

## **Water Quality Lesson Plan**

**Objective:** Students will learn about water quality and how human activities can positively or negatively affect it.

**Standards:** K-ESS3-3, G.8.K.2, G.9.K.1, G.9.1.1, 2-ESS2-2, G.9.2.1, G.9.3.1, G.9.4.1, 5-ESS3-1, EVS1-ETS1-1, EVS-ESS2-5, 6-ESS3-3

### **Introduction**

It's important to learn about water quality to see if any actions need to be taken to improve it.

Water quality experts inspect and measure water in different river accesses and streams along the Buffalo River. They look at the physical, chemical, and biological characteristics of the water.

**Audience:** 5<sup>th</sup> grade students

This lesson can be adapted to other ages by simplifying or using more complex vocabulary, using more visuals, and using alternate activities.

**Duration:** 45 minutes

**Vocabulary:** water quality, physical characteristics, chemical characteristics, biological characteristics, macroinvertebrates, point source solution, non-point source pollution

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### **Materials**

Physical Characteristics Activity: 3-5 water samples of different areas in Arkansas

- Survey sheet from water quality kit
- Pencils

Chemical Characteristics Activity: Water Quality Kit (can be provided by Arkansas Game and Fish Commission)

- Survey sheet from water quality kit
- Pencils

Biological Characteristics Activity:

- Macroinvertebrate roll (mat with invertebrates in different waters)
- Survey sheet from water quality kit
- Pencils

## **Procedure**

**Warm up:** Show students 4 types of bottles with water in them one with tea, one with tap water, one with water and dirt, and one with rubbing alcohol.

Have students discuss which one they think is the best to drink based on what they see and why

After students make their decision, show them the bar graph with their results

Inform students what's in the water bottles.

What you see doesn't tell you all you need to know about what's in the bottles.

Why would we want to know what's in our water? —because water affects us all, animals and plants depend on water

## **Main Lesson:**

- What is water quality? It describes the condition of the water (what's in the water)

It's important to check it because our health and all wildlife and plants need it.

We need clean drinking water, if the water quality is good it takes less money for water companies to make it drinkable.

Different animals live in or near water and depend on it to eat and drink from it.

Plants need water to continue to grow.

- What is measured in water quality?

Physical Characteristics - what we can determine using our 5 senses

Chemical Characteristics - What the water made up of

Biological Characteristics- living organisms found in water

- Physical Characteristics

Temperature - too hot or too cold is not good. An ideal range- 50 - 77 degrees F.

Affects physical, chemical and biological characteristics of water

Animals have a preferred temperature to survive and reproduce.

Affects water solubility, how fast or slow materials dissolve. For example, oxygen and carbon dioxide (as temperature decreases, O<sub>2</sub> and CO<sub>2</sub> increases).

Chemical reactions increase as temperature increases. For example, pollutants are more toxic at higher temperatures.

Higher temperatures decompose living things which reduces oxygen.

Turbidity is how clear or cloudy the water is – more clear is better.

Pure water is colorless - units measured from 0 (clear) to 70.

Taste and odor of drinking water should not have a strong smell or odor for public use.

Electrical conductivity is the ability for water to conduct an electric current

Solids, which are micro plastics or trash, can be found in solution (cannot be filtered) or in suspension (can be filtered) - 500ppm is the limit.

- Chemical Characteristics

High levels of dissolved oxygen are indicators of good water quality. Cooler temperatures = higher dissolved oxygen levels.

Organisms in water need a certain amount of oxygen for survival.

PH is how acidic or basic the water is (ideal range is 6-8 - ideal is pH of 7). Organisms can die if pH changes.

Low pH (more acidic) can lead to metals going into the water which can cause fish deformities.

High pH (more basic) is more toxic due to the ammonia in water.

The alkalinity is the ability of water to neutralize acids and bases to keep a stable pH.

Nitrates builds up from organic decay.

Phosphates comes from weathering of rocks. High levels can over-stimulate growth of plants in water. Much of it found in bacteria and algae.

- Biological Characteristics

The presence of macroinvertebrates in water are good indicators of water quality

Presence or lack of:

Macroinvertebrates

Bacteria

Algae

## Viruses

Macroinvertebrates chart: Based on which macroinvertebrates are found in water we can dictate if the water quality is good. More sensitive macroinvertebrates indicate good water quality, while more tolerant macroinvertebrates indicate poor water quality.

Now that we've looked at what characteristics dictate water quality, we will look at water pollution.

- Two types of pollution:

Point source - pollution traced to a single source. Examples: pipes, ditches, channels, sewers, tunnels.

Non-point source – pollution that comes from a bigger area (less concentrated) and depends on rain or wind to move the pollutants. Example: urban areas, farming communities.

Human activities that affect water quality lead to excess sediment found in water.

Farming, fertilizer, mining, manufacturing, city runoff, septic systems, wastewater treatment plants and the clearcutting of trees all leads to water quality issues.

- What can you do to help the water quality?
  - Plant native trees, grass, and wildflowers
  - Fence livestock
  - Preserve wetlands
  - Pick up trash

## Activities:

Teacher can choose one of the following activities. Each activity takes about 30-45 minutes.

After the activity students will share their finding by sharing with the class.

Activity 1: Students will examine physical characteristics found in water samples given to determine if water quality is good or poor. Students will work in groups to rate the physical characteristics of the water in the water bottle they are given and figure out the condition of the water in 3-5 different water samples.

- Temperature
- Turbidity
- Color
- Taste and odor
- Electrical Conductivity
- Solids

Activity 2: Students will examine chemical characteristics in water samples given to determine if water quality is good or poor. Students will work in groups to test chemical characteristics in water.

Using water quality kit students will determine the following:

- Dissolved Oxygen
- PH
- Alkalinity
- Nitrates
- Phosphates

Activity 3: Students will examine biological characteristics (macroinvertebrates found) to determine if water quality is good or poor. Students will determine if the water quality is good or not based on macroinvertebrates found in certain sections of the macroinvertebrates roll. Teacher will roll out macroinvertebrate on the floor and will have student count macroinvertebrates in different sections.