

## NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

### Reinstein Woods Environmental Education Center

93 Honorine Drive, Depew, NY 14043

P: (716) 683-5959 | F: (716) 686-0210 | [ReinsteinWoods@dec.ny.gov](mailto:ReinsteinWoods@dec.ny.gov)

[www.dec.ny.gov](http://www.dec.ny.gov)

Dear Educator:

Thank you for your interest in Reinstein Woods' environmental education programs. You have scheduled the program "Watershed Works" as an in-school program. In this packet, you will find an overview of the "Watershed Works" program and post-visit activities to supplement your program. Please try to go over the vocabulary list (found in the overview) with your students before the program.

We feel that our program will be of more value to students if related classroom activities are done after the lesson. The enclosed activities and resources are designed to reinforce concepts learned during the program.

The New York State Department of Environmental Conservation is currently sponsoring educational workshops for teachers. These workshops include Project WILD—a program that emphasizes awareness, appreciation, and understanding of wildlife—and Project WET, an education program that teaches about water resources. We also offer Project Learning Tree trainings for educators in grades PreK-12. To learn how you can attend a workshop to obtain these materials for use in your classroom, please contact Reinstein Woods or visit <http://www.dec.ny.gov/education/1913.html>.

We hope that this information is helpful to you and your students, and feedback is encouraged. Please take some time to complete and return the program evaluation following the lesson. We look forward to seeing you soon!

Sincerely,

Reinstein Woods Environmental Education Center Staff

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# WATERSHED WORKS

Grades: 3 – 8

Length: 45 min.

Maximum Students: 25

## Standards

State learning standards addressed through our program are listed below. Any standard marked by an asterisk is best met by completing the included post-lesson activities.

### 2017 P-12 Science Learning Standards

**5-ESS2-2.**; **5-ESS3-1.**; **MS-ESS3-4.**

#### Science and Engineering Practices

- Asking Questions and Defining Problems\*
- Planning and Carrying Out Investigations\*
- Constructing Explanations and Designing Solutions\*

#### Disciplinary Core Ideas

**ESS2.C:** The Roles of Water in Earth's Surface Processes

**ESS3.A:** Natural Resources

**ESS3.C:** Human Impacts on Earth Systems

#### Cross Cutting Concepts:

- Cause and Effect
- Influence of Engineering, Technology, and Science on Society and the Natural World

#### ELA/Literacy\*

- \*CCSS.ELA-LITERACY.WHST.6-8.7; .6-8.8; 6-8.9; .6-8.2; .6-8.2.D
- \*CCSS.ELA-LITERACY.RST.6-8.3;
- \*CCSS.ELA-LITERACY-W 3.1, 4.1, 5.1

#### Social Studies\*

- 3.3a, 3.3b, 8.8c

### Excellence in Environmental Education:

#### Guidelines for Learning (K-12)

**Strand 2.4**—Environment and Society

**Strand 3.1**—Skills for Analyzing and Investigating Environmental Issues

## Objectives:

### Students will understand that...

1. Most of the water on earth is found in oceans.(NYSSLS: ESS2.C)
2. Most freshwater is located in glaciers or underground, with a small amount found in streams, lakes, wetlands and the atmosphere. (NYSSLS: ESS2.C)
3. Human activities in agriculture, industry, and everyday life have had major effects on freshwater resources. (NYSSLS: ESS3.C.)
4. Individuals and communities are doing things to help protect Earth's resources and environment. (NYSSLS: ESS3.C.)

## Background:

*"We All Live in a Watershed", NYSDEC, 2009*

### What is a Watershed?

A watershed is the land that water flows across or under on its way to a river, lake, stream or bay. Water travels over farm fields, forests, suburban lawns and city streets, or it seeps into the soil and travels as groundwater. Watersheds are separated from each other by high points, such as hills or slopes.

To picture a watershed, think of a small brook that flows into a river. The river then flows into a lake. All the land that surrounds the brook, river and lake are in one watershed, because all the water in the area flows into the lake. In addition, the lake and its watershed may be a part of a larger river's watershed. Water in the larger rivers eventually makes its way to the ocean.



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### What is your Watershed Address?

Everyone lives in a watershed. The water in your backyard drains over or under the ground to a small creek or pond and is a part of its watershed. Where does the rain in your backyard end up? The answer to this question is your watershed address, the drainage basin where you live.

### What is a Drainage Basin?

A drainage basin is a larger watershed containing the watersheds of several other smaller rivers and streams. New York State has 17 major basins. Can you identify the basin you live in on this map of New York State watersheds?

### Watershed Problems

People can affect the environment's health when they pollute a watershed. Pollutants are materials that can harm plants, animals or humans. These materials may be discharged directly into a water body or washed off the land and into water bodies. Some can also seep into the soil and groundwater.

Examples of pollutants include soil from construction sites, waste from septic systems, fertilizers, pesticides and chemicals such as mercury, lead and arsenic. Road salt, soil and animal waste can also pollute if washed into a water body. Sources of pollution include atmospheric deposition (acid rain), runoff from paved roads and driveways, lawns, eroding stream banks, oil spills, landfills, industries, and farm fields. Depending on the type and level of pollution, the water body may become unsuitable for fishing, swimming, or even for aquatic animals to survive in.

A watershed may also be harmed when people change how and where water flows, for example, by paving large parking lots or changing the direction of a stream. Problems such as flooding or lower groundwater levels can result.

### Protect New York's Watersheds

Everyone lives in a watershed. It could be large or small. What you do at your house affects everyone downstream and around you.

**Get involved.** Little things can all add up. Get together with friends and adopt a section of waterway. Plan a picnic with friends and clean up the banks of a nearby waterway, bike route or highway.

**Sweep sidewalks and driveways rather than hosing them off.** Hosing hard surfaces wastes water and moves the debris into the storm drains. There it can collect and clog the drain and may also flow directly into a body of water. Instead, collect and compost yard waste.

**Don't waste water.** Wash your car on the lawn, or better yet, use a commercial car wash. Most commercial car washes recycle or pre-treat their waste water, thereby reducing its effect on the environment.

**Don't flush unused drugs and cosmetics down the drain.** These pollutants find their way out into the environment and can damage our watershed and everything living in it. Instead, dispose of these items, along with fats, grease, diapers and personal hygiene products in the garbage can.

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## Vocabulary

*Compiled from Project WET (Water Education for Teachers) and Project WILD Aquatic*

**Erosion-** the removal or wearing away of soil or rock by water, wind, or other forces or processes.

**Fresh water-** water with less than 0.5 parts per thousand of dissolved salt.

**Groundwater-** water found under Earth's surface between saturated soil and rock supplying wells and springs.

**Nonpoint source pollution-** widespread overland runoff containing pollutants; the contamination does not originate from one specific location, and pollution discharges over a wide land area.

**Organic-** of, related to, or derived from living organisms. Organic substances contain carbon.

**Pesticide-** a synthetic or non-synthetic product designed to control unwanted insects, animals, weeds or pathogens.

**Point source pollution-** pollutants discharged from any identifiable point, including pipes, ditches, channels, sewers, tunnels and containers of various types.

**Pollutant-** any chemical or object which is unnatural in an ecosystem such that it will cause harm to the soil, water, air or life that is found there. Pollutants can include oil, pesticides and runoff containing road salt and trash.

**Pollution-** contamination of soil, water or atmosphere by the discharge of harmful substances

**Potable-** suitable or safe for drinking.

**Riparian-** located or relating to the banks of a stream, river or other body of water. .

**Runoff-** water that drains or flows off the surface of the land.

**Sediment-** fragmented organic or inorganic material derived from the weathering of soil, alluvial, and rock materials; removed by erosion and transported by water, wind, ice and gravity.

**Watershed** – the land that water flows across or under on its way to a river, lake, stream or bay.

**Wetland-** any land area that tends to be regularly wet or a lowland area that is saturated with moisture, such as a marsh or swamp.



# WATERSHEDS IN YOUR CURRICULUM

Grades: 3, 7

Length: Multiple weeks

Subjects: Science, ELA

## NYS ELA Modules:

Reinstein Woods' presentation is a great introduction or supplement to these Common Core modules developed by NYS Education Department. [Click to discover more:](#)

### Grade 3 ELA Module 4



This module focuses on the importance of clean freshwater around the world. Using the children's book *One Well: The Story of Water on Earth* as an anchor text, this unit builds on the background knowledge students developed in second grade regarding cycles in nature, in order to help them deepen their understanding of their overall dependence on earth's limited water supply.

#### Unit 3 VoiceThread Model Recording

[Watch here](#) or download the zip file from the Downloadable Resources section below

### Grade 7 ELA Module 4B



This eight-week module focuses on a "science and society" topic, engaging students in reading compelling informational text about water sustainability, fresh water management, and how to make evidence-based decisions. In Unit 1, students read the article "Water Is Life" by Barbara Kingsolver as well as excerpts from *The Big Thirst* by Charles Fishman to build background knowledge about water sustainability and water management. Students determine main ideas and evidence in diverse media and clarify the issue of why humans need to manage water better. They also trace

arguments and evaluate the soundness of reasoning and the sufficiency and relevancy of evidence in the texts and media that they engage with in this unit. In Unit 2, students participate in a robust research project in which they investigate the strategies of better agricultural and industrial water management. This research begins with students reading more excerpts from *The Big Thirst* to scaffold their research skills. Then students conduct internet-based research. To organize their research sources and information, students use a researcher's notebook. Once they have finished gathering information, students analyze the impact of water management strategies.

# PRINT. PREP. GO!

## NGSS AND COMMON CORE ALIGNED LESSON PLANS

### THE DIRTY WATER PROJECT

#### **Teach Engineering**

[www.teachengineering.org](http://www.teachengineering.org)

**Subject Area:** Science and Technology

**Grade Levels:** 3<sup>rd</sup> – 5<sup>th</sup> grade

**Time:** 90 minutes

**Cost:** \$3 per group if not using collected materials

**Essential Question:** What is the best method for removing pollutants from water?

#### **Standards:**

#### **Next Generation Science Standards**

- *Disciplinary Core Ideas*
  - ETS1.A: Defining and Delimiting Engineering Problems
  - EST1.B: Developing Possible Solutions

#### **Common Core English and Language Arts**

- Common Core Extension: Have students write an opinion piece outlining the best method for removing pollutants from water based on their observations.
- CCSS.ELA- LITERACY-W 3.1, 4.1, 5.1



Figure 1 [www.jpl.nasa.gov](http://www.jpl.nasa.gov)

### HOW NATURAL AREAS FILTER WATER

#### **Nature Works Everywhere**

[www.natureworkseverywhere.org](http://www.natureworkseverywhere.org)

**Subject Area:** Science, Natural Resources

**Grade Levels:** 6th-8th grade

**Time:** Activity 1 – one to two 45 minute periods.

Activity 2 – two 45 minute periods.

**Essential Question:** How do paved areas impact the filtration of rainwater?

#### **Standards:**

#### **Next Generation Science Standards**

- *Disciplinary Core Ideas*
  - LS2.C: Ecosystem Dynamics, Functioning, and Resilience
  - LS4.D Biodiversity and Humans
  - ESS3.C Human Impacts on Earth Systems
- *Crosscutting Concepts*
  - Cause and Effect
  - Stability and Change
- *Science and Engineering Practices*
  - Asking Questions and Defining Problems
  - Developing and Using Models
  - Analyzing and Interpreting Data
  - Constructing Explanations
- *Performance Expectations Middle School*
  - LS2-4; LS2-5; ES3-3; ES3-4

#### **Common Core English and Language Arts**

- CCSS.ELA-LITERACY.WHST.6-8.7;
- CCSS.ELA-LITERACY.WHST.6-8.8;
- CCSS.ELA-LITERACY.WHST.6-8.9;
- CCSS.ELA-LITERACY.RST.6-8.3;
- CCSS.ELA-LITERACY.WHST.6-8.2;
- CCSS.ELA-LITERACY.WHST.6-8.2.D

# MAP IT!

Grades: 4 - 12

Length: 15 minutes

Subjects: STEM, SS

**Ersi GeoInquireies** are short, 15-minute lessons designed to be presented by the teacher in a SMART board format while also allowing opportunities for students to explore on their own. These lessons are free and require no downloads, but the expanded ArcGIS Online is freely available to U.S. public, private, and home schools as a part of the White House ConnectED Initiative. You can learn more about ArcGIS Online and how to get a school subscription at <http://connected.esri.com>.

## 4<sup>th</sup> Grade (3<sup>rd</sup> – 5<sup>th</sup>)



### Settlement patterns

from the Esri GeoInquiries™ collection for Upper Elementary

Target audience – Social Studies, grade 4

Time required – 15 minutes

#### Activity

Explore the relationship between the location of surface water and U.S. population settlement patterns.

#### Standards

**C3: D2.Geo.2.3-5.** Use maps to explain relationships between the locations of places and regions and their environmental characteristics.

**C3: D2.Geo.6.3-5.** Describe how environmental characteristics influence population distribution.

**CCSS: ELA-LITERACY.RI.4.7.** Interpret information presented visually and explain how the information contributes to an understanding of the text in which it appears.

#### Learning Outcome

- Students will analyze the relationships between surface water and population density.

Map URL: <http://esriurl.com/fourgeoinquiry4>



### Where does the water go?

from the Esri GeoInquiries™ collection for Upper Elementary

Target audience – Grade 4

Time required – 15 minutes

#### Activity

Investigate regional and local watersheds and the effect that elevation plays on the movement of rainwater through the watershed.

#### Standards

**NGSS: 4-ESS2-2.** Analyze and interpret data from maps to describe patterns of the earth's features.

**C3: D2.Geo.3.3-5.** Use maps of different scales to describe the locations of cultural and environmental characteristics.

#### Learning Outcomes

- Students will identify within which watersheds their school is located.
- Students will describe how elevation has an effect on the shape of watersheds.

Map URL: <http://esriurl.com/fourgeoinquiry8>

# Middle School



## A river runs through it

from the Esri GeoInquiries™ collection for Earth Science

Target audience – Earth Science

Time required – 15 minutes

**Activity** Discover how water is gathered and travels to larger and larger watersheds to meet the sea.

**Science Standards** MS-ESS2-4 – Global movements of water and its changes in form are propelled by sunlight and gravity.  
MS-ESS2.C – Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.

**Learning Outcomes**

- Students will explore local streams to determine from where their home use water originates.
- Students will follow local streams to see how water returns back to the nearest sea.

Map URL: <http://www.esriurl.com/earthgeoinquiry10>

# High School



## Down to the last drop

from the Esri GeoInquiries™ collection for Environmental Science

Audience – Advanced environmental science

Time required – 15 minutes

**Activity** Explore the impact of human activities on water resources.

**Science Standards** APES: I. C. Global water resources and Use  
APES: II. E. Natural Biogeochemical Cycles: water cycle  
NGSS: HS-ESS3. Earth and Human Impacts

**Learning Outcomes**

- Explore consequences of human actions on water resources.
- Examine the health impacts of availability to clean water.

Map URL: <http://esriurl.com/enviroGeoInquiry5>



## Dead zones

from the Esri GeoInquiries™ collection for Environmental Science

Audience – Advanced environmental science

Time required – 15 minutes

**Activity** Explore water pollution and its impact on ocean life in aquatic dead zones.

**Science Standards** APES: VI. Pollution (Pollution Types; Water Pollution)  
APES: VII. Global Change (Loss of Biodiversity; habitat loss, pollution)  
NGSS: HS-LS2-1 and HS-LS2-4

**Learning Outcomes**

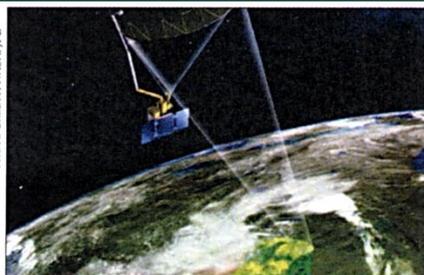
- Students will identify and describe the locations most affected by hypoxic conditions and dead zones.

Map URL: <http://esriurl.com/enviroGeoInquiry7>

# Click on the picture below for the full activity from PROJECT WET (WATER EDUCATION FOR TEACHERS)

[HTTP://WWW.PROJECTWET.ORG/SITES/DEFAULT/FILES/CONTENT/DOCUMENTS/BREATHING-BOREAL-012915.PDF](http://www.projectwet.org/sites/default/files/content/documents/breathing-boreal-012915.pdf)

PHOTO CREDIT: NASA/JPL



## The Breathing Boreal Forest

*The vast Northern boreal forest “breathes” so we can all breathe a little easier.*

### ■ Grade Level

Middle School

### ■ Subject Areas

Science, Math, Environmental Science

### ■ Duration

**Preparation time:** 30 minutes-2 hours (to freeze bread)

#### Activity time:

Warm Up: 5-10 minutes  
Part 1: 10-20 minutes  
Part 2: 30-45 minutes  
Part 3: 20-30 minutes  
Wrap Up: 5-10 minutes

### ■ Setting

Classroom, schoolyard, park

### ■ Skills

Gathering information (observing), Analyzing (identifying components and relationships, comparing, discussing), Interpreting (generalizing, drawing conclusions, relating, identifying cause and effect), Applying (decision making), Presenting (demonstrating, describing)

### ■ Vocabulary

Boreal forests, carbohydrates, carbon cycle, carbon dioxide (CO<sub>2</sub>), coniferous trees, diurnal, dormancy, drought, fossil fuels, freeze/thaw cycle, frost events, greenhouse gas, hardy, photosynthesis, precipitation, sink, temperate climate, tender

### ▼ Summary

In this activity students play the role of coniferous trees. First they learn about seasonal freeze/thaw cycles and dormancy through a game of tag. Students then juggle complex environmental factors to try to survive a growing season in a changing climate. Connections between freeze/thaw cycles, photosynthesis and the global carbon cycle are explored.

### Charting the Course

Project WET's *Molecules in Motion* activity is a fitting review of the physical states of water and the how they change. Project WET's SMAP *Dirt to Dinner* Activity about soil moisture is a good lead up to this activity, especially Part 3 and 4. Project WET activities are found in the *Project WET 2.0 Curriculum and Activity Guide*. Project WET SMAP activities can be found online at: [www.projectwet.org/SMAP](http://www.projectwet.org/SMAP).

### Objectives

Students will:

- observe that materials containing water are subject to the same physical changes as water (e.g. freezing and thawing).
- demonstrate how seasonal freeze/thaw cycles affect trees.
- discuss that plants exhibit different behaviors/characteristics during growing season than during dormancy.
- analyze the effect of daily frost events on plants.

- explore how temperature and water fluctuation affect growing seasons of plants.
- explore how increased global temperatures affect growing seasons of plants.
- recognize that plants play a major role in the global carbon cycle.

### Materials

#### Warm Up

- Two slices of bread—one normal, one frozen
- Whiteboard
- Marker

#### The Activity

##### Part 1

- **Freeze/Thaw Nametags** or costumes (Summer costume could be sunglasses and Winter costume could be hat and gloves)
- Boundary markers (cones, rope, etc.)

##### Part 2

- Boundary markers (cones, rope, etc.)
- **Tree Cards** (one per student)
- Survivor points—use small numerous objects such as paper squares, bright beads, poker chips, or noodles (you will need up to twelve per student)
- Container for survivor points
- **Spinners**
- Pencil
- Large paper clip
- **Growing Season Chart (15 Days)**

##### Part 3

- All materials from Part 2
- **Growing Season Chart (17 Days)**

Receive the free Project WET curriculum guide when you attend or host a training with Reinstein Woods! Visit <http://www.dec.ny.gov/education/1902.html> for more information.

# ADDITIONAL RESOURCES

## Activity Guides:

*Great Lakes in My World*

Alliance for the Great Lakes

- A K-8 curriculum that addresses Great Lakes state learning standards and benchmarks through science, social studies and language arts activities
- Companion web site:  
<http://www.greatlakes.org>

## Water & Watersheds

*Cary Institute for Ecosystem Studies*

- By emphasizing place-based learning, students investigate topics including where drinking water comes from, how much drinking water is used, and where waste water is treated through science inquiry while building an understanding of their local environment.
- 3 Units; K-12<sup>th</sup>
- <http://www.caryinstitute.org/educators/teaching-materials/water-watersheds>

## Internet Resources:

*Niagara/ Lake Erie Watershed*

NYS Department of Environmental Conservation

- <http://www.dec.ny.gov/lands/48024.html>

## Multimedia Resources:

*After the Storm*

United States EPA and The Weather Channel

- 30-minute video highlighting the dangers of water pollution and things people can do to clean and protect their watersheds
- Online at  
<https://archive.org/details/gov.epa.841-c-06-001>

*Where Did Earth's Water Come From?*

TED-Ed Originals

<http://ed.ted.com/lessons/where-did-earth-s-water-come-from-zachary-metz>

*Where We Get Our Fresh Water*

TED-Ed Originals

<http://ed.ted.com/lessons/where-we-get-our-fresh-water-christiana-z-peppard>

## TAKE IT OUTSIDE!

STEM IN YOUR SCHOOLYARD

## Our Runoff

*Cary Institute for Ecosystem Services*

**Time:** 2 class periods

**Setting:** Schoolyard and Classroom

**Objectives:** Student collect data about their schoolyard, neighborhood and town to estimate the amount of water that runs off these places into a nearby stream.

We've done the  
searching for you!

Find links to these resources and  
additional activities on our  
Watershed Pinterest Board.

Click the link below:

