Rangeland Roots-Range Science

Created by: IRRC	**Date:**
Subject: Science	**Grade Level:** 4th +
Time Required: Three 1hour sessions.	**Standards:** Standard: 3 Biology

Overview	Students will get a feel for rangeland science by taking short field trips to a vacant lot, where they will clip a plot, identify plants, and take repeat photos of a specific area, as if they were monitoring.
Goal(s) & Objective(s)	Students will identify plants as grasses, forbs, or shrubs. Students will identify rangeland plants as a renewable resource. Students will identify change in a rangeland area.
Prerequisites & Materials	This lesson can be a prerequisite for the Energy lesson or they can be 2 separate lessons. **Materials:** 1. Pictures or examples of forbs, grasses, and shrubs 2. Cardboard or stiff wire for plot frames 3. Clippers, or strong scissors 4. Paper Bags (3 per group) 5. Disposable or digital camera 6. Access to computers 7. Bold Markers 8. Paper 9. Large sheet butcher paper 10. ~56 sections of yarn 3 feet long 11. Plant Identification Guide (found on IRRC Website)
Teaching Activities: ***Instructional Approaches/Strategies***	**Introduction: Session I** 1. Ask students to give examples of how they get energy. Distinguish things that might allow a person to be energetic (such as sleeping) from getting actual energy from food. 2. Ask students to connect their observations to plants by looking at some grass. Ask if they could use the grass for energy, and if any other animals could. Explain the differences between renewable resources (solar energy, wood, grass) and nonrenewable resources (petroleum products- anything that is permanently gone once we use it). Begin a KWL for renewable resources on a flip chart. This would be a good place to end the first session.

Procedures- Session 2

1. Review renewable and non-renewable resources from the previous day. Ask if grass is a renewable resource (yes, because when my dad cuts the lawn, it grows back). Explain the differences between grass, forbs, and shrubs- (see IRRC attached plant identification guide).
2. Explain that students will clip all the plants within a frame (inside the frame or hanging out) and sort them into bags labeled “grass, forb, and shrub”.
    - Model safety procedures of how to clip a plant
3. They will then analyze what they have gathered using one of the methods below.
4. Students will then take a picture of the areas they clipped to observe how grass is renewed.

Session III

Activity 1: Create a pictograph of the group or class collection of forbs, grasses, and shrubs on butcher paper. Label the bottom (x) axes as “forbs, shrubs, and grasses” and the side (y) axes as number of plants. Paste or tape the plants in the correct column. One above the other. Using a plant press for 2-5 days to make plants easier to handle is recommended.

Activity 2: Allow the plants to dry in a warm location for several days (drying can be done in a cool oven 125-175^{o} and will take only an hour or two). Weigh the different categories of plants, being sure to subtract the weight of the bag. Make a numerical bar graph to show the different amounts of weight by types of plants. You may wish to discuss the differences in herbivores at this point - deer and sheep eat more forbs and shrubs, while cows and elk eat more grass. This could also fit in with the food web activity below.

Activity 3: Pass out index cards - 1 labeled with sun, 10-15 labeled as plants, 5 labeled as herbivores (or primary consumers), and 3 labeled as carnivores. Make an energy web starting with the "sun" standing on a chair with 10-15 strands of yarn. That person should throw one strand to each of the plants. The plants should have 3 strands of yarn each to give to herbivores, and each herbivore should have three strands to give to carnivores which might eat them. Snip one of the strings going from a plant, and discuss what might happen if enough plants are not available.

Closure- Session IV

Finish the KWL with what students have learned about renewable resources and rangeland plants. How will students be able to tell that grasses are renewable? Return to the site several times during the year to photograph the area. Discuss with students what types of things might cause rangelands to change.

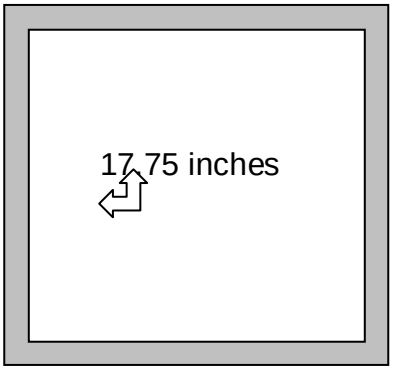
Assessment:	Use participation and response to KWL in closing to gauge student understanding. Review key concepts if necessary. Have students write a paragraph or make a PowerPoint presentation comparing renewable and non-renewable resources, showing how change happened when they took pictures, describing a food web, or describing how someone could tell the differences between forbs, grasses, and woody plants.

Vocabulary: grass, forbs, shrub, graph, weigh, renewable, non-renewable, rangeland

Background:

Rangeland plants (along with any other plant life) are considered renewable resources because they can store energy from the sun. Students can easily see this when they observe the grass growing back after being mowed. Grazers such as cattle, elk, sheep, and deer can repeatedly use the same plants after they grow back. We can use rangeland plants for energy by eating animals which have eaten the plants. This lesson provides students with several options to explore this energy web.

Before the lesson, make a square frame out of cardboard, wire,



or some other durable material, with interior sides of 17.75 inches (45 centimeters).

Find an area within walking distance of the classroom that has a variety of undisturbed plant life (A ditch bank, vacant lot, un-maintained schoolyard area, desert or meadow area). Evaluate the area for safety.

Rangeland Roots- Energy Lesson

Created by: IRRC	**Date:**
Subject: Math/ Science	**Grade Level:** 4th +
Time Required: 1 hour	**Standards:** Science- Standard 3: Biology Mathematics- Standard 2:Concepts and Principals of measurements

Overview	These two activities illustrate the flow of energy through an ecosystem. Students will first analyze what they eat, then what different types of organisms need to survive.
Goal(s) & Objective(s)	The students will differentiate between a producer, a primary consumer, and a secondary consumer. Students will be able to calculate why more organisms are at the lower levels of a food pyramid.
Prerequisites & Materials	(Optional) Range Science Lesson **Materials:** • Paper • Pencils • Overhead Energy Pyramid • Energy Worksheet • Math Worksheet
Teaching Activities: ***Instructional Approaches/Strategies***	**Procedures** **Introduction:** Have students write down anything they have eaten in the last day, skipping a line on their paper. Be sure they list food items separately. Give an example - a ham sandwich would be bread, ham, pickles, tomatoes, and cheese, all listed on separate lines. Have students keep their lists for activity #1. **Practice** **Activity #1:** 1. Show students the energy pyramid,(attached) and give them examples of producers, primary consumers, and secondary consumers. Ask them to come up with examples of their own. If students are working on note taking, this would be good information for their science notebook. 2. Divide students into groups. Have students tear or cut apart their list from the beginning of class. They can glue or tape each item from their food list to the food pyramid for their group. Demonstrate how to do

	this, and what types of food would go in each level. 3. Have students respond to the questions on the Energy on the Range Worksheet or discuss these questions as a class. **Activity #2:** 1. Use plants clipping instructions from the "Range Science" lesson (***session II).*** 2. Clip all the new vegetation in the plot frame and weigh it. This should take about 15-20 minutes, less if the location is close or students have done it before. As an option, the teacher could clip a plot and bring it inside for students to weigh. 3. Read through the first two questions on the "Energy Math" worksheet with your students. Have each student write a prediction for question 2 before they begin work. For high functioning students who are working on conversion factors, you may wish to white out the "fill in the blank" format. 4. Have students evaluate their responses based on what is reasonable - there should be less energy left at the end of the worksheet with the secondary consumer (Wolves). **Closure** Use the following four questions as a closing discussion: 1. Where does energy come from in the environment? (*sunlight)* 2. Why do people eat more producers than primary consumers? (*more energy is stored in plants than in animals, so it is easier to acquire calories from plants)* 3. Why do you think people still eat primary consumers, if less energy is present in that level? (*Answers will vary - this would be a good time to point out that most of the land that could be farmland is located in forests that many species need to survive. Livestock and other primary consumers such as deer can graze these areas, and rangeland areas not fit for farming, with little damage, while farming would diminish habitat)*
Assessment:	Evaluate students' completion and correct responses on the worksheet, based on what was covered in class.

Modifications: If you do not want or do not have the means to do a field trip for *Energy Lesson*, Skip activity II –Mathematics, and no prerequisite is required.

Attachments

Energy on the Range Worksheet
Energy Math Worksheet

Energy on the Range Worksheet

Name_____

1. Which level of the energy pyramid did most of the food items in your group come from?

2. Which level of the energy pyramid contains the greatest number of organisms?

3. What do you think would happen if there were more consumers than producers?

4. If mice eat grass seeds, and owls eat mice, sketch an energy pyramid containing grass, owls and mice.

5. In question 4, would there be more grass, owls, or mice?

6. If the grass didn't grow as well one year, what would happen to the numbers of mice? What would happen to the numbers of owls?

Energy Math

Name_____

1. Find the weight of all the Producers in your plot (in grams)

_____ grams

2. In this activity, you will find how much energy makes its way from producers to secondary consumers.
Based on this information, predict whether the amount of energy at the end will be greater than (>), less than (<), or equal to (=) the amount at the beginning.

The energy at the beginning will be_____ the energy at the end.

For questions 3-5, you will use your answer from the previous question to find a final answer.

3. The materials you clipped are all from Producers. Each 1000 grams of producers contains 300 calories of energy. How much energy is in **your** plot?

_____ grams x 300 calories ÷ 1000 grams = _____ calories

4. A mule deer (a primary consumer) can only use 10% of the energy from the plants it eats in your plot to grow! How much energy does the deer use from your plot to grow?

_____ calories x 0.10 = _____ calories

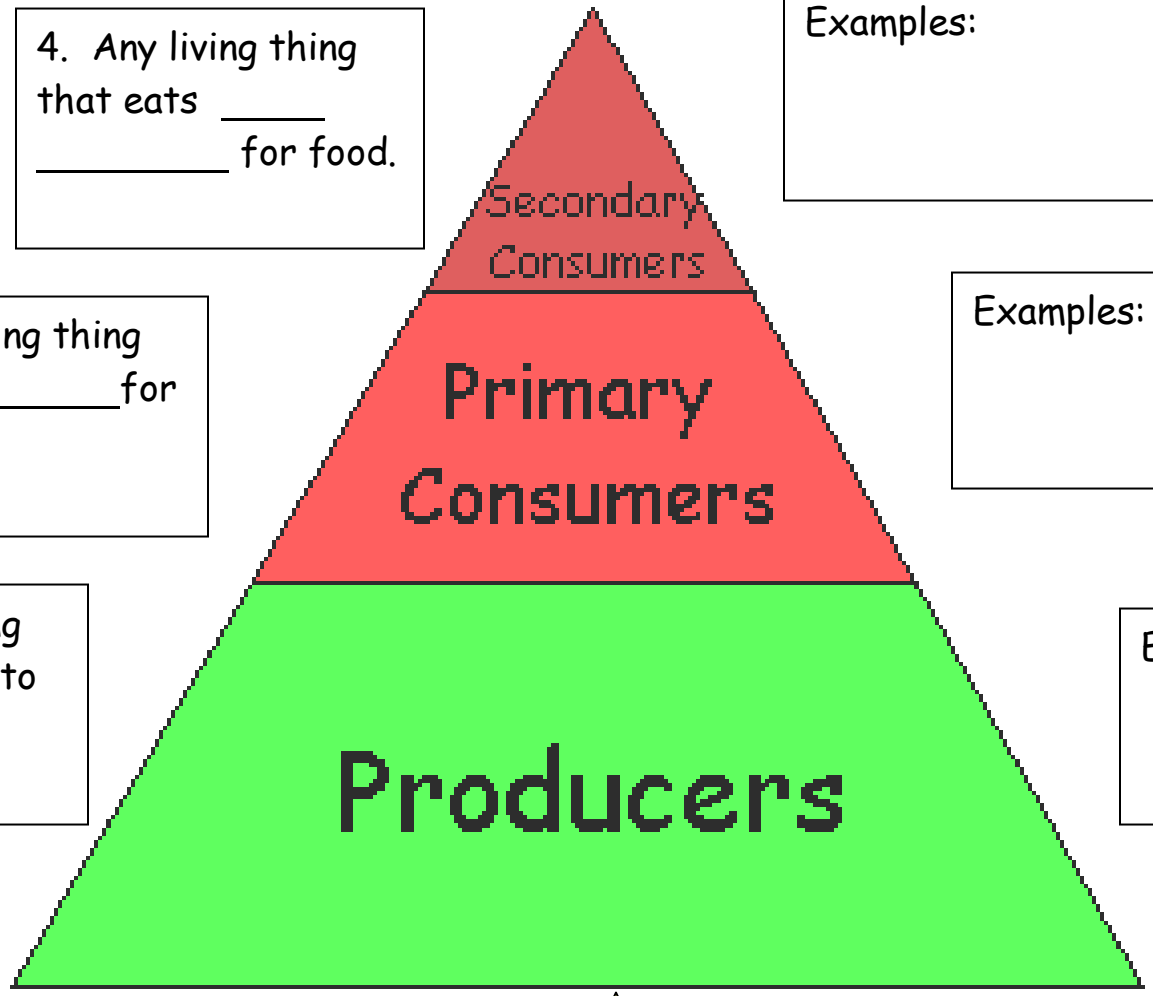
5. Finally, a predator (like a wolf, bear, or person) will eat the deer. Only 20% of the calories the deer used to grow are available as food for secondary consumers. The rest of the energy is stored in indigestible materials (bone, tendons, or hair). How much energy from the original plants could be transferred from the deer to a predator?

_____ calories x 0.20 = _____ calories

6. How did your prediction in question #2 compare to your final answer?

4. Any living thing that eats _____ _____ for food.

Examples:



3. Any living thing that eats _____for food.

Examples:

2. Any living thing that uses _____ to make food.

Examples:

1. All energy for plants and animals comes from the _____.