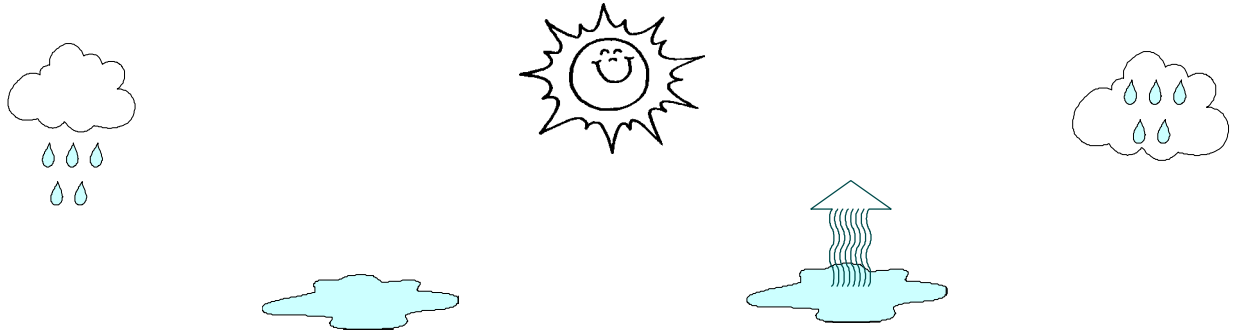
"Water: The Incredible Resource"

4th Grade Lesson

Michigan Farm Bureau Promotion and Education



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4th Grade Lesson – "Water: The Incredible Resource"
Michigan Farm Bureau Promotion and Education Committee

This lesson meets the following content standards for the upper elementary level:

SOCIAL STUDIES

II. Geographic Perspective

Content Standard 2: All students will describe, compare, and explain the locations and characteristics of ecosystems, resources, human adaptation, environmental impact, and the interrelationships among them.
(Human/Environmental interaction)

- 1-2: Describe the location, use, and importance of different kinds of resources and explain how they are created and the consequences of their use.

MATHEMATICS

I. Patterns, Relationships and Functions

Content Standard 1: Students recognize similarities and generalize patterns, use patterns to create models and make predictions, describe the nature of patterns and relationships, and construct representations of mathematical relationships. (Patterns)

- 1-2: Represent and record patterns and relationships in a variety of ways including tables, charts and pictures.

SCIENCE

I. Construct New Scientific and Personal Knowledge

Content Standard 1: All students will ask questions that help them learn about the world; design and conduct investigations using appropriate methodology and technology; learn from books and other sources of information; communicate their findings using appropriate technology; and reconstruct previously learned knowledge. (Constructing New Scientific Knowledge)

- 1-1: Generate reasonable questions about the world based on observation. (*Key concepts:* See Using Scientific Knowledge. *Real-World contexts:* See Using Scientific Knowledge.)

- 1-6: Construct charts and graphs and prepare summaries of observations. (*Key concepts:* Increase, decrease, steady. *Tools:* Graph paper, rulers, crayons. *Real-world contexts:* Examples of simple charts and graphs like those found in a newspaper.)

II. Reflect on the Nature, Adequacy and Connections Across Scientific Knowledge

Content Standard 1: All students will analyze claims for their scientific merit and explain how scientists decide what constitutes scientific knowledge; how science is related to other ways of knowing; how science and technology affect our society; and how people of diverse cultures have contributed to and influenced developments in science. (Reflection on Scientific Knowledge)

- 1-3: Describe ways in which technology is used in everyday life. (*Key concepts:* Provide faster and farther transportation and communication, organize information and solves problems, save time. *Real-world contexts:* Cars, other machines, radios, telephones, computer games, calculators, appliances.)

- 1-4: Develop an awareness of and sensitivity to the natural world. (*Key concepts:* Appreciation of the balance of nature and the effects organisms have on each other, including the effects humans have on the natural world. *Real-world contexts:* See Using Scientific Knowledge.)

Content Standard 5: All students will explain how parts of an ecosystem are related and how they interact; explain how energy is distributed to living things in an ecosystem; investigate and explain how communities of living things change over a period of time; describe how materials cycle through an ecosystem and get reused in the environment; and analyze how humans and the environment interact. (Ecosystems)

- 5-5: Describe positive and negative effects of humans on the environment. (*Key concepts:* Human effects on the environment--garbage, habitat destruction, land management, resource management. *Real-world contexts:* Household wastes, school wastes, waste water treatment, habitat destruction due to community growth, reforestation projects, establishing parks or other green spaces.)

V. Use Scientific Knowledge from the Earth and Space Sciences in Real-World Contexts

Content Standard 2: All students will demonstrate where water is found on earth; describe the characteristics of water and how water moves; and analyze the interaction of human activities with the hydrosphere.
(Hydrosphere)

- 2-2: Trace the path that rain water follows after it falls. (*Key concepts:* Precipitation-rain, clouds, fog, runoff. Flow- downhill, to ocean, underground. Bodies of water- streams, rivers, lakes, oceans. *Real-world contexts:* Examples of water flowing locally, including gutters, drains, streams, wetlands.)

- 2-3: Identify sources of drinking water. (*Key concepts:* Water sources- wells, springs, Great Lakes, rivers. *Real-world contexts:* Examples of local sources of drinking water, including wells, rivers, lakes.)

"Water – The Incredible Resource"
4TH GRADE LESSON
Presented by
Members of Michigan Farm Bureau
Written by: Laurie Isley

Materials/Actions	**Time Allotted**	
	2-5 minutes	Introduction

This lesson will teach you about water quality, water use, and the water cycle.

1. Introduce yourselves and show where you are from (use map or hand). Tell about your farm operation.

2. *Today we are going to talk about water. Water is one of our most important resources. 70 percent of our planet is covered with water. Today we will learn the stages water goes through forming a cycle, the importance of keeping our water clean, and the partnership between agriculture and clean water. All of the water we have now is all we have ever had. That's why it is important to keep it clean.*

Have students get out their scissors.

7-10 minutes

3. **Why do we need water?** – *to drink, to grow plants, for animals, etc.* **How might a farmer use water?** *Irrigation, plant growth, production.* **Where does water come from?** – *rain, rivers, lakes.*

Distribute water cycle worksheet, scissors and gold tab.

Write out the vocabulary words on the board.

I. Water Cycle

A. **What is a cycle?** *A cycle is a recurring sequence of events, or something that happens over and over again.*

B. Major parts in the water cycle include:

1. Precipitation – *In the form of rain, snow and hail comes from clouds.*

2. Surface Water – *The water that is seen on the ground, such as lakes and rivers.*

3. Evaporation – *When water is heated by the sun, it rises as an invisible vapor in the atmosphere.*

Students then cut out the holes from the water worksheet. Cut the blue sheet in a circle and fasten the two sheets together with a gold tab.

Pick up scrap paper and scissors.

Show the picture of Michigan's watershed.

Write the definition of a watershed on the board.

5-7 minutes

Have students split into groups of 4-5. *Note: groups of 4 work best, but we can only have a total of 6 groups.*

Pass out lab sheets. Have the students write on lab sheet as we proceed.

Give each group of students 4 jars half full of water and a bag with a plastic spoon of each of the contaminants. (vinegar, tang, gravel, rocks)

4. Condensation – *As water vapor rises, it cools and eventually condenses. When it condenses it becomes a liquid again. These water particles then collect and form clouds.*

C. **Today we are each going to make our own model of the water cycle**. Students complete the Water Cycle Worksheet. Review the worksheet utilizing given vocabulary words.

D. **What is a watershed?** *From where water begins to flow to where it empties. You are currently in the Traverse Bay watershed.*

1. **Where does the water flow?** (Use the map to show an example.) *Starts with puddles and runs into dicthes, then to the river and ends at the Traverse Bay and Lake Michigan* (insert appropriate watershed by county.)

II. <u>How water gets contaminated</u>

Have you ever seen contaminated water? How did you know? – *It looks dirty* – **How do contaminants get into water?** – *Runoff, pipes, spills*. **Can water be contaminated and look clean?** – *Yes.*

III. <u>Types of water contamination</u>

What is natural contamination? – *Anything that gets in the water not through the actions of man – soil, plants.*

vs.

What is artificial contamination? – *Anything that gets in the water impacted directly by man – runoff from lawns, litter, factory spills, etc.*

Now we are going to do an experiment with contamination. What is an experiment? – *A test to find out what will happen.* Have students make a prediction on the lab sheet about what they think will happen if they shake the jars.

A. Soil Erosion – **Is this a natural or artificial contaminant?** – *Natural.*

1. Rocks – Add a spoonful of the rocks to a jar and place the lid back on the jar.

2. Sand – Add a spoonful of the gravel to the jar and place the lid back on the jar. Shake both jars for 30 seconds. Observe the jars.

Ask students to write on the lab sheet the results of each jar.
Which is cleaner? Discuss how this type of action occurs naturally - soil erosion , weathering, etc. **What might some other natural contaminates be?** – *plant materials, algae.* **Have you seen any in the water?**

B. Other Contaminants – **Is this a natural or artificial contaminant?** – *Artificial*
(Hold up Tang - This is an example of an artificial contaminant)

1. Tang – Add a spoonful of tang to one jar and place the lid on the jar. After Shaking the jar.– **What do you see?** – *the Tang* – **Is that bad?** – n*o, because Tang is not harmful in grass, but if it was in the lake in large amounts, that would be a problem. However, too much of a good thing can become a contaminant.* The Tang may represent contaminates such as residue from processing plants, or runoff from livestock.

2. Vinegar – Add a spoonful of vinegar to the jar and place the lid on the jar. Shake both jars for 30 seconds.
Observe – **Can you see the vinegar?** – *no*– **Can you smell it? Is that harmful?** –*Could be* The vinegar may represent chemicals, such as sulfur.
Ask students to complete lab sheet for this experiment.

2 minutes

C. Review how contaminants get into the water – runoff, drains, ditches.
What happens to the water after it runs in the ditch? *Goes into the ground, flows to the stream and or lake – through the watershed.*
Refer to the watershed diagram to fully execute the interconnection of the water. Show students the e watershed and how all of the rivers and streams eventually lead to the bay.
How do we measure how much of a contaminant it takes to be harmful? Let's do an activity together to find out.

Pass out a plastic tray and an eye dropper to each group. Ask students to look at the back of the lab sheet for this experiment.

Be sure 3 large wells on each tray are filled with water.

15 minutes

IV. <u>Measuring Contamination – parts per million (ppm)</u>

A. **How is contamination measured?** – *Testing water.*

B. Parts per million (ppm) is the method used to determine if a contaminant is at a dangerous level.
What is a part per million? – *It is comparable to: one penny in $10,000 or one second in 12 days of your life.*

Instruct students to place the plastic tray over a half sheet of white paper.

Write the answers on the large, laminated worksheet to assist students in completion.

Walk around and help students with the procedure. *Note: color may disappear at different cups depending on how well students rinse the dropper.*

C. You will see nine indentations on this tray, and five large ones (we will call these wells). The first two wells are for cleaning the dropper. The third well must be keep clean and will be used to dilute the coloring.

1. **Presenters** add 3 drops of food coloring to the first compartment. This = 100% concentration. Have students describe the color and write their observation on the lab sheet. Make sure they make detailed descriptions, such as burgundy and pink, because each cup will be a different shade red.

2. Take one drop from the first compartment and place it in the second. Rinse the dropper in the water in the large wells and then add 9 drops of water to that compartment. <u>Be sure the students use clean water</u>. Record the observation and the percent of concentration on the lab sheet, which is 1/10.

3. Proceed like this to the ninth cup by taking one drop from the preceding compartment and placing it in the next. Clean the dropper in one of the first two wells, and add 9 clean drops of water to the compartment from the third well.

4. Complete worksheet questions with the students.

5. Remind students that parts per million is a method used to measure contamination. **Can you see the food coloring in the last cup?** – *no* – **Is it still there?** – *yes* – *Even though you cannot see a contaminant, it can still be present.*

D. Parts per million is a very small amount. However, depending on which chemicals we are dealing with, it still can be dangerous to have small amounts of chemicals in our water, even though we cannot see them.

2-3 minutes

V. <u>How agriculture helps keep water clean.</u>

So, how do we keep contaminates from getting into the water supply? – *Well, farmers have to take a lot of steps.*
Why is water important to agriculture? What do farmers do to keep water clean? – *Because water is so important to agriculture, farmers are stewards (or caretakers) of the land and water.*

2-3 minutes

Show picture of filter strip.

A. Waste management plans for livestock are used by farmers to be sure their water supply is kept safe. These plans may include manure pits or holding and spreading manure only at certain times. They have to make plans for when and where the manure is spread.

B. Filter strips along rivers and ditches are used to trap contaminants that may be in runoff.

C. Leave residue on soil (cover crops) – conservation tillage is used to help soil stay in place after the crop leaves the field. This keeps bare soil from running into the river. Explain the value of cover crops using the pictures provided in the kit.

Show an example of a GPS map to the students.

D. Use minimal amounts of crop protectants (fertilizers) - only enough to keep crops healthy.

E. Use technology, such as GPS(Global Positioning System) maps, to gather accurate information regarding the needs of the crop and soil.

2 minutes

VI. Summary

Today we have talked with you about the importance of clean water and the water cycle.

1. Let's review the types of contamination
   a. Natural
   b. Artificial

2. **Where does contamination come from?** – *Humans, industry, etc.*

3. **How can contamination be measured?** – *part per million.*

4. **What can you do to keep water clean?** – *place litter in the trash, don't dump harmful things on the ground, etc.*

5. **How do farmers keep water clean?** – *by using conservation tillage, management plans and technology.*

6. **Why is all of this information so important?** – *As we discussed at the beginning of the lesson, we cannot make any more clean water.*

Add blue food coloring to a jug of water.

2-3 minutes

Have another container to pour water into.

We would now like to conduct a demonstration to show how much water we actually have to use.

VII. Why water is important – Jug Demonstration

1. This gallon of water represents all the water on earth.

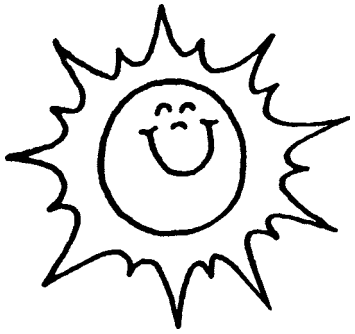
2. We will remove 1/4 cup from the jug, this 1/4 represents fresh water. The water remaining in the jug represents all ocean/salt water, and cannot be used for humans, plants or animals.

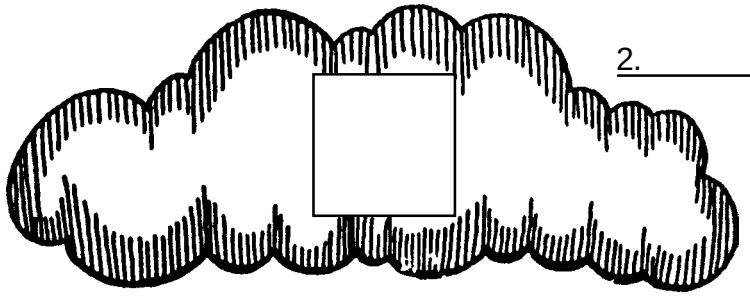
3. Of this 1/4 cup, 3 tablespoons represents the water locked away in glaciers and polar ice caps. Most of the remaining water represents the groundwater that we cannot reach below the earth's surface, and surface water in lakes and rivers.

4. Ask for a volunteer.. Place 2 drops in his/her hand. These two drops represent all of the fresh water available for us to use on earth. Everyone needs water – plants,

Name_____

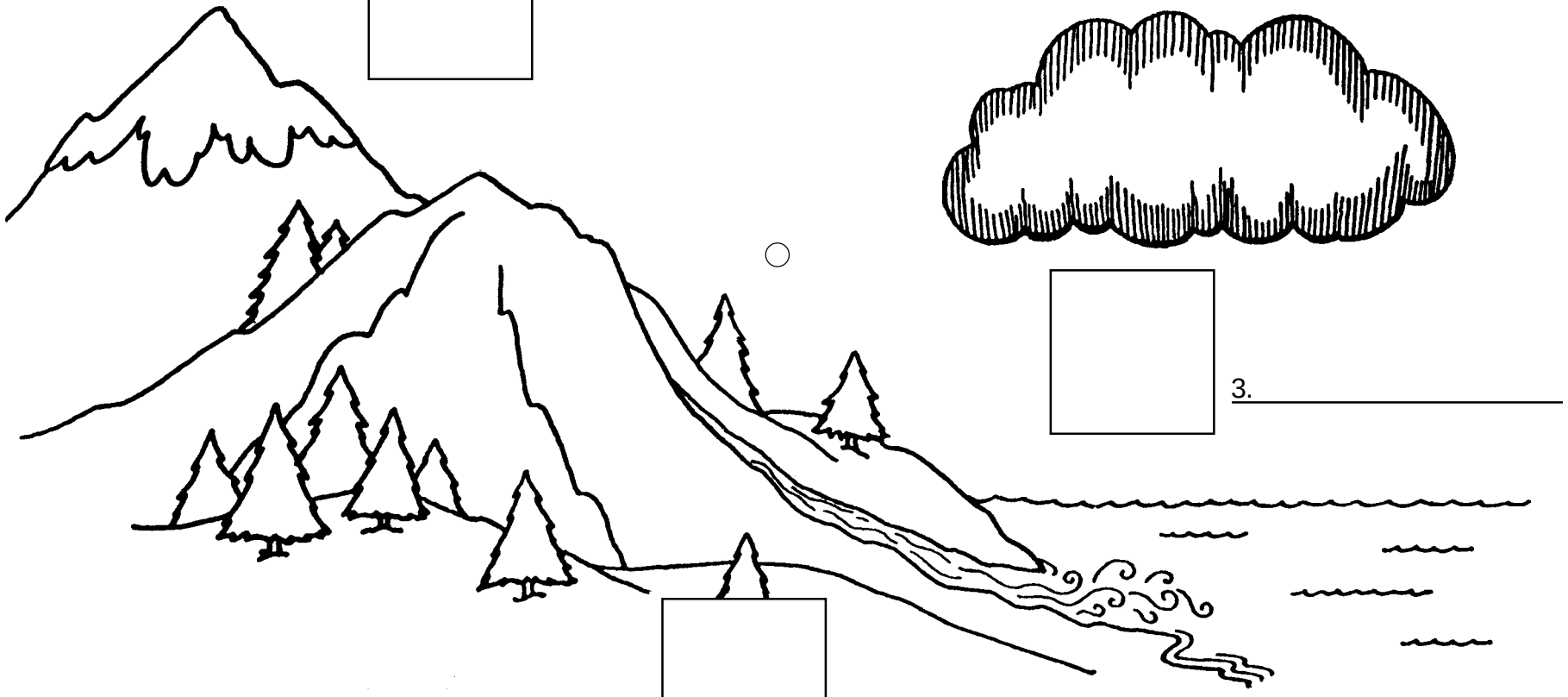
The Water Cycle





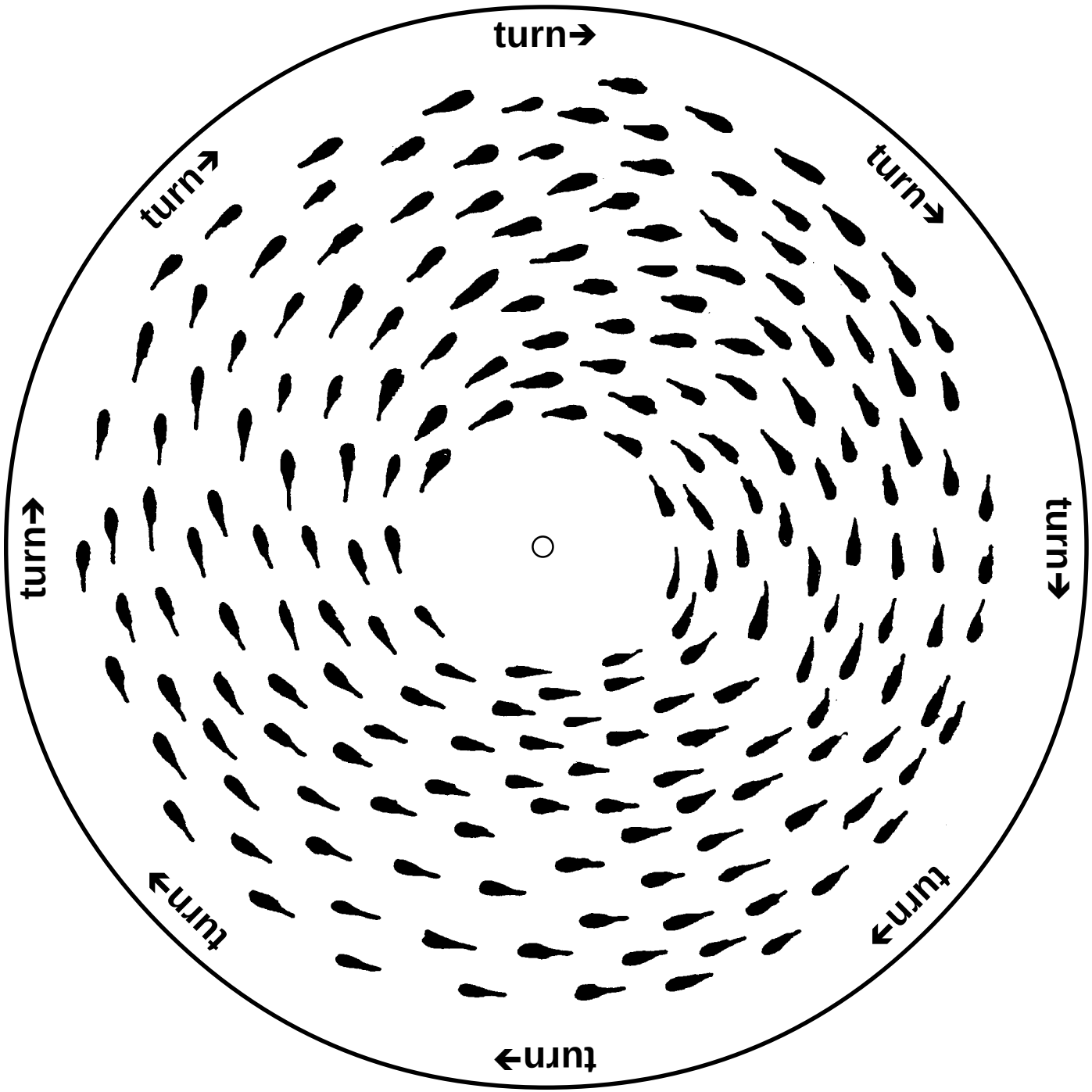
2. _____

1. _____



3. _____

4. _____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Parts Per Million (PPM)
Data Sheet

Name: _____

CUP NUMBER	COLOR	CONCENTRATION

1. When did the color disappear? Cup# _____

2. Which cup had 1 part per million (ppm) of food coloring? _____

3. What happened to the food coloring? _____

_____

_____

4. Is there still food coloring in cup #7? _____

Data Sheet for Parts Per Million (PPM)

Answer Sheet

CUP NUMBER	COLOR	CONCENTRATION
1		100% or 1/1
2		10% or 1/10
3		1% or 1/100
4		.1% or 1/1,000
5		.01% or 1/10,000
6		.001% or 1/100,000
7		.0001% or 1/1,000,000
8		.00001% or 1/10,000,000
9		.000001% or 1/100,000,000

1. When did the color disappear? Cup# (answers may vary from cup 5-7)

2. Which cup had 1 part per million (ppm) of food coloring? 7

3. What happened to the food coloring? The solution was diluted in the water until there was too little to see.

4. Is there still food coloring in cup #7? Yes, there is too little to see though.

Name:_____

Types of Water Contamination

Natural Contaminates: Rocks and Sand

What do you think will happen when we shake the jars? _____

_____

What is different between the two jars? _____

_____

What can we conclude from this? _____

_____

_____

Artificial Contaminates: Tang and Vinegar

What do you think will happen when we shake the jars? _____

_____

What is different between the two jars? _____

_____

What can we conclude from this? _____

_____

_____

"Water: The Incredible Resource"
4th Grade Kit Packing List

Based on 35 students per class
Each kit is designed for conducting two presentations**.**

Need:

- Water cycle activity sheet 70 copies
- Blue water cycle activity sheet 70 copies
- Lab sheets 70 copies
- White paper (half sheets)
- Gold claps for water cycle activity sheets
- Plastic Trays
- Watershed map
- Conservation pictures
- Global Positioning System map
- Jars with lids
- Jars with vinegar
- 6 bags of: tang
  stone
  sand
- Plastic spoons
- Containers of food coloring one red and one blue
- Gallon jug
- Measuring cup
- Eye droppers
- Laminated pie chart of sources of contaminants
- Laminated lab sheet for demonstration
- Dry erase marker
- ¼ measuring cup
- Tablespoon
- Roll of paper towels