*An integrated unit focusing on the management decisions regarding one of Arizona's major predators*

# Mountain Lions in Arizona

## *Lesson 1: The Lion as Predator – Agile as a Cat*

### LESSON OVERVIEW

In this lesson, students will learn about some key adaptations that make the mountain lion an effective predator. They will do this by comparing the ability of mountain lions to perform certain actions, such as jumping and listening, with the ability of humans to perform the same actions.

### SUGGESTED GRADE LEVELS

- 6 – 12

### ENDURING UNDERSTANDINGS

- All organisms have adaptations that allow them to survive in particular environments.

### OBJECTIVE

Students will:

- Work in small groups to analyze data.
- Perform a variety of simple actions.
- Compare abilities of mountain lions and humans.

### ARIZONA DEPARTMENT OF EDUCATION STANDARDS

| Grade | Science | Social Studies |
|---|---|---|
| 6 | S1-C2-04 | None |
| 7 | S1-C2-04; S1-C3-05; S4-C3-02 | None |
| 8 | S1-C2-04; S1-C3-05; S2-C2-04; S4-C4-01 | None |
| High School | S1-C3-06; S1-C4-04; S4-C4-02 | None |

*Note: The full text of these standards can be found in Appendix A.*

### TIME FRAME

- 1 – 2 days (45 minutes each day)

### MATERIALS

- *Are You as Agile as a Cat?* worksheet (1 per student)
- Meter sticks and tape (1 per group)
- Butcher paper (1 sheet per group)
- Protractors (1 per group)
- Markers (1 set per group)

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- Calculators (1 per group)

## TEACHER PREPARATION

- Make a copy of the *Are You as Agile as a Cat?* worksheet for each student.
- Gather materials.

## SUGGESTED PROCEDURES

1. Ask students: In what ways are mountain lions and humans similar? They can answer in the form of a journal entry or a class discussion. Discuss some student answers.
2. Explain to students that today they will be making comparisons between their abilities and those of mountain lions.
3. Hand out the *Are You as Agile as a Cat?* worksheet.
4. Read the first two paragraphs as a class or individually.
5. Briefly explain the assignment and each of the activities that students will be completing. Review how to use a protractor to be sure all students understand.
6. Divide the students into groups of three or four.
7. Allow the students to work. Check on groups periodically to ensure that all students are participating. Students may need two days to complete all of the activities.
8. After all groups have finished the activities, ask for volunteers to share their concluding paragraphs.
9. Collect the *Are You as Agile as a Cat?* worksheets.

## ASSESSMENT

- *Are You as Agile as a Cat?* worksheet
- Class discussion

## EXTENSIONS

- Students can construct a Venn diagram to compare mountain lions with humans.
- Students can study domestic cats, either through observation of their own pets or through the Internet, to identify ways in which they are similar to wild cats, such as the mountain lion.
- Encourage students to participate in the *Hot Topics Campfire Chat* with their parents at home.

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# Appendix A: Arizona Department of Education Standards – Full Text

**Science Standards**

| Grade | Strand | Concept | Performance Objective |
|---|---|---|---|
| 6 | 1 | 2 – Scientific Testing | 4 – Perform measurements using appropriate scientific tools |
| 7 | 1 | 2 – Scientific Testing | 4 – Perform measurements using appropriate scientific tools |
| | | 3 – Analysis and Conclusions | 5 – Formulate a conclusion based on data analysis |
| | 4 | 3 – Populations of Organisms in an Ecosystem | 2 – Explain how organisms obtain and use resources to develop and thrive in predator/prey relationships |
| 8 | 1 | 2 – Scientific Testing | 4 – Perform measurements using appropriate scientific tools |
| | | 3 – Analysis and Conclusions | 5 – Explain how evidence supports the validity and reliability of a conclusion |
| | 2 | 2 – Nature of Scientific Knowledge | 4 – Explain why scientific claims may be questionable if based on very small samples of data |
| | 4 | 4 – Diversity, Adaptation and Behavior | 1 – Explain how an organism's behavior allows it to survive in an environment |
| High School | 1 | 3 – Analysis, Conclusions, and Refinement | 6 – Use descriptive statistics to analyze data, including mean |
| | | 4 – Communication | 4 – Support conclusions with logical scientific arguments |
| | 4 | 4 – Biological Evolution | 2 – Explain how genotypic and phenotypic variation can result in adaptations that influence an organism's success in an environment |

## Appendix B: Worksheets and Overheads

The pages that follow contain the worksheets listed below:

A. *Are You as Agile as a Cat?* worksheet – Describes lab procedures, provides data tables and sound maps for the students to fill out, poses questions, and provides space for answers. (3 pages)

# Are You as Agile as a Cat?

All animals have evolved adaptations that allow them to survive in their environment. The mountain lion is no exception. Today you will look at the adaptations that make the mountain lion a good predator, capable of hunting its food, and compare these adaptations with those of humans.

You will be divided into small groups. Everyone in your group is expected to participate in each activity. This will increase your "sample size," or the amount of data you collect. Why is it important for scientists to have a large sample size? _____

_____

**JUMPING**

Mountain lions are very agile creatures. Part of their agility is related to their tremendous jumping ability. To compare your agility with that of a mountain lion, you are going to test how well you can jump.

Procedures

1. Move to a clear space in the classroom or outside.
2. Use chalk or tape to mark the starting point.
3. Without getting a running start, jump forward from this mark as far as you can.
4. Have a partner mark where you landed.
5. Measure the distance from the starting point to your landing point and write this under "Jump Distance" in Data Table 1.
6. Stand next to a wall.
7. Without getting a running start, jump as high as you can.
8. Have a partner mark the height on the wall.
9. Measure the distance from the floor to this mark and write this under "Jump Height" in Data Table 1.
10. Repeat steps 3 through 9 for each person in your group.
11. Calculate the average jump distance and height for your group.

*Data Table 1: Jumping Ability of Group*

| Name of Student | Jump Distance | Jump Height |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| **Average** | | |

Questions

1. A mountain lion has been recorded as jumping a distance of 45 feet forward. How does this compare with your group's average? _____
2. A mountain lion has been recorded as jumping to a height of 15 feet. How does this compare with your group's average? _____
3. Why is this tremendous jumping ability important to a mountain lion? _____

   _____

## VISION

For predators such as mountain lions, vision is an extremely important sense. The better an animal can see, the more likely it is to find prey that does not want to be seen. One important visual characteristic is the "field of vision," which is defined as the amount of space, in all directions, that an animal can see. This includes the peripheral or outer part of the field of vision.

You can calculate field of vision by measuring how far to the sides an animal can see when looking straight ahead. To compare your vision with that of a mountain lion, you are going to measure your field of vision.

Procedures

1. Draw a circle on a piece of butcher paper that is large enough for you to stand inside (approximately three feet in diameter). Mark the circle's center.
2. Draw a mark on the circle and label it 0°.
3. Use a protractor to mark off every five degrees on the circle.
4. Stand on the center of the circle facing the 0° mark.
5. Focus on an object straight in front of you, and do not move your eyes.
6. Have a partner stand in front of you and move slowly clockwise around the circle.
7. Tell your partner to stop when you can no longer see him or her.
8. Place a mark where your partner stopped.
9. Repeat steps 4 through 8 but have the partner move counterclockwise.
10. Determine your total field of vision by counting the number of degrees between the two marks.
11. Write this number in Data Table 2.
12. Repeat steps 4 through 10 for all members of your group.
13. Calculate the average field of vision for your group.

*Data Table 2: Field of Vision for Group*

| Name of Student | Field of Vision |
|---|---|
| | |
| | |
| | |
| | |
| **Average** | |

Questions

1. How many degrees does a circle have? _____
2. A mountain lion has an average field of vision of 287°. How does this compare to your group's average? _____
3. Why would a large field of vision be beneficial to a predator? _____
   _____
4. Many prey species have their eyes on the sides of their heads. How would this affect their field of vision? _____

## HEARING

Another important sense for predators is hearing. The cone-shaped ear of a mountain lion can be turned in many directions to collect sound and channel it into the eardrum.

Famous naturalist Joseph Cornell developed the concept of a sound map. This is a map on which you put together all of the sounds, in all directions, that you hear in a certain location. You will be making two sound maps, one with your regular hearing and one with modified hearing.

Procedures

1. Find a quiet space outside.
2. Sit down and face in one direction. You will face in this direction the entire time.
3. Spend five minutes completing a sound map in Figure 1 using your regular hearing. The "x" represents where you are sitting. Every time you hear a noise, draw a symbol that represents that sound at the approximate location where you hear it.
4. Spend five minutes completing a sound map in Figure 2 using modified hearing. Cup your ears with your hands so that they are focused in a particular direction. Periodically change the direction, but do not forget to mark any sounds you hear.
5. Compare your two sound maps with those produced by your partners.

*Figure 1: Normal Sound Map*

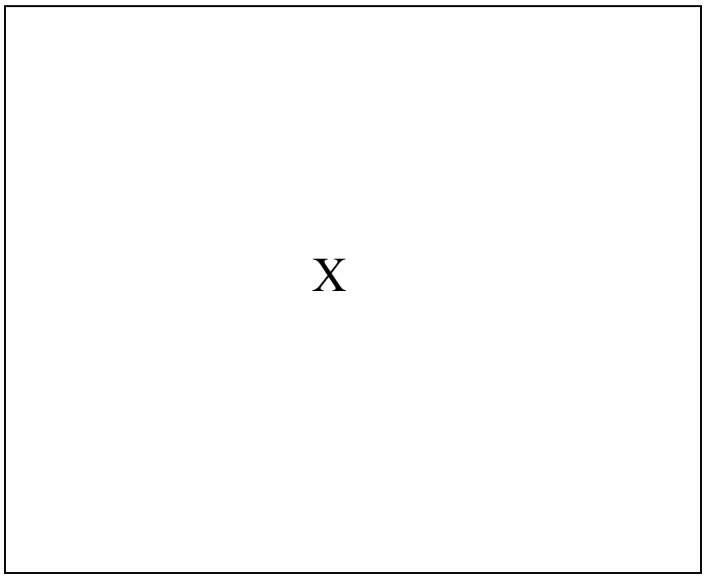
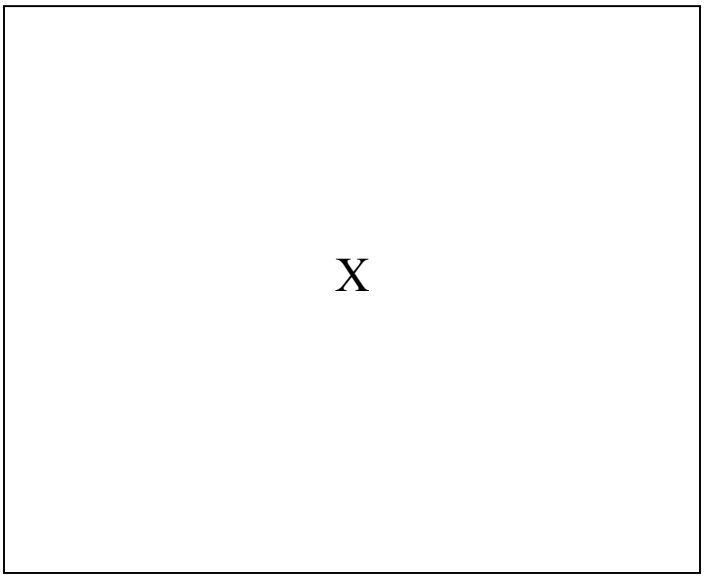



*Figure 2: Modified Sound Map*




Questions

1. What differences do you notice between the sound maps? _____
_____
_____
2. Which one do you think is most accurate? Why? _____
_____
3. Why is the ability to focus in on sounds important to the mountain lion? _____
_____

**CONCLUSION**

In a brief paragraph, compare the abilities of humans with those of mountain lions and explain why all of these adaptations make the mountain lion an efficient predator. You may use the back of this page for your paragraph.

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# Mountain Lions in Arizona

## *Lesson 2: The Lion as Predator – Feast of Plenty*

### LESSON OVERVIEW

In this lesson, students will learn the basics of a mountain lion's diet by researching one of its possible food chains and the subsequent food web. Each student will be assigned one of the mountain lion's prey species and asked to construct a food chain using that animal. Students will present their food chains to the class so they can all see the diverse resources required to keep mountain lions alive. Then, students will combine food chains to make a food web in order to understand how a small change in one part of the ecosystem can have a dramatic impact on all of the species.

### SUGGESTED GRADE LEVELS

- 6 – 12

### ENDURING UNDERSTANDINGS

- All energy in an ecosystem comes from the sun.
- Animals eat food to obtain the energy necessary for survival.
- Changes to one part of an ecosystem can affect all other parts of that ecosystem.
- Specialists are species that depend on one particular food to survive; generalists are capable of surviving on a variety of food types.

### OBJECTIVE

Students will:

- Use the Internet to research specific information about an animal.
- Create a food chain for a mountain lion.
- Present a food chain.
- Create a food web.
- Analyze the effects of changes in the food web.

### ARIZONA DEPARTMENT OF EDUCATION STANDARDS

| Grade | Science | Social Studies |
|---|---|---|
| 6 | S4-C3-01 | None |
| 7 | S4-C3-01; S4-C3-02; S4-C3-05; S4-C3-06 | None |
| 8 | S4-C4-01; S4-C4-02 | None |
| High School | S4-C3-01; S4-C4-04; S4-C5-04 | None |

*Note: The full text of these standards can be found in Appendix A.*

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## TIME FRAME

- 3 days (45 minutes each day)

## MATERIALS

- *Food Chain of a Mountain Lion* worksheet (1 per student)
- *Food Web of a Mountain Lion* worksheet (1 per student)
- Internet access or printouts of animal fact sheets
- Construction paper
- Markers, crayons, or colored pencils
- Scissors
- Glue and/or tape

## TEACHER PREPARATION

- Make copies of both worksheets for each student.
- Gather art materials.
- If no Internet access is available to students, visit some of the Web sites to print out fact sheets on the assigned animals for students to use for research.

## SUGGESTED PROCEDURES

1. Ask students: What types of food does a mountain lion eat? They can answer in the form of a journal entry or a class discussion. Discuss some student answers. Explain that scientists have discovered that mountain lions have a very diverse diet.
2. Hand out the *Food Chain of a Mountain Lion* worksheet.
3. Read the worksheet individually or as a class.
4. Assign each student one of the prey animals to research. Some animals may be assigned to more than one student. Explain that when they have become familiar with their animal, they will make a food chain with it that shows the mountain lion at the top and the foods that their prey animal eats at the bottom. They should illustrate their food chain with drawings or photos. Emphasize that they will be presenting this information to the class, so the food chain should be large enough for everyone to see easily. Appendix B provides suggested Web sites for student research.
5. Allow the students to work. If they do not finish in class, they can complete the assignment as homework.
6. When all students have finished, begin the presentations. Each presentation should include a brief description of the animal, its habitat, and an explanation of the food chain the student created. If several students are presenting the same animal, discuss any similarities or differences among their food chains.
7. After all presentations have been completed, allow time for students to answer the questions at the end of the *Food Chain of a Mountain Lion* worksheet. If they do not finish in class, they can complete the assignment as homework. Collect the worksheet when students have finished.
8. Begin the food-web component by handing out the *Food Web of a Mountain Lion* worksheet.
9. Read the worksheet individually or as a class.

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10. Explain that students will now make a food web by combining five food chains presented in class. One of the chains must be their own, but the other four can belong to any other student as long as four different organisms are used.
11. Allow the students to work on their food webs and answer the questions on the worksheet.
12. When all students have finished, discuss the questions. Be sure to emphasize that small changes to the environment can result in drastic changes to the entire ecosystem and the animals in it.
13. Collect the food webs and the *Food Web of a Mountain Lion* worksheets.

## ASSESSMENT

- Student-generated food chain
- Student-generated food web
- *Food Chain of a Mountain Lion* worksheet
- *Food Web of a Mountain Lion* worksheet
- Class discussion

## EXTENSIONS

- Students can research the diets of some of the other large predators found in Arizona (i.e., Mexican wolves, black bear, and jaguar) to see if they can determine the types of habitats in which each lives.
- Encourage your students to participate in the *Hot Topics Campfire Chat* with their parents at home.

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# Appendix A: Arizona Department of Education Standards – Full Text

**Science Standards**

| Grade | Strand | Concept | Performance Objective |
|---|---|---|---|
| 6 | 4 | 3 – Populations of Organisms in an Ecosystem | 1 – Explain that sunlight is the major source of energy for most ecosystems |
| 7 | 4 | 3 – Populations of Organisms in an Ecosystem | 1 – Compare food chains in a specified ecosystem and their corresponding food web<br>2 – Explain how organisms obtain and use resources to develop and thrive in predator/prey relationships<br>5 – Predict how environmental factors affect survival rates in living organisms<br>6 – Create a model of the interactions of living organisms within an ecosystem |
| 8 | 4 | 4 – Diversity, Adaptation and Behavior | 1 – Explain how an organism's behavior allows it to survive in an environment<br>2 – Describe how organisms are influenced by a particular combination of biotic and abiotic factors in an environment |
| High School | 4 | 3 – Populations of Organisms in an Ecosystem | 1 – Identify relationships among organisms within populations, communities, ecosystems, and biomes. |
| | | 4 – Biological Evolution | 4 – Explain how a change in an environmental factor can affect the number and diversity of species in an ecosystem |
| | | 5 – Matter, Energy, and Organization in Living Systems | 4 – Diagram the energy flow in an ecosystem through a food chain |

## Appendix B: Suggested Research Web Sites

Below are some suggested Web sites that students may use for research. It is recommended that you review the Web sites before using them with students:

- *eNature* – your students will need to search the database for their selected animal
  - http://www.enature.com/home/
- *Desert Animal and Wildlife* – a general site where about half of the animals can be found
  - http://www.desertusa.com/animal.html
- *Southwest Wildlife Factsheets* – a general site where about some of the animals can be found
  - http://www.southwestwildlife.org/factsheets/factsheets.htm
- *Plant and Animal Abstracts* – scientific reports for some of the animals, but it is intended for an older audience
  - http://www.azgfd.gov/w_c/edits/hdms_abstracts.shtml

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## Appendix C: Worksheets and Overheads

The pages that follow contain the worksheets listed below:

A. *Food Chain of a Mountain Lion* – Provides directions for the students to research and create a food chain. Poses questions regarding food chains and provides space for answers. (1 page)

B. *Food Web of a Mountain Lion* – Provides directions for the students to combine food chains to create a food web. Poses questions regarding food webs and provides space for answers. (1 page)

# Food Chain of a Mountain Lion

Although mountain lions tend to prey on large mammals, such as deer and elk, they will also eat smaller mammals, reptiles, and even insects if necessary. They have even been known to prey on livestock, such as cattle and pigs, if available. Table 1 shows a partial list of prey animals.

**Table 1: Arizona Animals Preyed on by Mountain Lions**

| | | | | | |
|---|---|---|---|---|---|
| Mule Deer | Coyote | White-tailed Deer | Cottontail Rabbit | Elk | Skunk |
| Bighorn Sheep | Ground Squirrel | Pronghorn | Raccoon | Javelina | Woodrat |
| Porcupine | Coati | Black Bear | Wild Burro | Bobcat | Wild Turkey |

Using the Web sites provided by your teacher or your own resources, research the animal that you have been assigned. You should be able to provide a description of the animal as well as its major habitat. You will also need to know which plants and/or animals your animal eats.

Based on this research, make a food chain starting with the mountain lion at the top. Be aware that your animal will probably eat more than one food item and you need to show all of those items on your chain. In addition, if any of those food items is also a predator, you must show the items that predator eats. For example, if the black bear eats fish you will also need to show what the fish eat. Be sure to include drawings or photos of the animals and plants that you have included on your food chain.

When all of the presentations have been completed, answer the following questions. If you run out of space, continue your answers on the back.

1. In an ecosystem, animals play various roles. Use any resources available to help you define the following roles: producer, consumer, primary consumer, decomposer, predator, and prey. Give an example of each one from the animals above.

2. Trophic (nutritional) levels are defined as the various levels of a food chain. Based on the roles above, what types of organisms are found at the highest trophic levels? What types of organisms are found at the lowest trophic levels?

3. Where do organisms at the highest trophic level get their energy? Where do organisms at the lowest trophic level get their energy?

4. Energy is lost as you advance through a food chain. Some estimates say that as you move up to the next trophic level, you lose 10% of the energy. Based on this estimate, how much energy is left by the time you reach the top of the food chain you created?

5. A mountain lion is referred to as a "top predator." What do you think this means?

# Food Web of a Mountain Lion

In the previous activity, you saw the wide variety of food that the mountain lion can eat. In particular, you looked at one prey item. However, the mountain lion exists in an ecosystem that includes a number of animals and plants. Scientists have suggested that the addition or removal of an animal from an ecosystem can affect many other animals and plants. You will have the opportunity to explore this idea by looking at a mountain lion's food web. While a food chain is a sequence that shows the transfer of energy from one organism to another, a food web is a complex network of food chains that shows the relationship between multiple species in an ecosystem.

Choose five food chains that were presented in class (yours and four others). Create a food web that links all of these food chains together. Be sure to include all of the animals and plants that were shown on the original chains, and be sure all of the links are completed. For example, you may find that more than one animal eats grass. As a result, you should have more than one link to the grass.

When finished, answer the questions below. If you run out of space, continue your answers on the back of this page.

1. Animals can serve a variety of roles in an ecosystem. These include predator, prey, producer, consumer, primary consumer, and decomposer. Based on your food web, what roles does the mountain lion play in this ecosystem? How do you know?

2. If above-average precipitation occurred one year causing a significant increase in the amount of grass available, what effect would this have on the other animals and plants in the ecosystem?

3. If the mountain lion were removed from the ecosystem, what might be the immediate effects on the other animals and plants? What might be the long-term effects?

4. The mountain lion is a true survivor. For many years, the United States government endorsed a program to eliminate this large predator. Although the program met with limited success, the mountain lion is still common in the western states. Explain why its diverse diet helps it survive.

5. The black-footed ferret is a small mammal similar to a weasel. Like the mountain lion, the ferret is a predator. However, it feeds on only one animal — the prairie dog. The black-footed ferret is one of the most endangered mammals in North America. In fact, it was once thought to be extinct. Explain why its limited diet may have an impact on its survival.

6. "Generalist" and "specialist" are two words used to describe animals based on their food variety. What do you think these terms mean? Which word describes mountain lions? Which describes black-footed ferrets?

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# Mountain Lions in Arizona

## *Lesson 3: Humans and Lions – Sharing Space Through Time*

### LESSON OVERVIEW

In this lesson, students will explore how habitat loss can affect the population of mountain lions. They will interpret a map that illustrates the historic and current range of mountain lions in the United States. After making a human population density map, they will compare the ranges of the two species to see if there is a relationship.

### SUGGESTED GRADE LEVELS

- 6 – 12

### ENDURING UNDERSTANDINGS

- Human population growth can negatively affect the survival of other species.

### OBJECTIVE

Students will:

- Learn how to read and interpret maps.
- Create a population density map given current data.
- Compare and contrast maps showing different data.

### ARIZONA DEPARTMENT OF EDUCATION STANDARDS

| Grade | Science | Social Studies |
|---|---|---|
| 6 | S1-C3-01; S1-C3-04; S4-C3-02 | S1-C1-01; S1-C1-02; S4-C1-01; S4-C1-03; S4-C4-02 |
| 7 | S1-C3-01; S1-C3-05; S3-C1-01; S4-C3-04 | S1-C1-01; S1-C1-02; S4-C1-01; S4-C1-03; S4-C4-05; S4-C5-06 |
| 8 | S1-C3-01; S1-C3-05 | S1-C1-01; S1-C1-02; S4-C1-01; S4-C1-03; S4-C4-02 |
| High School | S3-C1-01; S3-C1-03 | S1-C1-01; S1-C1-04; S1-C1-07; S4-C1-02; S4-C5-05 |

*Note: The full text of these standards can be found in Appendix A.*

### TIME FRAME

- 1 day (45 minutes)

### MATERIALS

- *Mountain Lions Through Time* worksheet (1 per student)
- *Humans Through Time* worksheet (1 per student)
- Crayons or colored pencils
- Wall map of the United States
- Picture of the United States at night (optional)

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## TEACHER PREPARATION

- Make copies of the two worksheets for each student. The *Humans Through Time* worksheet can be copied double-sided with the map on the back.

## SUGGESTED PROCEDURES

1. Ask students: Where in the United States do you think mountain lions can be found and why? They can answer in the form of a journal entry or a class discussion. Solicit ideas from students, using a wall map to reinforce their understanding. Discuss whether humans affect where mountain lions might be found. Tell students that they had some good thoughts but now it is time to look at the evidence.
2. Hand out the *Mountain Lions Through Time* worksheet. Allow time for students to look at the map and answer the questions at the bottom of the page.
3. When students have completed the worksheet, discuss their answers as a class. Be sure they understand that some of the questions may not have a correct answer at this time. All we can do, as scientists, is look at the data and try to draw conclusions. Later, when more data have been collected, we may be able to reach a more definitive answer.
4. Hand out the *Humans Through Time* worksheet and inform students that now we have a little more information. Explain that the United States takes a census, or a count, of all of its citizens every 10 years. From this information, we can calculate "population density," or the number of people per square mile. This data table shows the population densities of each state in 1880 and 2000. Notice that we have human population data for a year when the mountain lion inhabited its historic range and for a more current year.
5. Allow time for students to answer the questions at the bottom of the page. When they have finished, they are to color the map on the backside according to the population density of each state in 2000, and then to answer the questions pertaining to the map. If they do not finish in class, they can complete the assignment for homework.
6. When students have completed the worksheet, discuss any trends they may have noticed. If they do not point it out, you must guide them to a general conclusion that historically mountain lions could be found in parts of the United States where the population density of humans was low. Ask the students what this might mean in the future as the population of the United States continues to grow. Explore ways in which humans and mountain lions might coexist.
7. *Alternative Discussion:* Show the picture of the United States at night that was taken from space. Ask the students if, indeed, there seems to be a relationship between the density of humans and the current location of mountain lions.
8. Collect the *Mountain Lions Through Time* and *Humans Through Time* worksheets.

## ASSESSMENT

- *Mountain Lions Through Time* worksheet
- *Humans Through Time* worksheet
- Class discussions

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## EXTENSIONS

- Students can research the population density of mountain lions to confirm the idea that more mountain lions will be found in areas with less people.
- Encourage students to participate in the *Hot Topics Campfire Chat* with their parents at home.

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# Appendix A: Arizona Department of Education Standards – Full Text

**Science Standards**

| Grade | Strand | Concept | Performance Objective |
|---|---|---|---|
| 6 | 1 | 3 – Analysis and Conclusions | 1 – Analyze data obtained in a scientific investigation to identify trends<br>4 – Interpret simple tables and graphs produced by others |
| | 4 | 3 – Populations of Organisms in an Ecosystem | 2 – Describe how population density can affect the quality of life |
| 7 | 1 | 3 – Analysis and Conclusions | 1 – Analyze data obtained in a scientific investigation to identify trends<br>5 – Formulate a conclusion based on data analysis |
| | 3 | 1 – Changes in Environment | 1 – Analyze environmental risks caused by human interaction with biological or geological systems |
| | 4 | 3 – Populations of Organisms in an Ecosystem | 4 – Evaluate data related to problems associated with population growth and the possible solutions |
| 8 | 1 | 3 – Analysis and Conclusions | 1 – Analyze data obtained in a scientific investigation to identify trends<br>5 – Explain how evidence supports the validity and reliability of a conclusion |
| High School | 3 | 1 – Changes in Environments | 1 – Evaluate how the processes of natural ecosystems affect, and are affected by, humans<br>3 – Assess how human activities can affect the potential for hazards |

**Social Studies Standards**

| Grade | Strand | Concept | Performance Objective |
|---|---|---|---|
| 6 | 1 | 1 – Research Skills for History | 1 – Construct charts, graphs, and narratives using historical data<br>2 – Interpret historical data displayed in graphs, tables, and charts |
| | 4 | 1 – The World in Spatial Terms | 1 – Construct maps, charts, and graphs to display geographic information<br>3 – Interpret maps, charts, and geographic databases using geographic information |
| | | 4 – Human Systems | 2 – Describe the environmental, economic, cultural and political effects of human migrations and cultural diffusion on places and regions |

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**Social Studies Standards Continued**

| Grade | Strand | Concept | Performance Objective |
|---|---|---|---|
| 7 | 1 | 1 – Research Skills for History | 1 – Construct charts, graphs, and narratives using historical data<br>2 – Interpret historical data displayed in graphs, tables, and charts |
| | 4 | 1 – The World in Spatial Terms | 1 – Construct maps, charts, and graphs to display geographic information<br>3 – Interpret maps, charts, and geographic databases using geographic information |
| | | 4 – Human Systems | 5 – Analyze the effects of settlement on places (e.g., quality of life, transportation, population density) |
| | | 5 – Environment and Society | 6 – Describe the ways human population growth can affect environments and the capacity of environments to support populations |
| 8 | 1 | 1 – Research Skills for History | 1 – Construct charts, graphs, and narratives using historical data<br>2 – Interpret historical data displayed in graphs, tables, and charts |
| | 4 | 1 – The World in Spatial Terms | 1 – Construct maps, charts, and graphs to display geographic information<br>3 – Interpret maps, charts, and geographic databases using geographic information |
| | | 4 – Human Systems | 2 – Describe the effects (e.g., economic, environmental, cultural, political) of human migrations on places and regions |
| High School | 1 | 1 – Research Skills for History | 1 – Interpret historical data displayed in graphs, tables, charts, and geologic time scales<br>4 – Construct graphs, tables, timelines, charts and narratives to interpret historical data<br>7 – Compare present events with past events:<br>a. cause and effect<br>b. change over time<br>c. different points of view |
| | 4 | 1 – The World in Spatial Terms | 2 – Interpret maps and images (e.g., political, physical, relief, thematic, Geographic Information Systems [GIS] and LandSat) |
| | | 5 – Environment and Society | 5 – Analyze how humans impact the diversity and productivity of ecosystems |

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## Appendix B: Worksheets and Overheads

The pages that follow contain the worksheets listed below:

A. *Mountain Lions Through Time* – A historical look at the range of mountain lions in the United States. Poses questions regarding trends. (1 page)

B. *Humans Through Time* – A comparison between two years of human population density in the United States. Poses questions regarding trends. (2 pages)

C. *United States at Night* – A picture showing the lights of cities at night. (1 page)

# Mountain Lions Through Time

Below is a map of the current and historic (pre-1920) ranges for the mountain lion in the United States. Use the map to answer the questions.

*Figure 1: Current and Historic Range of Mountain Lions in the United States**

** Recent evidence indicates that the mountain lion may be extending its range*

**QUESTIONS**

1. In how many states could mountain lions be found before 1920?

2. In how many states can mountain lions now be found?

3. Why has such a dramatic decline occurred in the lion's range?

4. What is the overall trend in the mountain lion's current range?

5. What could be the reason for this trend?

6. Why have mountain lions been able to survive in Florida?

# Humans Through Time

Below is a data table that shows the population density for each state in 1880 and 2000. Use the table to answer the questions below.

*Table 1: Population Densities for United States, 1880 and 2000*

| State, Region, or Territory | Population Density (people/square mile) | |
|---|---|---|
| | 1880 | 2000 |
| Alabama | 24.9 | 87.6 |
| Alaska | 0.1 | 1.1 |
| Arizona | 0.4 | 45.2 |
| Arkansas | 15.4 | 51.3 |
| California | 5.5 | 217.2 |
| Colorado | 1.9 | 41.5 |
| Connecticut | 131.1 | 702.9 |
| Dakota Territory | 0.9 | N/A |
| Delaware | 69.2 | 401.1 |
| District of Columbia | 2960.6 | 9316.4 |
| Florida | 4.5 | 296.4 |
| Georgia | 26.5 | 141.4 |
| Hawaii | N/A | 188.6 |
| Idaho | 0.4 | 15.6 |
| Illinois | 55.6 | 223.4 |
| Indiana | 58.5 | 169.5 |
| Iowa | 29.5 | 52.4 |
| Kansas | 12.3 | 32.9 |
| Kentucky | 43.8 | 101.7 |
| Louisiana | 22.7 | 102.6 |
| Maine | 18.5 | 41.3 |
| Maryland | 84.0 | 541.9 |
| Massachusetts | 228.6 | 809.8 |
| Michigan | 29.0 | 175 |
| Minnesota | 9.3 | 61.8 |
| Mississippi | 24.0 | 60.6 |

| State, Region, or Territory | Population Density (people/square mile) | |
|---|---|---|
| | 1880 | 2000 |
| Missouri | 33.2 | 81.2 |
| Montana | 0.3 | 6.2 |
| Nebraska | 6.0 | 22.3 |
| Nevada | 0.6 | 18.2 |
| New Hampshire | 37.4 | 137.8 |
| New Jersey | 135.9 | 1,134.40 |
| New Mexico | 1.0 | 15 |
| New York | 108.2 | 401.9 |
| North Carolina | 27.6 | 165.2 |
| North Dakota | N/A | 9.3 |
| Ohio | 80.0 | 277.3 |
| Oklahoma | N/A | 50.3 |
| Oregon | 1.8 | 35.6 |
| Pennsylvania | 93.1 | 274 |
| Rhode Island | 211.7 | 1,003.20 |
| South Carolina | 29.3 | 133.2 |
| South Dakota | N/A | 9.9 |
| Tennessee | 33.8 | 138 |
| Texas | 5.8 | 79.6 |
| Utah | 1.7 | 27.2 |
| Vermont | 32.5 | 65.8 |
| Virginia | 39.4 | 178.8 |
| Washington | 1.1 | 88.6 |
| West Virginia | 26.9 | 75.1 |
| Wisconsin | 24.4 | 98.8 |
| Wyoming | 0.2 | 5.1 |
| United States | 14.0 | 79.6 |

*Data courtesy of the U.S. Census Bureau http://www.census.gov*

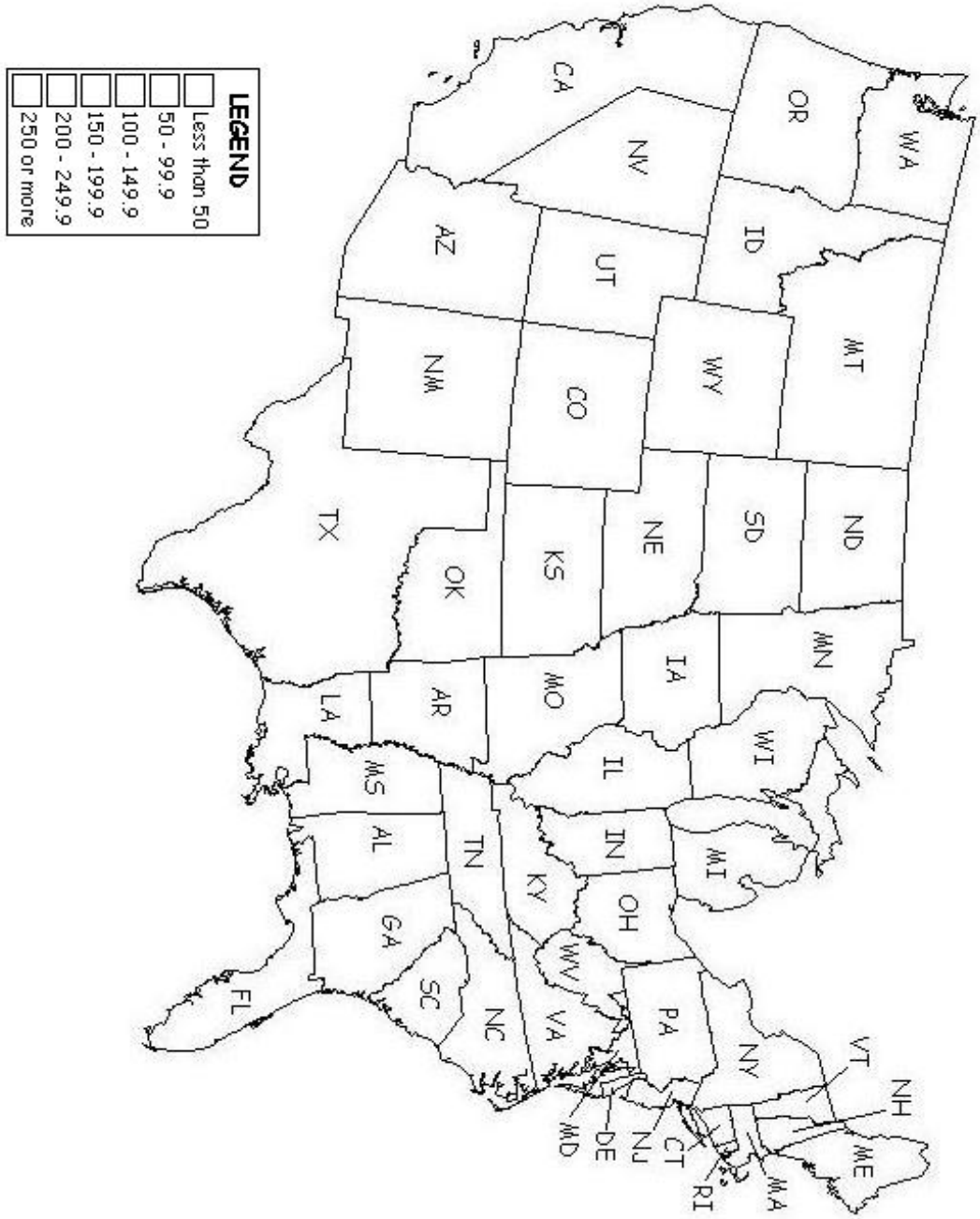
1. Explain why no data are available for Hawaii, Oklahoma, and North and South Dakota in 1880.

2. What trend do you notice between the population densities of the states in 1880 and in 2000?

3. Which state or region has the largest population density? Why? Which has the smallest? Why?

Use the 2000 Population Density data to color the map below. The densities will be divided into six ranges: less than 50, 50 – 99.9, 100 – 149.9, 150 – 199.9, 200 – 249.9, and 250 or more. Select six colors — one for each density range — and color the map and the legend. Answer the questions at the bottom.

*Figure 2: United States Map with Postal Abbreviations*




1. What basic trend do you notice about the colored map?

2. Why would the ranges used to represent the 2000 population density not be very good to represent the 1880 data?

3. Compare this map to the current range of the mountain lion. What do you notice?

# The United States at Night

Below is a photograph of North and Central America showing the United States at night. The lighted areas indicate the places where people live.

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# Mountain Lions in Arizona

## *Lesson 4: Humans and Lions – Conflicts Through Time*

### LESSON OVERVIEW

Students will learn about the history of predator management policies that led to the sharp decline in mountain lion populations throughout the United States. They will read a short article about mountain lion management and answer questions.

### SUGGESTED GRADE LEVELS

- 6 – 12

### ENDURING UNDERSTANDINGS

- Modern wildlife management is based on science as well as on the social pressures of the time.

### OBJECTIVE

Students will:

- Read and comprehend a scientific article.
- Create a bar graph from a given set of data.
- Develop conclusions supported by scientific data.

### ARIZONA DEPARTMENT OF EDUCATION STANDARDS

| Grade | Science | Social Studies |
|---|---|---|
| 6 | S1-C3-03; S1-C3-04; S1-C4-03 | S1-C1-02 |
| 7 | S1-C3-05; S1-C4-03 | |
| 8 | S1-C3-05; S1-C4-03 | |
| High School | S1-C3-06; S1-C4-02; S1-C4-04; S3-C1-05; S3-C2-03; S3-C2-05 | S1-C1-01; S3-C3-05 |

*Note: The full text of these standards can be found in Appendix A.*

### TIME FRAME

- 1 day (45 minutes)

### MATERIALS

- *History of Mountain Lion Management* article (1 per student)

### TEACHER PREPARATION

- Make copies of the *History of Mountain Lion Management* article for each student

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## SUGGESTED PROCEDURES

1. Ask students: "Do you believe it is legal to hunt mountain lions in the United States?" They can answer in the form of a journal entry or a class discussion. Select key answers for further discussion. Inform students that in many states hunting mountain lions is part of mountain lion management, and we are going to explore this further by reading an article on the history of mountain lion management.
2. Hand out the *History of Mountain Lion Management* article. Explain to students that they are to read the article silently and, when finished, answer the questions on a separate sheet of paper. If they do not finish in class, they can complete the assignment as homework.
3. When students have answered the questions, ask volunteers to read their paragraphs. Discuss their responses with the class. Point out that the many viewpoints that people have on this topic show that although science suggests an answer, decision-makers must take into account the values and concerns of stakeholders and constituents as well as science when making decisions. Decisions that will affect the public must respect the variety of backgrounds, experiences, and values that the public brings to the decision-making process. As a result, many questions may have more than one appropriate answer.
4. Collect the answers. If you will be reusing the article, collect it as well.

## ASSESSMENT

- Responses to *History of Mountain Lion Management* questions
- Class discussion

## EXTENSIONS

- Students can read and summarize the article "Predator Management: An Issue with Teeth" in the May-June 2001 issue of *Arizona Wildlife Views* magazine, published by the Arizona Game and Fish Department.
- Encourage your students to participate in the *Hot Topics Campfire Chat* with their parents at home.

## ARIZONA GAME AND FISH DEPARTMENT POSITION

The Arizona Game and Fish Department has determined that mountain lions will be destroyed if they attack a human or when they are judged to be a substantial threat to public safety. However, dogs, cats, and other small domestic pets could be considered a natural prey base for lions. The loss of these pets from lions will not be a sufficient reason to remove a lion from its home range. The agency has considered trapping and relocating problem lions; however, due to their large home ranges, the fact that all suitable habitat is occupied, and intraspecific defense of occupied habitat, this option will not be used.

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# Appendix A: Arizona Department of Education Standards – Full Text

**Science Standards**

| Grade | Strand | Concept | Performance Objective |
|---|---|---|---|
| 6 | 1 | 3 – Analysis and Conclusions | 3 – Evaluate the observations and data reported by others<br>4 – Interpret simple tables and graphs produced by others |
| | | 4 – Communication | 3 – Communicate the results of an investigation with appropriate use of qualitative and quantitative information |
| 7 | 1 | 3 – Analysis and Conclusions | 5 – Formulate a conclusion based on data analysis |
| | | 4 – Communication | 3 – Communicate the results of an investigation with appropriate use of qualitative and quantitative information |
| 8 | 1 | 3 – Analysis and Conclusions | 5 – Explain how evidence supports the validity and reliability of a conclusion |
| | | 4 – Communication | 3 – Present analyses and conclusions in clear, concise formats |
| High School | 1 | 3 – Analysis, Conclusions, and Refinement | 6 – Use descriptive statistics, like mean, to analyze data |
| | | 4 – Communication | 2 – Produce graphs that communicate data<br>4 – Support conclusions with logical scientific arguments |
| | 3 | 1 – Changes in Environments | 5 – Evaluate the effectiveness of conservation practices and preservation techniques on environmental quality and biodiversity |
| | | 2 – Science and Technology in Society | 3 – Support a position on a science or technology issue<br>5 – Evaluate methods used to manage natural resources |

**Social Studies Standards**

| Grade | Strand | Concept | Performance Objective |
|---|---|---|---|
| 6, 7, 8 | 1 | 1 – Research Skills for History | 2 – Interpret historical data displayed in graphs, tables, and charts |
| High School | 1 | 1 – Research Skills for History | 1 – Interpret historical data displayed in graphs, tables, charts, and geologic time scales |
| | 3 | 3 – Functions of Government | 5 – Describe the factors and processes that determine major domestic policies (e.g., social security, education, health care, parks, environmental protection) |

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## Appendix B: Worksheets and Overheads

The pages that follow contain the worksheets listed below:

A. *History of Mountain Lion Management* – An article describing how the government has managed mountain lions through recent history. Poses questions regarding mountain lion management. (2 pages)

# History of Mountain Lion Management

The United States has a long history of managing mountain lions and other large predators. According to a 2001 report by the United States General Accounting Office:

> The practice of managing wildlife is not new, nor is the control of predators. For centuries, control of mammalian predators has been practiced worldwide as a means of protecting livestock and enhancing game populations. The first recorded federal involvement in wildlife damage control in the United States occurred in 1885, when a federal agency sent questionnaires to farmers about crop damage caused by birds. By 1915, the Congress was appropriating funds for federal predator control operations directed at wolves and coyotes. In 1931, the Congress passed the Act of March 2, 1931 [Animal Damage Control Act (7 U.S.C. 426-426c)], authorizing the control of injurious animals. Since then, federal wildlife control activities have evolved along with demographic and societal changes. In the program's early years, for example, the emphasis was on conducting general eradication campaigns that might be directed at the entire statewide population of a particular species of predator.[1]

There are many reasons to support predator control measures, one of which is financial, primarily concerning the loss of livestock due to depredation. Estimates indicate that each year the United States loses $71 million due to livestock loss (Table 1).

*Table 1: Annual Livestock Losses Attributed to Predators*[2, 3]

| Livestock | Number Lost to Predators | Value of Loss (in millions) |
|---|---|---|
| Cattle | 147,000 | $51.6 |
| Sheep | 273,000 | $16.5 |
| Goats* | 61,000 | $3.4 |
| Total | 481,000 | $71.5 |

** Losses of goats and kids were reported only for three states: Arizona, New Mexico, and Texas*

Human safety is always a concern. As the human population of the country increases, wildlife habitat shrinks and people are more likely to encounter wildlife. Some of these encounters are going to be negative. In fact, thousands of people are injured or killed each year from animal attacks (Table 2).

*Table 2: Estimates of Annual Human Injuries and Fatalities in the United States from Wildlife Bites or Attacks*[4, 5, 6]

| Animal | Number of Injuries | Number of Fatalities |
|---|---|---|
| Bees and Wasps | More than 1,000,000 | 30-120 |
| Dogs | 800,000 | 17 |
| Rodents | 27,000 | Unknown |
| Venomous Snakes | 8,000 | 15 |
| Skunks | 750 | 0 |
| Foxes | 500 | 0 |
| Bears | 30 | 1 |
| Sharks | 28 | 2 |
| Alligators | 18 | .5 |
| Coyotes | 2 | 0 |
| Mountain Lions | 2 | .4 |

*Note: These data are extrapolated from various studies done in various geographic regions over various periods of time. They are probably understated because they exclude nonreported bites, which could be quite high in number.*

The government invested many resources in an attempt to eliminate these predators. "Between 1937 and 1970, federal employees…killed 7,255 cougars; 23,830 bears; 477,104 bobcats; 50,283 red wolves; 1,744 lobo wolves; 2,823,000 coyotes; and millions of other animals."[7] In addition to these efforts, many states offered bounties on animals they deemed to be "undesirable predators," particularly the mountain lion. Between 1907 and 1978, nearly 50,000 mountain lions were killed in the United States (Table 3).

*Table 3: Approximate Number of Mountain Lions Killed in United States, 1907 – 1978*[8]

| State | Time Period | Minimum Killed |
|---|---|---|
| Arizona | 1917 – 1973 | 8,557 |
| California | 1907 – 1973 | 12,705 |
| Colorado | 1917 – 1974 | 2,007 |
| Idaho | 1928 – 1973 | 2,781 |
| Montana | 1921 – 1974 | 503 |
| Nevada | 1917 – 1973 | 2,198 |
| New Mexico | 1917 – 1973 | 1,283 |
| Oregon | 1918 – 1973 | 6,831 |
| Texas | 1925 – 1973 | 776 |
| Utah | 1913 – 1978 | 6,253 |
| Washington | 1936 – 1973 | 5,253 |

Today, mountain lion management is based upon sound scientific principles. The Arizona Game and Fish Department states that "(m)ountain lions…will be managed to ensure their future ecological, intrinsic, scientific, educational, and recreational values, to minimize conflicts with humans, and to minimize adverse impacts on other wildlife populations."[9]

Hunting mountain lions is legal in eleven western states. Of the twelve states listed above, only California lists mountain lions as protected. In Arizona, approximately 200 – 300 mountain lions are legally harvested every year by hunters, and about fifty more are removed as outlined by Arizona state law.[10] A small population of mountain lions still exists in Florida, where the species is listed as endangered and receives protection according to the Endangered Species Act.

**Sources**:

[1] "Report to Congressional Committees: Wildlife Services Program." United States General Accounting Office. Nov. 2001.

[2] "Cattle Predator Loss." National Agricultural Statistics Services. May 2001 (data for 2000).

[3] "Sheep and Goats Predator Loss." National Agricultural Statistics Services. May 2000 (data for 1999).

[4] Michael R. Conover, William C. Pitt, K. K. Kessler, T. J. DuBow, and W. A. Sanborn. "Review of human injuries, illnesses, and economic losses caused by wildlife in the United States." Wildlife Society Bulletin. Vol. 23, No. 3. pp. 407-414. Fall 1995.

[5] "Bee and Hymenoptera Stings." eMedicine. http://emedicine.com/emerg/byname/bee-and-hymenoptera-stings.htm

[6] "Dog Bite Statistics." Northeast Arkansans for Animals. http://www.nafacares.org/Dog%20Stuff/dog_bite_statistics.htm

[7] Hansen, Kevin. *Cougar: The American Lion*. Flagstaff: Northland Publishing, 1993.

[8] Nowak, R. M. *The Cougar in the United States and Canada*. Washington, D.C.: New York Zoological Society and U.S. Fish and Wildlife Service Office of Endangered Species, 1976.

[9] "Predation Management Policy." Arizona Game and Fish Department. Department Operating Manual. A2.31. Sept. 14, 2001.

[10] "Mountain Lion." Arizona Game and Fish Department. http://www.azgfd.gov/h_f/game_lion.shtml

## Comprehension Questions

1. What is meant by the term "predator control"?
2. What are two reasons wildlife management agencies may decide to control predators?
3. Rewrite the following sentence in your own words: In the program's early years, the emphasis was on conducting general eradication campaigns that might be directed at the entire statewide population of a particular species of predator.
4. On average, how many people do mountain lions kill in the United States every year?
5. Use the data from Table 3 to calculate the average number of mountain lions killed every year in each state. Make a bar graph that clearly shows this information.
6. Based on the information presented in this article, write a paragraph explaining your position on whether the United States government was justified in nearly eliminating the mountain lion. Be sure to explain your reasoning, supported by scientific data provided in this article or in another scientific report you have reviewed. Be sure to identify your source(s) of information.

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# Mountain Lions in Arizona

## *Lesson 5: Humans and Lions – Encounters in Nature*

### LESSON OVERVIEW

Students will learn how to recognize when a mountain lion is preparing to attack and will identify proper actions to provide the greatest chance of survival if they are attacked. They will play a matching card game in which they must match the mountain lion's behavior with the relative risk and the recommended human action.

### SUGGESTED GRADE LEVELS

- 6 – 12

### ENDURING UNDERSTANDINGS

- Human activities can affect the potential for hazards.

### OBJECTIVE

Students will:

- Analyze animal behavior to assess risks they might encounter.

### ARIZONA DEPARTMENT OF EDUCATION STANDARDS

| Grade | Science | Social Studies |
|---|---|---|
| 6 | S1-C3-02; S1-C4-03 | None |
| 7 | S1-C3-02; S1-C4-04; S3-C1-01 | None |
| 8 | S1-C3-02; S3-C1-01; S3-C1-02 | None |
| High School | S3-C1-03 | None |

*Note: The full text of these standards can be found in Appendix A.*

### TIME FRAME

- 1 day (45 minutes)

### MATERIALS

- *Mountain Lion Behavior Risk Cards* (1 set per group)
- Paper or poster board (1 per group)
- Markers or colored pencils

### TEACHER PREPARATION

- Make copies of the complete set of *Mountain Lion Behavior Risk Cards* for each group of three to four students.
- To make reusable cards, laminate the sheets or attach to cardstock.
- Cut out the cards.

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## SUGGESTED PROCEDURES

1. Ask students, "What do you think would be the proper action to take if you encountered a mountain lion in the wild?" They can answer in the form of a journal entry or a class brainstorming session. Select several ideas to discuss as a class. Explain that their ideas are good, but now it is time to compare their ideas with those of scientists who have used verifiable data to determine when mountain lions pose a risk and what we should do to gain the greatest chance of survival.
2. Divide the class into groups of three or four.
3. Explain that each group is going to play a matching game. They will use a set of cards, each containing four topics: mountain lion action, the meaning of the lion's action, the risk to humans, and the appropriate behavior a person should take to survive. They are to deal out the cards and then lay them down one at a time, matching up the four categories until all of the cards have been matched. Then, working together, they must place the cards in order from least risk to most risk.
4. Allow the groups to proceed. Check answers periodically, pointing out problems with their answers, if necessary.
5. When all groups have finished or managed what they can, review the correct answers. Ask students, "Why do you think it is never an appropriate response to run from a lion?" Discuss student responses. If they do not arrive at the conclusion on their own, guide them to the fact that the mountain lion is a predatory animal that chases its prey. When a lion sees another creature running, the lion will often believe it to be prey and chase it.
6. Collect the cards from the students.
7. Group task: Inform the students that they have been hired by the U.S. Forest Service to create an informational flyer that will be handed out to hikers and bicyclists. Each group will design a flyer that clearly outlines the proper procedures people should follow if they encounter a mountain lion. Graphics and pictures may be used, but the directions must be easy to understand.

## ASSESSMENT

- Safety flyer
- Class discussion

## EXTENSIONS

- Contact local parks and wildlife agencies to see what educational materials they have on mountain lion safety. Request a copy. Allow your students to compare the official materials to their own.
- Students can contact local parks that may not have educational materials on mountain lion safety to see if they would be interested in using those created by the students.
- Encourage your students to participate in the *Hot Topics Campfire Chat* with their parents at home.

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# Appendix A: Arizona Department of Education Standards – Full Text

**Science Standards**

| Grade | Strand | Concept | Performance Objective |
|---|---|---|---|
| 6 | 1 | 3 – Analysis and Conclusions | 2 – Form a logical argument about a correlation between variables or sequence of events |
| | | 4 – Communication | 3 – Create a list of instructions that others can follow in carrying out a procedure (without the use of personal pronouns) |
| 7 | 1 | 3 – Analysis and Conclusions | 2 – Form a logical argument about a correlation between variables or sequence of events |
| | | 4 – Communication | 4- Write clear, step-by-step instructions for following procedures (without the use of personal pronouns) |
| | 3 | 1 – Changes in Environments | 1 – Analyze environmental risks caused by human interaction with biological or geological systems |
| 8 | 1 | 3 – Analysis and Conclusions | 2 – Form a logical argument about a correlation between variables or sequence of events |
| | 3 | 1 – Changes in Environments | 1 – Analyze the risk factors associated with natural, human induced, and/or biological hazards<br>2 – Analyze possible solutions to address the environmental risks associated with chemicals and biological systems |
| High School | 3 | 1 – Changes in Environments | 3 – Assess how human activities can affect the potential for hazards |

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## Appendix B: Worksheets and Overheads

The pages that follow contain the worksheets listed below:

A. *Mountain Lion Behavior Risk Cards* – A matching game that the students can play to understand mountain lion threats. (2 pages)

# Mountain Lion Behavior Risk Cards

Information provided by Defenses Against Cougars by E. Lee Fitzhugh at http://users.frii.com/mytymyk/lions/pumadfn.htm.

| | | | |
|---|---|---|---|
| **MOUNTAIN LION ACTION**<br>Far away and moving even farther away | **MEANING**<br>Secretive<br>Trying to avoid contact | **HUMAN RISK**<br>Insignificant | **APPROPRIATE RESPONSE**<br>Keep children where they can be observed. |
| **MOUNTAIN LION ACTION**<br>More than 100 yards away with attention directed away from people | **MEANING**<br>Indifferent | **HUMAN RISK**<br>Slight, if human response is appropriate | **APPROPRIATE RESPONSE**<br>Avoid rapid movements, running, and loud noise.<br>Keep close eye on children.<br>Watch mountain lion. |
| **MOUNTAIN LION ACTION**<br>More than 50 yards away; Seems to be following or focusing intently on people; Ears may be up. | **MEANING**<br>Curiosity | **HUMAN RISK**<br>Slight for adults, if human response is appropriate; Serious for unattended children | **APPROPRIATE RESPONSE**<br>Hold children and do not turn your back.<br>Try to stand higher than mountain lion.<br>Look for rocks and sticks and pick them up without bending over.<br>Watch mountain lion at all times. |

| | | | |
|---|---|---|---|
| **MOUNTAIN LION ACTION**<br>Closer than 50 yards and trying to hide; Seems to be focused on people. | **MEANING**<br>Assessing the success of an attack | **HUMAN RISK**<br>Substantial | **APPROPRIATE RESPONSE**<br>Hold children and place them behind adults. Do not run. Prepare to defend yourself. Raise hands or jackets to look larger. Pick up rocks and sticks without bending over and throw them at the lion. |
| **MOUNTAIN LION ACTION**<br>Hiding while creeping close; Staring at people. | **MEANING**<br>Moving into attack position | **HUMAN RISK**<br>Serious, if within 200 yards | **APPROPRIATE RESPONSE**<br>Hold children and place them behind adults. Try to place large objects like boulders and trees between yourself and the lion. Show your teeth. Make loud noises. Pick up rocks and sticks without bending over and throw them at the lion. |
| **MOUNTAIN LION ACTION**<br>Crouching low to ground with tail twitching and ears up; Staring intently at people. | **MEANING**<br>Awaiting the opportunity to attack | **HUMAN RISK**<br>Grave | **APPROPRIATE RESPONSE**<br>Hold children and place large objects between yourself and the lion. Pick up rocks and sticks without bending over and throw them at the lion. Use pepper spray if close enough and downwind. |
| **MOUNTAIN LION ACTION**<br>Head and body low to ground with tail twitching and ears turned "fur" side forward; Rear legs may be "pumping" or "treading" the ground. | **MEANING**<br>Imminent attack | **HUMAN RISK**<br>Extreme | **APPROPRIATE RESPONSE**<br>Make loud noises. Prepare to defend yourself by fighting back if attacked. Act aggressive, even running toward the lion while throwing rocks and sticks. Stop before you are within striking distance of the paws. Do not turn your back on the lion. |

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# Mountain Lions in Arizona

## *Lesson 6: Managing for Humans and Lions*

### LESSON OVERVIEW

In this lesson, students will explore the continuing discussion about the management of mountain lions in Arizona. After being assigned to play the role of a stakeholder, students must become familiar with the viewpoints of that stakeholder and then represent him or her at a town council meeting to determine if the protocol for handling human and mountain lion encounters should be modified. Portions of this lesson are © Arizona Science Center and are used with permission.

### SUGGESTED GRADE LEVELS

- 6 – 12

### ENDURING UNDERSTANDINGS

- Wildlife management is based on science as well as on the social pressures of the time.

### OBJECTIVE

Students will:

- Develop a critical stance in relation to mountain lion management.
- Develop an understanding of how various beliefs and values can affect the management of wildlife.

### ARIZONA DEPARTMENT OF EDUCATION STANDARDS

| Grade | Science | Social Studies |
|---|---|---|
| 6 | S2-C2-01; S3-C2-01; S3-C2-02 | S3-C4-03 |
| 7 | S2-C2-01; S3-C1-03; S3-C2-01; S3-C2-02 | S3-C4-03; S4-C4-08; S4-C5-07 |
| 8 | S2-C2-04; S3-C2-01; S3-C2-02 | S3-C4-03; S4-C4-05 |
| High School | S2-C1-01; S2-C1-03; S2-C1-04; S3-C1-01; S3-C1-03; S3-C1-05; S3-C2-02; S3-C2-03; S3-C2-05 | S3-C4-04; S3-C4-05; S4-C5-05; S4-C5-06 |

*Note: The full text of these standards can be found in Appendix A.*

### TIME FRAME

- 3 – 4 days (45 minutes each day)

### MATERIALS

- *Student Role* worksheets (Each worksheet describes one of 18 roles, each role to be assigned to one student)
- *Stakeholder Analysis Chart* (Photocopy onto an overhead transparency)

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- Overhead
- Butcher paper or other large paper (1 per group)
- Markers (1 set per group)
- *Position Analysis Worksheet* (1 per student)
- *Post-Meeting Worksheet* (1 per student)

## TEACHER PREPARATION

- Make an overhead of the *Stakeholder Analysis Chart.*
- Assign students to the roles and committees according to the *Role Play Positions* and *Committee Assignments* worksheets (Appendix B and C).
- Make copies of the *Student Role, Position Analysis,* and *Post-Meeting* worksheets for each student.

## SUGGESTED PROCEDURES

1. Ask students: How does society affect wildlife management? They can answer in the form of a journal entry or a class discussion. Discuss the idea that people with different beliefs and values can affect the management of wildlife, especially when dealing with controversial topics that may not have one correct answer. Explain that a stakeholder is a person who has an interest in a particular management decision.
2. Inform the students that they will now be given the opportunity to explore this issue firsthand. Each will be assigned the role of a stakeholder participating in a town council meeting. As a group of stakeholders representing different viewpoints, they will need to come to a consensus regarding a specific issue.
3. Hand out the *Student Role* worksheets. Read the section titled "The Problem" individually or as a class. After reading, inform the students that even though they will be playing fictitious characters, the scene they will be enacting actually happened and will likely happen again.
4. Explain that the roles are printed at the top of the page. They must read the section titled "Your Viewpoint" to understand the opinion of their character regarding this specific situation. Please remind the students that this is just one individual's viewpoint and may not represent all of the people with similar values. (Note: Many of these viewpoints were taken directly from public comments that were submitted to the Arizona Game and Fish Department.)
5. Hand out the *Position Analysis Worksheet*. Individually or with a partner who has the same role, students need to answer the questions and complete the "Beliefs Grid" based on the information provided. If they do not finish in class, they can complete the assignment as homework. *Alternative: The students can do additional research on the Internet to gain a deeper understanding of their characters' beliefs.*
6. Put the *Stakeholder Analysis Chart* on the overhead and complete it as a class, allowing each student to describe and fill in the information about his or her particular role. This will help all of the students to become familiar with the various viewpoints prior to the town council meeting. Inform the students that the neutral people must be convinced of a viewpoint if they are to support it.
7. It is now time to begin the town council meeting. Review the situation and remind students that they will each be assigned to a committee. As committee members, they must come to a consensus about this situation. At the end of the meeting, each committee will present their recommendation to the class.

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8. Break the students into their groups and allow them to work. Within their committees, they must complete a pro/con chart on a large piece of paper and come to a consensus.
9. When all groups have come to a consensus, begin presentations. Each group must select one person to speak. They must include some of the issues they discussed (pro/con chart) as well as their final consensus.
10. After each group has presented, hold a class vote on the situation.
11. If the class comes to a consensus, briefly discuss the results and hand out the *Post-Meeting Worksheet*. If the class cannot agree, allow stakeholders to "lobby" one more time for their position and vote again. Discuss the results and hand out the worksheet. *Alternative: hold a class discussion with the questions rather than having each student fill out the worksheet.*
12. Collect the *Student Role, Position Analysis,* and *Post-Meeting* worksheets.

## ASSESSMENT

- *Student Role* Worksheet
- *Position Analysis Worksheet*
- *Post-Meeting Worksheet* or discussion
- Group and class discussions

## EXTENSIONS

- The students can write a letter to the Education Branch of the Arizona Game and Fish Department in which they explain their viewpoint regarding mountain lion management and support it with facts.
- Encourage your students to participate in the *Hot Topics Campfire Chat* with their parents at home.

## ARIZONA GAME AND FISH DEPARTMENT'S POSITION

The Arizona Game and Fish Department has determined that mountain lions will be destroyed if they attack a human or when they are judged to be a substantial threat to public safety. However, dogs, cats, and other small domestic pets could be considered a natural prey base for lions. The loss of these pets from lions will not be a sufficient reason to remove a lion from its home range. The agency has considered trapping and relocating problem lions; however, due to their large home ranges, the fact that all suitable habitat is occupied; and intraspecific defense of occupied habitat, this option will not be used.

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# Appendix A: Arizona Department of Education Standards – Full Text

**Science Standards**

| Grade | Strand | Concept | Performance Objective |
|---|---|---|---|
| 6 | 2 | 2 – Nature of Scientific Knowledge | 1 – Describe how science is an ongoing process that changes in response to new information and discoveries |
| | 3 | 2 – Science and Technology in Society | 1 – Propose viable methods of responding to an identified need or problem<br>2 – Compare solutions to best address an identified need or problem |
| 7 | 2 | 2 – Nature of Scientific Knowledge | 1 – Describe how science is an ongoing process that changes in response to new information and discoveries |
| | 3 | 1 – Changes in Environment | 3 – Propose possible solutions to address the environmental risks in biological or geological systems |
| | | 2 – Science and Technology in Society | 1 – Propose viable methods of responding to an identified need or problem<br>2 – Compare solutions to best address an identified need or problem |
| 8 | 2 | 2 – Nature of Scientific Knowledge | 4 – Explain why scientific claims may be questionable if based on very small samples of data, biased samples, or samples for which there was no control |
| | 3 | 2 – Science and Technology in Society | 1 – Propose viable methods of responding to an identified need or problem<br>2 – Compare solutions to best address an identified need or problem |
| High School | 2 | 1 – History of Science as a Human Endeavor | 1 – Describe how human curiosity and needs have influenced science, impacting the quality of life worldwide<br>3 – Analyze how specific changes in science have affected society<br>4 – Analyze how specific cultural and/or societal issues promote or hinder scientific advancements |
| | 3 | 1 – Changes in Environment | 1 – Evaluate how the processes of natural ecosystems affect, and are affected, by humans<br>3 – Assess how human activities can affect the potential for hazards<br>5 – Evaluate the effectiveness of conservation practices and preservation techniques on environmental quality and biodiversity |

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**Science Standards**

| Grade | Strand | Concept | Performance Objective |
|---|---|---|---|
| High School | 3 | 2 – Science and Technology in Society | 2 – Recognize the importance of basing arguments on a thorough understanding of the core concepts and principles of science and technology<br>3 – Support a position on a science and technology issue<br>5 – Evaluate methods used to manage natural resources |

**Social Studies Standards**

| Grade | Strand | Concept | Performance Objective |
|---|---|---|---|
| 6 | 3 | 4 – Rights, Responsibilities, and Roles of Citizenship | 3 – Describe the importance of citizens being actively involved in the democratic process (e.g., voting, student government, involvement in political decision making, analyzing issues, petitioning public officials) |
| 7 | 3 | 4 – Rights, Responsibilities, and Roles of Citizenship | 3 – Describe the importance of citizens being actively involved in the democratic process (e.g., voting, student government, involvement in political decision making, analyzing issues, petitioning public officials) |
| | 4 | 4 – Human Systems | 8 – Explain how cooperation and conflict contribute to political, economic, and social activities |
| | | 5 – Environment and Society | 7 – Compare different points of view and research on environmental issues (e.g., land use, natural resources, wildlife, biomes) |
| 8 | 3 | 4 – Rights, Responsibilities, and Roles of Citizenship | 3 – Describe the importance of citizens being actively involved in the democratic process (e.g., voting, student government, involvement in political decision making, analyzing issues, petitioning public officials, Selective Service Act) |
| | 4 | 4 – Human Systems | 5 – Explain how cooperation and conflict contribute to political, economic, and social divisions (e.g., United Nations, European Union, NAFTA) |
| High School | 3 | 4 – Rights, Responsibilities, and Roles of Citizenship | 4 – Demonstrate the skills and knowledge needed to accomplish public purposes (e.g., group problem solving, public speaking, petitioning and protesting) |

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**Social Studies Standards Continued**

| Grade | Strand | Concept | Performance Objective |
|---|---|---|---|
| High School | 3 | 4 – Rights, Responsibilities, and Roles of Citizenship | 5 – Describe the role and influence of interest groups, lobbyists, and PAC's on elections, the political process and policy making |
| | 4 | 5 – Environment and Society | 5 – Analyze how humans impact the diversity and productivity of ecosystems<br>6 – Analyze policies and programs for resource use and management (e.g., the trade-off between environmental quality and economic growth in the twentieth century) |

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## Appendix B: Role Play Positions

The chart below lists the 18 roles available. Each role can be performed by two students, depending on your class size. Six roles support the Game and Fish position (Pro), six are against the Game and Fish position (Con), and six have not decided (Neutral).

The chart lists two numbers next to each role. The first number (Order) refers to the order in which you should assign the roles if you do not have 36 students in your class. For example, if you have only 30 students, you will not assign the positions associated with numbers 31 through 36. The second number (Committee) refers to the committee to which each person is assigned. Making committee assignments in this way ensures that an equal representation of positions sits on each committee.

| Order | Committee | Title | Position |
|---|---|---|---|
| 1 | 1 | Animal Rights Activist | Pro |
| 21 | 2 | Animal Rights Activist | Pro |
| 4 | 2 | Outdoor Recreationist | Pro |
| 23 | 3 | Outdoor Recreationist | Pro |
| 7 | 3 | Game and Fish Employee | Pro |
| 25 | 4 | Game and Fish Employee | Pro |
| 10 | 4 | National Wildlife Organization | Pro |
| 27 | 5 | National Wildlife Organization | Pro |
| 13 | 5 | School Teacher | Pro |
| 29 | 6 | School Teacher | Pro |
| 16 | 6 | Taxpayer | Pro |
| 19 | 1 | Taxpayer | Pro |
| 2 | 1 | Wildlife Biologist | Neutral |
| 33 | 3 | Wildlife Biologist | Neutral |
| 5 | 2 | Federal Government | Neutral |
| 34 | 4 | Federal Government | Neutral |
| 8 | 3 | Governor's Aide | Neutral |
| 35 | 5 | Governor's Aide | Neutral |
| 11 | 4 | News Media | Neutral |
| 36 | 6 | News Media | Neutral |
| 14 | 5 | Housing Developer | Neutral |
| 31 | 1 | Housing Developer | Neutral |
| 17 | 6 | Rancher #1 | Neutral |
| 32 | 2 | Rancher #1 | Neutral |
| 3 | 1 | Hunter | Con |
| 26 | 4 | Hunter | Con |
| 6 | 2 | Houndsman | Con |
| 28 | 5 | Houndsman | Con |
| 9 | 3 | School Board Member | Con |
| 30 | 6 | School Board Member | Con |
| 12 | 4 | Parent | Con |
| 20 | 1 | Parent | Con |
| 15 | 5 | Rancher #2 | Con |
| 22 | 2 | Rancher #2 | Con |
| 18 | 6 | Insurance Agent | Con |
| 24 | 3 | Insurance Agent | Con |

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## Appendix C: Committee Assignments

The chart below shows the committee assignments. Use this chart to make sure that your students have gone to the correct committees. Note: Not every committee will have representation from each position. In addition, since (in most cases) two people are assigned to each position, these people do not sit on the same committee.

| Committee | Members | Committee | Members |
|---|---|---|---|
| 1 | Animal Rights Activist | 4 | Game and Fish Employee |
| | Taxpayer | | National Wildlife Organization |
| | Wildlife Biologist | | Federal Government |
| | Housing Developer | | News Media |
| | Hunter | | Hunter |
| | Parent | | Parent |
| 2 | Animal Rights Activist | 5 | National Wildlife Organization |
| | Outdoor Recreationist | | School Teacher |
| | Federal Government | | Governor's Aide |
| | Rancher #1 | | Housing Developer |
| | Houndsman | | Houndsman |
| | Rancher #2 | | Rancher #2 |
| 3 | Outdoor Recreationist | 6 | School Teacher |
| | Game and Fish Employee | | Taxpayer |
| | Wildlife Biologist | | News Media |
| | Governor's Aide | | Rancher #1 |
| | School Board Member | | School Board Member |
| | Insurance Agent | | Insurance Agent |

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## Appendix D: Worksheets and Overheads

The pages that follow contain the worksheets listed below:

A. *Student Role* worksheets – A description of the scenario and the viewpoint of each of the stakeholders. (18 pages)

B. *Stakeholder Analysis Chart* – An overhead to allow the students to see the viewpoints of the various stakeholders. Portions of this worksheet are © Arizona Science Center and are used with permission. (2 pages)

C. *Position Analysis Worksheet* – A question-and-answer guide to help students understand the role they will be playing. Portions of this worksheet are © Arizona Science Center and are used with permission. (2 pages)

D. *Post-Meeting Worksheet* – A way to guide the discussion following the activity. Portions of this worksheet are © Arizona Science Center and are used with permission. (1 page)

# Student Role: Animal Rights Activist

**The Problem**

Homeowners have observed at least one mountain lion in a subdivision that borders U.S. Forest Service land and near an elementary school. No attacks on humans have occurred yet. In fact, no one has seen any aggressive behavior toward humans. However, a report confirms that a mountain lion has killed at least one dog recently. The Arizona Game and Fish Department, responsible for managing the wildlife of the state, has a protocol that details how situations like these are handled. It reads:

> *Mountain lions will be destroyed if they attack a human or when they are judged to be a substantial threat to public safety. However, dogs, cats, and other small domestic pets could be considered a natural prey base for lions. The loss of these pets from lions will not be a sufficient reason to remove a lion from its home range. The agency has considered trapping and relocating problem lions; however, due to their large home ranges, the fact that all suitable habitat is occupied; and intraspecific defense of occupied habitat, this option will not be used.*

Based on this protocol, the department has decided to take no immediate action. Some concerned citizens are questioning this policy and are asking the governor to require the agency to take action. Before making a decision, the governor has requested that a special town council meeting be held with various stakeholders and the department.

You have been assigned a particular role, and you will attend the town council meeting in that role. As a result, you must become familiar with the role. Read the information below to get an idea of the basic beliefs of your stakeholder. After reading, complete Table 1 on the *Position Analysis Worksheet.* Use the definitions and questions on the worksheet to help you complete the table. In addition, you may research your role on the Internet to get more ideas before you meet with the other stakeholders.

**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all activists.)***

As a "keystone" or top predator, mountain lions play a crucial role in the ecosystems of Arizona. If we cannot protect the mountain lion, we are sentencing the rest of our environment to certain death.

Developers have chosen to build homes in mountain lion habitat. As a result, we push the mountain lion and other wildlife species into smaller and smaller areas. What do we expect the animals to do? They need to survive as well. If we want to solve this problem, we need to keep people from using these areas, whether to live or to play. Maybe if we increased the taxes or fees for those people who insist on using prime mountain lion habitat, we could force them to reconsider their choices. But that is an issue that can only be dealt with by the legislature. The Arizona Game and Fish Department is correct in not taking any action.

Leave the lions alone! You chose to live near wildlife. You cannot pick "nice" animals over "mean" ones. You get both. If you have a problem, you should not have moved there in the first place.

# Student Role: Concerned Parent

**The Problem**

Homeowners have observed at least one mountain lion in a subdivision that borders U.S. Forest Service land and near an elementary school. No attacks on humans have occurred yet. In fact, no one has seen any aggressive behavior toward humans. However, a report confirms that a mountain lion has killed at least one dog recently. The Arizona Game and Fish Department, responsible for managing the wildlife of the state, has a protocol that details how situations like these are handled. It reads:

> *Mountain lions will be destroyed if they attack a human or when they are judged to be a substantial threat to public safety. However, dogs, cats, and other small domestic pets could be considered a natural prey base for lions. The loss of these pets from lions will not be a sufficient reason to remove a lion from its home range. The agency has considered trapping and relocating problem lions; however, due to their large home ranges, the fact that all suitable habitat is occupied; and intraspecific defense of occupied habitat, this option will not be used.*

Based on this protocol, the department has decided to take no immediate action. Some concerned citizens are questioning this policy and are asking the governor to require the agency to take action. Before making a decision, the governor has requested that a special town council meeting be held with various stakeholders and the department.

You have been assigned a particular role, and you will attend the town council meeting in that role. As a result, you must become familiar with the role. Read the information below to get an idea of the basic beliefs of your stakeholder. After reading, complete Table 1 on the *Position Analysis Worksheet.* Use the definitions and questions on the worksheet to help you complete the table. In addition, you may research your role on the Internet to get more ideas before you meet with the other stakeholders.

**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all parents.)***

I should not be afraid to live in my own house, but right now, I am. Just the other day, I was out in my yard with my 4-year-old daughter for quite a while, when suddenly I looked over and saw a mountain lion hiding in the trees not more than 10 feet from my daughter. It was clear to me that had I not been there, my daughter would have been attacked. Luckily, we were able to get inside. But what about the next time? Who knows how long it had been there or how long it would have stayed? And what about the school? If it took me that long to notice it in my own yard, how long will it take to notice in a schoolyard?

To make matters worse, when I reported the incident, I was told that it most likely was a bobcat and not a mountain lion. As if I am not intelligent enough to tell the difference between the two. This isn't rocket science!

If a mountain lion comes into an urban area, it needs to be removed by any means necessary—no exceptions! Otherwise, people will be harmed.

# Student Role: Concerned Taxpayer

**The Problem**

Homeowners have observed at least one mountain lion in a subdivision that borders U.S. Forest Service land and near an elementary school. No attacks on humans have occurred yet. In fact, no one has seen any aggressive behavior toward humans. However, a report confirms that a mountain lion has killed at least one dog recently. The Arizona Game and Fish Department, responsible for managing the wildlife of the state, has a protocol that details how situations like these are handled. It reads:

> *Mountain lions will be destroyed if they attack a human or when they are judged to be a substantial threat to public safety. However, dogs, cats, and other small domestic pets could be considered a natural prey base for lions. The loss of these pets from lions will not be a sufficient reason to remove a lion from its home range. The agency has considered trapping and relocating problem lions; however, due to their large home ranges, the fact that all suitable habitat is occupied; and intraspecific defense of occupied habitat, this option will not be used.*

Based on this protocol, the department has decided to take no immediate action. Some concerned citizens are questioning this policy and are asking the governor to require the agency to take action. Before making a decision, the governor has requested that a special town council meeting be held with various stakeholders and the department.

You have been assigned a particular role, and you will attend the town council meeting in that role. As a result, you must become familiar with the role. Read the information below to get an idea of the basic beliefs of your stakeholder. After reading, complete Table 1 on the *Position Analysis Worksheet.* Use the definitions and questions on the worksheet to help you complete the table. In addition, you may research your role on the Internet to get more ideas before you meet with the other stakeholders.

**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all taxpayers.)***

I could not be happier with the actions of the Arizona Game and Fish Department. Do you really think that the Florida government would kill all of the alligators if one attacks a person? No. It would cost too much. The same is true of lions in Arizona.

I do not believe that we, as taxpayers, should have to pay for the control of these animals that affect a very small percentage of the total population. These people chose to live where wildlife would become an issue. If they have a problem with the animals, they should be responsible for taking care of it. If you want the mountain lion to be controlled, then you had better find a way to pay for it. It may not seem like a lot of money right now, but when you consider the fact that so many more people are buying houses in the "wilderness," you can see that it will add up quickly.

Do not spend my money to deal with your problem!

# Student Role: Federal Government Employee

**The Problem**

Homeowners have observed at least one mountain lion in a subdivision that borders U.S. Forest Service land and near an elementary school. No attacks on humans have occurred yet. In fact, no one has seen any aggressive behavior toward humans. However, a report confirms that a mountain lion has killed at least one dog recently. The Arizona Game and Fish Department, responsible for managing the wildlife of the state, has a protocol that details how situations like these are handled. It reads:

> *Mountain lions will be destroyed if they attack a human or when they are judged to be a substantial threat to public safety. However, dogs, cats, and other small domestic pets could be considered a natural prey base for lions. The loss of these pets from lions will not be a sufficient reason to remove a lion from its home range. The agency has considered trapping and relocating problem lions; however, due to their large home ranges, the fact that all suitable habitat is occupied; and intraspecific defense of occupied habitat, this option will not be used.*

Based on this protocol, the department has decided to take no immediate action. Some concerned citizens are questioning this policy and are asking the governor to require the agency to take action. Before making a decision, the governor has requested that a special town council meeting be held with various stakeholders and the department.

You have been assigned a particular role, and you will attend the town council meeting in that role. As a result, you must become familiar with the role. Read the information below to get an idea of the basic beliefs of your stakeholder. After reading, complete Table 1 on the *Position Analysis Worksheet.* Use the definitions and questions on the worksheet to help you complete the table. In addition, you may research your role on the Internet to get more ideas before you meet with the other stakeholders.

**Your Viewpoint**

**(*Note – This is the opinion of one person and does not necessarily represent all federal employees.)***

I hesitate to support any change regarding the management of mountain lions at this time. It is not the role of the federal government to manage wildlife in the states. That role is best left to the state wildlife agencies.

State wildlife biologists have a better understanding of the environmental conditions and population status of the mountain lion within their state. Therefore, they are in the better position to make management decisions relative to mountain lions within Arizona.

Nonetheless, the federal government also shares an interest in providing public safety for people using their public lands. We need to have accurate data in order to make decisions. Otherwise, many resources, including significant time and money, would be wasted with management protocols or policies that would not have the desired effect or that would not withstand scrutiny by stakeholders.

# Student Role: Game and Fish Employee

**The Problem**

Homeowners have observed at least one mountain lion in a subdivision that borders U.S. Forest Service land and near an elementary school. No attacks on humans have occurred yet. In fact, no one has seen any aggressive behavior toward humans. However, a report confirms that a mountain lion has killed at least one dog recently. The Arizona Game and Fish Department, responsible for managing the wildlife of the state, has a protocol that details how situations like these are handled. It reads:

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Based on this protocol, the department has decided to take no immediate action. Some concerned citizens are questioning this policy and are asking the governor to require the agency to take action. Before making a decision, the governor has requested that a special town council meeting be held with various stakeholders and the department.

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**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all department employees.)***

The Arizona Game and Fish Department has invested a lot of time and money in researching the best ways to manage the wildlife of our great state. By all accounts, we are the experts in the field. The policies we have created are based on scientific evidence that addresses both the concerns of the public and the animals. We need to give ourselves more credit and stop being so sensitive to the opinions of a few people.

The department has prepared a protocol for dealing with mountain lions that is based on scientific and social data. It has been extensively reviewed by the public to take into consideration as many different perspectives as possible.

The mountain lions have shown no sign of aggression toward humans. Consequently, there is no reason why we should remove any at this time. We will continue to monitor the situation. If there ever should be a substantial threat to public safety, we will remove the lions at that time.

# Student Role: Governor's Aide

**The Problem**

Homeowners have observed at least one mountain lion in a subdivision that borders U.S. Forest Service land and near an elementary school. No attacks on humans have occurred yet. In fact, no one has seen any aggressive behavior toward humans. However, a report confirms that a mountain lion has killed at least one dog recently. The Arizona Game and Fish Department, responsible for managing the wildlife of the state, has a protocol that details how situations like these are handled. It reads:

> *Mountain lions will be destroyed if they attack a human or when they are judged to be a substantial threat to public safety. However, dogs, cats, and other small domestic pets could be considered a natural prey base for lions. The loss of these pets from lions will not be a sufficient reason to remove a lion from its home range. The agency has considered trapping and relocating problem lions; however, due to their large home ranges, the fact that all suitable habitat is occupied; and intraspecific defense of occupied habitat, this option will not be used.*

Based on this protocol, the department has decided to take no immediate action. Some concerned citizens are questioning this policy and are asking the governor to require the agency to take action. Before making a decision, the governor has requested that a special town council meeting be held with various stakeholders and the department.

You have been assigned a particular role, and you will attend the town council meeting in that role. As a result, you must become familiar with the role. Read the information below to get an idea of the basic beliefs of your stakeholder. After reading, complete Table 1 on the *Position Analysis Worksheet.* Use the definitions and questions on the worksheet to help you complete the table. In addition, you may research your role on the Internet to get more ideas before you meet with the other stakeholders.

**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all governor's aides)***

Since it is a government agency, the Arizona Game and Fish Department is required to make an informed decision that will benefit all of the people of Arizona. As a result, it is important that we do not rush to conclusions about the correct management of the mountain lions.

I believe that we should look at all sides of the issues, weigh the facts, and make a decision with which all of our citizens can agree. If someone disagrees, then his or her voice needs to be heard to see if we can find a way to reach a compromise.

This may mean that the department's protocol is right. Or it may mean that it needs to be modified to allow for the relocation of these animals. It may mean that the mountain lions need to be removed for the safety of the people. Or it may be some combination of these choices. I am confident that this town council meeting will provide us with the facts and viewpoints required to determine a proper course of action for the department.

# Student Role: Head of National Wildlife Organization

**The Problem**

Homeowners have observed at least one mountain lion in a subdivision that borders U.S. Forest Service land and near an elementary school. No attacks on humans have occurred yet. In fact, no one has seen any aggressive behavior toward humans. However, a report confirms that a mountain lion has killed at least one dog recently. The Arizona Game and Fish Department, responsible for managing the wildlife of the state, has a protocol that details how situations like these are handled. It reads:

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Based on this protocol, the department has decided to take no immediate action. Some concerned citizens are questioning this policy and are asking the governor to require the agency to take action. Before making a decision, the governor has requested that a special town council meeting be held with various stakeholders and the department.

You have been assigned a particular role, and you will attend the town council meeting in that role. As a result, you must become familiar with the role. Read the information below to get an idea of the basic beliefs of your stakeholder. After reading, complete Table 1 on the *Position Analysis Worksheet.* Use the definitions and questions on the worksheet to help you complete the table. In addition, you may research your role on the Internet to get more ideas before you meet with the other stakeholders.

**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all wildlife organizations.)***

Just as the Arizona Game and Fish Department is not responsible if a coyote eats your cat, they should not be held responsible for the actions of a few stray mountain lions. The department should be able to monitor mountain lions, as their protocol clearly outlines, and take action only if they become a substantial threat to human beings.

We need to be careful, however, how we categorize this threat. Human responses to the same situation can vary dramatically from person to person. We cannot rely on the word of one person, especially if that person has no wildlife experience. We should choose to remove an animal only when the decision can be backed up with scientific data. If removal is necessary, we should consider alternatives to killing the animal, such as relocation.

Finally, we need to develop some good legislation. Home developers should be required to inform potential buyers of these risks, and buyers should be held responsible for their decisions. In addition, we need to implement harsh fines for people who feed wildlife, such as deer and rabbits, that might attract lions.

# Student Role: Houndsman

**The Problem**

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**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all houndsmen.)***

Arizona is not the first state to deal with mountain lions, and it won't be the last. As our population continues to increase, the situation will only get worse. We have a unique opportunity to become the standard that all other states look to when dealing with similar situations.

The Arizona Game and Fish Department should look into the idea of "adverse conditioning." We know that mountain lions do not like dogs. When a lion encounters one, the lion will run up a tree where it becomes easy to catch. Whenever a mountain lion is seen, houndsmen should be permitted to track the lion and force it into a tree. At that time, department employees can be sent in to capture the animal and release it in a safer area. If the employees also fire "blank" bullets, the lions will develop a fear of humans and learn to stay away from urban areas.

This strategy would not only protect humans, it would also provide a safe alternative to killing the animal and promote an activity that would bring many tourists into the state. It is truly a win-win situation.

# Student Role: Housing Developer

**The Problem**

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**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all housing developers.)***

People love their houses. It is the biggest investment that they make with their money, and they want the best value for that money. As a result, they look for the biggest house, with the biggest lot, with the best view for the cheapest amount of money. Most often, that means that we must build new homes in new areas. We know that the houses we build now are right in the middle of wildlife habitat. We even cut down some of the trees to make room. But that is what people want.

At the same time, the people do want to feel safe and secure in their homes. They love to look outside and see the natural world. It means they are away from the problems that big cities bring — crime, drugs, etc. But it also means they have the potential for problems with mountain lions.

The more publicity this issue brings, the worse it is for business. If people are attacked by mountain lions in their yards or the neighborhood park, others are less likely to buy in similar areas. However, if people see mountain lions being shot and killed right next to houses, they fear a loss of property values. It is clear that we need more information before we support a decision.

# Student Role: Hunter

**The Problem**

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**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all hunters.)***

For many parts of Arizona, the best solution is to increase the hunting of mountain lions by allowing off-season hunts. Legal hunting, however, is not very practical in or around urban areas. Instead, we should open these areas up to archery-only hunting. It could even require a special hunting license. I believe I can speak for all recreational hunters in saying that we would be more than happy to help balance the mountain lion population.

Increasing the hunting opportunities is a great solution that would benefit everyone. Sales of special licenses would provide the department with more money to manage the wildlife in Arizona, recreational hunters would have additional opportunities, and the risk to everyday citizens created by mountain lions would be virtually eliminated. In addition, since the department would control the hunt, it could manage the lion population by appropriately managing the number of licenses offered.

Recreational hunters should be considered a resource for these types of animal removal situations.

# Student Role: Insurance Agent

**The Problem**

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**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all insurance agents.)***

The Arizona Game and Fish Department needs to take more aggressive action with regard to the mountain lion situation. If not, people will be harmed, and those people will take action against the department and the State of Arizona. Liability issues regarding the mountain lion will keep the department from doing its job and managing the other wildlife in the state — unless they deal with the mountain lions now.

With regard to citizens, there is no such thing as "personal liability." When the risk is very high, it is a public responsibility to try to alleviate it. There are only two ways to eliminate the risk posed by mountain lions: kill the lions or prevent the people from encountering them by closing off areas inhabited by them. With our growing population, the second choice is not very practical. As a result, the mountain lions must be removed from urban areas.

If action is not taken, it could cost the State of Arizona millions of dollars in legal fees and the citizens thousands in increased insurance premiums.

# Student Role: Local School Teacher

**The Problem**

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**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all teachers.)***

As a first grade teacher, I can tell you that animals play a very important role in the emotional development of young children. I often use animals as a way to spark the interest of my students. By using animals, I can get my students to write sentences and share ideas in ways they have never done before. In addition, taking care of their pets at home and in class often helps children to build a sense of responsibility.

I am afraid that if we begin a major campaign to eliminate mountain lions, we may emotionally scar the youth of Arizona. Imagine a child sitting at home watching television. Suddenly, the local news comes on and shows horrific scenes of dead mountain lions, creatures that look remarkably similar to their own cats. There is no way that we will ever know the true cost of these actions.

To make matters worse, I happen to teach at a school whose mascot is the cougar. And there are many other schools like mine. How are we supposed to tell our students that the Arizona government is killing our mascot on purpose? What can we say that will help them understand?

My students are asking the Arizona Game and Fish Department to leave the cougars alone.

# Student Role: News Media

**The Problem**

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**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all members of the news media)***

It is clear that the people of Arizona are concerned about the issue of mountain lions. Over the past year, nearly 100 reports of mountain lion sightings have been called in to our station. The vast majority of our viewers have expressed fear and concern about mountain lions close to their neighborhoods.

It is clear that the people have a fascination with wildlife and the possible dangers they present. If the Arizona Game and Fish Department does not take any action, the likelihood of an attack increases. With a school nearby, we feel we have the responsibility to inform the viewing public of this potentially dangerous situation.

We don't make the news; we just report it. Unfortunately, we never know how people will respond.

# Student Role: Outdoor Recreationist

**The Problem**

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**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all outdoor recreationists.)***

As a person who spends a lot of time in the outdoors, I am very pleased to see that the Arizona Game and Fish Department has chosen to take no action at this time. There is nothing like hiking in the mountains or camping in the woods and seeing animals in their natural environment. I cannot wait for the time when my children are old enough to experience wildlife first hand.

I still remember the first and only time I saw a mountain lion in the wild, nearly five years ago. At no time was I scared. In fact, my only reaction was, "Wow, how cool is this?"

We need to find ways to live with the animals without harming them. They are a valuable resource that makes Arizona a very special place to live. It is not the animals that are dangerous; it is the behavior of the people when they encounter the animals that is dangerous. We need to work actively on educating the citizens of Arizona about how their actions affect not only the environment, but also the animals that live there.

# Student Role: Rancher #1

**The Problem**

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**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all ranchers.)***

I love the outdoors. In fact, that was one of the reasons why I became a rancher in the first place. I want nothing more than for my children to be able to experience the wilds of Arizona in as natural a state as possible.

Speaking from personal experience, I know that the mountain lion will kill livestock. I have lost a number of my cattle because of mountain lion attacks. Since my income is dependent on the number of healthy cattle I have, these deaths have a dramatic impact on my family and me.

However, I have seen some of the science. I know that the lions are an important part of the ecosystem. Without them, we may have a whole bunch of other problems, including overpopulation of elk and deer, which graze the same grasses that my cattle do.

I would love to support the preservation of the mountain lion, but I need more information. I want to be assured that these mountain lions will not become a threat to my family's safety and livelihood. I will do what I can to help as long as I see that the overall result will be beneficial to everyone involved.

# Student Role: Rancher #2

**The Problem**

Homeowners have observed at least one mountain lion in a subdivision that borders U.S. Forest Service land and near an elementary school. No attacks on humans have occurred yet. In fact, no one has seen any aggressive behavior toward humans. However, a report confirms that a mountain lion has killed at least one dog recently. The Arizona Game and Fish Department, responsible for managing the wildlife of the state, has a protocol that details how situations like these are handled. It reads:

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**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all ranchers.)***

Large predators like the mountain lion will always be a threat to humans. Our country had it right a hundred years ago when we vigorously hunted them. They are killers. Everything about them says kill without mercy — their sharp teeth and claws, their stalking behavior, their beady eyes. It is their instinct to kill, and they will not make an exception of humans.

I have many fellow ranchers who have seen these killers in action. One in particular told me of an instance in which his sheep were going to get water from a pond on his property. A mountain lion hid and ambushed them. The sheep didn't have a chance. As the drought continues, we can only expect many more repeats of this situation all over the state.

Ranching is my livelihood. I should not have to worry about my cattle on my property. This type of risk would not be tolerated in any other type of job. If the lions are close to humans, they should be eliminated, either through legal hunting or predator management. If the Arizona Game and Fish Department will not do it, we will do it ourselves.

# Student Role: School Board Member

**The Problem**

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**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all school board members.)***

Mountain lions will kill people. Many people in California, many of whom were children, have lost their lives recently because of these creatures. It is bound to happen here as well, unless we take preventative measures now.

As a member of the local school board, I am greatly concerned about this mountain lion situation. The sighting of a mountain lion near one of our schools has already created panic. Many parents are calling and demanding that something be done or they will remove their children from the school. How can we protect our students and provide a safe learning environment if a mountain lion is close to the school? And what if an attack does happen? Right now, there is nothing that I, as a board member, can say to reassure parents that their children will be safe. That's not right.

We need to look after our children. We cannot let them become the food of choice.

# Student Role: University Wildlife Biologist

**The Problem**

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**Your Viewpoint**

***(Note – This is the opinion of one person and does not necessarily represent all wildlife biologists.)***

At this time, we lack appropriate data to allow us to make decisions regarding the management of mountain lions in Arizona. We do not have an accurate count of the mountain lion population. Therefore, we do not know if the population is increasing, decreasing, or remaining stable. We only know that the human population is increasing. As a result, we cannot say that we are seeing an increase in human and mountain lion encounters because the lion is losing its fear of humans or simply because there is less room for all of us now. We do know that most reported mountain lion sightings are inaccurate. It turns out that the people saw some other animal but did not have enough experience to identify it correctly. Of course, that does not mean we should discount those sightings that prove accurate.

Many studies give us information about mountain lions in a particular region. But we must hesitate to apply that information to the general population of lions. Regional characteristics that we are unaware of could account for differences in the behavior of lions.

I need more information before I am ready to decide this issue.

# Stakeholder Analysis Chart, page 1

| ROLE | POSITION | INTEREST | BELIEFS | VALUES |
|---|---|---|---|---|
| Animal Rights Activist | | | | |
| Outdoor Recreationist | | | | |
| Game and Fish Employee | | | | |
| Head of National Wildlife Organization | | | | |
| Local School Teacher | | | | |
| Concerned Taxpayer | | | | |
| University Wildlife Biologist | | | | |
| Federal Government Employee | | | | |
| Governor's Aide | | | | |
| News Media | | | | |

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# Stakeholder Analysis Chart, page 2

| ROLE | POSITION | INTEREST | BELIEFS | VALUES |
|---|---|---|---|---|
| Housing Developer | | | | |
| Insurance Agent | | | | |
| Hunter | | | | |
| Houndsman | | | | |
| School Board Member | | | | |
| Concerned Parent | | | | |
| Rancher #1 | | | | |
| Rancher #2 | | | | |

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# Position Analysis Worksheet

Answer the following questions to help you complete Table 1. Remember, you must answer the questions in the role that you have been assigned. As a result, some of the answers may not align with your personal opinions. Put yourself in this person's shoes.

**Position:** Your specific viewpoint about the issue and what action, if any, should be taken.

1. Do you think that the Arizona Game and Fish Department should continue with its current course of action or make changes?

2. What action do you think should be taken?

**Interest:** An immediate underlying concern applied to this specific issue that reflects your values and beliefs, and addresses why this issue is important to you.

1. Why do you care whether the Arizona Game and Fish Department continues with its current course of action?

2. What immediate concerns do you have regarding the department's policy?

**Beliefs:** Those ideas, whether true or not, that you hold regarding this issue.

1. What ideas or opinions do you have concerning the Arizona Game and Fish Department's position?

**Values:** Personal "guides" which tend to direct human behavior and reflect the relative importance of an individual's beliefs in a given situation. These are usually shaped by economic, social, cultural, educational, historical, legal, political, recreational, scientific, and spiritual beliefs and experiences.

1. What are your personal beliefs or "guides" that most strongly reflect the importance of this issue to you?

*Table 1: Beliefs Grid for Your Role*

| Role | Position | Interest | Beliefs | Values |
|---|---|---|---|---|
| | | | | |

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Questions to help you plan for the town council meeting:

1. What is your initial position?

2. What reasons do you have for this position?

3. What is the most important concern that you have?

4. What other stakeholders might agree with your position? Why?

5. What other stakeholders might disagree with your position? Why?

6. What strategies will you use to allow these people to see your viewpoint and possibly change their minds?

7. Which stakeholders have not yet taken a definite stand on the issue?

8. What strategies will you use to convince these people to support your position?

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# Post-Meeting Worksheet

*Answer the following questions from your own viewpoint. You do not need to be in your stakeholder role any longer.*

1. Were you surprised with the outcome of the vote? Why or why not?

2. Do you agree with the position of the stakeholder that you played? Why or why not?

3. How well did the outcome serve the interests of all the stakeholders? Explain.

4. One purpose of this activity was to increase understanding of other people's values and beliefs. Do you think it was successful? Why or why not?

5. Management is based on science but is influenced by society. Prove this statement by giving examples from the activity.

6. How was this activity similar to situations that may occur in real life?

7. How was it different?

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