Teacher Directions

Man-Made Water Cycle

**Brainteaser:** Convergent
- **Lining Fish Up Logically** (Attachment)
  Answer – Counter-clockwise starting with the freckled fish: Freckle, Farnsworth, Fred, Frieda, Phillip, Physty
- **Story with Holes** – This frequent flyer made many round trips from the tropics to the continent but never received mileage credit. Identify the frequent flyer. (water cycling between the ocean and the continent) The scientific concept is that water evaporates from the ocean and is carried over the land where it can turn to precipitation and fall to land, collect in rivers and flow back to the ocean.
- **Only Need Four Gallons** - You have a three gallon and a five gallon measuring device. You need to measure out four gallons. How would you do this? Explain with words or a diagram. **Answer:** Fill the five gallon container. Pour all but two gallons into the three gallon container. Empty the three gallon container. Put the two remaining gallons from the five gallon container into the three gallon container. Fill the five gallon container one more time. Pour one gallon from the five gallon container by filling the three gallon container. Now the five gallon container contains four gallons.

**Unit Activities:**
- **Investigating the Man-Made Water Cycle** (Whole Group Activity) - Introduce that today we are going to take another incredible journey, this time, not so pleasant! :) We will take a journey from the river to the water treatment plant to our homes through the sewer system to the wastewater treatment and back to the river. Today . . . where does all the water go? Break students into teams of 3-4. Each team is given a set of infrastructure cards. Students are to research using the following videos and links to place the cards in order of the path water flows from the river and back again. The first two are shared with the class. Wastewater Treatment PSA - [http://www.youtube.com/watch?v=Ldz29NqwK78](http://www.youtube.com/watch?v=Ldz29NqwK78) & Atlantic Treatment Plant - [http://www.youtube.com/watch?v=i9L45sC20qk](http://www.youtube.com/watch?v=i9L45sC20qk).
- **MM Water Cycle Team Research** - Each team will research information to help them order the parts of the MM water cycle. Student Links: Man-Made Water Cycle [http://goo.gl/AQ0q8d](http://goo.gl/AQ0q8d) EPAfor Kids - [http://goo.gl/rfweKq](http://goo.gl/rfweKq) & Water
Students share their findings. Teams justify their reasoning. Hand out the infrastructure definitions to different students and have each read theirs aloud. As each is read, move the cards around on the flipchart and in their groups for the final order. Critical Thinking - analyze & interpret, Relationships & Connections, Collaboration

- **Create a Man-Made Water Cycle** – STEM activity - Using the order created in the MM Water Cycle research, students will work in teams to sketch the process of water moving through the different parts as water flows from the river to our homes and back again. They will use the order of their infrastructure cards from last week and must include each part. Pipes moving from the river to the homes are to be colored blue for clean water and those leaving the home, brown for wastewater. Once groups are finished, place an arrow somewhere on the pipeline for each team signifying a break in the pipes or section of a treatment facility. Give some scenario for each such as "We had five inches of rain in less than three hours, flooding occurred as a result and the wastewater pump station could not handle the overflow. The pump is not repairable. What would you do to revise your system keeping in mind the need for pumping the water uphill to the ww treatment plant? Sketch a revision for the plan with their new ideas on paper and attach it to the design.

Give each team a different area to re-design/create. Evaluative, Critical Thinking, Collaboration

- **Pipe it Up** – This is another Project WET Urban Water activity where students will demonstrate their understanding of the order and passage of water through the man-made water cycle. You may wish to check out this set from Michael Kahle at Cobb Water. Students will work together to create the MM Water cycle using PVC pipes. They are to work cooperatively to place them in the correct order. Place two marbles in the set of pipes. Students must keep the pipes touching each other to move the marbles through the pipes. Note: gravity is important with wastewater and a pump may be needed to move it from the river to homes. If the marble drops, discuss cracks in the system, impacts on the environment if left untreated and the experts in the field needed to repair and create new pipes/system. Note: Directions are included in the kit. Here is a copy of the chart: [http://gaprojectwet.org/dragonfly%20gazette/past_issues/2005SummerInsert.pdf](http://gaprojectwet.org/dragonfly%20gazette/past_issues/2005SummerInsert.pdf) If you are brave, lead them in the Pipe it Up song to the tune of Jingle Bells. Collaboration
Teacher Directions

- **Venn Diagram** - Individually, students are to create a Venn diagram comparing and contrasting a man-made water cycle to a natural water cycle. Critical Thinking (Attachment)

- **From the Water Down Under** – This is a great listening activity. If your students have trouble listening and following directions, this will reinforce these skills. (Attachments)

- **Field Experience** - A field trip to a nearby wastewater treatment plant is an excellent follow-up to their study of the man-made water cycle. They will see each of the steps they learned at a wastewater treatment plant. The tour takes approximately 1-1½ hours. You may want to try to locate the wastewater treatment plant in your area. It was a more meaningful experience visiting the site where the students’ wastewater is treated. Also, ask if possible, if your group can see where the water flows back into the river. This is a good springboard for sharing their role as stewards and how protecting our stream directly impacts this river. Have students reflect while at the river. Relationships & Connections/Self-Reflection

  I would encourage you to call Kathy Nguyen in order to visit a plant in your area. Kathy Nguyen, Water Conservation Coordinator, Cobb County Water system – 770-419-6244. She schedules field trips for four wastewater treatment plants in the four corners of Cobb County: Smyrna, off Atlanta Rd., Kennesaw/Acworth, Noonday in East Cobb, and South Cobb/Mableton. She is also a good resource for scheduling guest speakers at your school on the topics of water conservation and the water cycle.

- **Enviroscape Model: Drinking Water & Wastewater** – Check this out a few days in advance from Michael Kahle. You will want to read the directions ahead of time in preparation for this activity. This is a model demonstrating three levels of water treatment. **Drinking Water Sources and Treatment** — shows where drinking water (residential and commercial, rural and urban) comes from and how it is delivered to us; **Wastewater Treatment** — shows what happens to water and waste after we use it (how sewage/wastewater is treated) What biosolids are and how they are being used or disposed. Use questioning throughout to promote higher order thinking. This is a good activity to use before you go to the wastewater treatment plant. Critical Thinking.

- **Problem-Based Research** – Have students research problems related to wastewater treatment plants. (i.e. – Flood or drought and their
impact on wastewater plants.) Evaluative/Relationships & Connections