

Lesson Plan 2:

Ecology and Ecosystem “Circus”

A lesson for grades 3-12, adaptable to the varying skills and abilities of each grade

Basic Principles:

- Each ecosystem hosts a variety of plants and animals that are uniquely suited to that environment.
- Sustainability, or a renewable balance between man and nature, is necessary for a healthy ecosystem.
- People interact with and impact their environment in both positive and negative ways.
- Healthy rangelands depend on maintaining the water, soil, plant, and animal resources.
- Active management by ranchers maintains healthy ecosystems.
- Livestock grazing is compatible with wildlife use and recreation.
- The aspects of an ecosystem (soil, water, vegetation, animals, etc.) impact and rely upon each other.

Fundamental Concepts:

- Selectivity
- Land use / multiple use
- Photosynthesis
- Conservation
- Grazing
- Ranching
- Ecosystems
- Natural resource ecology
- Sustainability
- Erosion
- Monitoring
- Livestock / Wildlife
- Connectivity
- Recreation (e.g. Hunting, Fishing)

Montana content standards met by this lesson:

End of Grade 4

- Science #3: benchmarks 1, 3, 4, & 5
- Science #4: benchmark 2
- Science #5: benchmarks 1 & 2

- Math #6: benchmarks 1 & 2
- Social Studies #3: 1, 2, 3, 5, & 7
- Writing #4: benchmarks 1 & 2
- Writing #6: benchmarks 1, 2, 3, & 4
- Speaking/Listening #2: 2, 3, 4, & 5
- Speaking/Listening #3: 1, 2, 3, 4, 5, 8
- Reading #1: benchmarks 2 & 4
- Reading #4: benchmarks 2 & 6
- Reading #5: benchmarks 1, 2, & 4
- Workplace #1: benchmarks 1, 3, & 4
- Workplace #2: benchmarks 1 & 2
- Workplace #3: benchmarks 3 & 4
- Library Media #1: 1, 2, 3, 4, & 5
- Library Media #2: 1, 2, 3, & 4
- Library Media #4: 1, 2, & 3

End of Grade 8

- Science #3: benchmarks 2, 4, & 5
- Science #5: benchmarks 1 & 2
- Math #6: benchmarks 1 & 2
- Social Studies #3: 1, 2, 3, & 5
- Writing #4: benchmarks 1 & 2
- Writing #6: benchmarks 1, 2, 3, & 4
- Speaking/Listening #2: 2, 3, 4, & 5
- Speaking/Listening #3: 1, 2, 3, 4, 5, 8
- Reading #1: benchmarks 2 & 4
- Reading #4: benchmarks 2 & 7
- Reading #5: benchmarks 1, 2, & 4
- Workplace #1: benchmarks 1, 3, & 4
- Workplace #2: benchmarks 1 & 2
- Workplace #3: benchmarks 3 & 4
- Library Media #1: 1, 2, 3, 4, & 5
- Library Media #2: benchmarks 2 & 3
- Library Media #4: 1, 2, & 3



photo by Keith Weller

Upon Graduation-End of Grade 12

- Science #3: benchmark 5
- Science #5: benchmark 4
- Social Studies #3: 1, 2, 3, 4, 5, & 7
- Writing #4: benchmarks 1 & 2
- Writing #6: benchmarks 1, 2, 3, & 4
- Speaking/Listening #2: 2, 3, 4, & 5
- Speaking/Listening #3: 1, 2, 3, 4, 8
- Reading #1: benchmarks 2 & 4
- Reading #4: benchmarks 2, 3, & 7
- Reading #5: benchmarks 1, 2, 3, & 4
- Workplace #1: benchmarks 1, 3, & 4
- Workplace #2: benchmarks 1 & 2
- Workplace #3: benchmarks 3 & 4
- Library Media #1: 1, 2, 3, 4, & 5
- Library Media #2: benchmarks 2 & 3
- Library Media #4: 1, 2, & 3

Student Inquiries (letters in parenthesis refer to Lesson Activities) :

- What is an ecosystem? (F)
- How do ranchers maintain healthy ecosystems? (A, B, D, E, F)
- Why do ranchers care about the environment? (A, E, F)
- What is a rangeland? (A, B, C, E, F)
- How do rangelands affect water quality?(A, B, C, D, E, F)
- Where does my food come from? (A, C, E)
- What is grazing? (A, C, D, E, F)
- Who grazes? (A, E, F)
- What do grazers eat? (A, C, E, F)
- How much can grazers eat? (A, B, C, D, E)
- What does grazing do to the plants? (C, E, F)
- Where does grazing occur? (A, E, F)
- How does grazing affect the ecosystem?(A, B, C, D, E, F)
- Do livestock and wildlife graze the same? (A, E, F)
- How do livestock and wildlife live in the same ecosystems together? (A, E, F)
- How much grazing can occur each year? (A, B, D, E,)
- What types of recreational uses can occur in conjunction with grazing? (A, E)
- How long can/have rangelands be(en) grazed? (A, E)
- How do grazing and ranching impact me? (A, E, F)
- Why can cows, sheep, and big wildlife species eat so much grass? (A, E, F)

- How does overgrazing wear out rangeland resources? (A, B, C, D, E, F)
- How do ranchers know what the conditions of their rangelands are? (A, E, F)
- How does ranching benefit wildlife? (A, B, E, F)
- How much land area is covered by rangeland in America? (A, C, E)
- How do plants get energy to grow? (A, B, C, D, E, F)
- How do the parts of an ecosystem rely upon each other? (A, B, C, D, E, F)

Instructional Objectives:

- Students will work together to learn the foundations needed for further study in this unit.
- Students will research to discover what information is known in the six targeted areas.
- Students will create a format by which to teach and explain their area of study to the rest of the class.
- Students will identify the most important principles and concepts for each targeted area.

Materials:

- Internet
- Library
- telephone
- notebooks and research folders
- pens, markers, posterboard, etc.
- computer lab if available
- a space large enough to contain six stations for students to rotate through

Lesson Activities

1) The following six areas are basic to understanding further lessons and studies in this unit: A - Rangeland Facts about Montana (or your state), B - Stream Dynamics and Riparian Area Functions & Processes, C - Plant Anatomy and Identification (using flora common to your area), D - Erosion: Causes & Prevention, E - Land Use & Sustainability, and F - Parts of an Ecosystem & How They Interact.

2) Divide students into six groups based on common scientific interests or similar ability levels (if possible, both). Assign each group to the area listed in 1) that best fits their interests and abilities.

3) Provide ample time for students to research the basic principles and fundamental concepts of their area of study. The goal is for the students to be able to provide their classmates with an overview of the most important and most interesting information they learn from their research, paying particular attention to principles and concepts noted here. (Others will be discovered, too.)

4) Students can make research folders in which to organize their discoveries.

5) Have each group of students create a station that will teach their classmates about their topic. Encourage students to be creative in their format. Student-created hands-on activities may be particularly fun and interesting for them.

6) Monitor and guide each group's work to make sure the content of their station is aligned with their topic, the principles, and the concepts. They may find the Student Inquiries (marked to designate the relevant six areas) helpful in focusing their research and station activity.

7) The Ecology and Ecosystem "Circus" can take place over the course of one, two, three, or six days, whichever works best for the classroom's schedule. For example, if two days are preferred, then on the first day, three of the groups will set up their stations and the other three groups of students will rotate through each station. Be sure the students presenting stations are given an opportunity to visit each other's lessons as well. The next day, just switch. The length of time needed at the stations will depend on grade level. For example, third grade students may only have 10 minutes of information to give at their stations, while high school students may need to do separate and longer presentations to the entire class, potentially for a whole class period.

8) With the teacher's guidance, each group should create an assessment the visiting students can complete at their station. Each student can keep all six of his/her assessments together in a folder and turn them in together.

Assessment Ideas/Suggestions:

- exit cards created by the students of that topic's group
- a survey created by the students of that topic's group
- whole-class game of "Jeopardy," with each group contributing 5 questions and the six key areas being the six Jeopardy categories
- worksheet or quiz created by the students of that topic's group

Ascending Levels of Intellectual Demand/ Station Activity Suggestions:

- The Plant Anatomy and Identification group could create a plant press and collect some samples of local grasses and plants. They could also include a plant dissection at their station.
- The Rangeland Facts about Montana group could create a trivia game which their classmates could play after learning the information from that group.
- The Stream Dynamics group could create a scale model of a stream and its components.
- The Erosion: Causes and Prevention group could seek examples in the community or on the school grounds of erosion, including areas where erosion is a problem and their ideas of how it could be reduced in that location, and areas where erosion is not a problem and why or where erosion is currently being managed well and prevented.
- The Land Use & Sustainability group could create a panel of community experts on various aspects of land use. For example, the panel might contain a game warden/wildlife expert, a rancher, an ecologist, a hunter, a fisheries expert, a geologist, a forest fire fighter, and a miner. The panel could then be present for a question & answer discussion with the class.
- The Ecosystem group could build a mini ecosystem, similar to a museum display, complete with explanation cards describing each part, its functions, and how it interacts with other parts of the ecosystem.

Ecology and Ecosystem "Circus" Rubric

Student's Name: _____

Date(s): _____

Skills Developed	Degree of Mastery (5 is highest)				
Demonstration of knowledge of how living organisms interact with each other and their environment	1	2	3	4	5
Understanding of the interactions of science, technology, and society	1	2	3	4	5
Demonstration of understanding of data and other information sources	1	2	3	4	5
Research skills of accessing, synthesizing, evaluating, and communicating information	1	2	3	4	5
Application of geographic knowledge and skills (human/environment interactions, region, etc.)	1	2	3	4	5
Use of an inquiry process, problem solving strategies, and resources to synthesize & communicate information	1	2	3	4	5
Application of appropriate speaking and listening skills and strategies	1	2	3	4	5
Selection and responsible use of appropriate resources for investigation	1	2	3	4	5
Development of team skills and conflict resolution skills	1	2	3	4	5
Application of gained knowledge to the creation of the group's station	1	2	3	4	5