2016 Douglas County Water Festival Teacher's Guide

Thank you for bringing your students to the Douglas County Water Festival, Sept. 23, 2016, sponsored by the Douglas County Conservation District. At the Festival we hope to engage your students in the question, ***Why does every drop count?***

Douglas County is pleased to support the Douglas County Water Festival 2016 at Bloomington East Park at Clinton Lake. This educational event is a collaborative effort led by the Douglas County Conservation District, funded in part by the Douglas County Heritage Conservation Council, and hosted by the U.S. Army Corps of Engineers. The DCHCC enthusiastically supports the participation of the Wakarusa River Valley Heritage Museum in the event where students will come to learn all about water, but will also hear important stories about the Wakarusa River Valley before the creation of Clinton Lake and will learn about the impact on the property owners during and after the reservoir's construction. The Clinton Lake Historical Society was formed to preserve the history of the area and the stories of the people.

Schedule: You and your class will travel together through 5 activity stations as a whole class in the time of day (morning or afternoon) you selected.

Morning	Afternoon
10:00-10:24 Station 1	12:30-12:54 Station 1
10:28-10:48 Station 2	12:58-1:18 Station 2
10:52-11:12 Station 3	1:22- 1:42 Station 3
11:16-11:36 Station 4	1:46- 2:04 Station 4
11:40-12:00 Station 5	2:10 - 2:30 Station 5

- Included in this teacher's guide is a student observations page you can copy for your students. Using the observation page is optional, but we suggest that students will better retain what they learned and observed if they write their observations. We suggest you have the students complete this observations page on the bus ride back to the school.
- Consider designating a class recorder and bringing a clipboard for that student. The recorder can note key information that others may need when they write their observations. The activities are just that - active, so it would be challenging for each student to record observations throughout the sessions.

Reminders and accommodations:

- In the case of inclement weather the event will be relocated to Rock Chalk Park. Teachers will be notified on Thursday, Sept 22, 2016 if inclement weather is predicted.
- We will provide at the first station a reusable water bottle provided by Douglas County Conservation District for each student so they have water to drink during the Festival and a water bottle to take home.
- Participants should wear sunscreen and bug spray; considering bringing a hat.

- Be prepared if your students have allergies to bee sting or other allergies. Discuss with the students safety at the lake, including water safety, poison ivy and ticks.
- Restrooms will be available.
- Do you have a student who needs physical accommodations? Please let us know how we can best provide an excellent experience for all students.
- If you plan to bring lunches and eat at the lake, bring blankets to sit on when you eat lunch; there are some picnic tables, but not enough for all.

2016 Douglas County Water Festival Activities:

When you arrive each teacher will receive their class schedule; **each class will rotate through 5 of the activities listed below**. Activities marked with an asterisk (*) have teacher resources attached in this of this document.

Presenter	Organization	Title of Presentation	Contact Info
Brad Rueschoff	KS Dept. of Wildlife, Parks & Tourism	Aquatic Nuisance Species	brad.rueschoff@ksoutdoors.com
Sharon Ashworth	Douglas County Extension	Water Filtering	sashworth@ksu.edu
Kasey Callahan	U.S. Corps of Engineers	Water Safety	Samantha Jones, 785-843-7665 samantha.jones@usace.army.mil
Marvin Boyer	U.S. Corps of Engineers	Water Quality	marvin.g.boyer@usace.army.mil 816-389-2381
LeeAnn Bennett	Central Plains Center for Bioassessment	*Macroinvertebrates	lbennett@ku.edu
Marin Massa	Wakarusa River Valley Heritage Museum	Clinton Lake history	rin@inorbit.com
Marin Massa	Wakarusa River Valley Heritage Museum	The Long Haul	rin@inorbit.com
Andrew Christenson	KU Environmental Studies	*Non-Point Source Pass	andy819@ku.edu
Andrew Christenson	KU Environmental Studies	The Long Haul	andy819@ku.edu
Carol Williamson & UKanTeach students	KU Center for STEM Learning	*Incredible Journey	cwilliamson@ku.edu
Carol Williamson & Heather Hendrickson	KU Center for STEM Learning	*Properties of Water	cwilliamson@ku.edu
Weston Halberstadt	KU Museum of Natural History	*Properties of Water	biodiversity@ku.edu
Keri Harris	Franklin Co. Conservation District	*Pollution Pass	Frco.conservation@gmail.com
Cheli Lopez	Jefferson Co. Conservation District	*Freddie the Fish	cheli.lopez@ks.nacdnet.net, 700 Jefferson, Suite B, Oskaloosa, KS 66066
Kim Bellemere	Grassland Heritage Foundation	Prairie Water	grasslandheritage@gmail.com
Bobbi Luttjohann	Kansas Water Office	H2O?	bobbi.luttjohann@kwo.ks.gov
Becky Blick	Retired teacher	*Incredible Journey	Blickbec29@gmail.com
David Dennon	Shawnee Co. Conservation District	Stream trailer	david.dennon@ks.usdA4:D19

Teacher Resources for some of the Water Festival sessions:

- NPS PASS.pdf (Pollution Pass Activity)

- incredible journey.pdf

Macroinvertebrates:

Learning about Nature Project: Wetland Field Trip Station

Aquatic Invertebrates ("Life on a little known planet")

Author(s): Nick Andrus, Charles Schneider, Peter Friedel, Seth Hydeman, Bob Hagen

Introduction/Background

Aquatic macroinvertebrates are small animals without backbones that can be easily seen without a microscope. Most people know little about them, despite their importance to wetland ecosystems. This is a great station that the students seem to really enjoy.

The "invertebrates" include animals with a great variety of body shapes and life cycles. For the most part, they don't have internal skeletons, unlike vertebrates (people and most of the animals we're familiar with). Also, for the most part, they are smaller than vertebrates. The "macro" in macroinvertebrates refers to the fact that these animals can be seen without special magnification—most range in size from a few millimeters in length to a few centimeters. The largest macroinvertebrates are giant squids that live in the deep ocean—10 meters in length or more. In freshwater habitats in our area, "giants" among the macroinvertebrates are crayfish and freshwater mussels—about 10 centimeters!

There are smaller invertebrates as well ("microinvertebrates"), which are usually much less than 1 millimeter in length. Zooplankton are microinvertebrates that live in ponds, lakes, and oceans throughout the world. (Without a microscope, zooplankton look like tiny dots swimming rapidly in the water.)

Adaptations. Despite their seemingly alien appearance, aquatic macroinvertebrates face the same basic challenges as we do: They need oxygen; they need food for energy and growth; they need to avoid becoming food for something else; they need to deal with changing environmental conditions (for example, temperatures too hot or too cold, habitats that are too wet or too dry). And, because every individual eventually dies, they need to reproduce. The diversity of body forms, life cycles, and behaviors among macroinvertebrates represent different solutions to these challenges. They are adaptations resulting from evolution over millions of years. By comparing adaptations among aquatic macroinvertebrates we can learn more about ourselves as well.

Ecological roles. The biologist E.O. Wilson has described invertebrates as "the little things that run the world." Aquatic macroinvertebrates are essential to the function of wetlands. They form vital links in the food webs that connect primary producers (plants) and larger animals. Some are herbivores that feed on plants; others are predators that feed on smaller animals. By feeding, they help to regulate the populations of their plant and animal prey—and in turn, they serve as food for larger vertebrates, such as fish, frogs, or birds. Many aquatic macroinvertebrates also have essential roles in recycling organic material. For example, scavengers speed the breakdown of dead leaves by breaking large pieces into tiny fragments as they feed on the bacteria and fungi that begin the decomposition process.

Station plan. Facilitators will have examples of some invertebrates in jars or aquaria for demonstration. But the heart of the station is a set of 5-gallon buckets containing a mix of aquatic macroinvertebrates collected before students arrive. After a short introduction by the facilitators, students will work in small teams around each bucket (5 groups, of 4-6 students). Team members use plastic cups to transfer debris and water from the buckets into white plastic trays, then look for the animals. Some animals can be observed in the tray, but most can be examined more easily after they are first transferred into smaller vials or plastic petri dishes. Before leaving the station, students return animals, water, and debris to the bucket for the next group. A few aquatic vertebrates (adult frogs, tadpoles, or fish) may be included at this station if they are present at the station site or are captured in the collection buckets. (They serve primarily as a contrast to invertebrates.) The plan for this station was developed as a practical alternative to students collecting macroinvertebrates themselves. Given the format of these field trips, there isn't enough time for the students to collect animals; good collecting sites are often muddy or wet; and both would make it difficult to manage the activity effectively with large numbers of students. However, in the future, some limited collecting with a dip net might be added as a supplemental activity if there is a boardwalk that would allow students controlled access to a suitable pool in the station area.

Goals: What do you want students to gain or be able do as a result of your activity?

1. Become aware of aquatic macroinvertebrates. Learn what some of the common types look like, where they live, and how they behave.
2. Observe the diversity of adaptations found among aquatic macroinvertebrates. Recognize that these are different solutions to similar problems.
3. Understand some of the ecological roles that aquatic macroinvertebrates have in a wetland ecosystem.

Secondary Goals – Extensions

1. Recognize that differing conditions across the wetland lead to development of different ecological communities. (Introduce the diversity of wetland habitats: permanent ponds vs. temporary ponds.)

Objectives - What actions or steps will students engage in that lead to accomplishing the goal(s)?

This station is intended to encourage hands-on engagement. Ideally, all students will search for, find, and observe macroinvertebrates in the pond-water buckets.

NPS PASS

Presented at the 2016 Douglas County Water Festival by Keri Harris, Franklin County Conservation District
www.fccdks.org

Define Pollution?

- The action or process of making land, water, air, etc dirty and not safe or suitable for use.
- Substances that make land, water, air, etc dirty and not safe or suitable for use.

There are two types or classifications of pollution, point source pollution and non-point source pollution.

Do not go into too much detail or it will ruin the activity

Non-point source (NPS) pollution comes from many different sources. NPS pollution is caused by rainfall or snowmelt moving over or through the ground. As the runoff moves, it picks up and carries away natural and human made pollutants, finally depositing them into lakes, rivers, wetlands, costal waterways, and ground waters.

The term "point source" means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged.

Activity:

This lesson is designed to help students learn and understand the difference between point and nonpoint sources of pollution.

Students will be presented with a bucket of candy (this is old candy that has been used for about 5 years for this lesson, it is NOT edible! Make sure students understand it is NOT edible) They will be able to take as few or as many pieces as candy as they want, THAT THEY CAN HOLD IN THEIR HANDS. They should observe and study their candy and become familiar with it in order to identify it later. If there is any candy left after all students select their set it aside and make sure that students understand the extra will not be used the rest of the activity; we will only be using the candy they have selected and are observing to be able to identify later. They should not mark the candy in any way.

Students should make a river (a line in the classroom that bends around desks, etc) with their candy in their hands. Select one end of the line to be the headwaters of the river and the other end as the delta. The candy now represents pollution in the river and following a flood the river flows and carries the pollution down stream. The student at the headwaters should pass their candy to the next person, who passes all the candy to the next person, who passes all the candy to the next person…. Continuing until the person at the delta is flooded with candy. You can use a bucket or bowl to pass the candy in. Once the pollution reaches the delta it can be spread out on a table. Students will be asked to come up (a few at a time) to collect their EXACT pieces of candy that they had before the floodwater rose and made it all flow downstream. Make sure they understand they are to collect only the exact pieces they had before the pass.

There should be a couple of easily distinguishable pieces that are visibly different from all the rest these represent point source pollution.* If there is only one sucker in the entire mix of candy the student who had the sucker would be able to identify it without a doubt as their EXACY piece because it is the only one. If that sucker was a type of pollution; and there was only one factory near the river who uses that type of chemical you would be able to POINT to the exact source of the pollution.

Remember the students are to recollect their EXACT pieces, not just the same kind of candy that they had. Students who had gum or tootsie rolls might be able to recollect the same number of pieces of gum/tootsie rolls but they would have no way to know if it is the exact same piece they had before. This helps understand non-point source pollution; we know what type of pollution it is but we cannot identify without a doubt who was producing the pollution, or whose piece of candy was whose.

Point source – we can point to the cause/producer of the pollution
Non-point source we know the type of pollution but it could have come from many sources so we are unable to point to the exact cause/producer.
Collect ALL the candy to return to the kit for use with the next group!

*A*s example if most of the candy is double bubble and tootsie rolls have a starburst, a sucker, and a box of Dots as the distinguishable pieces- use CHEAP candy when creating a kit, it is less appealing to kids. Halloween is a good time to get big bags of candy for this lesson; take a few <u>non chocolate</u> pieces from your own kids candy as the distinguishable pieces so you don't have to buy an entire bag.*

Incredible Journey Background Information

Taken from Project WET Curriculum and Activity guide, Generation 2.0

Summary: With a roll of a cube, students simulate the movement of water within the water cycle

Making Connections: When students think of the water cycle, they might follow the illustration of many water cycle posters: a circle of water which flows from a stream to an ocean, evaporates into the clouds, rains down on a mountaintop and flows back into a stream. The movement of water is much more dynamic than that. It is truly a cycle: water is ever-moving, with no beginning or end. By acting out a water molecule, students will travel the water cycle in a way that more closely approximates how water actually travels.

The following is a list of the station, cube side labels and explanation. Students will travel from station to station, collecting beads and (hopefully) thinking of the conditions that cause the water to move.

Station	Cube Side Labels	Explanation
Soil	One side *plant*	Water is absorbed by plant roots
Black bead	One side *river*	The soil is saturated, so water runs off into a river
	One side *ground water*	Water is pulled by gravity; it filters into the soil
	Two sides *clouds*	Heat energy is added to the water, so the water evaporates and goes to the clouds
	One side *stay*	Water remains on the surface (perhaps in puddle or adhering To a soil particle
Plant	Four sides *clouds*	Water leaves the plant through the process of transpiration
Green bead	Two sides *stay*	Water is used by the plant and stays in the cells
River	One side *lake*	Water flows into a lake
Red bead	One side *ground water*	Water is pulled by gravity; it filters into the soil
	One side *ocean*	Water flows into the ocean
	One side *animal*	An animal drinks water
	One side *clouds*	Heat energy is added to the water, so the water evaporates and Goes to the colds
	One side *stay*	Water remains in the current of the river
Cloud	One side soil	Water condenses and falls on soil
White bead	One side glacier	Water condenses and falls as snow on a glacier

Clouds (cont.)	One side *lake*	Water condenses and falls into a lake
	Two sides *ocean*	Water condenses and falls into the ocean
	One side *stay*	Water remains as a water droplet clinging to a dust particle
Ocean	two sides *clouds*	Heat energy is added to the water, so the water evaporates and goes to the clouds
Light blue bead		
	Four sides *stay*	Water remains in the ocean
Lake	One side *ground water*	Water is pulled by gravity; it filters into the soil
Dark blue bead	One side *animal*	An animal drinks water
	One side *river*	Water flows into a river
	One side *clouds*	Heat energy is added to the water, so the water evaporates and goes to the clouds
	Two sides *stay*	Water remains within the lake or estuary
Animal	Two sides *soil*	Water is excreted through feces and urine
Brown bead	Three sides *clouds*	Water is respired or evaporated from the body
	One side *stay*	Water is incorporated into the body
Ground Water	One side *river*	Water filters into a river
Orange bead	Two sides *lake*	Water filters into a lake
	Three sides *stay*	Water stays underground
Glacier	One side *ground water*	Ice melts and water filters into the ground
Clear bead	One side *clouds*	Ice evaporates and water goes to the clouds
	One side river	Ice melts and water flows into a river
	Three sides stay	Ice stays frozen in the glacier

Wrap up back at school: Students can use their bracelets to write stories about the places water has been. They should include a description of what conditions were necessary for water to move to each location and the state water was in as it moved. Discuss any cycling that took place (that is, if any students returned to the same station). Hopefully students should start to see the interconnected “web” of water.

Freddie the Fish – A Tragic Tale

Presenter will go over what Non Point Source Pollutions (NPS) are. These are pollutants that are caused by many different sources that can be carried by water and wind. There are many every day activities that contribute to this type of pollution like driving your car, washing the parking lots / paved roads, mowing the lawn, pets defecating outside (pet owners not cleaning up after them), treating the roads for ice and snow in the winter, smoke stacks from energy plants. All the little things add up to make a big problem. Freddie the Fish will endure these pollutants on his adventure that leads to a tragic ending.

Lists of vocabulary words

Sediment – Matter that settles to the bottom of a liquid

Silt- Find sand, clay carried by running water and deposited as sediment

Turbidity- the cloudiness or haziness of a fluid caused by large amounts of individual particles that are generally invisible to the naked eye. (Turbid- cloudy, opaque or thick with suspended matter)

Nutrients- a substance that provides nourishment essential for growth and maintenance of life

Pathogens- a bacterium, virus or other microorganism that can cause disease

Impervious Surface- artificial structures – such as pavements (roads, sidewalks, driveways and parking lots) that are covered by impenetrable materials such as asphalt, concrete, brick, stone and rooftops

Buffer- In this case a riparian buffer strip – a vegetated area near a stream, usually forested that helps shade and partially protect the stream from the impact of adjacent land uses.

Fertilizer – a chemical or natural substance added to soil or land to increase its fertilitly

Silviculture- the growing and cultivation of trees

Properties of Water

2016 Douglas County Water Festival Activity, Carol Williamson, KU Center for STEM Learning

Standards: 5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen. 5-PS1-2 Make observations and measurements to identify materials based on their properties.
Materials: Dropper and penny for each student. Paper towels or cloth rags. Number line from 0-60 on a white board where students can plot their data. 2 White boards Print copies of the pictures in the Explanation of the activity Magnetic models of water model or 2 magnets
Safety: General classroom safety guidelines should be followed.
Objectives: Students will be able to describe properties of water. Students will be able to observe the effect of water's surface tension when they put drops of water on a penny. Students will be able to relate water's surface tension to the polarity of the water molecule.

Engagement

Let each student get a dropper of water and a penny. Ask students to put one drop of water on their penny (then put the dropper down) and ask what they observe. Encourage them to use their senses:

- Can they smell it? (odorless)
- Can they see through it? (transparent)
- Can you see that a water drop magnifies (acts as a lens)? Look at some printing or a shape on the penny through the drop.
- Does water have a taste? Pure water? (tasteless)
- What is the color of water? (colorless)
- Is it a solid, liquid or gas? (Can be all three; the water in the dropper is a liquid.)
- A property we won't explore today is that lots of stuff dissolves in water. What is something that you have dissolved in water? (salt, sugar)
- If this water is a liquid, why does it take the shape of a drop instead of running all over the penny? (Revisit this question after the Exploration.)

Exploration

1. Ask: How many drops of water fit on a penny? First have them predict.
2. Have them collect data to see how many drops fit on a penny. Make sure the water is dropping out of the dropper – don't set the tip of the dropper in the water on the penny.
3. When someone has an answer, ask is that the number of drops that made the water flood off the penny, or is that the number of the last drop that stayed on the penny? Agree to record the last number that stayed on the penny.
4. Have each student record his/her number on the line graph you have prepared on a white board.

Explanation

Let's look at our data – how many drops of water fit on a penny. Look for trends to see if you have refined your answer.

Do you know what the formula for water is? (H_2O – two atoms of Hydrogen and one atom of Oxygen).
Show the magnets or water molecule model. Explain that the H has a + charge and the O has a – charge and these parts of the molecule are attracted to each other and to other water molecules. This attraction of water molecules creates a surface tension on drop or container of water that you may have observed as kind of like a "skin" on the surface.

Show the pictures below and ask if students have every filled a glass of water more than full? Seen a water strider (insect)? Can you use surface tension to explain these pictures?

Elaboration/Extension (if time)

Ask: Why did we get different answers to the question "How many drops of water fit on a penny?" (different droppers; heads or tails, other variables of dropping such as height of drop)

If you have time, have the students agree on variables and try again to see how many drops of water fit on a penny.

Evaluate

When you go back to school today, what will you remember about properties of water?

Resource: Google Images

Douglas County Water Festival

"Make Every Drop Count"

This note sheet should include key ideas from the stations about Kansas and how we interact with water.

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