Murder Ewe Wrote

(adapted from U.S. Forest Service, Rocky Mountain Region, 189-195)

Objectives

Students will: 1) Analyze information about a complicated wildlife population event, and apply the analysis to answering a number of questions. 2) Name three factors that can lead to a crash in a bighorn sheep population.

Materials

Six each of: *Mystery Story* and *Mystery Questions* (copied back-to-back), clues, and hint cards.

PROCEDURE

1) Tell the students that the biology and life history of any wildlife species, and how it interacts in its ecosystem, is incredibly complex.

2) Explain that wildlife biologists and land managers attempt to understand these complexities, but often learn the most from what might be considered disasters, such as big die-offs in a population. Explain that you have a story about an apparently mysterious die-off in a herd of Rocky Mountain bighorn sheep. (Though fictional, this story is a compilation of several real-life events.) Ask students to listen carefully, as they will be working in groups and solving the mystery later. Read the *Mystery Story* as a class.

3) Tell the students that to solve this mystery, they will need to answer a number of questions. Read the *Mystery Questions* to the class. Explain that each group will have a copy of the story and questions, as well as five clues to help them answer the questions.

4) Divide students into groups of about four, and instruct that one student in each group needs to have a pencil and paper in order to record the answers to the questions. (This duty may rotate.) Explain that the answers to questions 1-9 are found either in the story or in one of the clues. Explain that question 10 requires putting together all of the information. Tell them not to attempt this question until they have finished answering the others. Tell students that each group will get one hint card (teacher needs to make), which may be traded in for the location of the answer to one question. Suggest that if they are stuck on a question, they skip it and move on to the next one, using the hint card as a last resort. Explain that they may find the answer they are looking for later or may come across a harder question. Pass out a set of *Mystery Story/Mystery Questions***,** clues, and a hint card to each group. Give the students enough time so that most groups finish with questions 1-9.

5) Call on different groups to present their answers. As a class, discuss the answer to question #10. Review the steps wildlife managers took once they finally figured out the causes of the die-off, and discuss what steps they could take in the future to prevent or limit similar events. Discuss differing challenges of the bighorn sheep near where you live, as each species of sheep and location differ in challenges.

MYSTERY STORY OF THE TAYLOR CANYON ROCKY MOUNTAIN BIGHORN SHEEP HERD

(from U.S. Forest Service, Rocky Mountain Region, 192)

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 flyovers 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.

MYSTERY QUESTIONS: What caused this dramatic population crash?

1. How many Taylor Canyon bighorn sheep died between the summer and February 5th?

2. What unusual wildlife behavior could have been a clue that the sheep were not healthy?

3. Why did so many of the herd die in such a short period of time (January through February 5th)?

4. Why did the rams die earlier than the ewes?

5. Why were there only a few lambs in December, though there were many in the summer?

6. How do bighorn sheep get lungworms? What is the lifecycle of the lungworm?

7. What is the relationship between the pneumonia bacteria and the lungworm?

8. What human activities increased winter crowding and decreased winter food supplies for the Taylor Canyon bighorn sheep herd?

9. What conditions make it more likely that a bighorn sheep will get sick with pneumonia/ lungworm?

10. Name as many factors as you can that caused the die-off of the Taylor Canyon herd.

MYSTERY CLUES

(**adapted from** U.S. Forest Service, Rocky Mountain Region, 193-195)

A. Usually only unhealthy wild animals allow humans to get close to them.

B. Young or physically stressed bighorn sheep are more likely to get diseases than healthy unstressed sheep. Stresses may include a difficult winter, loss of habitat, fighting for mates or running from machines. Stressful conditions will kill off young sheep first, and an observer might notice a lack of lambs in a band.

C. Diseases spread easily among sheep herdsin crowded conditions. In wintertime bighorns tend to be more crowded than in summer. During summer, bighorn sheep stay at high elevations on public lands, eating nutritious alpine plants. When winter snows arrive,they typically move down into the valleys and canyons, where there are more private lands, more people, and more cattle. Private lands in Taylor Canyon are grazed in the summer by large numbers of cattle, leaving fewer plants for the bighorn. During this summer one rancher sold some of his valley land to a developer, who has begun building homes. By the time winter arrived there were fewer places to graze, with less food available on them.

D. Bighorn sheep, like people, can't fight off diseases as well when they are tired. Several factors caused the Taylor Canyon bighorns to use up extra energy and become tired this fall and winter:

*Their breeding season is November and December. Rams fight to breed with ewes. Because of the energy spent on fighting, rams have less energy leftover for a long, hard winter than ewes do.

*The elk hunters in December were riding snowmobiles. These loud machines easily spook bighorn, causing them to use up energy getting away.

*During cold weather, bighorn sheep spend lots of energy trying to stay warm. In mid-January temperatures were –20 at midday.

*When the ground is covered with snow, bighorns must paw through the snow to find grass to eat. This is tiring. Five feet of snow were on the ground in January.

*Deep snow makes walking more tiring for bighorns. It also makes bighorn herds congregate closer together, on a few pieces of bare ground or areas with the least snow. When animals are closer together, disease is more likely to spread throughout the heard.

E. Autopsies of Taylor Canyon bighorn sheep showed that dead bighorns carried both pneumonia-causing bacteria and parasites called lungworms. Even healthy bighorn sheep have the bacteria. But the bacteria only cause disease when there are open sores in the lungs. Lungworms cause these open sores in the lungs. The larval stage of the lungworm is found in small land snails that bighorns sometimes eat by accident when grazing. The larval stage of the lungworm then travels from the bighorn's stomach to its lungs, and causes the open sores. Once in the lungs, the lungworms mate and lay eggs. The pneumonia bacteria takes hold in the sores, and cause the bighorn's lungs to fillup with mucous. The bighorn tries to cough the mucous out. When the lungworm eggs hatch, the young larvae are coughed up and swallowed, leading to more sores and mucous in the lungs.

ANSWERS FOUND IN CORRESPONDING LOCATIONS

1: story

- 250 sheep in summer – 48 seen on February 5th= **202 sheep died**

2: A - Usually only unhealthy wild animals allow humans to get close to them.

3. D -Bighorn sheep, like people, can't fight off diseases as well when they are tired. Several factors caused the Taylor Canyon bighorns to use up extra energy and become tired this fall and winter (see "D" for specifics)

4. D - Their breeding season is November and December. Rams fight to breed with ewes. Because of the energy spent on fighting, rams have less energy leftover for a long, hard winter than ewes do.

5. B - Stressful conditions will kill off young sheep first, and an observer might notice a lack of lambs in a band.

6. E (see all of "E" for complete answer)

7. E - Pnemonia bacteria only cause disease when there are open sores in the lungs and it is the lungworms that cause these open sores in the lungs.

8. C - When winter snows arrive,they typically move down into the valleys and canyons, where there are more private lands, more people, and more cattle. Private lands in Taylor Canyon are grazed in the summer by large numbers of cattle, leaving fewer plants for the bighorn. Fewer places to graze and less food.

9. B- Young or physically stressed bighorn sheep are more likely to get diseases than healthy unstressed sheep, C- Diseases spread easily among sheep herdsin crowded conditions, and D- Bighorn sheep can't fight off diseases as well when they are tired (rams lost energy during breeding, elk hunters using snow mobiles made sheep run away and used energy, spent energy trying to stay warm on cold days, spent energy finding food in snow, walking in deep snow uses energy and deep snow causes sheep to stay closer together which allows diseases to spread easier)

10. Story and all clues