TEXAS STREAM TEAM

WATER EDUCATION CURRICULUM

KINDERGARTEN THROUGH 12TH GRADE

The Meadows Center for Water and the Environment
Texas State University
Texas Stream Team

www.JoinStreamTeam.org

The preparation of this publication is financed through grants from the U.S. Environmental Protection Agency through the Texas Commission on Environmental Quality. EPA has not formally reviewed the information in this publication. The views expressed are solely those of the grant recipient.

TABLE OF CONTENTS

WATER CHARACTERISTICS

WATER CYCLE

GROUNDWATER, WATERSHEDS, AND AQUIFERS

AQUATIC LIFE

K-2ND GRADE: WHAT IS WATER?

Objectives

- Describe the qualities of water with your senses.
- Identify the states of water.
- Explore how water moves between states.

Background

Water has three states: liquid, gas, and solid, and can be found in many things, including animals, plants, fruits, and people. Water is used for drinking, bathing, growing, and more. As a gas it is found in steam, fog, and breath. The solid form of water is visible in ice or crystal formations. Rivers, streams, oceans, and rain are all examples of water in the liquid state.

Materials

- Construction Paper
- White Paper
- Markers
- 6 containers (sandwich size or ice cube trays)
- Ice Cubes
- Tang
- Lemon Juice
- Soapy Water
- Watermelon
- Magnifying Glasses

Anticipatory Set – Riddles

- What do you call a snowman in the summer? A puddle!
- What runs but never walks? Water!
- What did the water say to the boat? Nothing. It just waved!

Pre- /Post-Test

KWL (Know-Want to Know-Learned) chart of water

Activities

MAKE A LAB REPORT JOURNAL

1. Have the students create lab journals in class or ahead of time.
2. Have the students fold the construction paper in half for the cover and 3 pages of white paper for the journal pages.

3. Have the students decorate the cover with their name and whatever they want to draw when they think of science.

SAMPLE INVESTIGATION

1. Demonstrate how to use all senses (**except taste**) to determine characteristics of each sample. Use soda as your demonstrating liquid.
2. Show how they can feel the stickiness when dried, smell the sugar, hear the carbonation, and see the darker color.
3. Demonstrate on the board or in your own lab report journal how to record your findings with words (i.e., it is brown) or illustrations (drawing the popping bubbles) or maps (circle map of all qualities uncovered).
4. One at a time, introduce a sample to each small mixed-ability group.
5. First ask them to draw, write, or map what they see, then smell, then feel, then hear.
6. After, have them draw or write what they think the sample is. Ask them why they hypothesized the sample to be such. Repeat for each sample.
7. After all samples are reported on, reveal what each sample is.

THINKING/DISCUSSION

Ask the group to find all common characteristics of the samples. Can they predict what is the main ingredient common to all? Water!

Have the students create a Bubble Map about water. Ask them if they can classify water into its different states.

ANNIE AND MOBY: CHANGING STATES OF MATTER VIDEO

Can the students list different states of water?

MAPPING

1. Divide the kids into groups of 4.
2. Create a Tree Map with Water at the top and 3 branches out for Liquid, Solid, and Gas.
3. Place Water State cards around the room/area.
4. Each group of 4 sends 1 person out at a time to find a card, bring it back to the table, and decide if it is a picture of a solid, liquid, or gas.
5. Once classified, have them place it on the Tree Map under the correct branch.
6. Continue until all cards are gone.

PONDER

Looking at the Tree Map, ask the kids to ponder how water can be in three states and how it changes. Example being heating an ice cube by connecting the ice cube card to the water puddle card.

Resources

- (n.d.) Annie and Moby: Changing States of Matter. [Full Video]. Available from http://www.brainpopjr.com
- “Water Match” Lesson Plan from (1995). Project Wet Curriculum & Activity Guide. Bozeman, Montana; The Water Course.
- The Water Sourcebook: Grades K-2, 3-5. Retrieved from http://water.epa.gov/learn/kids/drinkingwater/upload/The-Water-Sourcebooks-Grade-Level-K-2.pdf.

TEKS

English Language Arts and Reading – K.1A, K.1C, K.1D, K.5C, 1.1A, 1.1C, 1.1D, 2.1C, 2.2D

Mathematics- K.8A, K.8C, 1.8A, 1.8C, 2.10D

Science- K.1, K.2C, K.2D, K.2E, K.3C, K.7B, 1.2B, 1.2C, 1.2D, 1.2E, 1.5B, 2.2A, 2.2B, 2.2C, 2.2D, 2.2E, 2.5A, 2.5B

2^{ND}–5^{TH} GRADE: THE WATER CYCLE

Objectives

- Construct a model of the water (or hydrologic) cycle.
- Observe water as an element within the natural environment.
- Explain how the hydrologic cycle works and why it is important.
- Experience how water moves through the hydrologic cycle.

Background

The water cycle (or hydrologic cycle) is the movement of water in our world. Water is finite and only changes form such as solid, liquid, and gas. Heat and cold play important roles in how water changes states and moves in the environment. The water cycle describes how this movement occurs and the different ways it is transported through the cycle.

Materials

- Clear Plastic Jar
- Small Plate or saucer
- Hot Water
- Bag of Ice
- Food Coloring
- Water Cycle posters
- 2 Blue Ropes

Anticipatory Set – Interactive Water-Cycle Diagram

- Watch, The Water Cycle: A StudyJams! video from Scholastic
- Explore the USGS'S Interactive Water-Cycle Diagram. The Interactive Diagram is available for three levels of students.

Pre- /Post-Test

In mixed-ability groups, have the students create a flowchart of the water cycle starting with a cloud on the handout, making changes post-lesson in a different color.

Prior Knowledge Activation

With the whole group, map out the water cycle (i.e., liquid to air to cloud to rain). Define vocabulary such as evaporation, precipitation, run-off, accumulation, transpiration, and condensation. Ask if our water is finite.

Activities

WATER CYCLE IN A JAR

Demonstrate for the class to see:

1. Pour hot water into a plastic jar, filling it about 1/3 of the way.
2. Add several drops of food coloring.
3. Place small plate or sauces on jar and fill with ice.
4. Observe the water cycle as steam rises from warm water and droplets form on the bottom side of the lid.
5. On the original water cycle map, ask the students to add in attributes like heat to cause evaporation and cooling to cause precipitation.

WATER CYCLE IN ACTION

Discuss with the group how water can enter the cycle in different ways. Explain that it is not always simply rain to ground to stream to cloud.

To demonstrate this:

1. Set up a "cloud" station at the front of the room with the teacher as the sun. On the opposite side of the room, set up a "forest" station, a "mountain" station, and an "ocean" station.
2. Between the "forest" and "mountain" stations place blue rope to represent water runoff. Between the "ocean" and "mountain" stations place blue rope to represent water runoff.
3. Have the students start off at the "cloud" station while whispering "condensation" as they float nearby. When ready, the students choose to either rain down to the "forest" station or "ocean" station while whispering "precipitation" or snow down on the "mountain" station while whispering "precipitation."
4. Once in the "forest" station, the students wait in the trees until the "sun" comes by and helps them turn to gas to return to the cloud, while whispering "transpiration."
5. Once in the "ocean" station, the students wave back and forth whispering "accumulation" until the "sun" comes by and helps them turn into gas to return to the cloud, moving and whispering "transpiration."
6. Once in the "mountain" station, the students flow down the blue water run off ropes, whispering "run off" to either the "forest" or "ocean" stations.
7. Continue to flow until the students get a grasp of the vocabulary describing each movement in the water cycle.

GROUP DISCUSSION

As a whole group, discuss why the water cycle is important. Ask the students what would happen if one of the components were not present.

RUBRIC

Component of Water Cycle	Point Value
Sun	1
Cloud	1
Run Off	1
Accumulation	1
Heating	1
Cooling	1
Precipitation	1
Evaporation	1
Transpiration	1
Condensation	1

PONDER

Have the students ponder where they can see the water cycle in action in their community and in Texas. Can they think of local streams, rivers, oceans, etc., that are part of the process? Can they name areas in Texas where water may accumulate into watersheds?

Differentiating Learning

- Create a 3-dimensional model of the water cycle.
- Create a story of the life of a water drop.
- Create and perform a play based on the life of a water drop.

Resources

- Thirstin's Water Cycle Adventure, Retrieved from https://www.epa.gov/sites/production/files/2016-03/documents/graphic_grades_k-3_watercycle.pdf

- Thirstin's Ground Water Movement Activity, Retrieved from https://www.epa.gov/sites/production/files/2016-03/documents/activity_grades_k-3_groundwatermovement.pdf
- Follow a Drip Through the Water Cycle, Interactive water-cycle diagram, Retrieved from https://water.usgs.gov/edu/watercycle-kids-adv.html
- That Magnificent Ground Water Connection: The Water Cycle and Water Conservation, 1-2. Retrieved from http://www.epa.gov/region1/students/pdfs/gndw_712.pdf
- Video: The Water Cycle: A StudyJams!, Retrieved from https://www.scholastic.com/teachers/activities/teaching-content/water-cycle-studyjams-activity/

TEKS

§112.13. Science, **Grade 2**, Adopted 2017: (b) 2A, 2B, 2C, 2D, 2E, 3B, 4A, 5A, 5B, 8A, 8B

§112.14. Science, **Grade 3**, Adopted 2017: (b) 1A, 1B, 2A, 2D, 2F, 3A, 3B, 4, 5B, 5C, 8A

§112.15. Science, **Grade 4**, Adopted 2017: (b) 2A, 2B, 2D, 2F, 3A, 3B, 4, 7B, 8A, 8B

§112.16. Science, **Grade 5**, Adopted 2017: (b) 2A, 2B, 2C, 2F, 3A, 4, 7B, 8A, 8B

K-3RD GRADE: GROUNDWATER DEMO

Objectives

- Explain groundwater and surface water.
- Understand the water table.
- Understand the role of rain in groundwater.

Background

Groundwater is water stored in the ground that may or may not be accessible at the earth's surface. Water will travel down into the ground through permeable rocks until it hits a less permeable layer. Water that is trapped between two less permeable layers creates an aquifer between the confining layers. Rock that is more permeable and allows water to move through so it can be reached from the surface is called an unconfining layer. The highest level of water is called the water table. The area above this line is known as the unsaturation zone while the area below is the saturation zone.

Materials

- Clay
- Gravel
- 12 Jars
- Large paper
- Rocks
- Sponges
- Sand
- Water
- Writing Implements

Anticipatory Set

YouTube - Groundwater Animation

YouTube - Drop Inside the Edwards Aquifer

Pre- / Post-Test

30 Second Water Scavenger Hunt in Groups

Find as many sources of water as possible in 30 seconds and record. Did anyone get groundwater? Complete the pre/post-lesson.

Prior Knowledge Activation and Activities
Where does our water come from?

List as many ways as the class can think of. Rain is a big one. Ask if the students can figure out the puzzle of how water that rains down on us is used. Ideas could range from watering plants for food to filling cisterns to filling lakes.

MODEL GROUNDWATER

"Today we are going to make a model of the earth in a jar. We did it when we talked about the water cycle but now let's look more closely at the earth component."

1. In small groups, have a large mason jar, a sponge, water, sand, gravel, and large rocks.
2. Ask each group to pack 1/3 of the jar as tightly as possible with the material given to fill in all possible spaces. Note that some children may layer it while others just use sand, and some may go from large rock to gravel to sand to fill in gaps.
3. Next ask the students to use the sponge as a rain cloud and squeeze to simulate rain coming down on the earth components.

Did the water stay on top or did the water soak through? As the water soaks through, explain that this is known as groundwater. Further, explain that the upper line is called the water table, and the area below is the saturation zone and above is the unsaturation zone.

4. Have the students squeeze the sponge to simulate rain until there is some on top of the earth's components. This illustrates surface water and what a high-water table might look like.

Where might you find a high-water table? Coasts, beaches, etc.

GROUND CONSISTENCY

1. Taking it a step further, each group takes another jar and fills with only one element (1 group sand, 1 group gravel, 1 group clay, 1 group large rocks).
2. Poll the class for predictions on which earth base will allow for more groundwater to flow with ease and graph on the large paper.
3. Have each group create the earth base up to 1/3 of the jar height.
4. As before, using the sponge, have each group rain down on their land 3 times.
5. Compare the differences in water table and surface water.
6. Look back at the predictions to see if they were correct.

MOVING WATER MOLECULES

To demonstrate why it is easier for water to move through rocks, gravel, sand, then clay, have 1 group act as water molecules while the others act as the earth.

1. In Round #1, have the earth students stand with arm stretched out to sides not touching a partner and not within 1 foot of any other fingertips but in a mass in the middle of the

room. The water molecules try to walk through the "large rocks" and find it easy. Change up water molecule group each time for the next 3 rounds.

2. In Round #2, the earth is like gravel with arms extended but fingertips touching.
3. In Round #3, the earth is like sand with hands on hips and elbows lightly grazing.
4. In Round #4, the earth is like clay with hands at side and shoulders lightly grazing.
5. Have the students rank the difficulty of water molecules to move through the earth. Which types of earth would be easier to get groundwater supplies from?

PONDER

Where do you get your drinking water from? Do you live near an aquifer? If so which one?

Use the Texas Water Development Board's Major Aquifer 3D Viewer to find an aquifer near your school. Do you live in the Edward aquifer recharge zone? View the ArcGIS - Where is the Edwards Aquifer Recharge Zone? to find your home or school.

What happens to the groundwater during a drought, a flood, or an increased in water usage? What happens to the organisms that depends on the groundwater during these times?

Resources

- Aquifer in a Cup, 1. Retrieved from https://www.groundwater.org/file_download/inline/53cf286e-b080-415c-805f-dead6c4b229d
- Groundwater Animation. Retrieved August 12, 2013. from http://www.youtube.com/watch?v=uQRvN6MUajE
- The Edwards Aquifer Authority, Drop Inside The Edwards Aquifer. Retrieved from https://www.edwardsaquifer.org/education/multimedia-library/videos/
- Texas Water Development Board, Major Aquifer 3D Viewer Retrieved from https://www.twdb.texas.gov/groundwater/
- Where is the Edwards Aquifer Recharge Zone? Retrieved from https://www.arcgis.com/home/webmap/viewer.html?webmap=2dc9266dc088444b82dd368c2222f6f6&extent=-101.1491,28.3085,-96.6364,30.6844

TEKS

§112.11. Science, **Kindergarten**, Adopted 2017: (b) 1A, 1B, 2A, 2B, 2C, 2D, 2E, 3A, 3B, 3C, 4A, 4B, 7A, 7B, 7C

§112.12. Science, **Grade 1**, Adopted 2017: (b) 1A, 1B, 2A, 2B, 2C, 2D, 2E, 3A, 3B, 4A, 4B, 7A, 7B, 7C

§112.13. Science, **Grade 2**, Adopted 2017: (b) 1A, 1B, 2A, 2B, 2C, 2D, 2E, 3A, 3B, 4A, 7A, 7C

§112.14. Science, **Grade 3**, Adopted 2017: (b) 1A, 2A, 2D, 2F, 3A, 3B, 4, 5A, 5D, 7A, 7C, 8A, 9A, 9C

4^{TH}-7^{TH} GRADE: BASICS OF GROUNDWATER

Objectives

- Demonstrate how water tables change.
- Examine how nonpoint source pollution contaminates groundwater.
- Discuss how different earth bases affect groundwater movement.

Background

Groundwater is water located beneath the earth's surface. It is important because this is our water supply for that is used for drinking, eating, bathing, etc. Groundwater accumulates beneath the earth's surface in aquifers from water moving through permeable rock until it hits a less permeable layer.

The highest point of water is known as the water table. This may or may not be seen above the earth's surface and varies with depletion and repletion of water into the system. People use wells to reach these water reserves but must be careful to maintain a balance between using and recharging the groundwater supply to prevent from running out of water.

Pollutants can travel within water in the same manner, leading to contaminated groundwater supply, affecting people and animals alike.

Materials

- Clear Plastic Cups
- Clay
- Sand
- Gravel
- Rocks
- Water
- Kool-Aid Powder
- Pie Tins
- Aquarium Gravel
- Spray Bottle
- Nylon Hose

Anticipatory Set

Before students arrive, color a glass of water with orange and green food coloring to make it appear dirty. When the students arrive, inform them that you took this water from the dirtiest local water supply in town. Ask why they think the water is discolored. After discussing the quality of the water, dramatically drink it! Remind the students that all water sources have some level of pollution, even groundwater.

YouTube: What Is Groundwater

PBS: Groundwater Beneath the Surface

Pre- / Post-Test

With the class, create a Bubble Map for Groundwater. Add post-lesson in a different color to assess knowledge gain.

Activities

GROUNDWATER SCAVENGER HUNT

1. Beginning in the classroom, have students in mixed-ability groups draw a cross section of what groundwater may look like on large paper.
2. Take the class outside and have them focus on looking for where water went after the last rain. Off the roof? On the road? In the grass? Etc.
3. Walk around the school grounds looking for different escape routes the water may have taken.
4. Next pour water on pavement and on unpaved ground. Observe what happens. Can the students form hypotheses as to why the water acted as it did?

BUILDING THE GROUNDWATER UNDERGROUND

1. In groups of 4, with clear plastic cups, create different earth bases (clay, sand, gravel, and rock).
2. Pour water on to the surfaces to simulate rain and record what happens after 3 rains on the earth base. How do the results support or reject their hypotheses?
3. Taking a spray bottle with nylon hose over the bottom of the tube, have the students examine how a water well would pump water out of the ground for each earth base. What base is the easiest for the well to draw water from?

WATER TABLE

1. Each group takes a pie tin, fills it with aquarium gravel, and creates a small depression in the middle.
2. Fill the tin with water on the edge until the water seeps and rises in the depression. How does this compare to what people do? Creating manmade ponds and lakes!
3. Using the filtered squirter at the edge of the tin, squirt out water until you can see the water level change in the pond. This is an example of changes in the water table. The level below is the saturation zone while the level above is the unsaturated zone.
4. Now using red Kool-Aid mix sprinkled on the gravel away from the pond, rain on the gravel and observe what happens to the water table and the water quality. This demonstrates how groundwater can be contaminated.

PONDER

What likely happened to the level of the water table between spring and summer? Notice how easy it is for water to be contaminated from a distance and not by direct dumping. This is called nonpoint source pollution. How can this be prevented? How do we depend on groundwater?

PROJECT

Have the students research the history of groundwater or surface regulations for the state, county, or city. Have the students write a one-page report on why groundwater and surface water regulations are important? How have these regulations improved our water quality?

Resources

- That Magnificent Ground Water Connection: Deep Subjects: Well and Ground Water, 1-8. Retrieved from https://www.epa.gov/sites/default/files/2015-08/documents/mgwc-ww-well.pdf
- Northern California Public Media: What is Groundwater. Retrieved from https://www.youtube.com/watch?v=83qBb7KRkAE
- PBS: Groundwater Beneath the Surface. Retrieved from https://klru.pbslearningmedia.org/resource/20196d0e-5cab-408c-8ee0-9141a7d28b83/groundwater-beneath-the-surface/

TEKS

§112.15. Science, Grade 4, Adopted 2017: (b) 1A, 1B, 2A, 2B, 2C, 2D, 2F, 3A, 3B, 4, 7A, 7B, 8B

§112.16. Science, Grade 5, Adopted 2017: (b) 1A, 1B, 2A, 2B, 2C, 2D, 2F, 3A, 4, 5B, 7B, 9C

§112.18. Science, Grade 6, Adopted 2017: (b) 1A, 1B, 2A, 2B, 2C, 2E, 3A, 3B, 3C, 4A, 10E

§112.19. Science, Grade 7, Adopted 2017: (b) 1A, 1B, 2A, 2B, 2D, 2E, 4A, 8A, 8B, 8C, 10A

6^{TH}-10^{TH} GRADE: WATERSHED - THE MOVEMENT OF WATER

Objectives

- Identify a watershed and understand its processes.

Background

A watershed is an area of land from which all the water drains to the same location such as a stream, pond, lake, river, wetland, or estuary. A watershed can be large, like the Colorado River drainage basin, or very small, such as all the water that drains to a small farm pond. Large watersheds are often called basins and contain many small watersheds. The topography of the land surrounding a watershed plays an important role in how the watershed is depleted and recharged.

Materials

- Aluminum Foil
- Desk
- Water

Anticipatory Set

Take the teacher desk or table and raise one side on books to create an incline. When students arrive, place your books or materials on the high end and watch as they roll down and off the table. Try a few times to get them to stay. Ask what is wrong before connecting this lesson to rain making its way into the watershed.

Pre- / Post-Test

Write the following on the board when students arrive:

On a piece of paper, explain how a river's water level can rise if it does not rain directly on the river? Compare pre-/post-lesson responses.

Prior Knowledge Activation

Map out where water goes when it rains or take a walking field trip around the school to document potential destinations for water. Ask how students know water moved those directions (i.e., slope, pipes, etc.).

WGCU Curiouskids: What Is A Watershed? - Video

Oregon State University Ecampus: Understanding the Watershed- Video

PBS: A Watershed Moment- Video

Activities

CREATE A WATERSHED

1. In groups of 4, slightly crumple a piece of 15-inch aluminum foil. Spread the foil out on a flat surface while still protecting the folds and indentations. This represents a land surface.
2. Observe the contours and determine where the hilltops and valleys are. Where will water pull? Which pathways would rain follow across the terrain of the land surface?
3. Ask the kids to define a watershed (area of land from which precipitation drains to a single point. Sometimes referred to as drainage basins or drainage areas). Identify how many watersheds are found on the land surface.
4. Carefully sprinkle a small amount of water over the foil. Watch the movement of water over the land surface. Identify the watersheds.
5. Each group discusses how water flowed in their model and hypothesizes which areas are more susceptible to flooding than others. Simulate heavy rain to see if the hypothesis is accepted or rejected and why.
6. Using the same foil, have each group create the following watersheds:

    a. Water moves quickly across the land surface.
    b. Water moves slowly across the land surface.
    c. Water movement gathers within the smallest land surface.
    d. A watershed within a watershed.
    e. Two side-by-side watersheds.

RUBRIC

Give 1 point for each answer and compare pre-/post-test. Examples may include run-off, snow/ice melt, changes in topography that change the flow pattern or the river, dams (man-made and animal made), etc.

PONDER

Looking at how land formations and contours affect water flow, what potential problems can develop in watersheds from nonpoint source contaminants? How have humans impacted watersheds over time? Can these impacts be reversed?

National Geographic: 50 Years Ago, This Was a Wasteland. He Changes Everything - Video

PROJECT

Have your students identify your school's watershed address using the Texas Watershed Viewer. Then, have the students compare your school's watershed to two other locations. Do they have any thing in common such as the Watershed or River Basins?

Resources

- Enviromapper for Watersheds (n.d.). In Environmental Protection Agency Website. Retrieved from https://www.epa.gov/waterdata/waters-geoviewer
- How's My Waterway (n.d.). In Environmental Protection Agency Website. Retrieved from https://www.epa.gov/waterdata/hows-my-waterway
- Texas Parks and Wildlife: Texas Watershed Viewer https://tpwd.texas.gov/education/water-education/Watershed%20Viewer
- Project Wet Water Education Today: Explore Watersheds Retrieved from https://www.discoverwater.org/explore-watersheds/
- WGCUCuriouskids: What Is A Watershed? Retrieved from https://www.youtube.com/watch?v=yhsHS1sYfdc
- Oregon State University Ecampus: Understanding the Watershed Retrieved from https://www.youtube.com/watch?v=b98kdNGYZt0
- PBS: A Watershed Moment Retrieved from https://klru.pbslearningmedia.org/resource/729d87c8-ea5f-456d-826d-f4da88e8d101/a-watershed-moment/
- National Geographic: 50 Years Ago, This Was a Wasteland. He Changes Everything Retrieved from http://video.nationalgeographic.com/video/short-film-showcase/50-years-ago-this-was-a-wasteland-he-changed-everything?gc=%2Fvideo%2Fenvironment

TEKS

§112.18. Science, Grade 6, Adopted 2017: (b) 1A, 1B, 2A, 2B, 2E, 3A, 3B, 3C 3D, 7

§112.19. Science, Grade 7, Adopted 2017: (b) 1A, 1B, 2A, 2B, 2E, 3A, 3B, 3C, 3D, 8A, 8B, 8C, 10A

§112.20. Science, Grade 8, Adopted 2017: (b) 1A, 1B, 2A, 2B, 2E, 3A, 3B, 3C, 9C, 11B, 11C

§112.32. Aquatic Science, Beginning with School Year 2010-2011: (c) 1A, 1B, 2E, 2F, 2H, 2J, 3A, 3B, 3D, 4A, 4B, 7A, 7B, 7C, 12A, 12B, 12C, 12E

112.42. Biology (One Credit), Adopted 2020:(c) 1A, 1B, 1C, 1G, 2A, 2D, 3B, 3C, 4B, 13B, 13D

§112.37. Environmental Systems, Beginning with School Year 2010-2011: (c) 1A, 1B, 2E, 2I, 2K, 3A, 3B, 3D, 4C, 5B, 5C, 8A, 9A, 9B, 9E

§112.36. Earth and Space Science, Beginning with School Year 2010-2011: (c) 1A, 1B, 1C, 2G, 2I, 3A, 3B, 3D, 3F, 11A, 11D, 11E, 13A, 15C

5TH-8TH GRADE: HOW MUCH DRINKING WATER

Objectives

- Estimate percentages of water in the world.
- Evaluate water distribution on Earth regarding usable, fresh vs. salt water, etc.

Background

Water covers approximately 75% of the earth's surface. However, only about 0.419% is usable drinking water.

Materials

- Toss-able Globe.
- Aquarium
- Blue Food Coloring
- Measuring Cup
- Ice Cube Tray
- Clear Cup Filled with Sand
- Large Sheet of Paper
- Writing Implements

Anticipatory Set

Toss a globe around the room and record how many times thumbs are on water when caught (75 times out of 100 toss). The world is approximately 75% water.

Pre- / Post-Test

As a class, have the students vote on how much water is on earth and how much water is available for humans to drink. Record their answer on the board or a large piece of paper, then use a pie chart to diagram their answers. Compare pre-/post-lesson.

Prior Knowledge Activation

Can we drink all the water on Earth? Why not?

Activities

DIVIDING WATER

1. Fill an aquarium with 5 gallons of water to represent all the water on Earth.
2. Ask the class to list forms that water is found on earth in a Bubble Map.
3. Now let them predict the percentages for each source (ex – 10% rivers, 50% oceans) by drawing a pie chart.

4. Scoop out 18 ounces, add blue food coloring to the aquarium for the 97.2% of water being from oceans.
5. Pour 15 ounces from the scooped-out water into an ice cube tray for water in glaciers but since it is trapped, float the tray on top of the ocean water as unusable.
6. The last 3 ounces represent all the available freshwater on earth. Place a drop in a student's hand to represent all the freshwater located in lakes and rivers.
7. Pour the remaining 2.5 ounces into a clear cup of sand to represent groundwater.
8. Math time! Which forms are usable to us? Ground and surface water! If groundwater is .0397% and surface water .022%, how much is usable? .419% of course!
9. Ask the students to draw a new pie chart on the same sheet with the breakdown of freshwater on the earth and keep for evaluating knowledge gains.

VIDEOS

National Geographic: What Happen When a Town Runs out of Water?

National Geographic: What's It Like to Live in a Town Without Water?

PONDER

Why is all freshwater not usable? Why do we need to take care of surface/groundwater? What would you do if your town were to run out of water? How would your life be different? How can you positively influence environmental practices in the world, your state, your city, your school, your neighborhood, and your home?

PROJECT

Have the student write a paragraph on how the changing climate will affect the amount of drinking water available in the future.

Resources

- That Magnificent Ground Water Connection: The Water Cycle and Water Conservation, 4-6. Retrieved from http://www.epa.gov/region1/students/pdfs/gndw_712.pdf.
- National Geographic: What Happen When a Town Runs out of Water? Retrieved from http://video.nationalgeographic.com/video/news/140508-california-drought-lompico-vin?source=searchvideo
- National Geographic: What's It Like to Live in a Town Without Water? Retrieved from http://video.nationalgeographic.com/video/short-film-showcase/whats-it-like-to-live-in-a-town-without-water?source=searchvideo

TEKS

§112.18. Science, **Grade 6**, Adopted 2017: (b) 1A, 1B, 2C, 3A, 3B, 3C, 4A

§112.19. Science, **Grade 7**, Adopted 2017: (b) 1A, 1B, 2E, 3A, 3B, 3C, 3D, 4A, 8C

§112.20. Science, **Grade 8**, Adopted 2017:(b) 1A, 1B, 2E, 3A, 3B, 3C, 4A, 11B, 11C

§112.32. **Aquatic Science**, Beginning with School Year 2010-2011: (c) 7A, 12B, 12D

§112.36. **Earth and Space Science**, Beginning with School Year 2010-2011: (c) 13A

Math 7.1A, 7.3A, 7.4B

K-5TH GRADE: BUILD A BUG

Objectives

- Introduce some adaptations found in macroinvertebrates.
- Demonstrate how adaptation helps with survival.

Materials

- Team Cooties Game Instructions
- Examples of Aquatic Macroinvertebrate Adaptions
- Water Noodle with Garden Claw on End
- Rope
- Sunglasses with Googly Eyes
- Furry Hat/Wig
- Pipe Cleaners
- Feather Boa
- Balloons
- Straws
- Play-Doh
- Vampire Teeth
- Fishing Net
- Googly Eyes
- Feathers
- Puff Balls
- Beads
- Toothpicks
- Fabric Netting
- Paper
- Markers

Anticipatory Set

Team game of Cooties (instructions follow)!

Pre- /Post-Test and Prior Knowledge Activation

Tree Map- Why aquatic animals need adaptations.

Activities

CREATE A MACROINVERTEBRATE

1. Show the group some picture examples of adaptations found in macroinvertebrates.
2. Ask for a volunteer to be the macroinvertebrate (without breaking their back).
3. Ask the group to list adaptations and add to the volunteer (example – tails for swimming and maneuvering with a rope).
4. Discuss why each is needed and how it helps as you add it to the tree map. For older/more advanced groups, have students in smaller groups create a family of macroinvertebrates by each member dressing up, giving them each a name, and presenting to the other groups.

CREATE YOUR OWN MACROINVERTEBRATE

1. Using material provided, instruct each student to create their own macroinvertebrate and present it to their group, explaining why each adaptation is important. You can also have students come up with a list on their own of traits for a bug to create with Play-Doh (tough, fast, etc.).

THINKING/DISCUSSION

Add to Tree Map

As a group, ask if the students would add anything else to their Tree Map after creating their own macroinvertebrate. Any new adaptation categories that could help but were not mentioned?

PONDER

If you could have any adaptations for yourself, what would they be and how would they help you?

Resources

- Bugs Don't Bug Me, Retrieved from https://extension.usu.edu/waterquality/files-ou/Publications/Bugs-dont-bug-me.pdf

TEKS

§112.11. Science, **Kindergarten**, Adopted 2017: (b) 2A, 2D, 2E, 3B, 3C, 4B, 9A, 10A, 10B

§112.12. Science, **Grade 1**, Adopted 2017: (b) 2A, 2D, 2E, 3B, 9A, 9B, 10A

§112.13. Science, **Grade 2**, Adopted 2017: (b) 2B, 2D, 2E, 3B, 9A, 9C, 10A, 10C

§112.14. Science, **Grade 3**, Adopted 2017: (b) 1A, 1B, 2A, 2C, 2F, 4, 9A, 9B, 9C, 10A, 10B

§112.15. Science, **Grade 4**, Adopted 2017: (b) 2A, 2D, 2F, 3A, 4, 9B, 10A, 10B, 10C

§112.16. Science, **Grade 5**, Adopted 2017: (b) 3A, 4, 9A, 9B, 9C, 10A, 10B

Team Cooties Game Instructions

Step One: Write the following on the board:

1=head

2=body

3=antenna

4=eye

5=wings

6=leg

Step Two: Divide the class into teams, and give each team a piece of paper and markers. Instruct them that they must get a head and body first before they can continue to add other body parts. The team that collects all the necessary body parts is the winner.

- 1 head
- 1 body
- 2 antennae
- 2 eyes
- 2 wings
- 6 legs

They can draw that part on their paper once they gather the correct part. Each person of the team must draw at least one part on their cootie!

SUGGESTED PROPS FOR MACROINVERTEBRATES

Adaptions	Use	Items Representing Adaptions for Build A Bug	Items Representing Adaptions for Make A Macroinvertebrate
Legs, Claws, Hooked Feet, Suction Cups, Hairs on Legs	Holding on to rocks and hard substrate, scraping algae off rocks, attacking prey	water noodle with hooks on the end	Pipe cleaners
Tails	Swimming and maneuvering	Garland or rope	Pipe cleaners
Compound Eyes	Helping insects detect motion	Sunglasses with googly eyes glued on	Google eyes
Hairs on head or body	Help detect movement or chemical changes in water	Wig or furry hat	Puffy balls, feathers
Antennae	Sensing food, water, surroundings	Store bought or homemade antennae	Pipe cleaners
Gills	Breathing dissolved oxygen in the water	Feather boa	Feather
Air Bubbles	Breathing oxygen from the surface air	Balloon	Plastic necklace pop-beads, bouncy ball, beads
Breathing Tube	Breathing oxygen from the surface air	Straw	Straws
Specialized Mouth Parts	For scraping, piercing, shredding, etc. The mouth parts reflect food choices of the insect.	Vampire teeth	Toothpicks
Device for catching food, i.e., net (made by the insect or part of their body structure) or special hairs	Catching food in the current	Fishing net	Fabric netting and toothpicks, feathers

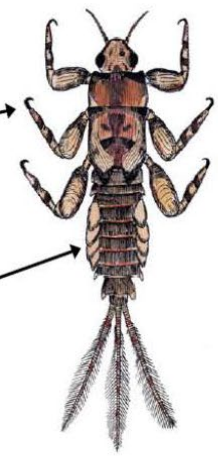
EXAMPLES OF AQUATIC MACROINVERTEBRATE ADAPTIONS

The **Blackfly larva** has a <u>net</u> on its head for collecting food.

The **Stonefly** nymph has <u>claws</u> for capturing prey and holding on tight to rocky substrates.

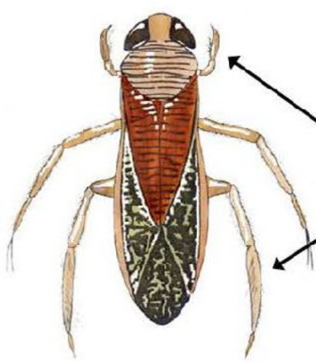
The **Stonefly** nymph has <u>gills</u> in its "armpits" for breathing dissolved oxygen in fast flowing streams.

The **Cranefly larva** has <u>tiny hairs</u> and <u>suction cups</u> along its body so it can hold on to rocks and hard substrates in fast flowing water.

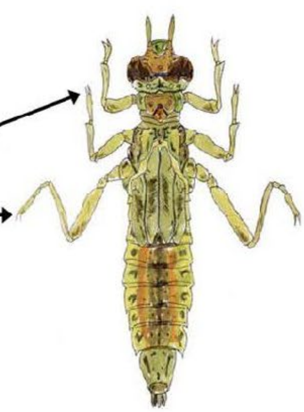


The **Mayfly** nymph has <u>hooks</u> for holding on tight to rocky substrates.

The **Mayfly** nymph has <u>gills</u> on its abdomen for breathing dissolved oxygen in fast flowing streams.



The **Water boatman** has <u>paddle-like legs</u> for swimming in slow moving water.



The **Dragonfly nymph** has <u>claws</u> on its legs for capturing prey and for climbing emergent vegetation.

K-6TH GRADE: MACROINVERTEBRATE GRAPHING

Objectives

- Describe and identify the quality of a stream site by analyzing the aquatic macroinvertebrates that live there.

Background

Sometimes it is easy to tell if a stream is polluted. Strange colors and dead fish are often indicators of poor water quality; however, biologists need to track water quality problems long before they reach this point. One of the most effective methods in detecting declining trends in water quality are through biological surveys of aquatic macroinvertebrates (small animals without backbones) because different species have different tolerance levels to pollution, they respond rapidly to changes in water quality.

To evaluate the health and productivity of a stream, biologists look at the types of macroinvertebrate species that live there. If many pollution-intolerant organisms, such as stonefly or caddisfly nymphs, are present, then water quality is probably good. Although the presence of certain species is an indicator of good water quality, the absence of these species does not necessarily indicate poor water quality. Other factors besides pollution may account for their absence.

- **Pollution Sensitive or Intolerant Species:**

Organisms that are intolerant to pollution and are easily killed, impaired, or driven off by poor water quality; includes many types of stonefly, dobsonfly, and mayfly nymphs and caddisfly larvae.

- **Pollution Tolerant Species:**

Organisms that can tolerate a wide range of water quality conditions; includes amphipods, scuds, beetle and cranefly larvae, crayfish, and dragonfly nymphs.

- **Pollution Tolerant Species:**

Organisms that are mostly tolerant of pollution that can withstand poor water quality; includes most leeches, aquatic worms, midge larvae, and sow bugs.

Materials

- Plastic baggies
- Candy: Skittles or M&Ms
- Graph Paper
- Colored Pencils
- Pictures of Macroinvertebrates

Anticipatory Set

Play Candy Land

Pre/Post Test

Compare student recorded answers pre- /post-test:

Why are there different amounts of macroinvertebrate types in different streams?

Graphing Activities

TOLERANCE GRAPHING

1. Ask the students to imagine that they are living in Candy Land and are catching macroinvertebrates in the Kool-Aid Stream, and the bag of colored candies represents the sample your group took from the stream, making sure each group has a different sample set.
2. Using graph paper, each group will create a bar graph of their samples using color as a descriptor.
3. Upon completion, ask each group to create a short paragraph (using words or drawings) to describe their section of Kool-Aid Stream, what is common there, and why they think that is so.

CONNECTION TO REAL LIFE

4. Inform each group that this correlate to macroinvertebrate and hand out the key below:
    a. Red = Stonefly Nymph (Intolerant)
    b. Orange = Caddisfly Larva (Intolerant)
    c. Purple = Beetle (Somewhat Tolerant)
    d. Blue = Cranefly Larva (Somewhat Tolerant)
    e. Yellow = Midge Larva (Tolerant)
    f. Green = Leech (Tolerant)
5. Instruct each group to write the new descriptors on their original graph under the colors.

ANALYSIS

6. Have the students look at the graph and create a short paragraph (or drawing) to describe the group's water quality and why they think that is so, paying particular attention to the tolerance of each macroinvertebrate listed.

PONDER

Each group will present both the Kool-Aid Stream and real-life stream findings to the class. As they are presented, the teacher will track each sample with a number on a drawing of a river and list the findings on the board. As a class, decide why samples differed despite being from the same river.

Resources

- Bugs Don't Bug Me, Retrieved from https://extension.usu.edu/waterquality/files-ou/Publications/Bugs-dont-bug-me.pdf

TEKS

§112.11. Science, Kindergarten, Adopted 2017: (b) 2A, 2B, 2C, 2D, 2E, 3A, 3B, 3C, 7B, 9A, 9B, 10B

§112.12. Science, Grade 1, Adopted 2017: (b) 2A, 2B, 2C, 2D, 2E, 3A, 3B, 7B, 9A, 9B, 10A

§112.13. Science, Grade 2, Adopted 2017:(b) 2A, 2B, 2C, 2D, 2E, 3B, 9A, 9C, 10A, 10C

§112.14. Science, Grade 3, Adopted 2017: (b) 2A, 2C, 2D, 2F, 4, 9A, 9B, 9C, 10A, 10B

§112.15. Science, Grade 4, Adopted 2017: (b) 2A, 2B, 2C, 2D, 2F, 3A, 4, 9B, 10A, 10B, 10C

§112.16. Science, Grade 5, Adopted 2017: (b) 2B, 2C, 2D, 2F, 2G, 3A, 4, 9A, 9B, 9C, 10A, 10B

§112.18. Science, Grade 6, Adopted 2017: (b) 2A, 2C, 2D, 2E, 4A, 12E

Name: ______________________

Date: _______________________

Macroinvertebrate Graphing Activity

Amount

Stonefly	**Caddisfly**	**Beetle**	**Cranefly**	**Midge**	**Leech**

K-6TH GRADE: IF BUGS COULD TALK

Objectives

- To describe and identify the link between land use activities within a watershed and water quality.
- To understand the link between aquatic macroinvertebrates and water pollution.

Background

A watershed is an area of land from which all the water drains to the same location such as a stream, pond, lake, river, wetland, or estuary. A watershed can be large, like the Colorado River drainage basin, or very small, such as all the water that drains to a small farm pond. Large watersheds are often called basins and contain many small watersheds. Watersheds can transport nonpoint source pollution. Nonpoint source pollution is associated with rainfall and snowmelt runoff moving over and through the ground, carrying natural and human made pollutants into water sources. Examples of nonpoint source pollutants include fertilizers, pesticides, sediment, gas, and oil.

Pollutants accumulate in watersheds due to various human driven and natural events. These pollutants, while sometimes inevitable, drastically alter the state of the ecosystem. If we can determine the type of pollutant and its cause, then we can classify the source of the pollutant and take preventative measures to reduce any further contaminants. Below are some examples of land use and their potential problems:

Land Use	Activities	Potential Pollution Problems
Agriculture	Tillage, cultivation, pest control, fertilization, animal waste	Sediment, nitrate, ammonia, phosphate, pesticides, bacteria,
Construction	Land clearing and grading	Sediment
Forestry	Timber harvesting road construction, fire control, weed control	Sediment
Land Disposal	Septic System	Bacteria, nitrate, phosphate
Surface Mining	Dirt, gravel, and mineral excavation	Sediment, heavy metals, acid, drainage, nutrient
Urban Run Off	Lack of automobile maintenance, lawn and garden care, painting	Oil, gas, antifreeze, nutrients, pesticides, paints

Aquatic macroinvertebrates can indicate the level of water quality. Stoneflies, mayflies, and caddisflies (called indicator species) are not well adapted to living in water with high levels of pollution. They are pollution intolerant. Often, when these species are limited or absent in a river or stream where they typically should be found, that can be indicative of poor water quality. Aquatic macroinvertebrates can be classified by their level of tolerance to pollution.

Sensitive or Intolerant Species:

Organisms easily killed, impaired, or driven off by bad water quality; includes many types of stoneflies, dobsonfly, and mayfly nymphs, caddisfly larvae, and water pennies.

Somewhat Tolerant Species:

Organisms with the ability to live under varying conditions may be found in good or poor-quality water; includes amphipods, scuds, beetle and cranefly larvae, crayfish, and dragonfly nymphs.

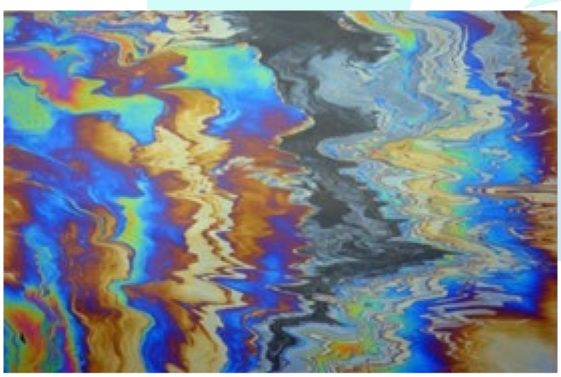
Tolerant Species:

Organisms capable of withstanding poor water quality; includes most leeches, aquatic worms, midge larvae, and sow bugs.

Materials

- 2 Plastic Baggies per Group filled with Skittles (One bag with more Skittles; one with less Skittles)
- Graph Paper
- Colored Pencils
- Pictures of Macroinvertebrates
- Pollutant Labels

Anticipatory Set



Ask the students to guess what this is a photo of.

Answer: oil pollution on water.

Pre- / Post-Test

Have the students list ways that they think pollutants affect macroinvertebrates and evaluate/add to this record post-lesson.

Graphing Activities

POLLUTANT TREE MAP

Starting with the entire class, create a Tree Map for Land Use with branches listing different land uses, the benefits of each, and how they can be harmful.

In small groups of mixed-abilities, students will each be given a pollutant card. Each group will create a Tree Map for their pollutant with branches answering: How they are used, how they can be beneficial, and how they can be harmful.

GRAPHING SAMPLES 1 AND 2

Hand each group 2 sample bags; one with more pollutants and one with fewer pollutants. Each group will create a bar graph of each sample bag without getting the skittles mixed up. Graphs can be on the same sheet of graph paper or separate. The Skittles will represent the following:

- Purple = Sediment
- Red = Pesticides
- Green = Fertilizers
- Yellow = Oil and Gas
- Orange = Toxic Waste

CONNECTING MACROINVERTEBRATES WITH THE MOST DESIRABLE ENVIRONMENT

Upon completion, have each group write a short description of each sample and what macroinvertebrates might thrive in the environment and glue or tape pictures of the macroinvertebrates that would most likely thrive in each of their samples.

PONDER

What adaptations do you think some macroinvertebrates have to help them thrive in more polluted environments than others?

Differentiated Learning

Discuss how pollutants can affect the food chain, create scenarios for each pollutant, and how it could happen in real life

Resources

- Gambier20. (n.d.). Rainbow Pollution, [photograph]. Retrieved August 12, 2013, from http://www.flickr.com/photos/gambier20/3208414588/.
- Bugs Don't Bug Me, Retrieved from https://extension.usu.edu/waterquality/files-ou/Publications/Bugs-dont-bug-me.pdf

TEKS

§112.11. Science, **Kindergarten**, Adopted 2017: (b) 2A, 2B, 2C, 2D, 2E, 3A, 3B, 3C, 7B, 9A, 9B, 10A, 10B

§112.12. Science, **Grade 1**, Adopted 2017: (b) 2A, 2B, 2C, 2D, 2E, 3A, 3B, 9A, 9B, 10A

§112.13. Science, **Grade 2**, Adopted 2017:(b) 2A, 2B, 2C, 2D, 2E, 3A, 3B, 9A, 9C, 10A, 10C

§112.14. Science, **Grade 3**, Adopted 2017: (b) 2A, 2C, 2D, 2F, 4, 9A, 9B, 9C, 10A, 10B

§112.15. Science, **Grade 4**, Adopted 2017: (b) 2A, 2B, 2C, 2D, 2F, 3A, 4, 9B, 10A, 10C

§112.16. Science, **Grade 5**, Adopted 2017: (b) 2B, 2C, 2D, 2F, 3A, 4, 9A, 9B, 9C, 10A

§112.18. Science, **Grade 6**, Adopted 2017: (b) 2A, 2C, 2D, 2E, 4A, 12E

Name: ______________________

Date: _______________________

Water Pollution Graphing Activity

Amount

Sediment **Fertilizer** **Pesticide** **Gas & Oil** **Toxic Waste**

K-6TH GRADE: WATER POLLUTION GRAPHING

Objectives

- To describe and identify the link between land use activities within a watershed and water quality.
- To understand the link between aquatic macroinvertebrates and water pollution.

Background

A watershed is an area of land from which all the water drains to the same location such as a stream, pond, lake, river, wetland, or estuary. A watershed can be large, like the Colorado River drainage basin, or very small, such as all the water that drains to a small farm pond. Large watersheds are often called basins and contain many small watersheds. Watersheds can transport non-point source pollution. Non-point source pollution is associated with rainfall and snowmelt runoff moving over and through the ground, carrying natural and human made pollutants into water sources. Examples of non-point source pollutants are fertilizers, pesticides, sediment, gas, and oil.

Pollutants accumulate in watersheds as a result of various human driven and natural events. These pollutants, while sometimes inevitable, drastically alter the state of the ecosystem. If we can determine the type of pollutant and its cause, then we can classify the source of the pollutant and take preventative measures to reduce any further contaminants. Below are some examples of land use and their potential problems:

Land Use	Activities	Potential Pollution Problems
Agriculture	Tillage, cultivation, pest control, fertilization, animal waste	Sediment, nitrate, ammonia, phosphate, pesticides, bacteria,
Construction	Land clearing and grading	Sediment
Forestry	Timber harvesting road construction, fire control, weed control	Sediment
Land Disposal	Septic System	Bacteria, nitrate, phosphate
Surface Mining	Dirt, gravel, and mineral excavation	Sediment, heavy metals, acid, drainage, nutrient

Urban Run Off	Lack of automobile maintenance, lawn and garden care, painting	Oil, gas, antifreeze, nutrients, pesticides, paints
Recreation	ATV, boating, camping, hiking, fishing	Sediment, gas, oil, garbage
Roads	Clearing trees, soil compaction, dirt excavation	Sediment, gas, oil

Materials

- 2 Plastic Baggies per Group filled with Skittles (One bag with more Skittles; one with less Skittles)
- Graph Paper
- Colored Pencils
- Pictures of Macroinvertebrates
- Pollutant Labels

Anticipatory Set

Show the students the vacation hotspot photo for Garbage Island, discussing how some pollution is seen but others not so much.

Prior Knowledge Activation

With the entire class, create a Bubble Map to define the word pollutant. As they occur, add the Pollutant Labels to the map. Now have them thinking back the Kool-Aid Stream activity. What was the goal? To determine water quality based on the number and different types of macroinvertebrates in the samples. Today the class will look at pollutants in a sample and make hypotheses as to what macroinvertebrates will be able to tolerate these environments.

Pre/Post Test

Have the students list ways they think land use affects water quality.

Activities Graphing

PROCEDURE:

Pollutant Tree Map
Starting with the entire class, create a tree map for Land Use with branches listing different land uses, the benefits of each, and how they can be harmful. In small groups of mixed-abilities, students will each be given a pollutant card. Each group will create a Tree Map for their pollutant with branches answering: How they are used, how they can be beneficial, and how they can be harmful.

Graphing Samples 1 and 2

Hand each group 2 sample bags; one with more pollutants and one with fewer pollutants. Each group will create a bar graph of each sample bag without getting the skittles mixed up. Graphs can be on the same sheet of graph paper or separate.

Purple = Sediment

Red = Pesticides

Green = Fertilizers

Yellow = Oil and Gas

Orange = Toxic Waste

Connecting with Land Use

Next have the groups discuss and record what land use activities are occurring in their watershed according to their sample. As a group, discuss how all types of pollutants are found in all samples, even if in small amounts. Bubble Map solutions for reducing these pollutants as a group.

PONDER:

What are some strategies to use on a large scale (in the community) and on a small scale (in their own home)?

Differentiated Learning

Create scenarios of how each land use could lead to pollution and how best management practices could be put in place to help.

Resources

- Bugs Don't Bug Me, Retrieved from https://extension.usu.edu/waterquality/files-ou/Publications/Bugs-dont-bug-me.pdf

TEKS

§112.11. Science, Kindergarten, Adopted 2017: (b) 2A, 2B, 2C, 2D, 2E, 3A, 3B, 3C,7A, 7B 9A,9B, 10A, 10B,

§112.12. Science, Grade 1, Adopted 2017: (b) 2A,2B, 2C, 2D, 2E, 3A, 3B, 9A,9B, 10A,

§112.13. Science, Grade 2, Adopted 2017:(b) 2A, 2B, 2C, 2D, 2E, 3B, 9A, 9C, 10A, 10B, 10C,

§112.14. Science, Grade 3, Adopted 2017: (b) 2A, 2B, 2C, D, 2F, 4, 9A, 9B, 9C, 10A, 10B,

§112.15. Science, Grade 4, Adopted 2017: (b) 2A, 2B, 2C, 2D, 2F, 3A,4, 9B, 10A, 10B, 10C,

§112.16. Science, Grade 5, Adopted 2017: (b) 2A, 2B, 2C, 2D, 2F, 3A, 4, 9A, 9B, 9C, 10A, 10B,

§112.18. Science, Grade 6, Adopted 2017: (b) 2A, 2B, 2C, 2D, 2E, 4A, 12C, 12F,

Name: ______________________

Date: _______________________

Water Pollution Graphing Activity

Amount

Sediment	Fertilizer	Pesticide	Gas & Oil	Toxic Waste

THE MEADOWS CENTER
FOR WATER AND THE ENVIRONMENT

TEXAS STATE UNIVERSITY

TEXAS STREAM TEAM

601 University Drive, San Marcos Texas 78666

512.245.1346 | txstreamteam@txstate.edu | www.JoinStreamTeam.org