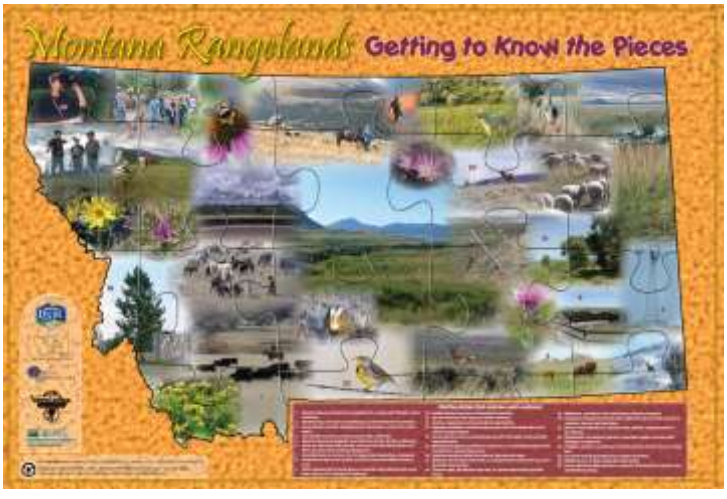

Lesson Title: Montana's Rangeland Grasses Discovery Kit

Grades: 4-6

Duration of Unit: 3 - 50 minute periods and several 10 minute observation time periods.

Materials:

1 -Montana Rangelands Poster as seen above. (Poster may be obtained from organizations listed at the end of lesson)

1 - Ranch Starter Kit – 16 Jiffy peat pots and 1 Montana rangeland seed packet.
(Kits can be ordered from organizations listed at end of lesson)
4 - Trays for holding Jiffy peat pots (such as small painting trays or any plastic tray)
4 - Small plastic cups
1- notebook for each group (4 total)

STAGE 1 – DESIRED RESULTS

Montana State Standards:

ELA 4-6. Speaking and Listening

1. Comprehension and Collaborations: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade appropriate topics and texts, building on others' ideas and expressing their own clearly.

NGSS 4. Earth's System: Processes that Shape the Earth

Disciplinary Core Ideas, ESS2.A: Earth Materials and Systems

Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organism, and gravity break rocks, soils, and sediments into smaller particles to move them around (4-ESS2-1)

NGSS MS. Matter and Energy in Organisms and Ecosystems

Disciplinary Core Ideas, LS2.A: Interdependent Relationships in Ecosystems

Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)

Understanding(s) /Big Ideas:	**Essential Question(s):**
Students will understand the impact of drought and grazing on rangeland grass systems. Students will understand the need for a healthy rangeland for organisms in their ecosystem. Students will analyze the growing process of native rangeland grass.	What happens to rangeland grasses when the grass is under drought conditions? What effect does grazing have on rangeland grass and grass root systems? What effect does flooding have on rangeland grasses?
Students will know: Students will know that grazing causes a more concentrated root system in rangeland grasses compared to non-grazing. Students will know that drought and flooding have negative effects on rangeland grasses.	**Students will be able to:** Students will be able to make conclusions based upon inquiry as to optimal rangeland grass growing conditions.

STAGE 2 – ASSESSMENT EVIDENCE

Performance Task(s):	**Other Evidence:**
Student groups will plant 4 jiffy pellets with rangeland grass seeds and take care of the pellets throughout the experiment. Students will journal the effects of different growing conditions for their grass plantings.	Students will receive a grade based on their participation and completion of the projects; student notebooks will be evaluated.

STAGE 3 – LEARNING ACTIVITIES

Learning Activities:

Activity 1: (One class period)
Post the Montana Rangelands poster in the classroom in a visible spot.

Discuss with students the variety of life seen on the poster. Ask students to discuss what other animals and plants may use the rangeland that are not pictured. Inquire to the importance of rangelands for humans. What impact does a healthy rangeland have on students and their families?

Let students know that they are going to be stewards of the land; they will be investigating methods to keeping rangeland grasses healthy.

1. Divide students up into 4 groups, give each group a notebook. Ask one student to take notes for the day, tracking all of the science steps that each group makes. They must write the date at the top of the page.
2. Give each group a tray with 4 jiffy pellets.
3. Ask each group to pour ½ cup of water onto their tray, not onto the pellet. Is that enough water to make the jiffy pellet swell to 2" tall, and turn soft? Ask students why the jiffy pellet did not moisten all the way. Introduce the term drought, and discuss how drought is a dry soil condition. Ask students to add 1 cup of water to the tray and watch the jiffy pellets, was this enough water? Continue until the jiffy pellets are fully puffed-up and evenly moist. (An even dark brown color and soft pellet indicates they are watered fully.)
4. Ask students to make a shallow hole in the jiffy pellet by pushing soil gently to the sides, do not rip the jiffy pellet netting. Give each group of students approximately 1 teaspoon of Montana Rangeland Seed mix, saving ½ tsp of grass for later.
5. Observe: are all the seeds the same size and color, could this indicate a variety of seeds from different grasses?
6. Ask students to divide the seeds into 4 equal parts and plant one part in each of the jiffy pellets.
7. Ask each group to cover the grass seed back up by gently pushing the soil back over the seeds.
8. Pour a small amount of water on the jiffy pellets and place in a cool room.
9. Ask students in each group to make an alternating schedule to check the pots. It will be their task to: make

sure the jiffy pellets are moist, record watering and observations of the plantings, and to report back to the group when they see grass growing. The group should report to the teacher when the grass is 2" tall. (Example of notebook journal from daily tasks on next page).

Inform students that they will be working with the rangeland grass plantings again as soon as each pot of grass has sprouted and grown to 2-3 inches. Once grass has sprouted, ask students to take their trays out and set them in a sunny location. The jiffy pellets will dry out faster in these conditions, so be careful! Schedule a class period to continue with the lesson within the next couple of days.

Teacher's notes:

Example of rangeland grass notebook entries:

Week 1:

Tuesday: Susie checked the rangeland grass planting. I noticed that there was mold growing on top of the planting and the jiffy pellet was really wet, I gently removed the mold and did not add any more water.
Wednesday: Justin checked on the planting, the jiffy pellets did not need water.
Thursday: Austin checked on the plantings, the tops of the jiffy pellets were getting light brown so I sprinkled a little water on top of each one to keep the seeds from drying out.
Friday: Emma checked on the planting, the pellets were getting a little dry on the edges so I watered them with just a little water, they soaked it up right away so I added just a little bit more to help with the weekend.

Week 2:

Monday: Susie checked on the pellets, since we were gone for the weekend the pellets seemed a little dry. I watered them until they were moist like when we started.
Tuesday: Austin checked the pellets because Justin was absent. The jiffy pellets were still moist.
Wednesday: Justin checked the pellets, they did not need water.
Thursday: Emma checked the pellets and noticed that they needed a little water and that there was some very narrow and fragile green spikes growing.
Friday: Susie checked the jiffy pellets today. I noticed that there were 10 green spikes. I checked in the notebook and it has been 10 days since we first planted our rangeland seeds! I forgot to water the pots so I had to come back right after school and make sure they had water for the weekend!

Week 3:

Monday: Austin checked the rangeland seeds. All the jiffy pellets had grass growing out of them. The grass was thicker and it was too hard to count how many blades of grass were growing. I watered the jiffy pellets until they were moist.

Tuesday: Justin checked the jiffy pellets; the grass was about 2" tall and since we set them in the sun the pots needed a little water.

Teacher's notes:

Activity 2: (One class period)

Begin this activity when rangeland grass is about 3 inches tall.

Tell students they are now going to begin the task of being stewards of our rangelands and that they will have to make decisions upon grassland management. Give each group 4 index cards and ask each group to number them 1- 4, writing the corresponding information below on each card. Then each card should be set next to one pot, students must carefully follow the directions on each card for the corresponding jiffy pot. Students will now need the plastic cup to set the jiffy pellet in that will be exposed to flooding.

1. **Grass cut to 1" tall and jiffy pellet kept evenly moist. When grass reaches 3" tall it is cut back to 1" again.**

2. **Grass not cut at all and jiffy pellet kept evenly moist.**

3. **Grass not cut at all, and jiffy pellet receives only 5 drops of water every 5th day.**

4. **Grass not cut at all, and jiffy pellet is kept sitting in plastic cup with 2" of water at all times.**

Note: planting on far left has been cut back to 1"

After completing steps 1 – 4, students will observe the 4 jiffy pellets each day (10 minutes). Students should observe the changes and record them in the group notebook, this time the whole group should do the monitoring together. Ask students to be specific in their observations, and to make comments. Continue this for 10 days, longer if you like, the grass will continue to undergo changes.

Activity 3A: Continuing the inquiry. (One Class Period)

Inquiry the results!
Ask students to evaluate what they discovered about each of the different conditions that the grass was placed under, using the following questions as a guide.

What data will be used to evaluate your rangeland stewardship?
Which condition appears to result in the healthiest grass?
Which condition(s) killed the grass? Why?
Which condition(s) stressed out the grass? Why? How did you form your opinion whether the grass was stressed?
When did you notice stress on the grass?
Compare the grass that underwent drought with the grass that received too much water for growth, stress, color, etc.?
Can you form a conclusion about the role of water on rangeland grasses?

Did all groups have the same results from the same growing conditions? If not, why did the results differ? Check journals for clues!

Activity 3B: Continuing the inquiry.....

1. Ask students to gently tear each of the jiffy pellets in half vertically in order to observe root growth. Ask the same questions as above about root conditions. *Students should note that cutting the grass to 1" caused the grass to develop a more vigorous root system indicating that grazing helps establish a more vigorous root system.*
Rank the importance of grazing to a more developed root system, ranking from not very important to very important.

2. Ask students to choose which condition is optimal for rangeland grass. Why?

3. Is it possible to create optimal conditions on all of Montana rangeland?

Possible correct answers:
Yes, we can be careful about how we use the land for grazing and about how we take care of the land.
Yes, we can observe rangeland for healthy systems and learn from those systems.
No, 70% of Montana is rangeland and we cannot control moisture and other conditions over the entire area.

Additional Inquiry: Handout the remaining grass in the seed packet to the groups.
Ask students to see if they can determine how rangeland grasses spread by seed through a visual inquiry.

Possible correct answers:
The seed has a sharp and barbed end on it, which catches in animal fur or bird feathers and then is dropped in another area.
The seed is also light enough to be blown a short distance by the wind.
The seed could become lodged in the hoof or foot of an animal or on the foot of a bird and be dispersed this way.
If the seed was dispersed near a water source, it could float to a new location.

Review:

Go back to the poster and discuss the role of grass for sustaining all of the organisms pictured on the rangeland. Is healthy grass essential for life on rangelands? Is healthy grass essential for recreation on rangelands? How does healthy rangeland affect the food chain on the rangeland?

"This project was a coordinated effort by Montana Department of Natural Resources & Conservation, Montana Department of Agriculture, and Agriculture in Montana Schools to educate students about the value of Montana Rangeland. Contributions and support for this project was also given by the USDA Natural Resources Conservation Service and Montana Weed Control Association."

For more information please contact:
http://agr.mt.gov/ or http://dnrc.mt.gov/cardd/camps/default.asp