

Life on the Edge

Original activity *Kids on the Edge* written by Kevin & Betty Collins,
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Subject: Science and Physical Education

Objective: Students will understand the hazards and perils of the life of a bighorn sheep.

Materials:

- Bighorn Sheep Course: The course may be made up of flat boards, balance beams, boxes, paper plates, craft foam, floor tape, or lines in the gym. Cones may be used to fence in the grazing area.
- Flagging tape, bandanas or other materials to differentiate rams, ewes and lambs & mountain lions
- Food tokens, (poker chips or construction paper)



Procedure:

1. Using the above mentioned items (and others you have on hand), lay out a bighorn sheep course prior to the lesson. Create an obstacle course of sorts, zigzagging your items, and making a difficult course for your bighorns to follow. Put your grazing area at one end of the course.
2. Review the articles in *Wildlife Express* and discuss difficulties bighorn sheep face in their lives.
3. Tell the students they will be doing a simulation of a bighorn sheep's life. Explain the course you have set up and tell them they will be walking the "trails" and finding food. Bighorns, with ewes leading, proceed from one side of the course to the grazing area and back. They collect food tokens along the trail and in the grazing area. Each adult bighorn will need to collect at least 7 food tokens. Each lamb will need to collect 5. As they are moving along, they need to avoid falling and being eaten by a predator. If you're a predator, the goal is not to get attacked by bighorns (stealing of your flag) and to eat bighorns.
4. Assign students to be lambs (young sheep), ewes (female sheep) or rams (male sheep). Have about half as many lambs as ewes and about a quarter as many rams as ewes. Assign 2 mountain lions.
5. Go over the following rules:
 - Only ewes and rams can defend themselves and snatch flags from predators.
 - The lambs are not allowed to steal flags from predators.
 - The lambs will not be able to put their hands out for balance. If the arms go out while walking on the trail, then they have fallen and are out. (This signifies the high mortality rate of lambs for their first two years of life.)
 - Bighorns are out if they fall off the course, get eaten by a predator, or if they do not collect enough food tokens.
 - While on the trail, bighorns cannot be preyed upon. Lambs may be taken by an occasional eagle. (You)
 - Once the bighorns reach the grazing area, they are to collect the rest of the needed food tokens and return to start of the course.
 - Predators are located in the bighorn grazing area. A bighorn is captured when the predator steals his or her flag. The predator must walk the bighorn to the out of bounds area.
 - Predators don't always get their prey. Predators must have 2 flags attached to them. Bighorns can steal their flags indicating a successful attack by the bighorn. If the predator loses both flags, then they have had an unsuccessful hunt and must leave the hunting grounds.
5. Evaluation: Use creative writing to explain the role you played in the activity from the point of view of that animal. What were your difficulties? Were you a survivor?

Murder Ewe Wrote

Subject: Science, Ecology, Social Studies

Objectives: Students will be able to analyze information, solve a mystery and create an alternate plan.

Materials:

- Wildlife Worksheets:* Mystery Story, Mystery Questions and Mystery Fact Cards,
- writing materials
- research materials

Procedure:

1. Photocopy one copy of "Mystery Fact Cards" to be cut apart, and a photocopy of the "Mystery Story" and "Mystery Questions" for each group of four to five students.
2. Ask students to share what they know about bighorn sheep. Discuss any additional background information about bighorn sheep with students (see Overview). Tell students they will be solving a mystery about bighorn sheep as a class using fact cards. They will also have a copy of a story and questions in their small group for reference.
3. Divide into groups of four to five students. Distribute the "Mystery Story" to each group. Have them read the story as a class or in their small groups.
3. Share the following guidelines with students: Using the story and 24 fact cards, we will solve this ecosystem mystery. Once you are given a fact card, you may not pass or trade it with others. Only as a group, using good communication skills, can we solve the mystery. The fact cards will be read to the rest of the class one at a time and in order. As the facts are read aloud, we will begin to piece together the solution to the mystery. It will be helpful to focus on the "cause," "weapon," and "motive," as well as previewing the questions.
4. Distribute a set of "Mystery Questions" to each group, so students can preview them.
5. Distribute one fact card to each student. Remind students they may not trade fact cards or give them to someone else! Have students read their fact cards one at a time in order. As fact cards are read, let students decide how best to organize the information and begin to solve the mystery. Students may struggle at first with the wealth of information, but that is part of the process. A possible strategy is to designate students as recorders of specific information for the class. Good group communication and participation are critical. Beware of letting a few students dominate the activity. It may be helpful for you to preview the questions and answers.
6. Discuss the questions as a class or have students address them in their small groups. Leave ample time for thorough discussion of mystery questions nine and ten.
7. To summarize the activity, ask:
 - What was the hardest part of this activity? The easiest?
 - What information was the most helpful? Why? Least helpful? Why?
 - What was the best way for you to organize all the information?
 - What is something you learned that you will share with others?
8. Have the students list the various factors that lead to the bighorn sheep population crash. Using the factors on their lists, have them create diagrams to show how the factors are connected.

Teacher Background information with Questions and Answers

Bighorn sheep, *Ovis canadensis*, live in the rugged terrain of the Rocky Mountains. They are tan-to-brown color, weigh about 75-200 pounds and stand about two-and-a-half to three-and-a-half feet tall. Adult males are called rams, adult females are called ewes (pronounced like "you"), and young are called lambs. They eat grasses and similar plants in high mountain meadows and rocky cliff areas. They are usually found in herds numbering 10 to 100. Rams are very muscular and known for their large curling horns which they use in dramatic collisions with other rams during breeding season. Ewes have small horns that don't curl very much. Bighorn sheep should not be confused with the Rocky Mountain goat, its shaggy, white, small-horned cousin.

The overall population of bighorn sheep has rebounded somewhat from destruction by market hunters in the late 1800s.

Limited hunting is now allowed under strict regulations. Throughout recorded history, bighorn sheep herds were known for precipitous die-offs. The reasons for these population crashes have remained a mystery and only recently have they been thoroughly investigated. Die-offs still occur today, but with proper wildlife and ecosystem management techniques, they are less severe.

The bighorn sheep die-off example used in this activity is fictional, but it is based on several case studies of bighorn population crashes in the west.

Students will solve an ecological mystery using the information provided, thinking and problem solving skills, and perhaps some resource books.

The overall message in this activity is that numerous factors, not one or two, lead to the population crash

Questions and Answers:.

1. How many bighorn sheep died between the summer and February 5? (Approximately 202 sheep died.)
2. What unusual wildlife behavior could have been an early clue that something was wrong with the herd? (On January 18, tourists were getting very close to the bighorns. Wild animals very rarely let humans approach them.)
3. Why did so many of the herd die in such a short period of time (January through February 5)? (Once the disease established itself in the unhealthy herd, deaths occurred quickly.)
4. Why did the rams die earlier than the ewes? (Rams were tired and worn out as a result of fighting during the breeding season.)
5. Why were there only a few lambs in December, though there were many in the summer? (The lungworm is passed from the ewe's body through the placenta and into the fetus' body. Lambs are more likely to eventually succumb to an infection of lungworm.)

6. How do bighorn sheep get lungworms? What is the lifecycle of the lungworm? (Bighorn sheep accidentally eat small snails while they graze. These snails are a host for lungworm larvae. The larvae penetrate the intestinal wall and travel to the lungs where they become adults. Lungworms lay eggs in the lungs. The eggs hatch and the young larvae enter the air passages where they are coughed up and swallowed by the bighorns. The lungworm larvae are excreted in fecal pellets and seek the host snail.)

7. Why don't all bighorn sheep die of pneumonia/lungworm? (Many bighorn herds are infected with both lungworm and bacteria. Healthy herds are usually able to cope with these disease-causes. Unhealthy herds cannot.)

8. What is the relationship between the pneumonia bacteria and the lungworm? (In weakened, stressed, or young bighorn, the lungworm lesions provide suitable sites for the pneumonia-causing bacteria to grow.)

9. Who or what caused the die-off of the bighorns? (No one intended to harm the bighorn sheep. Numerous factors working together caused the population crash. These facts include:

A. Presence of lungworm and pneumonia-causing bacteria.

B. Extreme weather caused bighorns to expend more energy than usual and this weakened them. Crowding caused by deep snows allowed the diseases to transmit from one animal to another easily.

C. Heavy grazing by cattle in the valley bottoms during the summer left little for wintering bighorns.

D. Stresses caused by the breeding season.

E. Stress caused by elk hunters riding snowmobiles nearby.

F. Habitat loss of critical winter grazing areas by real estate development.

10. As a class or in small groups, assume the role of an ecosystem manager. Discuss and/ or write a management plan about how you will prevent such a die-off in the future. What will be the best management practice(s)? What will be the least expensive management practice(s)? How will privately-owned land affect your plan? How will you include others in your planning efforts? If you don't have suggestions for the preceding questions, how can you learn more so you can form an opinion? (Numerous possibilities. Be sure to include the issue of private and public lands in the management proposal.)

Bighorn Sheep Mortality in the Taylor River Almont Area, Feverstein, Schmidt, Hibler, and Rutherford, 1978-1979: A case study. 1980.

Wildlife Worksheet

Mystery Story

The Taylor Canyon bighorn sheep herd lives in a typical Rocky Mountain ecosystem characterized by rugged mountains, canyons, and small grassy valleys. Valley bottoms are privately owned; most of the other higher terrain is public land.

During the summer months, wildlife biologists estimated the bighorn sheep herd to number 250. This was the largest herd size in many years. Numerous ewes with lambs were sighted in alpine meadows and scattered bands of rams were noted at higher elevations.

Late-season (December) elk hunters in the area reported lots of bighorns. All appeared healthy, although there seemed to be few lambs. Many male rams were observed fighting other male rams for females with whom to mate.

January brought heavy snows and cold weather. Snow depths were up to five feet and mid-day temperatures were as low as -20 degrees (F).

On January 18, wildlife biologists noted ski tourists pulled off the highway taking pictures of the bighorn sheep. one tourist came within ten feet of a ram. Bitter cold and deep snows persisted.

Ranchers noted that many of the bighorns appeared to be tired, ragged, and weak. The bighorns staggered and mucous discharge was observed coming from their mouths and noses. Many bighorns were coughing. On January 21, one rancher notified wildlife officials.

Two days later, wildlife officers found eight dead rams and two extremely sick ewes. Two dead bighorns were sent to a university lab where autopsies were performed to determine the cause of death.

On February 5, ground surveys and aerial fly overs found only 48 bighorn sheep alive. Some of the remaining bighorn sheep were netted and medically treated. Food was brought in. No more deaths occurred

What caused this dramatic population crash?

Wildlife Worksheet 2

MYSTERY QUESTIONS

1. How many bighorn sheep died between the summer and February 5?
2. What unusual wildlife behavior could have been an early clue that something was wrong with the herd?
3. Why did so many of the herd die in such a short period of time (January through February 5)?
4. Why did the rams die earlier than the ewes?
5. Why were there only a few kids in December, though there were many in the summer?
6. How do bighorn sheep get lungworms? What is the lifecycle of the lungworm?
7. Why don't all bighorn sheep die of pneumonia/lungworm?
8. What is the relationship between the pneumonia bacteria and the lungworm?
9. Who or what caused the die-off of the bighorns?
10. From the role of an ecosystem manager, discuss and/or write a management plan about how you will prevent such a die-off in the future. What will be the best management practice(s)? What will be the least expensive management practice(s)? How will privately owned land affect your plan? How will you include others in your planning efforts? If you don't have suggestions for the preceding questions, how can you learn more so you can form an opinion?

Mystery Fact Cards

Cut the facts apart on lines and give one to each student.

Fact #1

The autopsies revealed that the dead bighorns had pneumonia-causing bacteria.

Fact #2

Autopsies revealed dead bighorn were founds to have parasites called lungworms.

Fact #3

The elk hunters were riding snowmobiles. Bighorn are easily spooked by the presence of these noisy machines. They get nervous.

Fact #4

Heavy snows make travel difficult for bighorn. Herds begin to congregate on the few pieces of bare ground (or shallow snow accumulation areas) available.

Fact #5

When grazing, bighorn sometimes eat small land snails by accident.

Fact #6

The lungworm larvae can move across the placenta from the pregnant ewe into its fetus.

Fact #7

Lungworms form open sores in the lungs.

Fact #8

During cold weather, bighorn sheep spend lots of energy trying to stay warm, their caloric needs increase.

Fact #9

Young lungworm larvae are excreted in bighorn sheep fecal pellets.

Fact #10

During the summer, bighorn sheep stay at high elevations on public lands eating nutritious alpine plants. When winter snows arrive, they typically move down onto private lands in the valleys and canyons.

Fact #15

The breeding season for bighorn sheep is November and December. Rams actively fight for the right to breed ewes.

Fact #11

Pneumonia causes bighorn sheep's lungs to fill up with mucus. They try to cough it out.

Fact #16

The larval stage of the lungworm travels from the bighorn's stomach to its lungs.

Fact #12

During winter bighorn paw through the snow to eat grass. This is tiring.

Fact #17

Diseases spread easily among herds in crowded conditions.

Fact #13

Even healthy bighorn sheep have the bacteria that causes pneumonia.

Fact #18

Generally speaking, only unhealthy wild animals allow humans to get close.

Fact #14

The larval stage of the lungworm is found in small land snails.

Fact #19

Bacteria that cause pneumonia can only cause this disease if it finds open sores in the lungs.

Fact #20

Healthy bighorn sheep rarely get diseases. Young or physically stressed animals are more likely to succumb to diseases.

Fact #21

Ranchers grazed large numbers of cattle on their private lands in canyon/valley bottoms during the summer.

Fact #22

Once in the lungs, the lungworms mate and lay eggs. When the eggs hatch, the young larvae are coughed up and swallowed.

Fact #23

High activity levels tire and stress bighorns.

Fact #24

During the summer, one rancher sold some of her valley land to a real estate developer. A few homes were built that summer. A few more are planned.

Bighorn Sheep Haiku 3-D Style

Subject: Language Arts and Art

Objectives:

Students write in a variety of formats to record, generate and reflect upon ideas.
Students follow directions to make a three dimensional bighorn sheep.

Materials:

- Wildlife Worksheet* (Bighorn Haiku)
- Transparent tape
- scissors
- brown crayon
- black marker
- For each student
 - one large white paper plate
 - one cardboard toilet paper tube



Procedure:

1. Discuss the purpose of poetry with students. Introduce or review what a haiku poem is and where it originated. Share the following examples:

Lives in the mountains

Flying high in the sky

Sharp Talons, hooked beak

Not as alone

As I thought I was --

Animal Tracks

2. Review syllables with students.

3. Hand out *Wildlife Worksheet* and let students write a haiku poem about bighorn sheep.

4. Go over directions for making a paper plate bighorn with your students.

1. Cut off the outer rim of the paper plate, creating one long piece.

2. Cut the rim in half. Cut around the end of each rim for horns. (Round off ends).

3. Cut out the sheep's head and ear from the center of the paper plate.

4. Use a marker to draw the muzzle and eyes. (The muzzle is the nose area.). Write the final draft of the poem on the face with marker. Color the face light brown with crayon.

5. Tape the horns and ear to the sheep's head.

6. Tape the head to the toilet paper tube.

5. Display on bulletin board! Don't forget you can also send your poems to us, for a chance to be published in *Wildlife Express*!



WILDLIFE WORKSHEET

Bighorn Sheep Haiku

Haiku is a form of poetry that originated in Japan in the 1890's. It is usually written about nature. It does not rhyme and should be written in the present tense.

The seventeen-syllable poem has three lines. It goes like this:

Line 1: 5 syllables

Line 2: 7 syllables

Line 3: 5 syllables

To get started writing a haiku about bighorn sheep. Take some notes from this month's *Wildlife Express*. Write down important words and some thoughts you have about bighorn.

Write your poem on the lines provided.

Check your spelling with a partner. When finished, follow your teacher's directions to create a paper plate bighorn sheep. Write your final draft on your sheep's face.

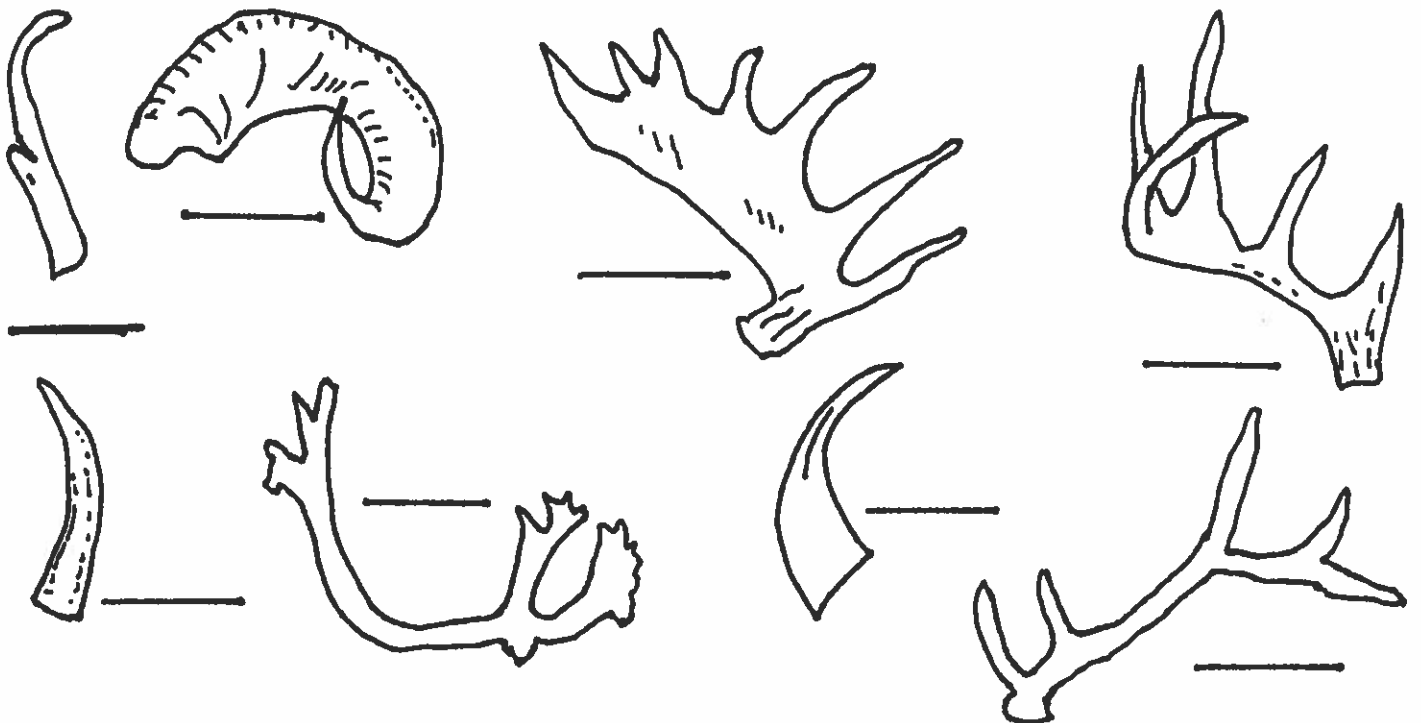


Horns and Antlers

Do You Know the Difference?

Write the letter of the name of the animal that grows the horn or antler in the spaces below. Circle the horns.

- | | | | |
|------------------|------------------|----------------------|------------|
| A. Mountain Goat | B. Bighorn Sheep | C. White-tailed Deer | D. Bison |
| E. Moose | F. Elk | G. Pronghorn | H. Caribou |



Now, brainstorm the differences between horns and antlers. Write an acrostic poem for horns and antlers explaining some of the differences.

H _____
 O _____
 R _____
 N _____
 S _____

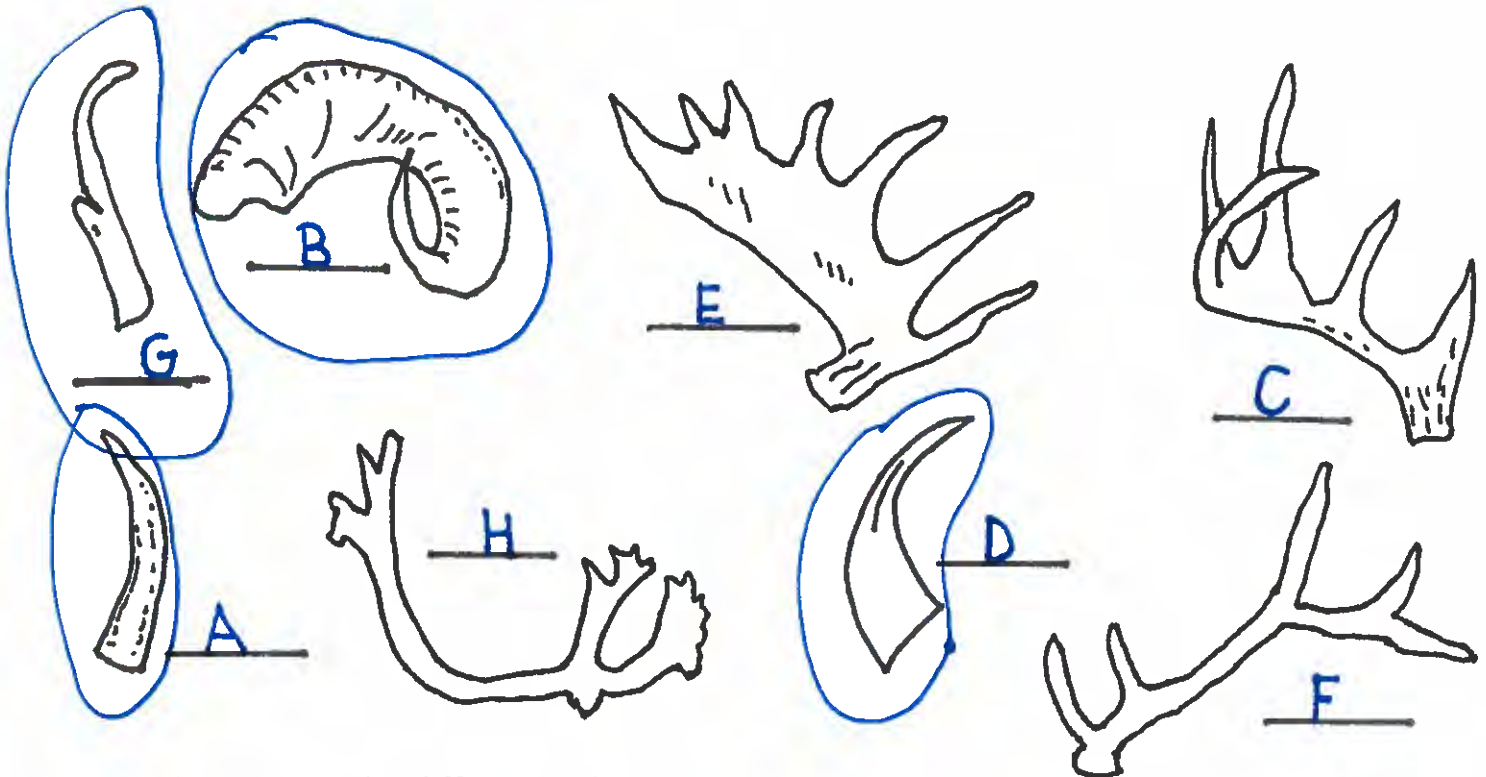
A _____
 N _____
 T _____
 L _____
 E _____
 R _____
 S _____

Horns and Antlers

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Write the letter of the name of the animal that grows the horn or antler in the spaces below. Circle the horns.

A. Mountain Goat	B. Bighorn Sheep	C. White-tailed Deer	D. Bison
E. Moose	F. Elk	G. Pronghorn	H. Caribou



Now, brainstorm the differences between horns and antlers. Write an acrostic poem for horns and antlers explaining some of the differences.

Hollow sometimes
On head
Really strong
Never stops growing
Stays on head

All bone
New each year
Temporary
Little at first
Elk, deer, moose
Rarely on females
Solid and branched