Educators, Please Note! WLSSD education staff is available to present the Water Drop program upon request, call Sarah at (218) 740-4784 to schedule an appointment.

Lesson Plan: "River Rangers – Water Quality and Wastewater Treatment" aka The Waterdrop Activity

Time Length: < 45 minutes

Grade Level: 4th Grade, highly adaptable to most grade levels

WLSSD

Clear Answers for Clean Water℠

Rationale/Overview:

Wastewater treatment is extremely important to the protection of health and water quality. This program is intended to introduce wastewater and storm water education to students and to help them understand the benefits of clean water. It is also intended to create awareness about the connection between personal behavior and the effect it has on water quality.

Objectives:

1. **Students will become familiar with the sources of water pollution**

2. **Students will see the relationship between wastewater from their homes and industry and the WLSSD wastewater treatment plant.**

3. **Students will recognize the difference between a storm drain and a sewer drain. They will understand that anything poured down a storm drain leads directly to the nearest stream or river and that anything poured down the sewer drain will go to the WLSSD wastewater treatment plant.**

4. **Students will recognize and appreciate the value of clean water and its role in their day-to-day lives.**

5. **Students will recognize their role in protecting water quality.**

Materials:

- 16 Posters
- 2 clear glasses + water
- Water Drop Costume
- "Pollutants" to fasten to the water drop
- Plastic pipettes for "poofing" air

The presentation:

(As you begin to speak, pick up the two glasses, one half-filled with water, the other empty.)
I have some water here that I got out of your faucet. Any time I want nice clean water, all I have to do is go to the faucet and get it. (*Pour water from one glass to another while speaking.)*

Water is one of the most important substances on earth. Without water, we couldn't live. 65% of your body is made up of water. What do we use water for? Drinking (*drink water from the glass)*, showering (*sprinkle some on one of the kids)*, playing *(play in the water with fingers)*, and farming *(sprinkle some on a plant in the room).*

All of those things take a lot of water because there are lots of people who use water every day. Our water supply is small, the water we have now is all we have ever had and all we will ever have. Where do we get our water? (*Respond to ocean, lakes, rivers, wells, underground, faucets, etc.)*

Poster I – Earth

Look at this earth. That's all water; it looks like we have lots of water, but did you know that 97% of the earth's water is salt water in the ocean? And, of the remaining 3% that's left, 2% is frozen (new ice is added as quickly as the ice melts) and only 1% is left for us to use.

Have you ever heard of the water cycle? The same water that was here at the beginning of time is the same water that you drink, bathe in, etc.

Poster 2 – Water Cycle

Did you know you could be drinking the same water that a dinosaur swam in? Water is always in one stage of a cycle. 1) Heat from the sun causes water to evaporate 2) the water rises into the air as water vapor 3) the water (vapor) stays in the air until it cools and condenses 4) the water falls to earth as rain or snow, and then it evaporates and starts all over.

Sixteen million tons of water falls to the earth every day. Nature keeps it balanced. For every drop of rain that falls, another drop evaporates. But how much of that water can we use? (1%) Why only 1%? (*The rest is salty or frozen.)*

Poster 3 – Watershed

This is a watershed – the Your watershed's name here watershed.

Here are the hills around us. Here are the cities and towns (*name them*) in our watershed. You probably live very close to this area. All the water in this watershed drains downhill. It all eventually ends up in the St. Louis River/Lake Superior (*illustrate*).

Review watershed again…

Now….. what happens to the water in this watershed when it rains? (*It eventually flows to the lowest spot – the St. Louis Rive/Lake Superior*.)

Poster 4 – Neighborhood

**** Have a student don the Water Drop Costume now if using this activity to demonstrate storm sewers; if the bulk of your lesson is about wastewater treatment, save the costume for the next step.*

Introduce the Water Drop, consider naming it, and prep students to think about what types of things this drop might encounter as it falls in their community.

Say this is your neighborhood. Has anyone ever helped wash your family car? With what? Has anyone ever helped fertilize the yard? Has anyone ever helped paint something? What happens to the soap, excess fertilizer, or paint? What are other things we do outside that could leave something behind? As our Water Drop moves through our community, it could pick up many different pollutants.

Do you know where this water ends up? It goes down the storm drains and straight to the nearest stream or river. (*What river would this end up in if it was in your neighborhood?*) And that's not all that ends up in the river. *Show industry, agriculture, oil/dirt/etc. from the street.*

These are what we call non-point sources of pollution because we can't really pinpoint where all this pollution comes from. It comes from all over.

So far, we've been talking about outside water that goes down the storm drains. There's a difference between storm drains and sewer drains.

Write on calk board to reinforce: **storm drains = outside**
Sewer drains = inside

Let's talk about the inside drains now. Remember sewer drains = inside.
(Ask five students helpers to come up to the front and form a semi-circle of posters that take the drop of water through the wastewater process.)

What does the water look like that comes out of your faucets at home?

Poster 5 – Clean Water Drop

*** if you haven't already, have a student participant don the Water Drop Costume*

Clean sparkling, like this. He needs a name. Let's name him some name that starts with "W." (*Ask the students to think of a name.*) Good, W~_____ Water Drop.

Where do you get the water inside your home? (*The kitchen sink, good. Will you be my kitchen sink and stand here with me so we can all see the sink?)*

Posters 6, 7, 8, 9 (these four can be arranged in any order they call them out)

What other places in your home do you get water? (*Good, you'll be my …shower, washing machine, and toilet.*)

Look at the bottom of each place where we get water – what do you see?

The water gets dirty each time we use it. What kinds of things make it dirty? *(Have students list pollutants from inside their homes that the water will carry with it, and stick the velcroed bits to the water drop as suggestions are made).* Observe the water drop when

What happens next? The dirty water is running down a pipe, isn't it?

Poster 10 – Pipe

Pipes carry wastewater down the sewer drains to be cleaned.

(*Add the term wastewater to the blackboard beside "sewer drains = inside")*

The water came in from the faucet nice and clean, but now what's happened to it? (*Yes, things are stuck to it… talk about some of the things and reinforce that it got there from using it at their homes – showers, etc.)*

The water travels down little pipes out of your house and into bigger pipes that run under the ground all the way to the Western Lake Superior Sanitary District wastewater treatment plant. (*Write on the board – WLSSD = wastewater treatment plant*.)

Poster 11 – Dirty Water Drop @ the End of the Pipe

The water would stay dirty and get worse if we didn't clean it. Cleaning the water is one of the most important things we can do in our neighborhood. Let's follow this little dirty water drop and see how he/she gets cleaned up.

Poster 12 – Dirty Water Going Through the Bar Screen

After he's traveled downhill through the pipes to the WLSSD treatment plant, W_____ the Water Drop goes through a screen – we call it a bar screen. The bar screens catch large solids like your shoes, plastic, or your dead-goldfish. (*If asked….The solids get hauled to the landfill in a big truck.)*

********Remove applicable pollutants from the costume as the water drop continues through the process as follows*********

Poster 13 – Primary Treatment

Now W_____ will go through the first step of cleaning wastewater, called primary treatment. In primary treatment, our little water drop is stirred around very slowly so the heavy particles can settle to the bottom of large tanks: gravel, coffee grounds, grit, etc. *(Don't forget to slowly stir the water drop.)*

Poster 14 – Secondary Treatment

Okay, now, W_____ is ready for the second step of wastewater treatment, called secondary treatment. In secondary treatment good bugs – or good bacteria – eat up most of the remaining "dirt" in our water. These good "bugs" need lots of air so the wastewater churns around in a big mixer. The bacteria or "good bugs" will get heavy and sink to the bottom.

Optional Additional Movement: extra volunteers may act as good bacteria if costumes are available, circling the water drop and gently "eating"/removing pollutants. Other students may add oxygen by gently blowing in that direction or using a disposal pipette to "poof" air into the mix.

(If asked, the "good bacteria" come in with the wastewater – nothing is added.)

Poster 15 – Filter

Finally, the last stage of wastewater treatment is to run the water through a filter made of coal and rocks and sand so it will get even cleaner.

Poster 16 – Clean Water Back to Environment

The cleaned water is put back into the St. Louis River. We call it effluent.

Look back at secondary treatment: see this sludge? Sludge looks like mud – it is the solids we removed from the water. Now the sludge can be treated again and recycled too. We treat sludge with a special process to make "Biosolids." Biosolids can be put on farm fields to be used as fertilizer.

Okay, that's how water gets cleaned – let's review it once. (*Start at beginning and have the class guide you through process.)*

Thank students and collect the posters.

Every day, all day and night at WLSSD – millions of gallons of wastewater are cleaned (*If asked, about 40 million gallons every day.)* If we don't clean it, it will become dangerous: disease, chemicals, kill fish, animals.

Review the two types of drains – sewer & storm.

The reason I go from school to school to talk about clean water is because I'm a River Ranger. I protect the water and I try to show you how important it is, and to see if you'll help. River Rangers help take care of our environment by no wasting clean water and by keep pollutants out of the water.

Can you think of some ways to save clean water so it doesn't have to be cleaned?

- Take shorter showers
- Turn off water while brushing teeth
- Don't water when it rains
- Fill the washer and dishwasher before running them
- Fix leaking faucets
- Don't use the toilet for a trash can

Can you think of some ways to help keep water clean?

- Keep trash out of streams & rivers
- Ask your parents to bring paint, oil, antifreeze and other hazardous products to WLSSD – don't pour these things down the drain
- Wash your car on the lawn so the soap doesn't get down in the storm drain – the lawn will help filter out the soap
- Protect the banks of streams and rivers
- Ask your parents not to use too much fertilizer on your lawn or garden
- Keep pets away from streams and rivers