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Mystery Creek

Abstract: This lesson is designed to introduce the Riparian Ecosystems unit. It is intended to spark students' interest and get them out into nature observing their surroundings. By sparking student interest they will come up with questions about Riparian Ecosystems which will be answered throughout the unit. It is also created as a tool to make the teacher aware of what the students are curious about.

Grade Level: 4th

Utah State Core Curriculum Standards:

Benchmark: Utah has diverse plant and animal life that is adapted to and interacts in areas that can be described as wetlands, forests, and deserts. The characteristics of the wetlands, forests, and deserts influence which plants and animals survive best there. Living and nonliving things in these areas are classified based on physical features.

Standard 5: Students will understand the physical characteristics of Utah's wetlands, forests, and deserts and identify common organisms for each environment.

Objective 1: Describe the physical characteristics of Utah's wetlands, forests, and deserts.

Instructional Time: 35 minutes in class, approximately 20-30 for the mini-field trip (time may vary depending on driving distance)

Materials: KWL worksheet, chart paper, science journals, magnifying glasses

Terminology: Riparian: Of, on, or relating to the banks of a natural course of water
Ecosystem: An ecological community together with its environment, functioning as a unit

Intended Learning Outcomes:

1. Use science process and thinking skills
2. Manifest scientific attitudes and interests
3. Understand scientific concepts and principles

Background Information:

A Riparian area is defined as the narrow strip of land adjacent to a body of water; specifically, creeks and rivers. The area consists of various plants, animals, rocks, and minerals. Riparian ecosystems are a vital component of the health of the body of water. If the Riparian ecosystem is healthy it performs many functions such as: stabilizing the banks, storing and releasing water, controlling erosion, filtering sediment, and improving the quality of water. They also provide

shelter and food for many animals. Utah is an area rich in riparian ecosystems because of our many creeks and rivers.

Invitation to Learn:

The students will be drawn into the lesson by the mini field trip to the creek. They will not be told the exact purpose of the visit at first, just that they are going to be making observations about the environment around them. This will excite the students because the field trip is a mystery. They will be told the visit has a special purpose and they need to be very observant scientists, taking in everything around them, but they can't know until the bus ride home.

Prior Knowledge Assessment:

The purpose of this lesson and field trip is to find out what students know about riparian ecosystems. They may know about the banks of creeks and rivers, but not that it's called a riparian ecosystem or how crucial it actually is. The questions that they come up with will drive instruction for the rest of the unit.

Procedures:

- Ask students to gather their science journals because they are going on a mystery field trip
- Do not tell students anything about where they are going, just that they need to have their science caps on and be ready to observe
- On the bus ride to Emigration Creek (or walk if it's within walking distance) tell students that they are going to a very special place that they have probably been to many times before, but today it is very different because they are going to pay special attention to the banks of the creek. They will have microscopes to get a closer look at organisms on the banks if they need them
- Once at the creek give students approximately 15 minutes to walk around and write/draw what they observe and be thinking of questions that they have about what they see
- Once back in the classroom give the students 5 minutes to write down a reflection of what they saw and any further questions they may have that they didn't get to write down at the fieldtrip
- Discuss what students observed at the mini-field trip – write on the board what students observe
- Discuss with students what they thought was so unique and special about the location
- Ask if any students can tell you what an ecosystem is (explain if necessary)
- Tell the students that where they just were is a riparian ecosystem
- Define riparian for the students and tell them that they most likely have been in them many times and just didn't know it
- Pass out a KWL sheet to each student and have your own on chart paper to fill out as a class
- Give students 3 minutes to fill out the K and W portions of the KWL sheet
- Make a class KWL sheet to be posted on the walls (the W portion is most important as it will guide the rest of the lessons in the unit)
- Tell the students that for the next two weeks they will be learning all about riparian ecosystems and the questions they came up with will be answered

- Explain that over the next two weeks as they learn new things about riparian ecosystems they need to be recording those facts in the L column
- It needs to be emphasized to the students that the following two weeks are going to be filled with experiments and discovery about the riparian ecosystems and that another field trip to a different location will take place (this should get students especially excited)

Adaptations and Modifications for Special Learning Needs:

Students with difficulties writing ideas for one reason or another will be allowed to illustrate what they see on the field trip. Students who are ELL can still participate in all activities on the field trip. These students will also be allowed to express observations through illustrations. Students with physical handicaps (wheelchairs especially) will have special assistance in getting to the banks of the creek. If this is the case a spot in the creek that is easily accessible by wheelchair will be chosen.

Assessment:

Student journals will be read by the teacher for depth of questions and detail in observation. KWL sheets will also be read for depth of questions. The following rubric will be used:

You Got It!	Almost There	Needs Work
5+ in depth questions are present and reflect what was observed. 7+ detailed observations made	At least 4 questions are present based on what was observed, but don't reflect a lot of deep thought. 4-6 somewhat detailed observations made	Very few questions present and they don't reflect deep thinking Observations are vague

References:

<http://bcn.boulder.co.us/basin/learning/ecology.html>
http://www.blm.gov/education/LearningLandscapes/teachers/ecosystems_riparian.html
<http://en.wikipedia.org/wiki/Riparian>
<http://biology.usgs.gov/s+t/noframe/m6290.htm>

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Mini-unit Lesson Plan

Reconnaissance in the Riparian Zone

Abstract: This lesson will explain the characteristics of riparian zones and how natural and human influences affect them. Students will learn to make observations and take samples of the riparian zone along the Jordan River.

Grade Level: Fourth Grade.

Utah State Core Standard V: Students will understand the physical characteristics of Utah's wetlands, forests, and deserts and identify common organisms for each environment.

Objective 1: Describe the physical characteristics of Utah's wetlands, forests, and deserts.

- Describe Utah's wetlands (e.g., river, lake, stream, and marsh areas where water is a major feature of the environment) forests (e.g., oak, pine, aspen, juniper areas where trees are a major feature of the environment), and deserts (e.g., areas where the lack of water provided an environment where plants needing little water are a major feature of the environment).
- Locate examples of areas that have characteristics of wetlands, forests, or deserts in Utah.

Science Benchmark: Utah has diverse plant and animal life that is adapted to and interacts in area that can be described as wetlands, forests, and deserts. The characteristics of the wetlands, forests, and deserts influence which plants and animals survive best there. Living and nonliving things in these areas are classified based on physical features.

Instructional Time: The lesson takes place over two days. 1st day: 45 minute lesson on riparian zones and to set up hypothesis. 2nd day: 60 minutes to gather data in the field and evaluate results.

Materials:

- Flagging
- Tape measure
- Worksheet
- Clipboards

Terminology/Key Vocabulary:

- Riparian Zone: A green section of life along side a stream or river.
- Aquatic Zone: The stream area.
- Water table: The top of the groundwater.
- Greenline: The first plants you encounter as you move away from the water.
- Grasses: Made up of hollow stems that are jointed and leaves with parallel veins.
- Sedges: Consist of solid triangular stems with no joints.
- Forbs: These have broad leaves with net-like veins.
- Shrubs: These have woody stems and stay alive year round.

- Canopy: The overhead area covered by trees or branches.

Intended Learning Outcomes:

- Use Science Process and Thinking Skills.
- Manifest Scientific Attitudes and Interests.
- Understand Science Concepts and Principles.
- Communicate Effectively Using Science Language and Reasoning.

Background Information:

A riparian zone is a combination of vegetation, which can change greatly from place to place. Riparian vegetation along a desert stream may be sparse while the vegetation next to a mountain stream may be tall and lush. The riparian zone is critical to the health of all streams and their immediate environments. It sits between the aquatic and upland zones and without it, these zones would be negatively affected.

The riparian zone is wetter than the upland zone because of its susceptibility to flooding and its close proximity to the water table. Riparian vegetation contributes shade, food and shelter for aquatic organisms. It also provides homes to many animals that move between land and water, such as amphibians and waterfowl. Riparian vegetation reduces erosion and controls runoff to the stream, as does vegetation in the upland zone. The riparian zone simulates a sponge by soaking up water as it runs off the land and then gradually releases it back into the stream.

The riparian zone usually has more varieties of species than other zones. Plants are thicker and display a greater variety of shape and height. Plants such as sedges and rushes are not generally found in the upland zone because they need a lot of water. Sagebrush on the other hand cannot tolerate the riparian zone because the environment is too wet. Emergents are found only in the aquatic zone and grow up through the water exposing their leaves on the surface.

Riparian zones make up less than 3% of Utah's land area, yet 75% of the 360 bird species found in the state depend on these areas for part of their life cycle. The cottonwood/willow forest is a type of riparian zone predominant in Utah. The cottonwoods create a tall canopy while the willows form a thick understory. Other types of riparian vegetation can be found in the many landscapes of Utah. Salt grass and cattail are common in western salt marshes while alkali bulrush and coyote willow are found in sagebrush country. You'll likely discover Subalpine fir and Engelman spruce in high mountain environments.

Water supply is the major component that controls the growth of riparian vegetation.

Floodwaters transport nutrients, sediment and new seeds from upstream. They can also wipe out larger, established vegetation allowing new seedlings to grow. In contrast to floods, groundwater supplies a constant source of water for the stream and riparian zone. The closer you get to the stream, the closer the water table is to the surface of the soil. Groundwater comes to the surface at the edge of the stream. Different soils in a riparian zone influence the amount of water and nutrients available. Organic-rich soil holds water and makes available large amounts of nutrients to plants without releasing them to the water.

Human activities can and have had a negative influence on riparian zones and mitigate its value for both the ecosystem and people. Some of the negative consequences of human interaction with riparian areas can be linked to such things as road building, where oil and other pollutants are introduced into the stream. Farmers clear riparian zones resulting in erosion and loss of farmland during floods. Allowing cattle to overgraze in riparian areas can also result in increased erosion and the introduction of fecal coliform bacteria into the stream.

We should care about riparian zones because its vegetation provides erosion control and filters out sediment from runoff that reduces turbidity levels in the stream. They also supply water to underground aquifers. Riparian zones control floodwater by absorbing runoff and then releasing it over time. Riparian zones concentrate water and nutrients from the stream and adjacent upland zones resulting in thick vegetation that provides more opportunities for organisms to survive.

Invitation to Learn: The teacher will review with the students what a riparian zone is based on their experience at Emmigration Creek and what purpose(s) it provides. What kind of vegetation might you find in a riparian zone? Is the same vegetation found in different Utah biomes along a riparian habitat? The teacher will then discuss why riparian zones are important for people as well as other living organisms.

Prior Knowledge Assessment: Discuss and ask questions relating to the different types of vegetation that are found in different riparian zones. Talk about and prompt students' thinking about specific types of plants and trees found along rivers and streams in different areas in Utah. Students' responses would provide a transition into the lesson or into further review as needed until they exhibit a good understanding of the types of plants found in riparian areas.

Instructional Procedure:

1. Pair up students and give them a tape measure, clipboard, flagging and worksheet.
2. Prior to students making field observations, review with students how to identify the different vegetation types they're likely to encounter and how to locate the greenline. This can be practiced in the schoolyard in an area where vegetation meets bare ground. The more this can be modeled and students can practice, the more successful they will be. Also review additional background information and new terminology.
3. The pairs of students will create a hypothesis pertaining to what kind of effects no vegetation will have on the river and note any observations that will help them with their conclusions.
4. Review safety procedures before going out to the field. Remind them of what should or shouldn't be picked up (such as a hypodermic needle) and what they should report to an adult.
5. Once in the field have each pair of students measure 50ft. along the stream tying a piece of flagging at each end. Then have them measure 30ft. out from and perpendicular to the two flags already tied.
6. Have students observe how far the overhead trees or canopy cover shades the stream. Have them estimate this in ft. and then write down. Talk about how the canopy lowers the temperature and adds organic material to the stream creating a food source for aquatic organisms.

7. Have students look at the ground cover and write down what they see out to their 30ft. markers. Explain that the ground cover indicates how well the riparian zone prevents erosion and filters runoff before entering the stream. Talk about what they might find including rock, litter or organic debris, and vegetation. Explain that a mixture works best because rock prevents erosion while vegetation acts as a filter, and litter does both.
8. Students will write down the vegetation types they find along the greenline and record them on their worksheets as well as what kind of groundcover they found and information on canopy if any.
9. They will also be required to sketch the area they observed.
10. Back in the classroom, students will then take their data and draw conclusions based on results of their observations.

Adaptations for Special Need and ELL Students:

- Place students who need extra help with another willing student who can assist.
- Have students make drawings. It may be all that is necessary for assessment purposes.
- ESL students may need only draw what they observed.

Assessment:

- Informal – Teacher assesses student responses during class discussion.
- Formal – Teacher will assess the observation worksheets. They will be checked to see if students articulated what their hypothesis was, what observations they made, and what conclusions were drawn. They're drawings of their survey area will serve as further indication of comprehension.

*Adapted from Utah Stream Team, Utah State University Water Quality Extension, IV-4b. The Riparian Zone.

Extension: To further enhance your understanding of riparian areas and the important role water plays in our lives, you can explore the following websites and have students complete the activities.

http://www.bellmuseum.org/distancelearning/watershed/novice7_a2.html

1. Play the Watershed Game. Type in your name and click.
2. Click Novice Level after reading explanation.
3. Answer the questions. How did you do?

<http://www.usoe.k12.ut.us/curr/science/core/4th/4thSciber/4THINTRO/intro.htm>

1. Click on the first box at the left, the picture of the stream.
2. Scroll down and click Water: It's Everywhere.
3. Scroll down to Model It and do the activity. What did you find out?
4. Scroll down to Water Trivia.

- a. How many miles of streams are there in the U.S.?
- b. How much water does a 2,000-acre farm use per/day?

<http://www.r6.fws.gov/jordan/index.html>

1. Read the second paragraph and name three things, which have negatively affected riparian habitat along the Jordan River.
2. Click Things You Can Do.
 - a. What does the disappearance of songbirds indicate?
 - b. How many species of birds absolutely require riparian habitat?
 - c. How much riparian habitat remains in its natural condition in the western United States?

Performance Criteria for Multiple Assessment
(12 points)

Hypothesis well articulated, variables identified. 3 points	Hypothesis stated, variables not clear. 2 points	Hypothesis not stated. 1 point
7-10 observations gathered and well documented. Drawings are complete. 3 points	3-6 observations made with weak descriptions. Drawings incomplete. 2 points	1-2 observations made, descriptions not clear. No drawings. 1 point
Conclusions analyzed and reformulated in light of new evidences and input from others. 3 points	Conclusions stated only. No new insights revealed. 2 points	Conclusions are incomplete. 1 point
Worked well with partner and followed directions. 3 points	Partners needs intervention by teacher. 2 points	Partners get in fistfight. 0 points