-shaped depression in the surface of the land or ocean floor.

Biotic

1. Consisting of living organisms. An ecosystem is made up of a biotic community (all of the naturally occurring organisms within the system) together with the physical environment.

2. Associated with or derived from living organisms. The biotic factors in an environment include the organisms themselves as well as such items as predation, competition for food resources, and symbiotic relationships

C

Clarity Clearness of appearance, as of water

Condensation The conversion of a gas turns into a liquid.

Contaminate To introduce a substance that would cause: (1) The concentration of that substance in the ground water to exceed the maximum contaminant levels, or (2) An increase in the concentration of that substance in the ground water where the existing concentration of that substance exceeds the maximum contaminant levels

D

Data Recorded observations from experiments

Discharge The volume rate of water flow, including any suspended solids (i.e. sediment), dissolved chemical species (i.e. $CaCO_3$) and/or biologic material (i.e. diatoms), which is transported through a given cross-sectional area.

Distillation

1. The evaporation and subsequent collection of a liquid by condensation as a means of purification: the distillation of water.

2. The extraction of the volatile components of a mixture by the condensation and collection of the vapors that are produced as the mixture is heated: petroleum distillation.

Dry deposition In areas where the weather is dry, the acid chemicals may become incorporated into dust or smoke and fall to the ground through dry deposition, sticking to the ground, buildings, homes, cars, and trees. Dry deposited gases and particles can be washed from these surfaces by rainstorms, leading to increased runoff. This runoff water makes the resulting mixture more acidic. About half of the acidity in the atmosphere falls back to earth through dry deposition.

E

Ecosystem A system formed by the interaction of a community of organisms with their environment.

Elevation A geographic location is its height above a fixed reference point, a mathematical model of the Earth's sea level as an equipotential gravitational surface

Estuary Region of interaction between rivers and near-shore ocean waters, where tidal action and river flow mix fresh and salt water. Such areas include bays, mouths of rivers, salt marshes, and lagoons. These brackish water ecosystems shelter and feed marine life, birds, and wildlife.
Evaporation The process by which water is changed to gas or vapor; occurs directly from water surfaces and from the soil.
Evapotranspiration The return of water vapor to the atmosphere by evaporation from land and water surfaces and by the transpiration of vegetation.

F

Freshwater Water found in rivers, lakes under the ground; fresh water is not salty and it is good to drink.

G

Groundwater The water beneath the surface of the ground, consisting largely of surface water that has seeped down: the source of water in springs and wells.

I

Infiltration - 1. The penetration of water through the ground surface into sub-surface soil or the penetration of water from the soil into sewer or other pipes through defective joints, connections, or manhole walls. 2. The technique of applying large volumes of waste water to land to penetrate the surface and percolate through the underlying soil.

L

Lake A body of fresh water of considerable size, surrounded by land.

N

Nonpoint source When rain and melting snow flow over the land, pollutants are picked up and carried away to Lake Erie via local streams and storm sewers. This run-off is called non-point source pollution because it enters our streams and storm sewers, not from a single, identifiable source, but from numerous sources spread over a large area.

O

Oxygen A reactive element that is found in water, in most ROCKS AND MINERALS, in numerous organic compounds, and as a colorless tasteless odorless diatomic gas constituting 21 percent of the atmosphere, that is capable of combining with all elements except the inert gases, that is active in physiological processes, and that is involved especially in combustion

P

pH Measures the acidity of a solution. It is the negative log of the concentration of the hydrogen ions in a substance.

Point Source Water pollution coming from a single point, such as a sewage-outflow pipe.

Pond A body of smaller than a lake, sometimes artificially formed, as by damming a stream.

Precipitation Liquid or solid water that falls to earth .

R

Reactive Tending to be responsive or to react to a stimulus

River A natural stream of water of fairly large size flowing in a definite course or channel or series of diverging and converging channels.

Runoff That part of precipitation or snowmelt that appears in streams or surface-water bodies.

S

Secrete To generate and separate (a substance) from cells or bodily fluids:

Sewage The waste and wastewater produced by residential and commercial sources and discharged into sewers..

Solvent Liquid in which something is dissolved, e.g. the water in saltwater.

Stormwater Any rainwater or melting snow or ice that flows over the surface of the land to the nearest sewers, lake or stream

Stream A steady current in water flowing in a channel or watercourse.

Substrate The surface beneath a wetland in which organisms grow or to which organisms are attached.

Surface tension An increased attraction of molecules at the surface of a liquid resulting from forces of attraction on fewer sides of the molecules.
Surface water All water naturally open to the atmosphere (rivers, lakes, reservoirs, ponds, streams, impoundments, seas, estuaries, etc.)

T

Transpiration To give off wastes from the surface in the form of vapor, as plants.

U

Universal solvent A substance capable of dissolving all or a large variety of substances. Water is at times recognized as a universal solvent because of the many substances that it can dissolve. However, water is not capable of dissolving all substances, especially those that are nonpolar or hydrophobic in nature.
Urban Pertaining to, or designating a city or town.
Urbanization The act or fact of urbanizing, or taking on the characteristics of a city.

W

Wastewater The sanitary sewage from homes and businesses as well as stormwater that enters the street sewers, streams and rivers.
Water cycle The continuous movement of water on, above and below the surface of the Earth, including precipitation, condensation/transpiration, evaporation and collection.
Watershed The area of land that drains into a body of water.
Wet deposition Acid rain (rain falling through an atmosphere containing sulphur dioxide and nitrogen oxide pollutants thus making the rain acidic (pH less than 7. 0); in lakes without the ability to neutralize the acid survival of fish eggs and young is compromised.