The Mystery of the Wonder Wetlands

Students engage with tools that sample water quality

This activity satisfies one of the required JNMN lessons needed to complete the Junior Water Science Master Badge.

WATER MASTER

Appropriate Ages 8-12

Expected Time: 50 min

Learning Objectives:

Students will understand how biologists use scientific ideas to measure the quality of a natural habitat and its ability to support and sustain native life.

Students will be able to describe the importance of water quality and identify potential hazards that can affect the quality of water in a habitat.

NE Science Standards:

Grades 3-6

SC.3.7.2.D

SC.4.6.3.C

SC.5.8.2.B

SC.5.3.1.D

SC.5.13.4.C

SC.6.9.3.A

Did You Know?

Wetland Restoration Projects do various things, improve habitats for wildlife, increase flood protection, or improve water quality.

Nebraska contains more acres of wetlands than any surrounding state. These wetlands are very diverse and dynamic and include marshes, lakes, river and stream backwaters, oxbows, wet meadows, fens, forested swamps, and seeps.

BEFORE YOU TEACH

BACKGROUND KNOWLEDGE

Wetlands are places where the soil is soaked with water at least some of the time, creating muddy or flooded conditions, such as marshes, lakes, wet meadows, forested swamps and oxbows along rivers. Wetlands are very productive habitats and are move valuable in their natural state. Acre for acre, there is more life in a health wetland than almost any other kind of habitat. These productive places support huge numbers of insects, fish, birds, reptiles and amphibians and more.
Source:Nebraska Game & Parks

VOCABULARY

Acid: chemical that tastes sour and forms a water solution which turns blue litmus paper red -pH levels 0-6

Base: a base is a substance that can neutralize the acid - pH levels 8-14

Wetland: area where all year or for varying periods of time, water covers the soil or is near the surface.

Water Quality: The measurement of the cleanliness and healthiness of water.

Materials And Prep:

Universal pH paper
Tapwater poster pH Cl Scale
Vinegar
Baking Soda
Dixie Cups
pH Tracer
Sampling cup on pole
Mystery Wetlands Story
25 Worksheets
LaMotte Drinking Water Strips
Test tubes
Tablets
Color sliding scales
Bucket

Engage: 5 min

Read the provided "Wonder Wetland Mystery" to the class. The story will walk your class through a wetland that has been showing signs of decay. In our 'Wonder Wetland,' plants have struggled to grow and animals have been losing food and habitat. Today they will be acting as wetland biologists to try and solve the mystery of the Wonder Wetlands! Have students start by going through the story and trying to find clues about what might be wrong with the wetlands. Once students notice some of the clues from the story, have them think about what could be affecting the ecosystem. Students should discover that the quality of water could be one of the factors affecting the health of the ecosystem.

JUNIOR NEBRASKA MASTER NATURALIST

Explore: 10 min

After students discover that water quality could be affecting the ecosystem, ask them if they have any ideas how we could find out if the water was the problem. pH is one way scientists can tell if water is healthy for an ecosystem. Define pH to be the number of hydrogen ions that water presents with once mixed with other elements in its environment. Split students into groups and instruct them to use litmus paper tests to test the pH of three different water samples. One sample should be acidic (vinegar), one should be basic (baking soda dissolved in water) and one should be neutral (pure water). The students should test the pH of each sample and record the level on their "Wonder Wetlands Mystery" worksheet.

Display the Tracer PockeTester used by Environmental Scientists, and explain that this device is pH Meter (tester). In the tip of the PockeTester are electrodes that sense the number of Hydrogen ions. The resulting pH represents a spectrum of numbers that indicate the character of the liquid as being basic, neutral or acidic. The extent of the water quality problem gets worse when the number recorded is several places away from 7 (pure water). For example a pH of 3 would be worse for the water quality than a pH of 5. When we compare the pH of liquids that are familiar to us with the corresponding pH from a water sample, we quickly realize the extent of the water quality problem.

Explain: 15 min

Once all groups have recorded the pH of the three samples, have students consult the pH spectrum to determine their pH numbers, and then discuss their findings. They should notice that one sample is acidic, one is basic, and one is neutral. Ask them what they think is best for watering plants and feeding animals - have them think about what we drink at home! The neutral sample is the 'healthiest' for our ecosystems. If you would like, perform a class demonstration to show students that when you mix an acid and a base it becomes neutral.

Extend: 10 min

Give each group a fourth 'mystery sample' which should be slightly acidic, but not as acidic as the vinegar. You can achieve this by diluting one part vinegar and one part water. Tell students that this water sample came from the "Wonder Wetlands" from the story. By testing the pH of the water we can see if it is neutral enough to support the plants and animals in the ecosystem. They should record that the water sample is not neutral and is more acidic than it should be. Ask students what they think could have caused the wetlands pH to change. Ask them where they would look first for clues? A water detective needs several samples to make an educated claim. Show them the pole with the water sample cup attached and ask them how it might be used to help solve their problem. Have them explain what the sampling process might look like. How many places would they collect a water sample and test the pH strip? Where would they sample? Maybe at different locations? For 5th and 5th grade, encourage students to imagine that they are driving in a truck on a road upstream from the wetland, they get out and sample often, but the pH samples remain the same. They have to keep looking until they find the section of water where the pH changes. Put them in the driver's seat, where do they go from here? Locations for a change in pH can be targeted using software. Water Scientists who use mapping software download the watershed map, and then on the watershed layer place the layer of the city, so that they can see both the Wonder Wetland's watershed on the map and the city. This helps scientists target as they search and sample upstream. They can use this software to visually pinpoint manufacturing plants or other buildings whose waste might be polluting the wetland. In some cities, Water Scientists have water discharge maps that can make searching even easier.

Evaluate: 5 min

Using their worksheets, students draw a quick sketch of the wetland attached to a stream that was then connected to a river and place dots throughout the drawing where they would conduct water sampling. Then write a conclusion that includes what the pH of the Wonder Wetland water sample is and why they think the ecosystem might be struggling.

HANDS ON EXTENSION

IN THE LAB:

Find out what happens when you affect the pH of the water you give your plants. Start with three separate plants, one should be watered with neutral water, one watered with an acid, and one watered with a base. Have students observe what happens to each plant after changing the pH of their water.

OR:

Direct students to bring drinking water samples from their homes in a ziploc baggie. Test and evaluate the drinking water samples. If their home's drinking water could be improved, there is a solution, the Brita Water Filtration Pitcher. The educator should come to the class with two drinking water samples, one from the tap and one sample from the Brita Filtration Pitcher. Are there significant differences? You can request the drinking water test strips and Brita Filtration Pitcher from the Junior Master Naturalist Coordinator.

OR:

Insert Chlorine tablet DPD1R into a clean test tube that contains 5 mL of a water sample from a pool. Cap and mix until the tablet disintegrates. Insert test tube into the Octa-Slide 2 Viewer. Have a volunteer do the color match then determine whether the water is under chlorinated, over chlorinated or just right.

IN THE FIELD:

Head out to a local water source where you can test the water quality. A lake, pond, or river nearby will allow you to obtain a sample where students can test the pH, nitrates, dissolved oxygen and more! While there, cleaning up trash and pollution from our local ecosystems will ensure our habitats remain healthy for plants, animals and us! Contact the Junior Master Naturalist Coordinator for testing materials.

*COMPLETING ANY ACTIVITY FROM THIS SECTION WILL COUNT AS YOUR SECOND ACTIVITY REQUIREMENT FOR THE ZOOLOGY MASTER BADGE.

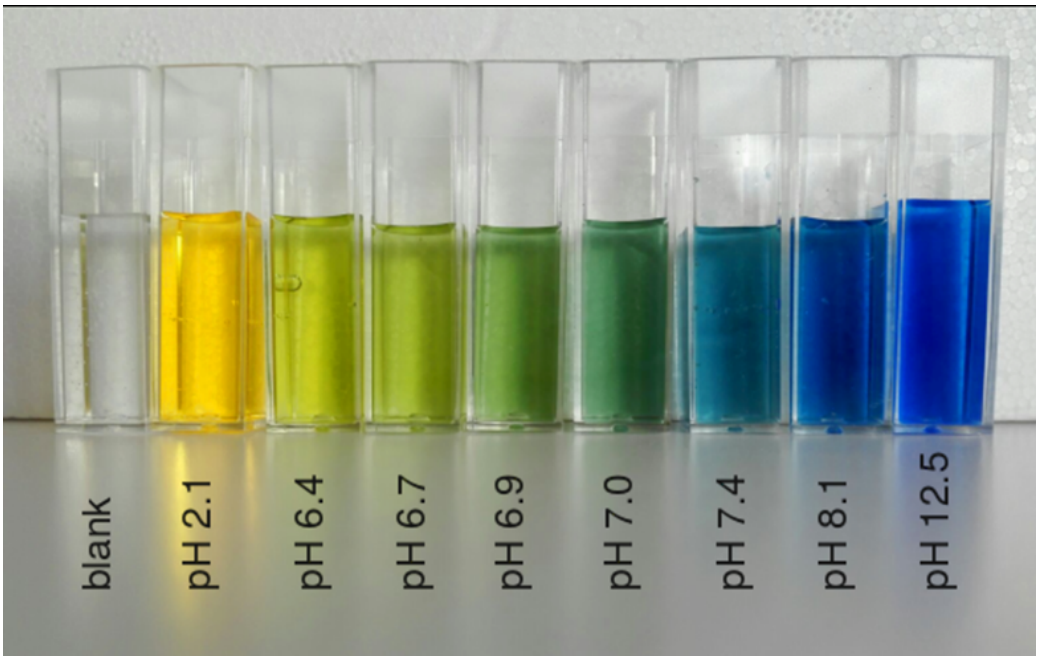
WONDER WETLAND MYSTERY

Not far from the tall grass growing alongside the hiking trail, I hear a chorus frog, it sounds like moving fingers down the length of a comb, brrrllllp...brrrllllp... Not just one, but several frogs - oops I almost got my shoes wet. There's water all through this part of the wetland, if not on top of the land, just inches below it. This land is flat and lies far beneath the nearby hills and when I look across the wetland, it's flat as a pancake except for a few trees here and there, but mostly full of grasses that are greening up, a big change from the yellow color of winter. I've heard that when it floods down here, this area holds a lot of water long enough for the mosquitoes to go nuts. Then I hear the Leopard Frog, its call sounds like a series of kisses, mwah, mwah..I look and look but can't spot him because just as I get close, he goes silent. There's lots of sounds in the wetland today, I hear the trill of a Red-Winged Blackbird in the air, a sure sign of Spring, the females are finding a place to build their basket nests in the middle of the cattails. I see that the Painted Turtles are out sunning themselves on a log and when they hear my footsteps, eight small ducks immediately take flight as the turtles slip into the safety of water. I jump, frightened by their whoosh.

The ground is getting muddy again, so I'm careful where I set my feet. I see animal tracks, some from what looks to me like a mink and several raccoon tracks. I look up again, hoping to see the mink, but there's only butterflies, plants and grasses everywhere. Twisted around the branches of a bush, spreading out leaves to steal the sunlight, there's an occasional grapevine blocking my view. Oh, cool some of those tiny duckweed plants are floating on the surface, wait, that's a new pond. Then I see a mess of dead limbs blocking the stream and I know right away it was the work of beavers. Cattails and reeds border the pond, some are tall shoots of green, but some are brown from last Fall with their fluffy seeds poking out from the oval shaped 'cat's tail'.

As I walk farther, I see a marsh, full of water, but never deeper than 3 feet. It's about the length of a football field. I walk towards the edge of the water and come across a dead fish smell, "yuck, there's its white belly floating on top of the water. I wonder what happened and look to see whether it has a hook in its mouth. Oh, there's another one, and three more rotting on the edge of the marsh. That's strange, why doesn't the mink and raccoon eat these, it would be such an easy meal? Something... doesn't seem right. As I poke around more, I notice 5 small trees alongside the marsh whose leaves are wilted and dying, but it's not just that. What I don't see is also worrying me, usually, catching dragonflies in midair, I see Tree Swallows zipping up and down and sideways, but not today. There's little life here, I come across another dead fish floating near the bank. What is going on?

WONDER WETLAND MYSTERY WORKSHEET



Cup #1 _____ Cup #2 _____ Cup #3_____

Wonder Wetlands Sample Cup _____