

# **“Wonder Water Walk: Tracing Nonpoint Source Pollution” Lesson Plan**

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## **Lesson Summary:**

This lesson will provide guidelines for taking a walk after a rain on a school campus or adjoining area in order to identify runoff patterns and nonpoint source pollution.

This curriculum was written to accompany the educational video “*Karst in the Ozarks.*” Students should watch the video before beginning the lesson. It is available online at <http://www.watersheds.org> .

## **Missouri Show Me Standards:**

### ***Process Standard: 4.7***

Students will demonstrate within and integrate across all content areas the ability to identify and apply practices that preserve and enhance the safety and health of self and others.

### ***Science Contents Standards – Strand 5 Earth Systems:***

5.3A5abc (water importance, problems and solutions)

5.34Abc (human caused erosion)

5.2E5ab (water cycle)

## **Related Vocabulary:**

Watershed	Water cycle
Nonpoint source pollution	Evaporation
Sediment	Condensation
Erosion	Precipitation
Fertilizer	Runoff
Pesticide / Insecticide	Infiltration
Household hazardous waste	Groundwater

## **Related Web Links / Background Information:**

<http://www.watersheds.org/teacher/WatershedsEverywhere.pdf> [Watershed lesson]

<http://www.dnr.mo.gov/shpo/docs/MODrainageBasins.pdf> [MDNR – Missouri Watershed Map]

<http://www.dnr.mo.gov/env/wpp/pub/wpp-tips.htm> [MDNR - Tips to protect our water]

<http://www.cares.missouri.edu/> [Mizzou – create various maps for area]

## **Required Materials:**

***Student Footwear:*** Shoes that can be gotten wet (river sandals, old tennis shoes, crocks, water proof hiking boots). Flip flops are NOT recommended for they can slip and slide easily and they do not provide enough side and sole protection.

***Jackets:*** Depending on the season and weather conditions, jackets or coats may or may not be required.

**Clothing:** In warm weather it is best if students wear shorts so not to get wet pants bottoms.

**Plastic Bag:** Have students bring a small plastic bag such as the kind from a store to put their wet shoes and clothes in.

**Technology:** Teacher or school cell phone / school phone number / Digital camera with card reader system or USB port / computer(s) / Computer with Wall Projection or Smart Board /

**Visuals:**

- Overhead transparency of the water cycle or projected Internet water cycle image
- Overhead transparency map of school's watershed.

**Optional Materials:**

- walking sticks for students (for balance stability)
- assorted pails, water magnifier and assorted nets (to catch floating objects or examine found critters)
- Thermometers (to take the temperature of water channels, mud puddles)
- trash bags (to collect trash)
- Work gloves (for collecting trash)
- Sunscreen, bug spray, small first aid kit (for protection of ultra violet rays, insect bites, and cuts)
- Small pocket notepads and pencils for students
- Google Earth of school campus / create MAP for school yard using website: <http://www.cares.missouri.edu/>

**Safety Considerations:**

*Before venturing out check the following:*

- Obtain administrative permission
- Determine any hazards that exist in the area to be walked
- Conduct water walk after a rain event, not during
- Students all have appropriate footwear and dress
- Explain and discuss potential safety hazards before taking the trip with students
- Obtain parent permission if the walk goes off of the school campus
- Have a cell phone on with the school number
- Notify the school office of your departure and return time
- Be aware of any students with insect or plant allergies (or any health concerns).

*During the Activity:*

- Direct students where to walk and the designated boundaries.

- Do not let students cross any roads or streets without you being the crossing guard.
- Do not enter flooded channels that are more than knee deep for students
- Inform students to keep a constant eye out for threatening objects that have washed into the area: glass, assorted metals, and rusted objects.

**Time Requirements:**

*Preparation:*

- Assess the potential area to be walked (time will vary according to campus and teacher familiarity)
- Collect required and desired optional materials (time will vary according to accessibility)

Wonder Water Walk Lesson:

- *Warm Up:* Conduct several days before anticipated walk so students can bring appropriate footwear and dress. (about 15 minutes).
- *Wonder Water Walk:* Approximately one class period
- *Wrap Up:* Approximately 15 minutes

**Lesson Warm Up:**

Ask the students the following questions. Depending on students familiarity with the water cycle the students may need just a review or may need to be taught the process.

- Why does it rain?
- Explain or review the water cycle and the related processes using a water cycle diagram.
- What would happen if it did not rain?
- Where does the water go after a rain or snow melting event?
- What is the address of the school's watershed?
- If using Google Earth or Missouri cares website with map for school, show and discuss maps.

Explain to the students that they are going to be taking a water wonder walk to trace the path of water after a rain or snow melting event. See safety considerations and required materials above.

- Explain how to dress and any other precautions taken (sunscreen, insect repellent)
- Explain the hazards to keep a constant eye out for.
- Explain what other materials will be taken and why.
- Have the students predict or "wonder" what they may observe. Consider having a student make a list of these predictions.

## **Wonder Water Walk:**

Conduct the trip when the weather conditions and time constraints are aligned.

- Have the students put on their required footwear. If applying sunscreens then have the student do so indoors (remind students not to touch eyes).
- If applying insect repellent, do so when the students have exited the building. The teacher should apply the repellent. Explain that the repellent is an insecticide. Read the warning label.
- Remind students of ALL safety considerations and designated boundaries.
- As the walk occurs have students report and share observations.
- Take pictures of all nonpoint source pollution that the students observe. Include students in the pictures!
- Have students take turns collecting trash and carrying the trash bags. Be sure collectors wear work gloves.
- Look for the following occurrences during the walk. The list below is a general guideline. Depending on the campus and conditions only part of the list may be observed. If the trash is excessive then a collection should be arranged for another time. Other related observations may be made that are not listed. Use questioning that encourages the students to make the observations on their own. When conducting questions and observations acquire student attention with a predetermined signal. If desired, assign a student or two to be recorders of the classes observations and create list of observations on a small pad.

### **Observe and Record Occurrences:**

Surface cover (note all concrete, vegetative cover and spouts and gutters of roofs)

Runoff (note color, odor, amounts, direction of movement, elevation changes and continued pathways)

Mud puddles (note source of mud and any depressions)

Litter (note type, quantity and general condition)

Pet waste / Animal carcasses (note type and general level of decomposition)

Lawn (note possible applications of fertilizer)

Gardens (note possible applications of fertilizers or insecticides)

Assorted oils (note sources and pattern of dispersal)

Storm drains (note collection of natural and man-made debris)

Erosion (note source such as construction areas – cause and degree)

Efforts to decrease erosion / sediment catchments such as black plastic fences, hay bales (note the degree to which the efforts are successful)

Infiltration (note the areas where water is soaking into the ground)

Animals, insects, plants (note types and general groups)

Evidences of animals (tracks, scat, burrows)

Water temperatures (if possible take the temperature of water drained and collected off of asphalt and vegetated surfaces.

Return to classroom in ample time for students to change footwear and wash up as need. Tell the students to make future observations on their own when on the playground or traveling to and from school. Tell them that you will wrap up the lesson and observations during their next class period.

### **Lesson Wrap Up:**

- Have the digital pictures set up to be seen on a projected screen or smart board.
- Show the pictures. Identify and discuss all the pictured observations. Identify all the nonpoint sources of pollution. Discuss how these sources could be prevented.
- Discuss other nature observations and occurrences.
- If trash was collected include a summary of its contents.
- Include a discussion of where the runoff will travel to and the water's quality.

### **Modifications:**

The lesson difficulty could be decreased by making the following adaptations:

- Narrow the scope of the observations
- Shorten the time of the water wonder walk

The lesson difficulty could be increased by making the following additions:

- Provide students a map of the campus (contact superintendent's office). Have them create a key for all types of their observations and label them on the map.
- Students make a quantitative list of all the litter collected and graph their result.
- Have students use the Internet to estimate the quantity of nonpoint source pollutants (sediments, pesticides, insecticides, automobile fluids) which are released into waterways in Missouri or the U.S. annually.
- Visit the local waste water treatment plant. If a field trip cannot be arranged, consider getting a self tour and taking pictures to share with students.

### **Assessments:**

To assess the students' learning, have them answer one or more of the following questions.

- Explain how the water cycle occurs. Include key terms.
- Explain under what conditions rain or melted snow and ice would do which of the following:
  - a. Runoff
  - b. Infiltrate
- Construct a table of nonpoint water pollution sources. Include in the table a column for the type, description and possible method of elimination.