

“What’s the big deal about the jaguar?”

A unit of focused study for students in grades 5-8, concerning the presence of jaguars in the American Southwest



Photo courtesy of Warner Glenn

*Presented by members of the JAGCT (Jaguar Conservation Team)
Education Committee*

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JAGUAR MINI TEACHING UNIT - CURRICULUM MAP [ARIZONA]

TIME FRAME	STANDARDS	THINKING SKILLS	CONCEPTS	ASSESSMENT
<p>DAY I</p> <p>4 hours</p> <p>The full day could possibly be used, with some direct instruction, to assist students with practicing the skills needed in the lesson.</p>	<p><u>Science</u> 1SC-E3 1SC-E6 4SC-E7</p> <p><u>Math</u> 5M-E1</p> <p><u>Language Arts</u> R-E2 W-E3 LS-E2</p>	<p>Encoding and Decoding</p> <p>Using Information</p> <p>Communicating Information</p> <p>Analytical Thinking</p> <p>Critical Thinking</p> <p>Evaluative Thinking</p> <p>Comparative Analysis</p> <p>Identification of Characteristics</p> <p>Research Skills</p>	<ol style="list-style-type: none"> 1. The five essentials of wildlife habitat are: food, water, shelter, space, in a suitable arrangement. 2. Wildlife responds to its environment through physiological or behavioral adaptations. 	<p>RRR Journal Entries – Scored with Rubric</p> <p>What is a felid chart and presentation scored with the RRR Journal rubric</p>
<p>DAY 2</p> <p>4 hours</p> <p>The full day could possibly be used, with some direct instruction, to assist the skills needed in the lesson</p> <p>(Mapping and Graphing skills are needed in this lesson, if students do not already have them.)</p>	<p><u>Social Studies</u> 1SS-E1 3SS-E1 4SC-E7 (see also: Science)</p> <p><u>Science</u> 1SC-E3 1SC-E4 2SC-E4 4SC-E7</p> <p><u>Math</u> 2M-E1</p> <p><u>Language Arts</u> R-E2 W-E8 LS-E2 VP-E2</p>	<p>Encoding & Decoding</p> <p>Analytical Skills</p> <p>Critical thinking</p> <p>Synthesis</p> <p>Problem Solving</p> <p>Use & Communicate Information</p>	<ol style="list-style-type: none"> 1. Environmental factors such as soil, climate, elevation, geology, and vegetation determine what kind of wildlife will be found in an area. 2. The five essentials of wildlife habitat are: food, water, shelter, space, in a suitable arrangement. 3. Species competition and environmental factors interact to keep wildlife populations in dynamic balance within the ecological community. 	<p>RRR Journal Entries Scored with Rubric</p> <p>If I were a jaguar, where would I live ? Scored with RRR Journal Rubric</p>

TIME FRAME	STANDARDS	THINKING SKILLS	CONCEPTS	ASSESSMENT
<p>DAY 3</p> <p>4 hours</p> <p>The full day could possibly be used, with some direct instruction, to assist the skills needed in the lesson</p>	<p><u>Social Studies</u> 1SS-E1 3SS-E1 3SS-E4 3SS-E7 3SS-E8</p> <p><u>Language Arts</u> R-E2 R-E4 R-E6</p>	<p>Analytical Thinking</p> <p>Critical Thinking</p> <p>Synthesis</p> <p>Encoding & Decoding</p> <p>Identification of Relationships</p> <p>Comparative Analysis</p> <p>Use & Communication of Information</p>	<ol style="list-style-type: none"> 1. The esthetic, economic, and spiritual values humans place on wildlife vary from person to person and culture to culture. 2. Responsible environmental actions are the obligations of all levels of society, beginning with the individual. 3. Hunting and fishing are biologically sound wildlife management tools when conducted using prescribed scientific methods. 	<p>RRR Journal Entries Scored with Rubric</p> <p>El Tigre scored with the RRR Journal Rubric</p>
<p>DAY 4</p> <p>4 hours</p> <p>The full day could possibly be used, with some direct instruction, to assist the skills needed in the lesson</p>	<p><u>Social Studies</u> 1SS-E10 3SS-E2</p> <p><u>Science</u> 2SC-E2</p> <p><u>Math</u> 5M-E3 6M-E3</p> <p><u>Language Arts</u> LS-E3 VP-E1</p>	<p>Analytical Thinking</p> <p>Critical Thinking</p> <p>Synthesis</p> <p>Encoding & Decoding</p> <p>Use & Communication of Information</p> <p>Identification of Needs & Characteristics</p> <p>Comparative Analysis</p> <p>Identification of Relationships</p> <p>Research Methodology</p>	<ol style="list-style-type: none"> 1. Human activities are an important factor affecting plant and animal succession, distribution, and population levels. 2. Increasing human population and activities require more open space and often negatively impact wildlife populations. 3. Humans are a part of the natural world and cannot be separated from it. 4. Humans have at their disposal tools and knowledge to significantly impact the quality and quantity of wildlife habitat. 	<p>RRR Journal Entries Scored with Rubric</p> <p>The Changing Land Questions Scored with the RRR Journal Rubric</p>

TIME FRAME	STANDARDS	THINKING SKILLS	CONCEPTS	ASSESSMENT
<p>DAY 5</p> <p>4 hours</p> <p>The full day could possibly be used, with some direct instruction, to assist the skills needed in the lesson</p>	<p><u>Social Studies</u> 1SS-E1</p> <p><u>Math</u> 6M-E3</p> <p><u>Language Arts</u> R-E3 W-E8</p>	<p>Encoding & Decoding</p> <p>Synthesis</p> <p>Research Methodology</p> <p>Evaluative Skills</p>	<ol style="list-style-type: none"> 1. Protection and enhancement of wildlife habitat are the two most important tools for the long term survival of wildlife species. 2. Wildlife issues and trends are complex and require analysis of alternatives and consequences. 	<p>RRR Journal Entries Scored with Rubric</p> <p>Tracing the history of jaguar conservation scored with RRR Journal Rubric</p>

<p>DAYS 6, 7</p> <p>[Students work (individually or in teams) on final project, practicing critical thinking skills developed to this point.]</p>	<p><u>Social Studies</u> 1SS-E1 2SS-E7 3SS-E1 3SS-E2 3SS-E8 4SS-E6</p> <p><u>Science</u> 1SC-E3 1SC-E4 1SC-E6 2SC-E6 3SC-E1 3SC-E3 3SC-E4 4SC-E7</p> <p><u>Math</u> 2M-E2 3M-E4</p> <p><u>Language Arts</u> W-E5 W-E8 LS-E1 VP-E1 VP-E2 VP-E3</p>	<ol style="list-style-type: none"> 1. Increasing human population and activities require more open space and often negatively impact wildlife populations. 2. Humans are a part of the natural world and cannot be separated from it. 3. Humans have at their disposal tools and knowledge to significantly impact the quality and quantity of wildlife habitat. 4. Protection and enhancement of wildlife habitat are the two most important tools for the long term survival of wildlife species. 5. Wildlife issues and trends are complex and require analysis of alternatives and consequences. 	
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Social Studies

- 1SS-E1 Understand and apply the basic tools of historical research, including a chronology and how to collect, interpret, and employ information from historical materials
- 1SS-E10 Describe the geographic, political, economic, and social characteristics of the Aztecs, Mayas, and Mound Builders and their contributions to later civilizations
- 2SS-E7 Explain the obligations and responsibilities of citizenship
- 3SS-E1 Demonstrate understanding of the physical and human features that define places and regions in Arizona, including the use of geographic tools to collect, analyze, and interpret data
- 3SS-E2 Describe the impact of interactions between people and the natural environment on the development of places and regions in Arizona, including how people have adapted to and modified the environment
- 3SS-E4 Demonstrate understanding of the characteristics, purposes, and use of geographic tools to locate and analyze information about people, places, and environments
- 3SS-E7 Explain the effects of interactions between human and natural systems, including the changes in the meaning, use, and distribution of natural resources
- 3SS-E8 Use geographic knowledge, skills, and perspectives to explain past, present, and future issues
- 4SS-E6 Describe how people respond to positive and negative incentives
- 4SC-E7 [Physical geography: Biota]

Science

- 1SC-E3 Organize and present data gathered from their own experiences, using appropriate mathematical analyses and graphical representations
- 1SC-E4 Identify and refine questions from previous investigations
- 1SC-E6 Analyze scientific reports from magazines, television or other media
- 2M-E1 Construct, read, analyze and interpret tables, charts, graphs and data plots
- 2SC-E2 Describe how science and technology are interrelated
- 2SC-E4 Identify characteristics of scientific ways of thinking
- 2SC-E6 Demonstrate how Science is an ongoing process of gathering and evaluating information, assessing evidence for and against theories and hypotheses, looking for patterns, and then devising and testing possible explanations
- 3SC-E1 Recognize how scientific knowledge, thinking processes and skills are used in a great variety of careers
- 3SC-E3 Identify a specific need and propose a solution or product that addresses this need, taking into consideration various factors
- 3SC-E4 Implement a proposed solution or design and evaluate its merit
- 4SC-E7 Explain and model the interaction and interdependence of living and non-living components within ecosystems, including the adaptation of plants and animals to their environment

Math

- 2M-E2 Make valid inferences, predictions and arguments based on statistical analysis
- 3M-E4 Analyze functional relationships to explain how a change in one variable results in a change in another
- 5M-E1 Estimate, make and use measurements (U.S. customary and metric) to describe and make comparisons
- 5M-E3 Estimate, use and describe measures of distance, perimeter, area, volume, capacity, weight, mass and angles
- 6M-E3 Use *if...then* statements to construct simple valid arguments

Language Arts

- R-E2: Use reading strategies such as making inferences and predictions, summarizing, paraphrasing, differentiating fact from opinion, drawing conclusions, and determining the author's purpose and perspective to comprehend written selections
- R-E3 Analyze selections of...nonfiction...by making inferences about the events, setting, style, tone, mood and meaning of the selection
- R-E4 Identify the author's purpose, position, bias and strategies in a persuasive selection
- R-E6 Compare and contrast the historical and cultural perspectives of literary selections
- W-E3: Write a summary that presents information clearly and accurately, contains the most significant details and preserves the position of the author
- W-E5 Write a report that conveys a point of view and develops a topic with appropriate facts, details, examples and descriptions from a variety of cited sources
- W-E8 Demonstrate research skills using reference materials such as a dictionary, encyclopedia and thesaurus to complete effectively a variety of writing tasks
- VP-E1 Analyze visual media for language, subject matter and visual techniques used to influence opinions, decision making and cultural perceptions
- VP-E2 Plan, develop and produce a visual presentation, using a variety of media such as videos, films, newspapers, magazines and computer images
- VP-E3 Compose, contrast and establish criteria to evaluate visual media for purpose and effectiveness
- LS-E1 Prepare and deliver an organized speech and effectively convey the message through verbal and nonverbal communications with a specific audience
- LS-E2: Prepare and deliver an oral report in a content area and effectively convey the information through verbal and nonverbal communication with a specific audience
- LS-E3 Interpret and respond to questions and evaluate responses both as interviewer and interviewee

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Press Release

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Release: February 4, 2002

Jaguar Photographed In Southern Arizona

A young male jaguar has been photographed south of Tucson, according to Arizona Game and Fish Department officials. The photograph was taken by a surveillance camera that was monitoring potential jaguar travel corridors on the Arizona/Mexico border.

In an effort to conserve the rare endangered species, the exact location at which the photograph was taken isn't being released at this time.

“This photograph is really exciting. It is great to know that jaguars are roaming our borderlands, at least occasionally. We will continue to monitor the area to see if the animal is a transient or attempting to establish a territory. Since we are unsure whether the animal is still in the area, there are no proposed changes for land or recreational use,” said Bill Van Pelt, Arizona Game and Fish Department’s nongame mammals program manager .

Van Pelt said a Jaguar Conservation Team (JAGCT) was formed in 1997 in cooperation with residents in southern Arizona/New Mexico to gather jaguar data and monitor potential travel corridors on the borderlands. The U. S. effort has also stimulated a parallel conservation effort in Mexico. All JAGCT members, along with federal and state wildlife managers, have been notified to be on the alert and to watch for jaguar.

As part of this cooperative effort, the Malpai Borderlands Group, founded in 1997, has established a fund to cover depredation expenses if a proven jaguar livestock kill is identified.

Jaguars were placed on the federal endangered species list July 22, 1997 and illegal take of the species could result in state and federal fines of up to \$100,000 fine and a year in prison.

There have been 63 jaguar sightings in Arizona since 1900. The last Arizona photograph was taken in August 1996.

The closest known population of jaguars is 135 miles south, deep in the Sierra Madre of Mexico

Jaguars (*Panthera onca*), which are the third largest cat in the world, are secretive cats that are muscular with relatively short limbs and a deep-chested body. They are cinnamon-buff in color with many black spots that are often broken circles or rosettes. A black or melanistic phase can occur.

Jaguars are the only cat species found in the Western Hemisphere to truly roar, like an African lion, tiger, or leopard.

Historically, jaguars were found in virtually every habitat type known to Arizona and New Mexico.

These habitats include everything from shrub-invaded desert grasslands to montane-conifer forest. In recent times, they have been most closely associated with evergreen-oak woodlands, extending northward from Mexico.

Jaguars once ranged from southern Argentina, up along the coasts of Central America and Mexico, and into the southwestern United States as far north as the Grand Canyon. Today, this range is greatly reduced and fragmented.

Throughout their entire range, jaguars are recognized and protected under the Convention on International Trade in Endangered Species (CITES). In the United States and Mexico, they are considered an endangered species under each country's Endangered Species Acts.

In addition, an Arizona-New Mexico Conservation Agreement, involving participation by state and federal agencies, local governments, nongovernmental entities, such as the ranching community, houndsmen, and private citizens has been established to help conserve the species. The goals of this agreement include educating the public, identifying habitat and travel corridors for population maintenance, and the development of strong public-private partnerships using innovative and adaptive management to conserve the jaguar in Arizona and New Mexico.

Recognizing the lack of information about jaguars, the team has been aggressive in collecting sound scientific data. In 1998, members from the working group traveled to Brazil to collect information on jaguar depredation on livestock and published a book on jaguar sign. Working group members are also monitoring remote-census cameras in mountain ranges recently occupied by jaguars. JAGCT is currently printing an informational brochure on jaguars.

If you see a jaguar, it is extremely important to note several things:

- Observe specifics of the area so managers can find the **exact location**.
- Note the specific **characteristics** of the animal **coloration, size, posture and behavior**.
- If possible, take a photograph or video of the jaguar and the area.

- Collect any sign (scat, hair, track tracing) if possible, without destroying the integrity of the track.
- **Report** the sighting immediately to Van Pelt at (602) 789-3573.

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A special word to teachers

As indicated by the press release (see preceding pages), jaguars have now been photographed on soil in southeastern Arizona, including the young male captured on a remote camera set up to monitor wildlife traveling through a corridor (much like a ‘wildlife highway’) in December 2001.

The jaguar is a creature of mystery and myth – and whether it is a transient or occasional resident of Arizona and New Mexico has yet to be determined. The jaguar, also known as *el tigre*, is the largest of the North American felines (cats). It has often been featured in art and drawings, as well as oral traditions, among indigenous peoples of the Southwest and Latin America.

Yet, until recently, jaguars were not even creating a ‘blip’ on the radar screen of most Arizona and New Mexico residents. The first documented existence of a jaguar in Arizona, via photograph taken by Warner Glenn in 1996, set off a flurry of activity, surrounded by a great deal of debate.

So...what’s the big deal about the jaguar? This guided study unit will help lead you and your students to reach your own conclusions.

Instructional strategies:

The **curriculum map** will assist you in planning your classroom activities and includes:

- Suggested time frame
- Correlations to state education standards
- Thinking skills stressed for each activity
- Concepts covered by the lesson
- Assessment for each lesson.

An **assessment summary** sheet may be found in the Appendices (Appendix B).

Student teams:

If cooperative learning is being practiced within your classroom, we highly recommend that students be assigned to teams (4-5 students per each) for the duration of this unit. Teams will work on specified tasks for most lessons, and the culminating activity for this unit will be student presentations by teams. Consideration should be given for group dynamics within each team, ensuring optimum diversity of learning styles.

If cooperative learning is not currently in place within your classroom, we recommend that students complete the unit requirements individually. (Final presentations may be either individual students or small teams, at the discretion of the teacher.)

It is also recommended that each student be given a copy of the “RRR Journal” (Appendix A) to record data gleaned from each activity on a daily basis. This will help provide the necessary information for the final presentation.

Unit goals:

This unit is designed to be a guided study for social studies, suitable for students in grades 5 through 8, emphasizing social studies standards for students in both Arizona and New Mexico. Additional standards in Language Arts, Science, and Math are also identified where appropriate. Concepts are identified at the beginning of each lesson, as well as in the curriculum map.

Feline resource kits:

To assist with the teaching of this unit, resource kits (available on a no-cost loan basis) have been developed to provide materials, which will enhance the teaching of this unit. Each resource kit includes:

- Jaguar skull (replica)
- Mountain lion skull (replica)
- Bobcat skull (replica)
- Domestic cat skull
- “Biotic communities of the Southwest” [map of vegetative communities], David E. Brown and Charles H. Lowe
- *Borderland Jaguars*, David E. Brown and Carlos A. Lopez-Gonzalez [2 copies per trunk]
- *Eyes of Fire*, Warner Glenn [15 copies per trunk]
- *Tracking the Felids of the Borderlands*, Jack Childs [2 copies per trunk]
- *Onza! The Hunt for the Legendary Cat*, Neil B. Carmony
- *Eyewitness Books: CAT*, by Dorling Kindersley
- Video: “Eyewitness: Cats”, by Dorling Kindersley
- Video: “Cats: Caressing the Tiger”, by National Geographic
- Video: “Jaguar: Year of the Cat”, by NATURE
- Highway maps of Arizona and New Mexico
- *Arizona Atlas and Gazetteer* and/or *New Mexico Atlas and Gazetteer*

To determine the location of the resource kit nearest you, please refer to Appendix G.

Summary of the Learning Components in the Unit

Content Areas:

- *Social Studies (Geography, History, Economics, Culture, Government)
 - *Environmental Education
 - *Language Arts (Reading, Writing, Speaking, Listening)
- *Math
 - *Science
 - *Arts (Drama, Visual Art, Dance & Music)

Thinking Skills & Processes:

- Analytical Thinking
 - Critical Thinking
 - Creative Thinking
 - Problem Solving
 - Synthesis
 - Encoding & Decoding
 - Recall
- Use and Communication of Information
 - Evaluative Skills
 - Representation of Ideas
 - Identification of Needs & Characteristics
 - Identification of Relationships
 - Research Methodology
 - Comparative Analysis

Group Process Skills:

- Goal(s) Set to Accomplish Task
 - Establish a Time Line
 - Identify Obstacles
 - Clarify Roles & Tasks
 - Produce a Finished Product

Day 1: “What is a felid?”

Concepts:

1. The five essentials of wildlife habitat are: food, water, shelter, space, in a suitable arrangement.
2. Wildlife responds to its environment through physiological or behavioral adaptations.

Objectives:

- The student will identify wildlife sign and use it to draw conclusions about wildlife found within a given area.
- The student will identify species of wild cats found in the American Southwest.
- The student will compare adaptations of adult wild cats: jaguar, cougar, bobcat, ocelot.

Glossary:

Adaptation: a characteristic of an animal or plant that helps it adjust to its environment, thereby increasing its chances for survival.

Carnivore: an animal that eats meat

Extirpated: species has been eliminated from all or a portion of its historic range

Felid: mammal of the cat family.

Habitat: the arrangement of food, water, shelter or cover, and space suitable to animals' needs.

Natural history: Factors pertaining to the natural life of an animal: physiology, behavior, range and distribution.

Sign: “clues” left by animals, such as footprints, scat, nibbled leaves, etc.

Background:

Almost everywhere you look, you can find *sign* left by wildlife. Some are easy to spot: nibbled plants or leaves, nests, a hole in the ground or in a tree, footprints (tracks).

Careful observation of the sign can provide a variety of clues such as the species of animal that visited, the relative size of the animal, the number of animals that were there. Experienced wildlife watchers might also be able to detect where the animal lives, what it eats, perhaps even what it does to stay alive.

Wildlife footprints, called tracks, can tell a story. By examining the size and shape of a track, the number of toes, the presence (or absence) of toenails, we can learn a great deal about “who’s been here”. Observing the pattern of an animal’s stride can also indicate whether an animal was walking casually, stalking, or running.

Because wildlife is often hard to find (or is in an area too rugged for humans to easily travel), biologists need to rely upon wildlife sign as indications of how many and what species of an animal are in a specific location. Wild cats are especially elusive (hard to find). Consequently, much of what we know about wild cats is learned through careful and scientific observation of their sign.

The American Southwest is home to both the cougar (*Felis concolor*) and bobcat (*Lynx rufus*). Historically, the jaguar (*Panthera onca*) also lived in this geographical range, though likely in small numbers. Likewise, the ocelot (*Felis pardalis*) once inhabited portions of Arizona and New Mexico.

It is uncertain as to whether a breeding population of jaguars lived within the American Southwest. There are historic accounts of “hunters taking both young jaguars and jaguars running together as far north as the Mogollon Rim” (David E. Brown, Borderland Jaguars, page 34). After being extirpated from the USA by the middle of the Twentieth Century, the jaguar is once again making occasional forays north of the Mexican border. Though still extremely rare on American soil, it is important to understand the similarities and differences of these three species of felids, and to consider their habitat requirements.

The jaguar is only one of several wild cats (felids) that live in the American Southwest. This activity will help students better understand each of those felines and how they adapted to life within this area.

Materials:

- Butcher paper, newsprint, or other large drawing paper
- Rulers or yardsticks
- Markers, crayons, or large drawing pencils
- Scissors
- 4-5 each of various small objects, approximately 1” in diameter or thickness (e.g.: smooth stones, erasers, marbles, bottle tops/caps, etc.)
- Clear plastic wrap
- Small (6”) square of acrylic/plastic
- (Optional) Video: “Eyewitness: Cats” by Dorling Kindersley or “Cats: Caressing the Tiger” by National Geographic or “Jaguar: Year of the Cat” by NATURE
- Reference materials on wild cats (jaguar, bobcat, cougar) of the USA: internet, trade books, encyclopedias
- Reference material on domestic cats
- Tracking the Felids of the Borderlands*, Jack Childs
- Copy of RRR Journal (one per student) – Appendix A

Lesson outline: Part I

1. Divide classroom into small groups (teams). Assign each team the task of researching the physiology and natural history of bobcats, mountain lions, or jaguars. If the class is large enough, assign each team a specific source from which to research this information – e.g., one bobcat team will use trade books, one will use the internet, one will use encyclopedias. [Optional: watch video/video segment on cats. Especially note physical and behavioral characteristics of the bobcat, cougar, and jaguar.]
2. Students identify the following for each species: size, weight, color (including any unique pattern), patterns of behavior, preferred habitats for each, physical track pattern for each. Each group creates a visual portrayal of their species for presenting their team’s information to the class.
3. Teams share their findings.

Lesson outline: Part II

1. Ask each group to solve a problem: “How can we trace our own footprint without disturbing that print in any manner?” Groups can brainstorm ideas and prepare their best idea to share with the class.
2. As a class, select two or three ideas to test. Ask one student to walk over soft earth, leaving behind several “traceable” footprints. Have students test the methods selected by the class. Which processes are successful? Which are not? Why? How can any problem(s) be corrected? Keep testing until the class discovers a successful method. Each group should then practice the most successful technique until they are comfortable with the process.
3. Compare the “best” method determined by the students with that used by many field researchers: place several small stones of approximately equal size around the track, taking pains to avoid “bumping” the track; place a sheet of clear acrylic/plastic over the stones; use a dry erase marker to trace the outline; store in a manila envelope or other small, protective cover until traced onto paper.
4. Compare various field guides on animal tracks and identify the advantages and disadvantages of each.
5. Each student completes the questions in Day 1 of his/her RRR Journal.

Questions for classroom discussion:

1. What is the difference between a ‘wild’ cat and a ‘domesticated’ cat?
2. What are the main physical and behavioral characteristics of the three species of wild cats found in Arizona and New Mexico?
3. How can you discriminate between the footprint of a mountain lion and of a jaguar? How do you know you are looking at the tracks of a feline?
4. What references did you use to obtain this information?

Discuss any differences of information presented by references that address the same topic – e.g., differences of size or weight, range, population numbers, etc.

- What factors might account for any discrepancies noted?
- Are they significant?
- When using information for making scientific decisions, what factors ought to be considered? How do we account for differing data when we make reports or publish materials?

Assessment:

Refer to Assessment Summary, Appendix B.

Extensions:

1. Create a silhouette for a breed of domestic cat and compare to the three wild cats, noting similarities and differences.
2. Trace the “family tree” of domesticated cats and compare to that of their wild ancestors.

Day 2: “If I were a jaguar, where would I live?”

(Activity adapted from “Rainfall and the Forest”, a Project WILD activity.)

Concepts:

1. Environmental factors such as soil, climate, elevation, geology, and vegetation determine what kind of wildlife will be found in an area.
2. The five essentials of wildlife habitat are: food, water, shelter, space, in a suitable arrangement.
3. Species competition and environmental factors interact to keep wildlife populations in dynamic balance within the ecological community.

Objectives:

- The student will correlate rainfall with vegetative communities
- The student will define potential habitat of the jaguar in the American Southwest.
- The student will compare verified sightings of jaguars with available habitat.

Glossary:

Abiotic: nonliving

Biotic: of, or relating to, life

Limiting factor: influences naturally occurring in the environment (or caused by human activity) that serve to control wildlife populations – e.g., lack of adequate cover/shelter, lack of adequate food supply/prey base; etc.

Plant community: an association of plants, each occupying a certain ecological position or niche, inhabiting a common environment and interacting with each other.

Background:

Many natural systems affect wildlife survival and populations. The type, amount and distribution of precipitation can influence the type of plant life that will grow in a given area. Additionally, elevation, latitude, soil, amount of sunshine, and other abiotic factors will determine the likelihood of a plant species being found within a given area.

Plant communities support wildlife and help form the basis of habitat. All wildlife depends upon habitat: food, water, shelter, and space, in their proper arrangement.

This activity will help students recognize some of the relationships which help define plants within a habitat, which will therefore determine what kind of wildlife can live in a given area.

Materials:

One per team:

Highway map of state

One sheet of tracing paper the same size as map

Four markers/crayons of different colors

Information on average annual rainfall amounts and the elevation of 25-30

locations within the state (use information provided or have students research in their teams)

Vegetative map of state (check with your local agricultural extension service or NRCD) – approximately the same size as highway map [see “Biotic Communities...” map in Felines resource trunk]

Data: recorded sightings of jaguars (Appendix C) – OR – refer to Table 2 in *Borderland Jaguars* (page 6)

Map of potential habitat for jaguars (Appendix D)

RRR Journals

Lesson outline:

1. Give each team the materials outlined above.
2. Ask each team to outline the state on the tracing paper, using the map provided.
3. Using the chart of average rainfall amounts (at the conclusion of this lesson) have students separate the list of locations into four rainfall level groups: 0 - 5”; 5.1 – 10”; 10.1 – 15”; 15+”.
4. Assign a color for each level of rainfall. Students will make a large dot (about the size of a dime) of the appropriate color for each location in the correct place. (Placing the tracing paper over the map will help.) Do not write names of the locations on the map.
5. Consolidate each color into rainfall patterns, using stripe or dotted patterns or any others the students wish. (The purpose is to show general patterns of precipitation, rather than individual town/city amounts. Thus, students should not connect in a dot-to-dot pattern but should connect adjacent areas of similar precipitation by including them within a larger pattern. [HINT: Use a newspaper temperature chart for explanation. Temperature patterns are depicted for a broad band of the nation or state, rather than displaying each individual site.]
6. Compare the finished map to a vegetative map of the state. What correlations can you find? How many different vegetative types can be found within the same rainfall amount? What amount of rainfall would you expect to find for the following plant communities: grassland, chaparral, pine forest? Remember that we are only using 25-30 reference points for this activity: greater accuracy could be achieved by incorporating more reference points.
7. Compare vegetative communities with others sharing approximately the same annual rainfall. Do they each have the same vegetation? What might account for any differences? (Check the highway map to learn of topographical features which might have some influence.)
8. On the student-drawn map, identify locations of actual jaguar sightings (Appendix C or *Borderlands Jaguar*).
9. Compare the vegetative maps with habitat needs for jaguars (page 11). Where might a jaguar be able to live *if vegetation was the only influence on this animal*? Why don't we find them in those places? Consider the behaviors of jaguars, their food requirements, and the effects of human population on habitat. Would a jaguar be likely to survive in those areas you just identified? Why or why not?
10. Answer questions in your RRR Journal.

Project WILD "Rainfall and the Forest" Resource Sheet

Annual Rainfall for Arizona Cities

Cities	Average Precipitation (inches)	Elevation (feet)
Ajo	8.56	1,736
Alpine	21.16	8,000
Casa Grande	9.25	1,405
Clifton	13.53	3,465
Douglas	13.42	4,020
Flagstaff	20.80	6,993
Fredonia	9.38	4,675
Gila Bend	6.86	737
Grand Canyon	15.62	6,965
Holbrook	8.67	5,061
Jacob Lake	19.32	7,920
Kayenta	7.71	5,641
Kingman	9.79	3,345
McNary	28.58	7,320
Nogales	18.63	3,800
Parker	4.50	425
Payson	22.08	4,910
Phoenix	7.66	1,117
Prescott	19.63	5,355
Safford	9.68	2,900
Sedona	17.75	4,223
Tuba City	6.77	5,936
Tucson	12.00	2,410
Wickenburg	12.20	2,070
Willcox	12.92	4,200
Williams	21.17	6,750
Winslow	8.04	4,880
Yuma	3.17	138

Other Resources

- Arizona Natural Vegetation maps (Bulletin A-45) are available for \$2.00/copy from the University of Arizona Office of Agriculture and Communication, Tucson, Arizona 85719.
- The Soil Conservation Service Arizona Base maps are available from the Arizona Game and Fish Department Education Branch.

* Rainfall data updated 1/10/97

Day 3: “El Tigre”

Concepts:

1. The esthetic, economic, and spiritual values humans place on wildlife vary from person to person and culture to culture.
2. Responsible environmental actions are the obligations of all levels of society, beginning with the individual.
3. Hunting and fishing are biologically sound wildlife management tools when conducted using prescribed scientific methods.

Objectives:

- The student will identify the various esthetic, economic, and spiritual values attributed to the jaguar throughout history.
- The student will recognize changes of attitude attributed to hunting from the 1800’s to the present time.

Glossary:

Borderlands: geographical area where Arizona, New Mexico, and Mexico come together

Folklore: stories, culture, traditions, beliefs from a given area

Legend: stories passed from one area or generation to another (may or may not be based upon actual facts)

Onza: a legendary large cat in Mexico

Taxonomy: method of classification

Tigre: Spanish for Jaguar

Background:

It has been said that humans are story-seeking animals. Virtually every society and every world religion has attempted to influence behavior through stories, fables, parables, legends, myths, and allegories. Stories clarify what a group values: explains its view of the world, reinforces its interpretation of events, instructs members in appropriate conduct, and identifies heroes to emulate and villains to disdain.

Materials:

Eyes of Fire, Warner Glenn

Onza! The Hunt for a Legendary Cat, by Neil Carmony

“Agua Bravo” (short story)

A map of South America, Central America, and the U.S.A. [preferably one that clearly illustrates the USA Borderlands - especially AZ and NM]

“*Rohonas and Spotted Lions: the Historical and Cultural Occurrence of the Jaguar, Panthera onca, Among the Native Tribes of the American Southwest*”, Steve Pavlik (Appendix H)

“What to do if you see a jaguar along the Arizona-New Mexico Borderlands” (pamphlet – text included in Appendix I)

Background:

There are six species of wild cats naturally occurring in Mexico and the USA, but only six of those are ‘shared’ by both countries:

Feline (cat) species	In Mexico	In the U.S.A.
Jaguar (<i>Panthera onca</i>)	X	X ¹
Mountain lion (<i>Felis concolor</i>)	X	X ²
Bobcat (<i>Lynx rufus</i>)	X	X ²
Ocelot (<i>Felis pardalis</i>)	X	X ³
Jaguarundi (<i>Felis yagouaroundi</i>)	X	X (Texas only)
Margay (<i>Felis wiedii</i>)	X	Texas*
Lynx (<i>Felis lynx</i>)		X**

¹Species occurs in Arizona and New Mexico, although the jaguar was extirpated in the mid-1900’s and has been reported on US soil only rarely in recent years.

²Species occurs in Arizona, New Mexico, and numerous other states

³Remnant populations live in Texas. Historical records indicate the ocelot once also lived in Arizona and New Mexico.

*One skin, claimed to have been collected in Texas, was recorded in that state in the 1800’s. Many believe it was actually brought up from Mexico.

**Records of early trappers indicate the lynx may have lived in New Mexico at one time; however, these reports have not been validated.

Of these cats, only the jaguar and the mountain lion are large enough to prey on cattle and horses as the *onza* is said to do.

The jaguar (*el tigre* in Mexico), the largest New World cat, is found in various habitats throughout the Americas [North, South, and Central]. Fossil records indicate jaguar remains in numerous sites in North America. In the Southwest (Arizona, New Mexico, Texas, and Sonora), they evidently coexisted with mammoths, ground sloths, and other now-extinct species during the Pleistocene period (about 10,000 years ago) [Borderland Jaguars, Brown].

Over the years, several of the cats have been killed north of the border in southeastern Arizona; the most recent account of a jaguar being killed in Arizona was from Cochise County in 1986. There are two or three reasonably reliable accounts of jaguars being killed in southwestern New Mexico between 1900 and 1905, but there are no jaguar specimens in museum collections from that state. There have been no recent kills (or confirmed sightings) reported in New Mexico (April 2002).

In 1969, the Arizona Game and Fish Commission prohibited the killing of jaguars in Arizona, and the animal subsequently received federal protection under the Endangered Species Act. Once believed extirpated from the state, the jaguar has now been photographed on at least three different occasions between 1996 and 2002. Do those cats live in Arizona year-round? Are they occasional ‘transients’ from populations in northern Mexico? At this time, no one knows for certain. However, the confirmed presence of

these animals on Arizona soil has created much excitement, as well as serious concern. (This will be addressed on Day 5.)

Today, jaguars are becoming scarce in Mexico, which prohibited hunting the cats for sport in 1987. However, with the continuing rapid growth of the human population, the outlook for *el tigre* there is in doubt.

As one of the leading jaguar authorities in the world, Dr. Alan Rabinowitz, Director of Science for the Wildlife Conservation Society, makes the following observations:

Few animals have been incorporated into the religious beliefs, ideologies and artistic traditions of ancient civilizations and modern peoples as the big cats. This has been so prevalent that examination of ancient and modern beliefs can often give us insight into what top predators shared the landscape with modern man. Jaguars have been a dominant symbol and religious icon throughout much of the neotropics where they occurred as the dominant carnivore (Saunders 1991, 1995). Although the Native Americans of the Southwestern United States are relatively recent newcomers, there is no indication that jaguars were ever part of their religious ideology, art, or culture. Instead, any feline imagery decorating their ritual paraphernalia were patterned after the puma, which was regarded as the supreme hunter and associated with rain, fertility and warriors (Saunders 1991). The predominance of the puma in the mythic worlds of Native American cultures can be found among the Zuni of New Mexico, the Miwoks of California, and the Apaches, Hualapais, Navajo, and Papagos of Arizona (Hansen 1992).

The lack of anecdotal evidence, mythology, religious beliefs or folklore about the jaguars in old books, by hunters, or recorded among Native American groups north of the border strongly suggests a lack of permanent presence even by relatively small numbers of individuals within the last several hundred years.

- **Jaguar**, Alan Rabinowitz

Rabinowitz believes that an investigation must be done to be sure that jaguars that may be occasionally crossing into the borderlands regions are not a subspecies which would further support the myth of the possibility of the onza theory. History and research start to be very interesting and become a mystery to solve – especially when you combine folklore and science.

Steve Pavlik, a high school educator in Tucson, Arizona, has delved into the cultural views toward jaguars, as depicted through historical traditions of Native Americans of the Southwest. Pavlik discovered evidence of jaguars within art and/or archaeological sites in Texas, New Mexico, Arizona, Tennessee. [For a more detailed summary of this paper, see Appendix H.]

A great deal of interest was generated by the book Eyes of Fire: Encounter With A Borderlands Jaguar, by Warner Glenn. In 1996, he saw and photographed a jaguar in the wild in the United States. (Warner Glenn has hunted mountain lions as a professional hunting guide for 60 years in southeastern Arizona. This was the first jaguar that he had ever seen. His father, who had also been a professional hunting guide, had hunted for 50 years in the area - and he had never seen a jaguar.)

The publication of this book generated the same type of folklore about the sighting of a jaguar as the stories of the sighting of the *onza* had created, several decades earlier.

Lesson Outline:

[NOTE: The teacher may choose to tell/read this to the class, copy the material for students to read, or assign research to individual students or groups. If using the 'Felines' resource trunk, each student may individually read Warner Glenn's account of his encounter with the jaguar. Information presented here provides additional background for students to better understand various cultural attitudes and beliefs toward the jaguar.]

El tigre – the jaguar

The jaguar is a mysterious cat. Because it is so elusive and hard to catch or even see, there is limited published research on the species. Thus, many legends have developed, especially in Mexico, which is one of the habitats of the jaguar. One Mexican legend is that of the *onza*. Some of the folklore and science that we know about the jaguar comes from people who have pursued the *onza* and other large cats in Mexico and the Border Region of the U.S.

Note: *The following excerpts were taken from the book ONZA! The Hunt for a Legendary Cat by Neil B. Carmony*

We all love to hear an amazing story and enjoy reading reports of strange phenomena. Being fascinated with the unknown is as human as admiring sunsets. Mystery adds zest to our lives and people seize upon it at every opportunity.

Our subject is the *onza*, a legendary large cat believed by some to roam the remote canyons and forests of western Mexico. Its existence is unknown to science. Of equal interest are the Mexicans who believe in the fabulous beast and tell of its supernatural abilities. Perhaps the most interesting of all are the American investigators who have sought to unravel its secrets. The people who have searched for the *onza* are as fascinating as their strange quarry.

Stories told by rural people are usually the source of wildlife legends. The Abominable Snowman or Yeti of the Himalaya Mountains in Asia is probably the most notorious creature of the myth, but fans of Scotland's Loch Ness Monster would dispute this. Bigfoot or Sasquatch the ape-man of America's Northwest, refuses to be found, but belief in his existence refuses to die. Not a year goes by without reported sightings of Nessie or Bigfoot or some other fabulous critter. The lake monsters and the ape-men continue to defy all attempts to capture them, but these creatures and many others of dubious authenticity have excited imaginations, fired debates, and inspired explorations of far-away places and in so doing have provided people with untold pleasure.

The *onza* is western Mexico's equivalent of Bigfoot or Nessie. The legend of this large cat with amazing powers has its origins in tales told by Indians and in the writings of early explorers and missionaries in the service of the Spanish Crown. But it was not until the twentieth century that the *onza* became known north of the border. In the late 1920s writer Frank Dobie returned from a trip to the wilds of the

Sierra Madre with stories about the strange cats. The *onza* became front-page news in 1938 when the Lee brothers, mountain lion and jaguar hunting guides based in Arizona reported that a client Joseph Shirk, had bagged one of the rare creatures in Sinaloa, Mexico. The men produced photographs of the *onza* to back up their claim. Despite the fact that scientists thought the cat in the Lees' photos looked a lot like a mountain lion, others were not so sure and interest in the animal persist to this day.

Determining what an animal such as the Lee-Shirk cat is, and where it fits into the family tree of living things, is the job of a taxonomist specializing in mammals. Taxonomy (also called "systematics") is the science of classifying and naming plants and animals. . . .

Scientists have to identify, name, and catalog plants and animals and map their ranges as the first steps in understanding their relationships and evolutionary histories. . . . Knowing that photos and legends are not enough, *onza* sleuths have spent decades searching for the specimens that would reveal the cat's identity beyond all doubt.

The information these detectives have gathered has provided us with a great deal of information and folklore about the jaguar and other wildcats in Mexico and the Borderlands.

1. Read *Eyes of Fire* (a personal, experiential account), *Onza! The Hunt for a Legendary Cat* (folklore), or "Agua Bravo" (legend). (Students may also do their own research in a variety of references to learn about various cultural beliefs toward the jaguar.)
2. Locate the Borderlands of the U.S.A. on a map. Within that region, locate the following: The Peloncillo Mountains, The San Bernadino Valley, The Animas Mountains
3. (Older students) Read "Rononas and Spotted Lions: the Historical and Cultural Occurrence of the Jaguar, *Panthera onca*, Among the Native Tribes of the American Southwest", by Steve Pavlik (summary provided), and "What to do if you see a jaguar along the Arizona-New Mexico Borderlands".
4. Answer questions in your RRR Journal.

Questions for classroom discussion:

1. Discuss attitudes toward the jaguar through three or more cultures and throughout history. How have attitudes toward wildlife, as depicted by the jaguar, changed over time? Provide an explanation for why you believe attitudes have changed in the past 150 years.

Assessment:

Refer to Assessment Summary, Appendix B.

Extension:

Research personal, family, community *el tigre* folklore. Recommended places to start: local historical museums or historical publications, archived photos, 'older folks' who have lived in your community most of their lives.

Day 4: “The Changing Land”

Concepts:

1. Human activities are an important factor affecting plant and animal succession, distribution, and population levels.
2. Increasing human population and activities require more open space and often negatively impact wildlife populations.
3. Humans are a part of the natural world and cannot be separated from it.
4. Humans have at their disposal tools and knowledge to significantly impact the quality and quantity of wildlife habitat.

Objectives:

- The student will identify changes in land-use patterns over a defined period of time.
- The student will suggest possible reasons as to why those changes may have occurred, and how those changes may have impacted wildlife.
- The student will project a ‘vision’ for the area for 10 and for 50 years into the future, based upon current population trends and development, and will discuss advantages and disadvantages posed for wildlife.

Glossary:

Migratory corridor: a ‘pathway’ used by wildlife to move from one area to another

Materials:

Select from one or more of the following:

Two aerial maps for your school (one taken in the 1970’s or before, one taken in the 1990’s or later) [available from your local zoning and planning commission, or use those provided in Feline Resource Kit*]

*If using aerial photos in the Feline resource kit, please adapt accompanying questions to those photos.

Arizona Atlas and Gazetteer or *New Mexico Atlas and Gazetteer*

Background:

The human population in Arizona is one of the fastest-growing in the entire USA. More people means more housing, more jobs, more schools and community buildings, more shopping and entertainment areas. It also means more use of our natural resources – e.g., water, land, forests – to accommodate the demands of this burgeoning population.

While growth is neither ‘good’ nor ‘bad’, it does require careful planning to meet the needs of all interested parties: industry, agriculture, outdoor enthusiasts, natural resource agencies (local, state, and federal), mining, landowners, and others. We refer to those who have interests in an issue as “stakeholders”.

Meeting the needs of all stakeholders is not easy, especially during periods of rapid growth. Careful planning is vital to ensuring that, while accommodating human needs, the quality of life – for humans and for wildlife – will be maintained for future generations.

Lesson outline: Option 1

1. Display an aerial photo of your school/community (or one from the resource kit) which depicts the area 20 or more years ago. Have students locate those buildings or natural features that are still present. [Parents or grandparents may have stories to share about the area from the time period represented. These can become an important part of the material to use with this activity as it presents a baseline as to how the community once functioned.]
2. Display an aerial photo of the same area from a current date (or as recent as you are able to obtain). Students should note as many similarities between the two as possible, as well as any differences (new buildings, roads, open space – what was there but is now gone and why, businesses that have opened, etc.).
3. Students should discuss those changes observed and offer suggestions as to why they might have occurred. [Using a local historian might be of some use. For example, a fire might have destroyed a building or other landmark, but occurred long before the students were born. Why did this community build here? What happened to any wildlife that was here? Is the economy of the community today the same as it was when first founded? Etc.]
4. Thinking about changes that have occurred over the past 20 (or more) years, students describe or draw the same community in 10 years and in 50 years. How will these changes impact their lives and those of the entire community? Who determines what changes and what remains the same? How should any potential conflicts of interest be resolved?
5. Based upon your thoughts (#4), how does a ‘changing landscape’ and changing land-use patterns impact migratory corridors? Prey base? What is impacted when the prey base changes for wildlife?
6. What habitat remains in this area that **might** provide food, water, shelter, space for jaguars? Is it feasible and realistic to expect that they might return to this area? Why or why not?

Lesson outline: Option 2

1. Invite an older member of your community (perhaps a member of the local historical society) who has lived in the area for most of his/her life to address the class on the natural and cultural history of the region over his/her lifetime. If possible, have your guest share archival photos. [Parents or grandparents may have stories to share about the area from the time period represented. These can become an important part of the material to use with this activity as it presents a baseline as to how the community once functioned.]
2. Display a photo, or host a class discussion, of how the area looks today. Students should note as many similarities between the historic and the current accounts as possible, as well as any differences (new buildings, roads, open space – what was there but is now gone and why, businesses that have opened, etc.).
3. Students should discuss those changes observed and offer suggestions as to why they might have occurred. [Using a local historian might be of some benefit for this portion of the lesson. For example, a fire might have destroyed a building or other landmark, but occurred long before the students were born. Why did this community

build here? What happened to any wildlife that was here? Is the economy of the community today the same as it was when first founded? Etc.]

4. Thinking about changes that have occurred over the past 20 (or more) years, students describe or draw the same community in 10 years and in 50 years. How will these changes impact their lives and those of the entire community? Who determines what changes and what remains the same? How should any potential conflicts of interest be resolved?
5. Based upon your thoughts (#4), how does a ‘changing landscape’ and changing land-use patterns impact migratory corridors? Prey base? What is impacted when the prey base changes for wildlife?
6. What habitat remains in this area that **might** provide food, water, shelter, space for jaguars? Is it feasible and realistic to expect that they might return to this area? Why or why not?

Questions for classroom discussion:

1. (If using photos) Study the earlier photo: what do you believe was the most important use of land at the time this photo was taken?
2. (If using photos) Study the later photo: has the land pattern changed? If so, identify features that have changed.
3. Based upon your observation and study of the photos, what factors might account for these changes over time?
4. Does the earlier photo indicate potential jaguar habitat? Why or why not?
5. Does the later photo indicate potential jaguar habitat? Why or why not?
6. How have migratory corridors for wildlife, as depicted in these two photos, changed over the years?
7. Is it likely that a jaguar might use this habitat as it appears today? Why or why not?

Assessment:

Refer to Assessment Summary, Appendix B.

Day 5: “Tracing the history of jaguar conservation”

Concepts:

1. Protection and enhancement of wildlife habitat are the two most important tools for the long-term survival of wildlife species.
2. Wildlife issues and trends are complex and require analysis of alternatives and consequences.

Objectives:

- The student will research answers to a series of questions, using at least two of the following: internet, trade books, US government publications, archived newspaper or media reports, artifacts.
- The student will create a chronological time line from the earliest record to the most recent.
- The student will compare and contrast the ESA and the conservation team approaches to wildlife management.

Glossary:

Conservation agreement: voluntary agreement between two or more parties that provide a course of action for conserving a species

ESA (Endangered Species Act): legislation passed by Congress in 1973 to provide legal protection for species (plant and animal) designated to be at risk of extinction

Extinction: to cease to exist

Materials:

Copy of “Questions to research” (at conclusion of this lesson)

(Optional) Conservation time line (at conclusion of this lesson)

(Optional) Arizona: www.azgfd.gov - click on Heritage Data Management System for access to information about species in your geographic region. New Mexico: click on <http://fwie.fw.vt.edu/states/nm.htm>

NOTE: If class time permits, allow students to conduct their own original research, using whatever references (periodicals, internet, trade books, etc.) are available to them

Environmental Conservation Timeline (at conclusion of this lesson)

Background:

The history of conservation in the U.S. is relatively recent. Some events, such as passage of the ESA (Endangered Species Act) in 1973, have been widely noted. Others, such as the designation of the first national wildlife refuge in 1903, have seemingly faded from memory.

When studying conservation or environmental events, it is important to note not only **what** happened but also **why**. Things we now take for granted – such as the Clean Air Act or the Clean Water Act – are actually rather recent events in our history.

Until the early 1900's, few people were noticing the changes in wildlife populations, the extirpation or extinction of species, and the continual changes brought about by expanding human populations. The demise of the passenger pigeon and the Carolina parakeet brought to light a 'new' problem: what happens to species when human activity alters their habitat? From unsustainable harvesting to pollution to overdrawing water from ponds, wildlife's struggle for survival suddenly came face-to-face with a new threat: *humans*.

During the last century, a number of laws were enacted to help wildlife, habitat, and the conservation of species. The **ESA**, passed in 1973, was intended to help conserve species facing the risk of extinction. The U.S. Fish and Wildlife Service and the National Marine Fisheries Service (both federal agencies) were given the responsibility of administering this law. Under the ESA, the federal government (through the Secretary of the Interior) determines whether sufficient biological evidence is available to designate a species as threatened or endangered.

Although the ESA has been effective at helping to stabilize and/or reestablish populations of targeted species (e.g., bald eagle, peregrine falcon), the number of endangered species in the USA continues to grow, due to a multitude of reasons – especially that of habitat alteration and/or destruction. Further complicating the protection of endangered species is the perception by some that the ESA has been too-frequently used as a heavy-handed 'legal club' to accomplish its goals, often at the expense of those individuals and communities most directly impacted by its designations. Under the ESA, certain restrictions may limit a landowner's rights to develop or use that land they way he chooses: i.e., a landowner may not be able to follow through on intended usage of that land, if it might negatively impact an endangered or threatened species.

Alternatively, some say species protection under the ESA has not worked because policy makers have not adequately funded the ESA. With inadequate funding, federal agencies (such as the US Fish and Wildlife Service) often do not have the necessary resources to efficiently carry out a species program which might, in its earliest stages, be preventative. Many also believe that the federal government has also not provided adequate economic incentives to the landowner, that could prevent species decline. (At the time of this writing, federal legislation seems to be evolving that direction.)

Section 6 of the ESA encourages each state to develop and maintain conservation programs for federally-listed threatened and endangered species within their state borders. Because many 'T&E' species occur on private lands, it is important that policies and incentives encourage protection of the landowners' interest, while also providing for the conservation of species in need of help.

With a **conservation team** approach to conservation, cooperative conservation agreements are enacted among individuals and the government, without the official designation of 'endangered' for the species in question. In essence, the local or regional people, with support from a state or federal agency (or both), develop a management plan

to protect and reclaim a species. Various state and federal agencies have been using this approach as one method to manage wildlife.

Like the ESA, there are some who have criticized conservation teams. Their objections often center upon failure to provide sufficient protection for an endangered species – i.e., there is no legal requirement to force people to manage for the best interest of the species or the habitat. Also, because conservation teams are comprised of volunteer stakeholders, there is often little or no available funding to carry out those conservation strategies that the team would like to implement.

Prior to being listed as an endangered species in 1996, the jaguar was originally protected by a conservation team agreement, with the intent of developing a management plan (using local input) for continued protection of this species. Despite the listing of the jaguar as endangered, this team (known as the JAGCT) continues to meet twice each year, with committees assigned to research a variety of issues, such as designation of critical habitat, livestock depredation, information and education.

While neither the ESA nor the conservation team approach is flawless, both have advantages and both have disadvantages – for both wildlife and humans.

Lesson outline:

1. Distribute the questions below to each student or team. (Feel free to add your own questions, based upon the history of your community.)
2. Students and/or groups compile their findings on a ‘master timeline’, from the earliest event to the most recent.
3. Students discuss correlations, if any, between natural and human-caused events.
4. Students discuss difficulties in interpreting cause-and-effect, given limited amounts of information from which to draw conclusions.
5. As a class, discuss the relative advantages and disadvantages of using the ESA and/or a conservation team for managing the following: jaguar, Colorado pikeminnow (occupying the entire Colorado River drainage), Southwestern willow flycatcher (migratory songbird). What limits does each management style place upon each of these species?
6. Answer questions in your RRR Journal.

Questions to research:

1. When was the first national wildlife refuge created? Where? By whom?
2. When did the last passenger pigeon die? Why was that significant?
3. What is the Endangered Species Preservation Act? When was it passed?
4. When did Congress pass the Endangered Species Act? How is it different from the Endangered Species Preservation Act?
5. When was the bald eagle listed as ‘endangered’? Is it still endangered?
6. When was the jaguar listed as ‘endangered’?
7. What is the Migratory Bird Act? What does it do?
8. What is NAFTA? When did it become law? What does it do?

9. What record exists of major fires (more than 10,000 hectares or 25,000 acres) that occurred in northern Mexico or the Borderlands since 1990?
10. What was the population of Cochise County (AZ), Hidalgo County (NM), and Hermosillo (Mexico) in 1900? In 1950? In 1990?
11. In what year did the U.S. stop paying bounties for wolf pelts?
12. What is 'wilderness' as defined by Congress? What does it mean for a community? Who is impacted by a 'wilderness' designation? Who 'gains' from this designation and who 'loses'?
13. How many plants and how many animals are on the federal threatened or endangered list as of 1980? 1991? 1995? 2000?
14. How many plants and how many animals are on the federal threatened or endangered list for your county or region as of today?
15. What other natural events (drought, flood) have occurred in your community within the past fifty years?

Additional resources:

1. "Protecting America's Living Heritage: A fair, cooperative and scientifically sound approach to improving the Endangered Species Act, *Ten Principles for Federal Endangered Species Act Policy*, March 6, 1995, Department of the Interior
2. *"Jaguar Conservation Assessment – how and why it was", Judy Keeler, November 1, 2000 (Appendix J)
3. Potential Habitat Report, JAGCT Habitat Committee (see Appendix D)
4. "Objectives and Strategies Identified in Jaguar Conservation Agreement", Arizona Game and Fish Department, April 1998 (Appendix E)

Questions for classroom discussion:

1. What is the ESA and what does it do?
2. What is a conservation agreement and what does it do?
3. What is the JAGCT?
4. Identify two similarities between the ESA and the JAGCT.
5. Identify two differences between the ESA and the JAGCT.
6. What protection currently exists for conservation of the jaguar?
7. How might the presence of an endangered species (jaguar) impact:
 - A landowner (rancher or farmer)
 - A real-estate developer
 - A wildlife biologist
 - A nature enthusiast (e.g., wildlife watcher or photographer)
 - A county or city planner
8. What should you do if you think you see a jaguar?

Assessment:

Refer to Assessment Summary, Appendix B.

Environmental Conservation Timeline

- 1903** President Theodore Roosevelt sets aside Florida's Pelican Island as the nation's first national wildlife refuge.
- 1914** The last known passenger pigeon and Carolina parakeet die. The passenger pigeon was once the most abundant bird species in America.
- 1924** The Gila Wilderness area is designated as a 'roadless' area. This is the first such designation in the world.
- 1964** The Wilderness Act is passed by Congress. This provides protection from development and human intrusion by mechanical means.
- 1966** Congress passes the Endangered Species Preservation Act, which calls on the Interior Secretary to list endangered species and gives statutory authority to carry out species preservation programs.
- 1969** **Arizona Game and Fish Commission prohibits killing jaguars in Arizona**
- 1969** Law is altered to regulate sale and export of furbearing animals.
- 1973** Congress enacts the Endangered Species Act.
- 1978** Amendments to the Endangered Species Act
- Established the Endangered Species Committee with authority to exempt federal projects from the provisions of the ESA if the net social benefits of an exemption clearly outweigh those of complying with the Act, and certain other criteria are met:
 - Required the Secretary of the interior to designate "to the maximum extent prudent," critical habitat for each new species listed as endangered.
- 1991** More than 639 plants and animal species are on the federal threatened or endangered list.
- 1995** The U.S. Supreme Court, in *Secretary of the Interior v. Sweet Home Chapter of Communities for a Great Oregon*, upholds the government's ability to prevent habitats from being harmed as part of the Endangered Species Act.
- 1996** The Jaguar is granted protection under the Endangered Species Act. The U.S Fish and Wildlife chose not to designate critical habitat.
- 1997** The Arizona Game and Fish Department and New Mexico Department of Game and Fish entered into a Conservation Agreement with other state, local, and federal cooperators, with voluntary participation by many private individuals, to conserve the jaguar along borderlands of Arizona and New Mexico and to stimulate parallel efforts in Mexico (Johnson and Van Pelt 1997).
- 1998** The Governor of Arizona signed legislation into law (Senate Bill 1106) which imposes a \$2,500 criminal penalty (Class 2 Misdemeanor) and up to \$72,500 in civil penalties for the unlawful take of a jaguar.

Days 6 and 7: “*What is the future of the jaguar in the American Southwest?*”

Concepts:

1. Increasing human population and activities require more open space and often negatively impact wildlife populations.
2. Humans are a part of the natural world and cannot be separated from it.
3. Humans have at their disposal tools and knowledge to significantly impact the quality and quantity of wildlife habitat.
4. Protection and enhancement of wildlife habitat are the two most important tools for the long-term survival of wildlife species.
5. Wildlife issues and trends are complex and require analysis of alternatives and consequences.

Objectives:

- The student will identify known population centers of jaguars in northern Mexico.
- The student will analyze jaguar habitat components in Arizona.
- The students will evaluate the potential habitat designation for jaguars in Arizona.
- The student will identify the major stakeholders in the question of jaguar management.
- The student will hypothesize the future of jaguars in Arizona, using scientific data to defend his thesis.
- The student will be able to identify procedures to follow in the event he sees a jaguar.

Glossary:

Critical habitat: habitat deemed necessary for a species or a population to survive.

[Habitat components include food, water, shelter, and space in a suitable arrangement.]

Hypothesis: theory awaiting research or action to corroborate or disprove an assumption

Materials:

One copy of each of the following per student/group:

Potential habitat (map developed by the JAGCT – Appendix D)

Map of northern Mexico, with jaguar population centers identified (may be done by students)

Recent human population census numbers for southern Arizona and northern Mexico (use maps to determine specific towns/counties/states)

“What to do if you see a jaguar” (Appendix I)

Visual aid materials (dependent upon the type of final presentation selected by each student/team)

Background:

Wildlife management is a complex issue and must account for wildlife as well as human needs. Although there are usually several management plans that could be initiated, all

have consequences which impact humans and wildlife to varying degrees. To manage wildlife successfully, we must work to bring all those who have a direct interest (the ‘stakeholders’) together to analyze all possible alternatives and consequences.

Lesson outline:

1. In small groups, students identify and outline the known population centers of jaguars on a map of northern Mexico. Using a color-coded system (developed by either each group or the class as a whole) note the type of vegetation found within those areas. Also note human population numbers for each. (Visit <http://wcs.org> for information on jaguar distribution.)
2. Using the potential habitat identified by the JAGCT habitat team, students should mark on their Arizona maps (developed on Day 2) all similar vegetation found within Arizona, along with human population numbers for those areas.
3. Compare the two maps and hypothesize the long-term potential for jaguars in both areas. Discuss those factors that might encourage or discourage the survival for this species. Consider the various perspectives of humans whose livelihood might be impacted, including: landowners, ranchers, wildlife watchers, outfitters/guides, local businesses.
4. Read “What to do if you see a jaguar” (Appendix I). Identify areas where humans might encounter a jaguar, based upon the maps you have developed. Be able to cite the action to follow if you should encounter this rare species.
5. As a team, plan a presentation to your class (or another group) to share what you have learned about the jaguar and managing for its future. Each presentation should include at the interests of at least five different stakeholders, representing different perspectives. (You should at least include one local landowner, one state wildlife official, one biologist, one federal official.) The following identify some different ways you might like to do this:
 - ❖ Prepare a debate, with one side representing the ESA and one side representing the JAGCT. The moderator should be the jaguar.
 - ❖ Use a newscast approach to share your information, with one student playing the role of the newscaster and others representing various stakeholders.
 - ❖ Develop a “Wax Museum” or poster presentation.
 - ❖ Write an article for your school paper.
 - ❖ Prepare a Power Point presentation.

Glossary

Abiotic: nonliving

Adaptation: a characteristic of an animal or plant that helps it adjust to its environment, thereby increasing its chances for survival.

Biotic: of or relating to life

Borderlands: geographical area where Arizona, New Mexico, and Mexico come together

Carnivore: an animal that eats meat

Conservation agreement: voluntary agreement between two or more parties that provide a course of action for conserving a species

ESA (Endangered Species Act): legislation passed by Congress in 1973 to provide legal protection for species (plant and animal) designated to be at risk of extinction

Extinction: to cease to exist

Extirpated: species has been eliminated from all or a portion of its historic range

Felid: mammal of the cat family

Folklore: stories, culture, traditions, beliefs from a given area

Habitat: the arrangement of food, water, shelter or cover, and space suitable to animals' needs

Legend: stories passed from one area or generation to another (may or may not be based upon actual facts)

Limiting factor: influences naturally occurring in the environment (or caused by human activity) that serve to control wildlife populations – e.g., lack of adequate cover/shelter, lack of adequate food supply/prey base; etc.

Migratory corridor: a 'pathway' used by wildlife to move from one area to another

Natural history: Factors pertaining to the natural life of an animal: physiology, behavior, range and distribution.

Onza: a legendary large cat in Mexico

Plant community: an association of plants, each occupying a certain ecological position or niche, inhabiting a common environment and interacting with each other.

Sign: "clues" left by animals, such as footprints, scat, nibbled leaves, etc.

Taxonomy: method of classification

Tigre: Spanish for Jaguar

Bibliography

Books:

Borderland Jaguars, David E. Brown and Carlos A. Lopez Gonzalez, University of Utah Press, Salt Lake City, 2001

Eyes of Fire: encounter with a borderlands jaguar, Warner Glenn, Printing Corner Press, El Paso, 1996

Eyewitness Books: CAT, Juliet Clutton-Brock, Alfred A. Knopf, New York, 1991

Onza! The Hunt for a Legendary Cat, Neil B. Carmony, High-Lonesome Books, Silver City NM, 1995

Tracking the Felids of the Borderlands, Jack Childs, Printing Corner Press, El Paso TX, 1998

Videos:

“Cats: caressing the tiger”, National Geographic video, 1991 [running time: 60 minutes]

“Eyewitness Cat”, Dorling Kindersley, 1994 [running time: 35 minutes]

“Jaguar: year of the cat”, NATURE video library, 1995 [running time: 60 minutes]

Miscellaneous:

Arizona (New Mexico) Atlas and Gazetteer, DeLORME

Biotic Communities of the Southwest, David E. Brown and Charles H. Lowe

Characterizing and Mapping potential Jaguar Habitat in Arizona, James R. Hatten, Senior GIS Analyst and Annalaura Averill-Murray, Regional Nongame Biologist in cooperation with the Jaguar Conservation Team Habitat Subcommittee

Websites:

<http://www.nwf.org/keepthewildalive/catsvideo.cfm>

Appendix A: RRR journal



Spencer 11.

MY READING/ RESEARCH & REFLECTION JOURNAL

General information

NAME: _____

TEAM MEMBERS:

DATE JOURNAL STARTED: _____

DATE JOURNAL WAS ENDED: _____

Each day you should answer the question sheet in your journal for any stories and information that you have read, viewed, or heard that day. (See the question sheet on the next page.) State at least one thing you have learned from the learning activities and reading. This can be a very personal statement - it does not have to be something you learned. Each day, think of one question you would like to have answered either in class or through your own research. Your journal will be very important in the preparation of your final performance task.

You should also review the scoring rubric your teacher will use to evaluate your journal (Jaguar Mini Unit Assessment & Scoring Summary)

Example:

I learned the jaguar is the largest cat in this part of the world. I thought the mountain lion was the largest ca t in this part of the world. I am surprised to find there are still people who pay others to take them hunting. I did not know people made their living taking other people hunting. I would like to know more about how the North American jaguar compares to the African Lion.

RRR Journal Entry for All Reading & Research

The following questions should be answered on everything you read, hear, or view in this unit

1. What is the publication in which the reading, research, photography, video etc. occurred?
 - *Does the publication have a point of view or a specific agenda?*
 - *Is it published by and for a particular group who would have a very specific point of view?*
 - *Who wrote, directed, photo documented, or otherwise documented the article or presentation? What was his/her qualifications for producing the article/story/research/documentary etc?*
 - *What is his/her knowledge of the subject?*
 - *What motivated him/her to produce the publication?*
2. What is the purpose of the article/story/research/documentary etc.?
 - *Is it to tell a story (true or fictional), provide information, or is it to persuade?*
3. Are there scientific facts, historical facts, social facts, economic facts or cultural factors you can observe in this publication?
4. The two most important pieces of information in this for me were:

5. How did this publication make you think about the issue? How did it make you feel or how did it make you think?

Sample page:

Title: **TRACKING THE FELIDS OF THE BORDERLANDS**

Author: JACK L. CHILDS

Publication: BOOK

Publication's Point of view

It is scientific information on the tracks of various animals and includes help to know and identify animals by their tracks or footprints.

Author's Point of View

A hunting guide and a person who is doing research on the jaguar.

He has had a lot of experience hunting and tracking animals, but not as much as some other people. He seems to have only facts in the book and not much personal opinion. The book shows a lot of pictures to support all of his information and facts

I learned how to tell the difference between a mountain lion and a jaguar track. Also, I learned how to tell the difference between a mountain lion and a jaguar kill.

It makes me think it takes a long time to learn how to do all of this tracking. I like to be outside and like animals. It makes me feel like I might want to try to do some animal tracking and I would like to learn to be very good at it.

My main question is would I need to have dogs to do this work or just do it by myself like we did at school today.

Students: please note the final entry in your RRR Journal should be the self-evaluation of your performance task (individual or team presentation). Evaluate how successfully you met the following standard.

Attribute of the Expected Outcome and Its Characteristics:

- The presentation answers the four main questions. (What is the problem? What is a possible solution? What is another possible solution? Which solutions do you believe have the best chance of succeeding?)
- The presentation uses a minimum of four sources and four visual aides.
- The student demonstrates the ability to use current data, information, visual support material, critical and creative thinking in the development of his/her responses to the questions.
- The presentation displays teamwork, organization and thorough preparation and practice.

MY READING/ RESEARCH & REFLECTION JOURNAL

NAME: _____

TEAM MEMBERS:

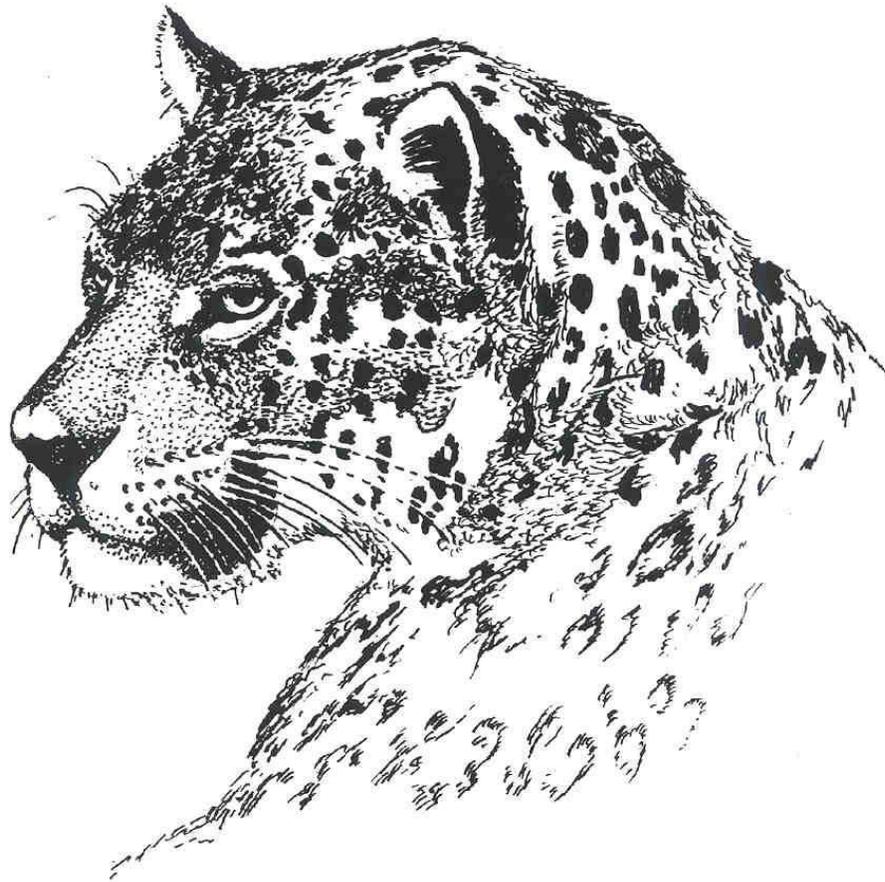
DATE JOURNAL STARTED: _____

DATE JOURNAL WAS ENDED: _____

Suggestions on keeping a journal:

You should make notes in your journal each day, while the information is fresh and clear in your mind. When you finish this study unit on jaguars, you and your team will make a presentation to the class. As you prepare your team presentation, you will need to refer to your notes a great deal - so make sure you collect all data accurately and answer all questions completely.

Appendix B: Assessment Summary



Spencer 11.

Jaguar Mini Unit Assessment & Scoring Summary

Student Name: _____ *Group Name/Code* _____

This unit is worth a total of 100 points:

- **50 points are possible for the RRR Journal**
- **40 points are possible for the culminating Performance Task (multiply rubric score by 10)**
- **6 points are possible for a written exam (20 selected response [true & false or multiple choice] or short answer questions and one short essay question**
- **4 points for a written student self-evaluation using the rubric criteria your teacher(s) uses to grade your performance task presentation. (It should be your final entry in the RRR Journal**

	4	3	2	1	NS	Total #
Day/ Assignment Title	All questions & work completed in a thorough and thoughtful manner	All questions & work completed in a somewhat thorough and thoughtful manner	Most of the questions and completed work show hasty preparation and limited thought	Few questions answered and work NOT thoroughly completed	Limited or no work completed; limited or no effort demonstrated	
Day 1 Point of view questions answered on all sources						
Day 1 What is a felid?						
Day 2 Point of view questions answered on all sources						
Day 2 If I were a jaguar, where would I live?						
Day 3 Point of view questions answered on all sources						
Day 3 El tigre chart						
Day 4 Point of view questions answered on all sources						
Day 4 The changing land						

Day/ Assignment Title	All questions & work completed in a thorough and thoughtful manner	All questions & work completed in a somewhat thorough and thoughtful manner	Most of the questions and completed work show hasty preparation and limited thought	Few questions answered and work NOT thoroughly completed	Limited or no work completed; limited or no effort demonstrated	
Day 5 Point of view questions answered on all sources						
Day 6 Tracing the history of jaguar conservation						
TOTAL of RRR Journal						_____/50
Performance Task Score (See rubric attached to performance task)						Multiply score by 10 to get Total ____
Student Self Evaluation (Written, using the criteria in Performance Task Rubric)						_____/4
Test or Quiz						_____/6
TOTAL Score						_____/100

Teacher comments:

The achievement(s) you demonstrated in this unit:

The area(s) you need to improve in future learning units:

Appendix C: Recorded Sightings



Spencer 11.

SPECIAL REPORT

State: Arizona Project Number: W-53-R-33
Project Title: Wildlife Surveys and Investigations
Study Title: On the Status of the Jaguar in the Southwest

There are a number of jaguars (Felis onca) recorded for the Southwest United States, including California (Nelson and Goldman, 1933; Hock, 1955; Leopold, 1959) and Texas (Taylor, 1947). Bailey (1931) considered jaguars "native" to Arizona and New Mexico; Brown (1902) and Goldman (1932) described this species as a regular, if not very abundant, resident of southeastern Arizona. Reports of this noteworthy animal in Arizona and New Mexico were summarized by Barber (1902), Bailey (1931), Hock (1955), Lange (1960), and Housholder (1975). These records show that the jaguar ranged widely throughout a variety of habitats from Sonoran desertscrub upward through subalpine conifer forest. Most animals, however, appear to have been taken from Madrean evergreen-woodland, shrub-invaded semi-desert grassland, and river bottoms. The last record of a jaguar killed in New Mexico was in 1905; the latest jaguar taken in Arizona was in 1971. The likelihood of jaguars again occurring in the Southwest United States is increasingly remote and a summation of their occurrence in Arizona and in adjacent Sonora, Mexico, appears appropriate.

Records of jaguars known to have been taken in Arizona and New Mexico since 1900 are summarized in Table 1. Not included in the table are animals taken on guided hunts; such jaguars may have been captured in Mexico or Central America and released.

The 2 most recent records were males and were taken within 6 km of the United States-Mexico boundary. This has led some to consider all jaguars in the Southwest United States as "drifters" from Mexico that expanded their range by subsisting on livestock. The widespread occurrence of this animal in Arizona prior to World War II (including females with young) makes this assumption appear forced. Further contradicting the "wanderer" hypothesis are numerous jaguar reports in the Southwest that predate the introduction of domestic animals.

James Ohio Pattie (1831), the first Anglo to enter Arizona, provided an account of his party taking a leopard-like animal in the thickets of the lower Colorado River in the 1820s. A member of Emory's boundary survey reported seeing a jaguar in 1848 in Guadalupe Canyon near the present Arizona-New Mexico line in an area where livestock were absent (Baird, 1859). Phocian Way, a miner in the Santa Rita Mountains south of Tucson, reported the taking of a "tiger" in the summer of 1858. Way (1858) elaborated on the lack of beef and depended on game for meat.

Further evidence of a thinly scattered, native jaguar population is the pattern of decline. Plotted at 10-year intervals, the number of jaguars taken in Arizona and New Mexico shows a decline characteristic of an over-exploited

resident population (Fig. 1). If jaguar kills were the result of incursions from Mexico, the number of kills should have always been erratic and irregular.

McBride (1978) showed that mountain lions can maintain reproducing populations at extremely low densities over large areas; presumably, the jaguar also was able to maintain a low-density population of widely distributed individuals.

The decrease in jaguars in the Southwest United States between 1900 and 1950 cannot be attributed to a decline in northern Mexico. The development of interior Sonora did not accelerate greatly until after World War II, and organized cat hunting expeditions and predator control measures did not exist there until the late 1930s (McCurdy, 1981). Burt (1938), McCurdy (1981), and G. L. Robinson (pers. comm. fide Kelly Neal, Arizona Game and Fish Department) reported jaguars as relatively common in the mountains of southeastern Sonora in the 1930s and ranchers were taking jaguars in northern Sonora through the 1960s (K. Neal, pers. comm.). Jaguars are still considered common in the Sierra Bacate near Guaymas, Sonora (G. L. Robinson, pers. comm. fide K. Neal).

The animal, when encountered, was relatively easy to take. Most accounts of shot animals described them as standing still, at close range when taken; jaguars, like all felids, are relatively easy to trap. Unlike most cats, however, jaguars appear to be susceptible to poison (Table 1). Kill data indicate that this cat was eliminated concurrent with the settlement and development of Southwest rangelands. Ten of the animals were reported taken by livestock operators and at least 5 were taken by predator control personnel.

Prepared by: David E. Brown
Project Leader

Literature Cited

- Bailey, V. 1931. Mammals of New Mexico. USDA Bur. Biol. Surv. North Amer. Fauna. 53:1-412.
- Baird, S. F. 1859. Mammals of the boundary. in United States and Mexico boundary survey under the order of Lieut. Col. W. H. Emory. Vol. 2, part 2:1-62. Wash., D. C.
- Barber, C. M. 1902. Notes of little-known New Mexican mammals and species apparently not recorded from the territory. Biol. Soc. Wash. Proc. 15:191-193.
- Brown, H. 1902. in R. W. Shufeldt 1921. The mountain lion, ocelots, lynxes and their kin. Amer. For. 27:629-636, 659.
- Burt, W. H. 1938. Faunal relationships and geographic distribution of mammals in Sonora, Mexico. Univ. Mich. Mus. Zool., Misc. Publ. 39:1-77.
- Goldman, E. A. 1932. The jaguars of North America. Proc. Biol. Soc. Wash. 45:143-146.
- Hock, R. J. 1955. Southwestern exotic felids. Amer. Midl. Nat. 53:324-328.
- Housholder, B. 1971. The grizzly bear in Arizona. Published by the author. 2nd Printing. 39p.
- _____. 1975. Arizona jaguars. Published by the author. 1p.
- Lange, K. I. 1960. The jaguar in Arizona. Trans. Kansas Acad. Sci. 63:96-101.
- Leopold, A. S. 1959. Wildlife of Mexico. Univ. of California Press, Berkeley and Los Angeles. 568p.
- McBride, R. T. 1978. The status and ecology of the mountain lion (Felis concolor stanleyana) of the Texas-Mexico border. M.S. thesis. Dept. of Biol. Sul Ross State Univ., Alpine, Texas. 160p.
- McCurdy, R. 1981. Life of the greatest guide; hound stories and others of Dale Lee. Blue River Graphics, Phoenix. 237p.
- Nelson, E. W., and E. A. Goldman. 1933. Revision of the jaguars. Jour. Mamm. 14:221-240.
- Pattie, J. O. 1831. The personal narrative of James Ohio Pattie of Kentucky: Timothy Flint, ed. John H. Wood Co., Cincinnati.
- Taylor, W. P. 1947. Recent record of the jaguar in Te J. Mammal. 28:66.
- Way, Phocian R. 1960. Overland via jackass mail in 1858: the diary of Phocian R. Way. W. A. Duffen, ed. Arizona and the West.

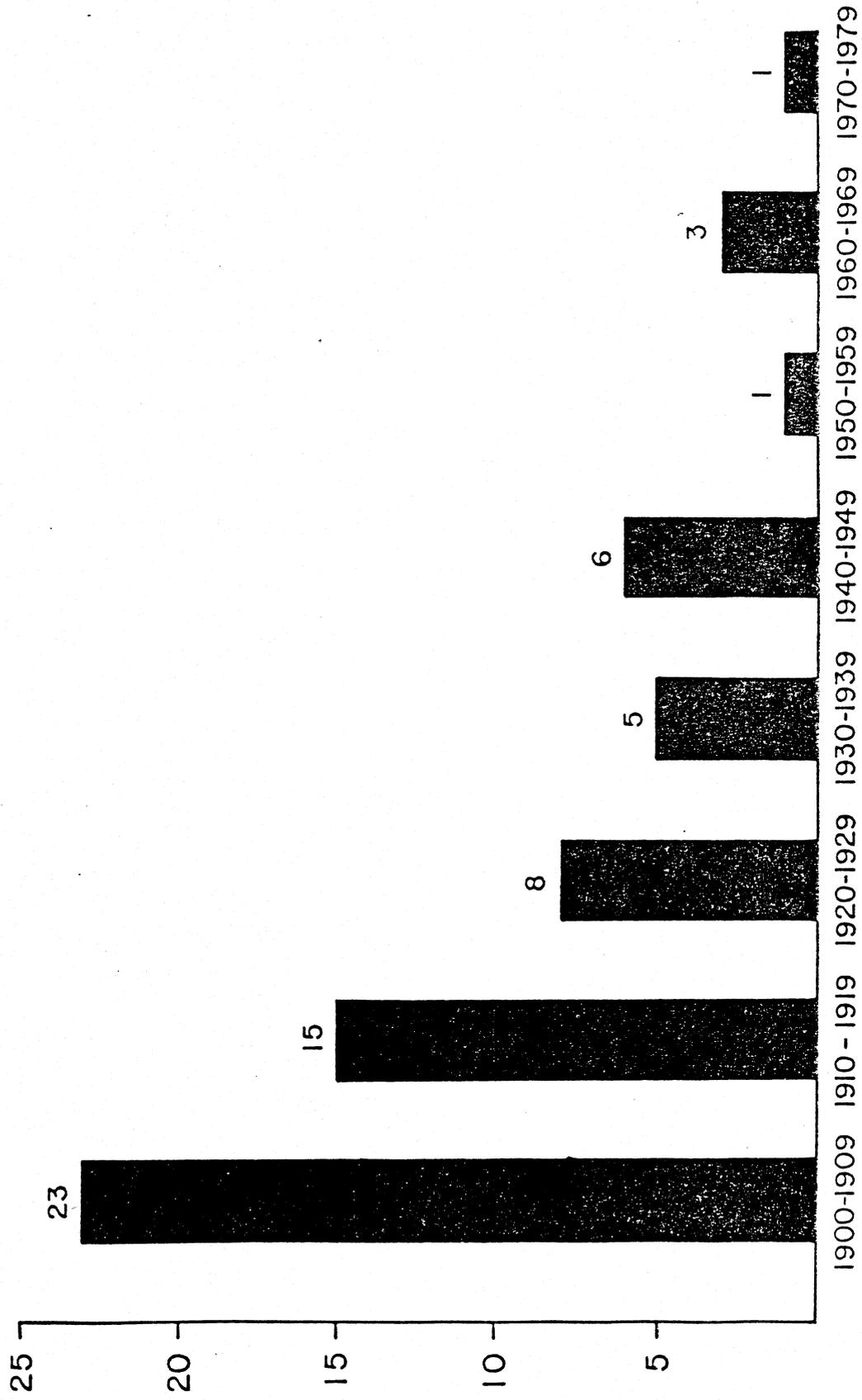
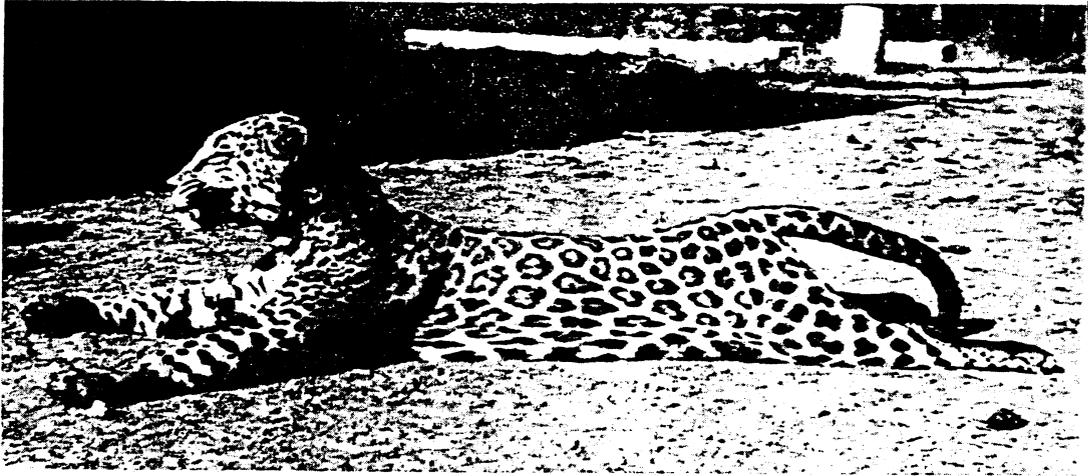


Fig. 1. Number of jaguars recorded killed in the Southwest United States by 10-year intervals, 1900-80.

(A)



(B)



Fig. 2. Two of the last jaguars taken in Arizona. The female (A) was taken in September 1963 near Big Lake in Apache County; the young male (B) was taken in November 1965 by a deer hunter in the Patagonia Mountains, near the Mexican border. Both animals exhibit rosette patterns characteristic of the arizonensis race (Goldman 1932).

Table 1. Summary of jaguars taken in Arizona and New Mexico since 1900^a as recorded by Bailey (1931), Goldman (1932), Hock (1955), Lange (1960), and Housholder (1975)

Year	Number of Animals	Location	Notes
1900 (ca.)	1	Baboquivari Mountains, Arizona	(H. Brown 1902)
1900 (ca.)	1	Chiricahua Mountains, Arizona	(H. Brown 1902)
1900 (ca.)	2	Near Globe, Arizona	(H. Brown 1902)
1900 (ca.)	3-4	Mountain ranges southwest of Tucson, Arizona	(H. Brown 1902)
1900	1	Mogollon Mountains (Taylor Creek), New Mexico	Trapper (Barber 1902)
1901	1	Dos Cabezas Mountains, Arizona	Taken by ranchers; <u>fide</u> E. J. Hands. (Lange 1960)
1902	1	Otero County, New Mexico	No details on capture (Bailey 1931)
1902	1	Rincon Mountains, Arizona	In U.S. National Museum; (Brown 1902)
1902	1	Catalina Mountains, Arizona	(Housholder 1975)
1903	1	Datil Mountains, New Mexico	Poisoned by rancher (Bailey 1931)
1903	1	Atascosa Mountains, Arizona	Reported in Amer. Field 60:340
1903	1	Peloncillo Mountains, New Mexico	Shot by rancher (Bailey 1931)
1904 (ca.)	1	Near Camp Verde, on Verde River, Arizona	Killed by Mr. West (Housholder 1971)

Table 1. Summary of jaguars taken in Arizona and New Mexico since 1900^a as recorded by Bailey (1931), Goldman (1932), Hock (1955), Lange (1960), and Housholder (1975) (Cont.)

Year	Number of Animals	Location	Notes
1904-05	1	Sierra de los Caballos, New Mexico	Shot by hunter (Bailey 1931)
1904-07	2	Patagonia Mountains, Arizona	Reported by rancher to Vernon Bailey
1907	1	South of Grand Canyon, Arizona	No details; (Lange 1960)
1907	1	Mogollon Rim near Ft. Apache, Arizona	No details; (Lange 1960)
1910	2	Head of Chevelon Creek, Arizona	♀ and young; reported by E. W. Nelson (Lange 1960)
1910	1	Chiricahua Mountains, Arizona	Reported by rancher to warden Housholder (1975)
1912	1	Chiricahua Mountains, Arizona	Univ. of Ariz. collection (Lange 1960)
1912	2	West of Sunset Pass, Arizona	Poisoned; reported by E. W. Nelson (Lange 1960)
1912	1	65 mi. northwest of Prescott, Arizona	Taken by ranchers (Lange 1960)
1912	1	Catalina Mountains, Arizona	"Taken"; reported by C. T. Vorhies (Lange 1960)
1912	1	Rincon Mountains, Arizona	"Killed"; reported by C. T. Vorhies (Lange 1960)
1913	1	Tortolita Mountains, Arizona	"Taken" (Goldman 1932)
1909-1918	1	Near El Tovar, Grand Canyon, Arizona	Reported by E. W. Nelson (Lange 1960)

Table 1. Summary of jaguars taken in Arizona and New Mexico since 1900^a as recorded by Bailey (1931), Goldman (1932), Hock (1955), Lange (1960), and Housholder (1975) (Cont.)

Year	Number of Animals	Location	Notes
1917	1	3 mi. west of Greaterville, Arizona	♂, (Bailey 1931); in U.S. Museum
1918	1	Santa Rita Mountains, Arizona	♀ Trapped; reported by Stanley P. Young (Lange 1960)
1919	1	6 mi. northwest of Greaterville, Arizona	♀, "collected"; in National Museum; reported by Vernon Bailey
1920	1	Rincon Mountains, Arizona	Newspaper account in Holbrook Observer (Goldman 1932, Lange 1960)
1920	1	Santa Rita Mountains, Arizona	Reported by V. Bailey as "killed"
1924	1	Cibecue, Apache Indian Reservation	♂, type specimen; in National Museum (Goldman 1932, Lange 1960)
1926	2	Ruby area, Arizona	Poisoned by predator control agent for U.S. Biol. Surv.; 1 in National Museum
1926	1	Santa Maria Mtns.; 40 mi. west of Prescott, Arizona	♂, taken by rancher; reported by M. E. Musgrave (Lange 1960)
1926-1930	1	Chiricahua Mountains, Arizona	Secondhand report (Lange 1960)
1928-1929	1	Sand Tank Mountains, Arizona	Secondhand report (Lange 1960)
1932	1	Grand Canyon Village, Arizona	No details (Lange 1960)

Table 1. Summary of jaguars taken in Arizona and New Mexico since 1900^a as recorded by Bailey (1931), Goldman (1932), Hock (1955), Lange (1960), and Housholder (1975) (Cont.)

Year	Number of Animals	Location	Notes
1933	1	Ruby District, Arizona	Taken by U.S. Biological Survey (Lange 1960)
1933	1	Estrella Mountains, Arizona	Taken by rancher (Housholder, 1975)
1934	1	Ruby District, Arizona	Taken by Frank Hibben (Lange 1960)
1939	1	Bloody Basin, Arizona	Trapped; (Lange 1960)
1941	1	Ruby District, Arizona	Taken by U.S. Fish and Wildl. Serv. (Lange 1960)
1947	1	Atascosa Mountains, Arizona	Reported by game ranger (Lange 1960)
1948	1	Patagonia Mountains	Hunter? (Lange 1960)
1949	1	Cerro Colorado Mountains, Arizona	Taken by deer hunter; displayed in Nogales; newspaper account
1957-58	1	White River area, Arizona	Taken by J. Gilbert; in Univ. of Arizona mammal collection (♂ ?)
1961	1	Empire Mountains, Arizona	Taken by ranchers; (♂ ?) newspaper account.
1963	1	Big Lake, Arizona (9,000')	♀, Taken with varmint call; newspaper account (Fig. 2).

Table 1. Summary of jaguars taken in Arizona and New Mexico since 1900^a as recorded by Bailey (1931), Goldman (1932), Hock (1955), Lange (1960), and Housholder (1975) (Cont.)

Year	Number of Animals	Location	Notes
1964	1	Black River, Arizona	♂, Taken by U.S. Fish and Wildlife Service predator control agent; newspaper account and files of U.S. Fish and Wildlife Service.
1965	1	Patagonia Mountains, Arizona	♂, Taken by deer hunter (Fig. 2); skull in University of Arizona mammal collection.
1971	1	Santa Cruz River, east of Nogales, Arizona	♂, Taken by juvenile duck hunters with shotgun. ^b (Housholder 1975)

^a A memorandum of H. C. Lockett in a letter of Lyndon L. Hargrave to E. A. Goldman, dated July 14, 1943, also refers to a female and 2 cubs taken in the Grand Canyon--probably between 1885-1890 (Lange 1960).

^b Jaguars were now protected. A bitterly contested court case ensued and although the juvenile defendants were guilty of taking a protected species, they retained ownership of the hide. The skull was donated to the University of Arizona mammal collection.

Appendix D: Potential Habitat



Spencer 11.

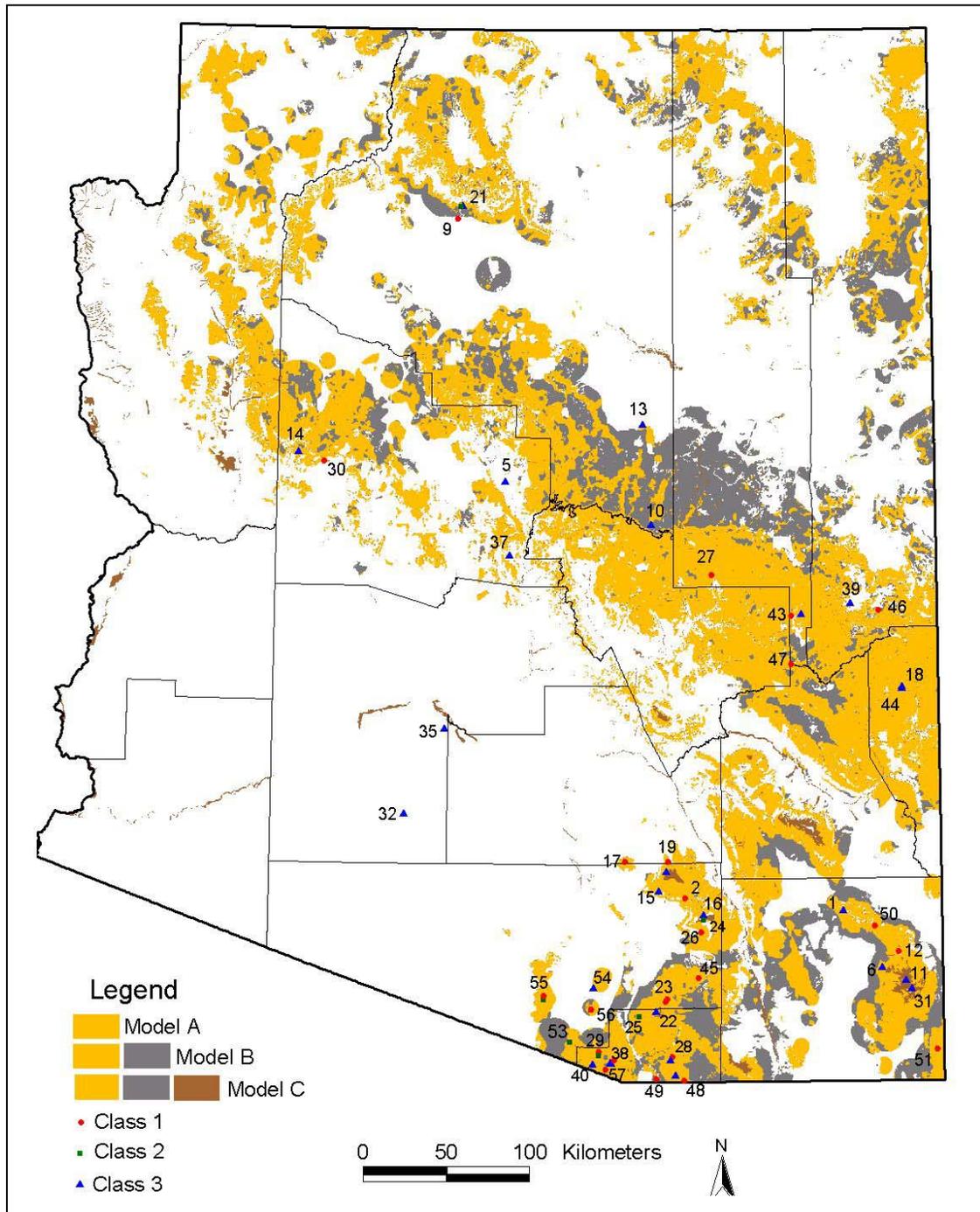


Figure 13. Potentially suitable habitats for jaguars in Arizona were identified by 3 separate model runs, and used different habitat criteria for each model. Model A was the most restrictive, with a TRI filter and only 4 biomes. Model B was identical to Model A, but without the TRI filter. Model C was similar to Model B, but included all potential biomes (Fig. 12). All 3 models excluded areas that were further than 10 km from water.

Appendix III. Ranking system and sighting form for jaguar sightings established by the JAGCT in 1997.

Ranking Criteria

Class I-some sort of physical evidence is provided for verification

- 10 A jaguar is in the possession of the observer, via trapping, hunting, treeing by hounds, or a road-kill, and visual evidence of the sighting can be provided for verification. Examples of evidence are: photographs, videos, pelage or hair follicle, skull, or carcass.
- 9 Verifiable jaguar sign is presented for evaluation. Examples of sign are: tracks (measurable or plaster casts), scat, kill verification, or hair follicles.
- 8 A jaguar is observed, and reported separately, by two reliable individuals. Inconclusive physical evidence is provided. Examples of inconclusive evidence is shadowy photographs or incomplete measurements of tracks or scats.

Class II-Detailed information of sighting is provided. Attempts to verify the sighting will be made by the state wildlife agencies.

- 7 An experienced observer, who is familiar with wildlife in the area and spends long hours in the field reports a jaguar sighting. No physical evidence is provided. Examples of an experienced observer are: biologist, trapper, hunting guide, and naturalist.
- 6 An observer accustomed to looking for details and spending long hours in the field provides an accurate description of a jaguar. Examples of a detailed observer include bird watchers, rock collectors, and ranch hands.
- 5 An observer is not "experienced in the outdoors" but seems reliable. Examples of reliable observers include college professors, and zoo keepers.

Class III-Information of a cat sighting is provided. No follow-up will be attempted.

- 4 Details of observer are vague and not specific or account is inconsistent.
- 3 Observer seems to have questionable credibility and exaggerates other events.
- 2 Observer describes a cat-like sighting.
- 1 Observer describes something besides a jaguar or provides information of no value.

Appendix E: Objectives and Strategies



Spencer 11.

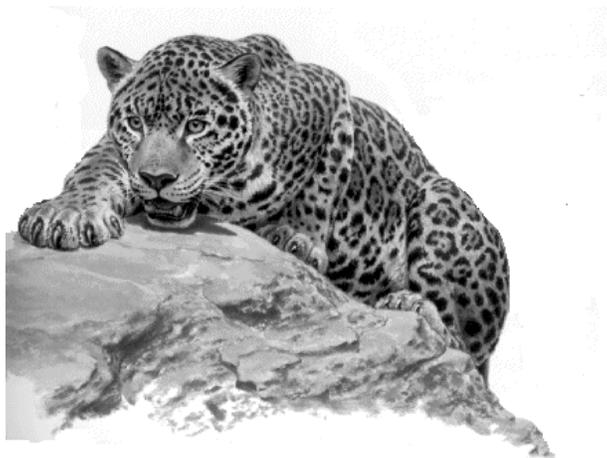
CONSERVATION ASSESSMENT AND STRATEGY
FOR THE
JAGUAR IN ARIZONA AND NEW MEXICO

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CONSERVATION ASSESSMENT AND STRATEGY
FOR THE
JAGUAR IN ARIZONA AND NEW MEXICO

Terry B. Johnson and William E. Van Pelt

INTRODUCTION

In 1994, the U.S. Fish and Wildlife Service (Service, or USFWS) published a proposed rule to list the jaguar (*Panthera onca*) as endangered pursuant to the Endangered Species Act (Act, or ESA) of 1973, as amended (USFWS 1994a). The jaguar had previously been listed as endangered only from the U.S.-Mexico border south through Central and South America (c.f. USFWS 1972, 1975, 1994b). In 1979, the Service had announced that its failure to list the jaguar as endangered north of the U.S.-Mexico border was an oversight that would be rectified "as quickly as possible" (USFWS 1979). Prior to the 1994 proposal, efforts to rectify the oversight failed, due to workload considerations and higher priorities.

The Service's 1994 listing proposal described various threats to the jaguar. The purpose of this Conservation Assessment and Strategy is to address those threats by providing for conservation of the subspecies of jaguar occurring in Arizona and New Mexico, consistent with the intent of the Act. The program described herein will be accomplished through actions to gather relevant information essential to management and conservation, reduce specific threats, provide long-term commitments to identify and eventually coordinate protection of jaguar habitat, and carry-out any other appropriate conservation actions. Thus, this document and its companion *Memorandum of Agreement for Conservation of the Jaguar in Arizona and New Mexico* (JAGMOA) will allow the Service to consider how the identified threats will be reduced by implementing these actions, as the Service considers the proposed rule to list the jaguar.

This document embraces two components. First, a Conservation Assessment describes the current status of the jaguar in the United States, and identifies and assesses risks to the jaguar in Arizona and New Mexico. The Assessment focuses the second component, the Conservation Strategy, on reducing or eliminating these threats in Arizona and New Mexico, which might allow for expansion of the range currently occupied by the Arizona subspecies, and thus contribute to promoting recovery of the species.

Information in this document comes primarily from the state level, an approach that considers regional variation and provides a complete habitat and species assessment. It was compiled primarily by the Arizona Game and Fish Department (AGFD) and the New Mexico Department of Game and Fish (NMDGF), with considerable assistance from the U.S. Fish and Wildlife Service (USFWS) and other cooperators.

The following subsections provide life history, status, and management information on the jaguar.

DESCRIPTION

The jaguar is a member of the cat family (Felidae; Order Carnivora). It is allied with the "roaring" cats (African lion, tiger, leopards), and is the largest cat native to the Western Hemisphere (Nowak 1991). Adult males average 200 pounds in weight, and may exceed 300 pounds. Adult females average 150 pounds. Juveniles weigh 80 to 100 or more pounds. Jaguars are muscular, with relatively short, massive limbs and a deep-chested body. Adult lengths range from about six to eight feet (body and tail). Jaguars are cinnamon-buff in color, with many black spots. A black or melanistic color phase occurs primarily in the southern parts of the range.

LIFE HISTORY

The life history of the jaguar has been summarized by Nowak (1991) and Seymour (1989), among others. Jaguars breed year-round range-wide, but at the southern and northern ends of the range there is evidence of a spring breeding season. Gestation is about 100 days; litters range from one to four cubs (usually two). Cubs remain with their mother for nearly two years. Females begin sexual activity at three years of age, males at four. Studies have documented few wild jaguars more than 11 years old.

The list of prey taken by jaguars range-wide includes more than 85 species (Seymour 1989; see also Rabinowitz and Nottingham 1986). Prey include peccaries (javelina), capybaras, pacas, armadillos, caimans, turtles, and various birds and fish. Javelina and deer are presumably dietary mainstays in the U.S.-Mexico borderlands, as they are in Jalisco (western Mexico; B. Miller pers. comm.), the nearest area in which jaguars have been (and are still being) studied. Dietary overlap of jaguars and mountain lions in Jalisco is about 70 percent (B. Miller pers. comm.), with jaguars tending to slightly larger prey.

Jaguars are known from a variety of habitats (Nowak 1991, Seymour 1989), including the arid American Southwest (Nowak 1994). Toward and at middle latitudes, they show a high affinity for lowland wet habitats, typically swampy savannas or tropical rain forests. However, they also occur in upland habitats in warmer regions of North and South America. Swank and Teer (1989) stated that jaguars prefer a warm, tropical climate, usually associated with water, and are only rarely found in extensive arid areas. However, jaguars occur in dry tropical forest in Jalisco (B. Miller pers. comm.), and as recently as 1991 local residents told D.E. Brown and T.B. Johnson (pers. obs.) that jaguars were not unusual, and in fact were still hunted, in the arid Sierra del Bacatete (Sonora, Mexico).

Quigley and Crawshaw (1992) estimated that a minimum of 772 to 1160 mi² is needed to support 30 to 50 adult jaguars; the actual area depends upon prey density, habitat composition, and the amount of human exploitation. Individual jaguar home ranges vary from 11 to 16 mi² in Belize (Rabinowitz and Nottingham 1986) and from 10 to 20 mi² in Jalisco, Mexico (B. Miller pers. comm.). In Jalisco, home ranges tend to be smaller in the dry season than in the wet season, and females with young kittens tend to have smaller home ranges than those with older kittens (B. Miller pers. comm.). However, B. Miller (pers. comm.) has noted that individuals recorded at the same location on consecutive days have actually traveled as much as nine miles overnight before returning to that location.

TAXONOMY

Five subspecies of jaguar were recognized by Hall (1981) and eight by Seymour (1989),¹ including two with historic ranges extending into the United States (the Arizona jaguar, *Panthera onca arizonensis*; and the northeastern jaguar, *P.o. veraecrucis*). Records from Arizona and New Mexico (and California) are attributed to *arizonensis*, the type specimen of which was collected by Jack Funk in 1924, near Cibequ, Navajo County, Arizona (Goldman 1932). Nelson and Goldman (1933) described the distribution of *arizonensis* as the mountainous parts of eastern Arizona north to the Grand Canyon, southwestern New Mexico, northeastern Sonora, and formerly (perhaps; see below) southeastern California. Jaguar records for Texas (and perhaps Louisiana) have been attributed to *veraecrucis*. Nelson and Goldman (1933) described the distribution of *veraecrucis* as the Gulf slope of eastern and southeastern Mexico from the coast region of Tabasco north through Vera Cruz and Tamaulipas to central Texas.

DISTRIBUTION

Swank and Teer (1989) indicated the jaguar's historic distribution included portions of Arizona, New Mexico, and Texas. However, they considered the presently-occupied range to extend from central Mexico through Central America into South America, as far south as northern Argentina.

Bailey (1905) stated the jaguar was once reported as common in southern and eastern Texas but by the turn of the century had already become extremely rare. Nowak (1975) believed an established population once occurred in dense thickets along the lower Nueces River and northeast to the Guadalupe River. He suggested jaguars probably continued to wander from Mexico into the brush country of the southernmost part of Texas. However, the most recent Texas jaguar record is from Kleburg County in 1948 (Nowak 1975). Habitat fragmentation and loss above and below the U.S.-Mexico border now make reoccurrence

¹*Panthera* is used herein as the genus for the jaguar, per Nowak (1991) and others. Various earlier publications, including some of those referenced herein refer it to the genus *Felis*.

The jaguar may have occurred historically in Louisiana (Baird 1859; Lowery 1974; Nowak 1973, 1975), but habitat fragmentation and loss now make reoccurrence unlikely.

The jaguar also may have occurred historically in California. This seems logical, considering the historical condition of the lower Colorado River and its tributaries from southeastern Arizona and eastern New Mexico (e.g. Santa Cruz, San Pedro, and Gila Rivers. In 1827, the James Ohio Pattie expedition killed a jaguar on the Colorado River below the mouth of the Gila River, near Yuma (see Brown 1983 and Davis 1982). Merriam (1919), Nowak (1975), and Strong (1926) mentioned reported jaguar occurrences in California, but without sufficient evidence to warrant acceptance by the California Department of Fish and Game (R. Jurek pers. comm.). Regardless, as with Texas and Louisiana, habitat fragmentation and loss now make reoccurrence in California unlikely.

Although female jaguars have been reported from the United States, evidence of breeding in Arizona-New Mexico is limited to: a reported kill of a female with two kittens, near the Grand Canyon between 1885 and 1890 (Arizona; see Lange 1960); a reported kill of a female and her young at the head of Chevelon Creek in 1910 (see Brown 1987 and Nowak 1975); and a newspaper report of a female killed and her two kittens captured in the Chiricahua Mountains in 1906 (see Brown 1987). Recent sightings in Arizona and New Mexico appear to be mostly, if not entirely, of transient young males from Mexico.

The historic and current distribution of jaguars for Arizona and New Mexico is as follows:

Arizona. Davis (1982) published reports by several explorers in the 1800s of jaguars killed in southeastern Arizona or adjacent Sonora, Mexico. Among them was an 1855 notation by Dr. C.B.R. Kennerly in Emory's (1857) Boundary Survey that natives considered *el tigre* (the jaguar) common in the Santa Cruz River valley [which is south of Nogales, Arizona and Sonora]. Goldman (1932) believed the jaguar historically was a regular, but not abundant, resident in southeastern Arizona. Hoffmeister (1986) considered it an uncommon resident south of the Mogollon Rim, concluding that reports between 1885 and 1965 indicated a small but resident population existed in Arizona. Brown (1983) suggested jaguars were resident historically in Arizona and ranged widely throughout a variety of habitats from Sonoran desertscrub upward through subalpine conifer forest. Most historic records were from Madrean evergreen-woodland, shrub-invaded semidesert grassland, and along major rivers.

Jaguars persisted in central Arizona as late as the 1960s, when three were taken on the Fort Apache and San Carlos Indian Reservations. Individuals were occasional reported from southeastern Arizona into the 1970s and 1990s, individuals were unlawfully killed there in 1971 and 1986, and two uncaptured animals were

documented by photographs in 1996 (Baboquivari Mountains, Pima County; Peloncillo Mountains, Cochise County).

The total number of jaguar records (known specimens, killings reported, and credible sight records) for Arizona since 1848 is at least 84 (AGFD unpubl. records; see also Brown 1983 and Lange 1960).

New Mexico. Barber (1902) speculated that jaguars made their way into the Mogollon Mountains of New Mexico by ascending the Gila River, presumably from Arizona. Bailey (1931) suggested they seemed to be native to southern New Mexico, but should be regarded as wanderers from Mexico. Bailey listed nine reports from New Mexico from 1855 to 1905. Brown (1983) stated the last record from New Mexico was from 1905. Nowak (1975) mentioned jaguars were reported along the Rio Grande as late as 1922. Halloran (1946) reported that dogs "jumped" a jaguar in the San Andres Mountains in 1937. Findley et al. (1975) stated that jaguars once occurred as far north as northern New Mexico. A jaguar first seen in Arizona in March 1996 was tracked into extreme southwestern New Mexico (Peloncillo Mountains) shortly thereafter.

MANAGEMENT STATUS

The jaguar is federally listed by the United States of America, pursuant to ESA, as endangered within its historic range south of the United States (USFWS 1975). It is also proposed as endangered within its former range in the United States (USFWS 1994a) and is listed under the Convention on International Trade in Endangered Species (CITES) as an Appendix 1 species. CITES prohibits international trade among member nations in Appendix 1 species, including trophies, skins, and products.

The jaguar is also listed by Mexico as an endangered species. It was first listed there on May 17, 1991, as threatened (SEDUE 1991). It was uplisted to endangered on May 16, 1994 (SDS 1994). No explanation was published with the uplisting, nor is any available from officials in Mexico (F. Abarca pers. comm.). Under Mexican law, endangered and threatened species (or any parts thereof) can only be taken for scientific or recovery (captive propagation) purposes, and then only with prior authorization from the Secretariat of Environment, Natural Resources, and Fisheries (SEMARNAP by its Spanish acronym). In Mexico, specimens and parts of endangered species cannot be used for commercial purposes.

Until recently, the states of Arizona and New Mexico had considered the jaguar to be extirpated from within their borders as a resident species. In Arizona (AGFD 1988), recent records were attributed to transient individuals from Mexico. As mentioned earlier, more recent records now indicate the species is at least occasionally present in both states. Whether the animals occurring there are resident or transient is unknown. Regardless, both

states give the jaguar endangered (NMDGF 1996) or "species of special concern" (AGFD 1988, in prep.) status under state law or policy guidelines. Current state regulations are as follows:

Arizona. Jaguars are listed as a nongame mammal under Commission Order 14, with no open season for legal take by hunting. Violation of this order is considered a Class 2 misdemeanor. The State of Arizona, through criminal prosecution, may seek to recover a maximum of \$750 and/or four months imprisonment for each animal unlawfully taken, wounded, or killed. The Arizona Game and Fish Commission may also assess civil damages of an unspecified amount, for unlawful take.

Arizona Revised Statute 17.239, Subsection A, declares that "Any person suffering property damage from wildlife may exercise all reasonable measures to alleviate such damage, except that reasonable measures shall not include injuring or killing game mammals, game birds or wildlife protected by federal law or regulation." Because the jaguar is not classified by Arizona as a game mammal, and is not federally listed for the United States as endangered or threatened, this statute provides legal grounds for take of a depredating animal. However, livestock depredation by a jaguar has not been an issue in Arizona since at least 1965, and none of the jaguars occurring in the state since then has been taken as a depredating animal. An attempt was made to claim such take in conjunction with the 1986 Dos Cabezas jaguar, but the court did not recognize it and criminal penalties were assessed.

The jaguar is being considered for inclusion on the Department's list of *Wildlife of Special Concern in Arizona* (AGFD in prep.), and was included on the Department's previous list of *Threatened Native Wildlife in Arizona* (AGFD 1988).

New Mexico. On July 25, 1991 the jaguar was added to the list of endangered species and subspecies of New Mexico, as a restricted species (see NMDGF 1996) . According to New Mexico law, it is unlawful for any person to take, possess, transport, export, process, sell, or offer for sale a jaguar in New Mexico. Violation of provisions of Subsection C of Section 17-2-41 NMSA 1978, or regulations pursuant to that section, is a misdemeanor, and upon conviction, a person shall be fined \$1000 or imprisoned for a term of not less than 30 days nor more than one year, or both.

RISK ASSESSMENT

The Service assessed real and/or potential problems that face the jaguar, based on one or more of five "factors," as required by Section 4(a)(1) of the Act. The Service stated that four of the five listing factors were being compromised, and were thus threatening jaguars. A fifth factor, disease or predation, was not considered applicable. The four applicable factors, and the relevant findings of the signatories to the JAGMOA, are as follows:

~~Present or threatened destruction, modification, or curtailment of its habitat or range.~~ Throughout the jaguar's suspected historic range within the United States, clearing of habitat, destruction of riparian areas, and fragmentation or blocking of movement corridors has probably contributed to preventing jaguars from recolonizing previously inhabited areas. Although a resident population of jaguars is not currently known to occur in the United States, individuals from Mexico have crossed and are still crossing into Arizona and New Mexico for varying periods of time. The most recent records are from 1996, for Arizona (Baboquivari Mountains) and Arizona-New Mexico (Peloncillo Mountains). The Peloncillo jaguar was first seen in March 1996 (Glenn 1996). Its tracks were first seen a year earlier (W. Glenn pers. comm.; B. Starrett pers. comm.) and as recently as December 1996 (W. Glenn pers. comm.).

Little is actually known about the habitats historically used by jaguars in the Southwest. Inferences from documented specimens and other records suggest that riparian habitats (especially broad river valleys and floodplains) were important as movement corridors and perhaps as foraging and denning habitat (river floodplains and tributary canyons). Many such habitats have been radically altered, and in some cases destroyed, over the past century. Efforts to restore them are underway in the United States, but could be enhanced through stronger private-public partnerships and progressive management. The importance of other habitats (e.g. desertscrub, grasslands, evergreen woodlands, and conifer forests) is unknown, except that likely prey populations (e.g. deer and javelina) are widely present in them. Notably, however, two of the three most recent jaguar records from Arizona were in north-south oriented mountain ranges (Peloncillos, Baboquivaris) that extend into Mexico, which should facilitate cross-border movement.

Finding: Actual habitat requirements of jaguars in the U.S.-Mexico borderlands are largely speculative, and based on anecdotal information and inference. Thus, at this point, habitat conservation actions should be focused on gathering information on actual use-patterns of jaguars occurring in and near the U.S.-Mexico borderlands in Arizona and New Mexico. Existing land-protection efforts and federal/state land-management programs could then be focused on habitats actually important to the jaguar. Existing state

and federal laws and policies are adequate to provide for such actions, especially in regard to lands under management jurisdiction of the Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, and U.S. Forest Service. On private lands, the potential for habitat conservation measures is limited by the extent to which the landowners wish to cooperate in such programs. Before such proposals are made, better information is needed on what is and is not suitable jaguar habitat, and the extent to which dispersal or recolonization is likely. Acquisition or "set-aside" protection mechanisms such as wilderness designation or broad area closures may not be necessary to meet the jaguar's habitat needs.

~~Overutilization for commercial, recreational, scientific, or educational purposes.~~ Although the demand for jaguar pelts has diminished since the 1960s, it still exists, as does illegal hunting of jaguars. In 1992, Arizona Game and Fish Department personnel infiltrated a ring of wildlife profiteers. That operation resulted in the March 1993 seizure of two jaguar specimens, one of which was taken in Arizona's Dos Cabezas Mountains in 1986. The specimens had been covertly purchased from the suspects. During the investigation, several ties were discovered to jaguar hunting in Mexico. Hounds bred and trained in the United States were being sold to Mexican nationals for the purpose of hunting jaguars. Mexican nationals prosecuted by the U.S. Fish and Wildlife Service in 1989 for illegally importing jaguar pelts into the United States were continuing to provide jaguar hunts in Mexico. Unlawful jaguar hunting still occurs in Mexico, including in a Jalisco jaguar preserve (B. Miller pers. comm.). Estimated values of jaguar hunts and pelts are as follows (fide J. Phelps, AGFD): cost of legal hunt in Venezuela, \$10,000 to \$15,000; cost of illegal hunt in Mexico, \$10,000 to \$15,000; value of legally taken pelt \$10,000; value of illegally taken pelt, \$5,000 to \$8,000.

Finding: Hunting and unlawful take of jaguars still occurs in Mexico, but no relevant specific data are known at this time. The species is already federally listed as endangered for that portion of its range by the United States and Mexico. Listing the species north of the U.S.-Mexico border would not convey greater protection for animals south of the International Border. The two known incidents of unlawful take in the United States over the past 30 years were both in Arizona (1971, Nogales area; 1986, Dos Cabezas Mountains). The first involved two juvenile duck hunters who, on approaching a water hole, surprised and shot a young jaguar (Brown 1987). The hunters claimed not to know the season was closed for the species. They were found guilty, and the jaguar skull was deposited at the University of Arizona, but were allowed to keep the hide. In the second case, a houndsman killed a jaguar at night after following it with his hounds. He first thought it was a mountain lion, then recognized it as a jaguar and killed it anyway. Several years later, at the conclusion of a covert investigation of

other activities, he was charged with violation of such a number of state and federal wildlife laws (including unlawful take of a jaguar) as to suggest little concern for the legality of his actions. Had the jaguar been federally listed for Arizona, the penalties invoked might well have been greater in both cases, but whether they would have been a deterrent to the killing of the Dos Cabezas animal is arguable. Even so, state civil damages and/or criminal penalties could be made comparable to civil and federal penalties under the Act, thus providing comparable deterrent values. Enhanced educational efforts are also needed to address unlawful take. The Service could also invoke the "similarity of appearance" clause of Section 4(e) of ESA to protect the jaguar, thus enabling assessment of the full civil and criminal penalties under Section 9 of ESA for acts of unlawful take. Meanwhile, the Lacey Act of 1990 (as amended; 16 U.S.C. 701) provides a means of addressing unlawful traffic in jaguar specimens or parts thereof, and CITES also provides a means of legal recourse in cases of unlawful trade involving signatory nations such as Mexico. Regardless, further reduction or outright elimination of the population in northern Mexico is the principal risk to continued presence of the jaguar in the United States.

Inadequacy of existing regulatory mechanisms. Arizona and New Mexico both provide protection to the jaguar under state laws, but unlawful take has still occurred (e.g. Arizona: 1971 and 1986). The Service infers that the greater federal penalties incurred under protection of ESA for unlawful take would be a more substantial deterrent, and in some cases could operate in concert with the Lacey Act, CITES, and applicable state laws. Under ESA, unlawful take could result in civil penalties of as much as \$25,000 per violation (see ESA, Section 11(a)1) and criminal penalties of up to \$50,000 and one year in prison for each violation (see ESA, Section 11(b)1).

Finding: Although two jaguars were killed unlawfully in the United States during the past 30 years (Arizona: 1971 and 1986), it is doubtful that protection under ESA would have prevented such take. In the first incident, two juvenile duck hunters, on approaching a water hole, surprised and shot a young jaguar (Brown 1987). The hunters claimed not to know the season was closed for the species. They were found guilty, and the jaguar skull was deposited at the University of Arizona, but were allowed to keep the hide. In the second case, a houndsman killed a jaguar at night after following it with his hounds. He first thought it was a mountain lion, then recognized it as a jaguar and killed it anyway. Several years later, at the conclusion of a covert investigation of other activities, he was charged with violation of such a number of state and federal wildlife laws (including unlawful take of a jaguar) as to suggest little concern for the legality of his actions. Had the jaguar been federally listed for Arizona, the penalties invoked might well

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Other natural or manmade factors affecting its continued existence. USDA Animal Plant and Health Inspection Service-Animal Damage Control (APHIS-ADC) personnel use traps, snares, and M-44 ejector devices with cyanide capsules to resolve coyote depredations in Cochise and Hidalgo counties. Mountain lion problems are resolved through use of trained dogs, and in Hidalgo County also by use of foot snares. Any of these methods could result in take of a jaguar.

Finding: ADC personnel have not taken a jaguar during the past 30 years of use of the above-mentioned devices and methods, and the potential for doing so is exceedingly low. To further reduce threat to jaguars when using these devices and methods, APHIS-ADC abides by all state and federal laws, internal policies, and mitigation measures listed in environmental documents. In Arizona, the threat to jaguars was further reduced in 1994 by passage of Proposition 201, as incorporated into A.R.S. 17.301.D, which prohibits use of traps, snares, and poisons on public lands in Arizona. Formal consultations between the Service and APHIS-ADC regarding ongoing predator control actions within the jaguar's historic range have not been concluded as this document is being written. In those consultations, APHIS-ADC has considered potential impacts to two other endangered cats resident in South Texas, the jaguarundi (*Felis yagouaroundi*) and ocelot (*F. pardalis*). It could extend the same or other special considerations to the jaguar, perhaps restricting or providing explicit guidelines for use of M-44s and traps or snares in Cochise, Pima, and Santa Cruz counties in Arizona, and Hidalgo County in New Mexico.

CONCLUSION

Historically, jaguars occurred widely but sparsely in the American Southwest and adjacent Mexico. In Arizona and New Mexico, the number of records indicates the jaguar was probably resident, but evidence of breeding is scant. The more recent records (post 1960) are largely, if not entirely, of young males, suggesting dispersal from a core population persisting in Sonora, Mexico. Through the 1960s, most jaguars that were seen in Arizona-New Mexico were killed. Two jaguars occurring in the United States in the 1970s and 1980s were also killed.

For the jaguar to persist in Arizona-New Mexico, it must be protected from killing, its habitat needs must be met, and a core population in adjacent Mexico must be sufficient to provide for dispersal to the United States. In terms of vegetation, jaguar habitat in Arizona-New Mexico appears to range from riparian-lined river valleys to desert grassland, desert scrub, Madrean oak woodland, and higher elevation conifer forest. Abundance of available prey, and suitable resting sites, may be more important than a particular vegetation type.

The mosaic of habitats in which jaguars have occurred in Arizona-New Mexico is mirrored by a complex pattern of land ownership. A patchwork mosaic of federal, state, tribal, and private lands overlays the habitat mosaic. A conservation program for the jaguar must consider both mosaics, and provide opportunities and incentives for involvement by all the interested and affected parties. It must include the approaches noted by Weber and Rabinowitz (1996) as hallmarks of successful conservation projects: field research (to provide a sound scientific basis for decisions); consideration of relevant cultural, economic, and political factors; design and implement a comprehensive approach to conservation (including public education); and monitoring and feedback.

INTRODUCTION

This conservation strategy describes the goal, objectives, strategies, and activities that will be implemented to conserve jaguars in Arizona and New Mexico. It reflects the metapopulation concept² for species persistence and an ecosystem management³ approach for habitat conservation. Planning and management proposals and actions will be coordinated among the two states, the Service, other government cooperators, and private entities.

The primary feature of this Strategy is an interstate/intergovernmental Jaguar Conservation Team (JAGCT). JAGCT members may be assigned to various technical committees as information or other needs (e.g. review of materials) arise. Each state wildlife agency JAGCT member is responsible for coordinating the conservation strategy activities within its respective state. Any member of the public may assist by attending JAGCT meetings, providing comment on documents and proposed actions, and by voluntary participation in the Arizona-New Mexico Jaguar Working Group (JAGWG), when it is established by the JAGCT.

This Strategy will be further developed and implemented through cooperation of federal, state, tribal, and other government cooperators, and through partnerships with private landowners and organizations. Species restoration and habitat conservation is linked to key federal, state, and private land ownership patterns. This Strategy identifies both short and long-term objectives, and sets various time frames to complete activities. The state wildlife agencies will reallocate funds and personnel as necessary to implement this Strategy, and will aggressively seek new funds to facilitate implementation.

²A metapopulation of wildlife is one in which animals dispersing from a larger, persistent, core population are essential to maintaining relatively transient peripheral subpopulations, or occasional occurrences. In this situation, a healthy core population of jaguars in northwestern Mexico is believed essential to providing dispersing individuals that range into Arizona and New Mexico for as-yet unknown periods of time.

³For purposes of this document, ecosystem management means coordinated management of habitats and species within a given broad area to maintain, or restore where appropriate, biological diversity. Effective management of one species, the jaguar, cannot be achieved without considering the full spectrum of wildlife, habitats, land uses, and human factors that operate within its area of occurrence. The very presence of jaguars may indicate an increasingly hospitable landscape in Arizona-New Mexico, and/or landscape changes in Mexico that are causing jaguar populations there to increase and disperse, or to decrease through emigration.

Effective conservation of the jaguar and its habitat under this Strategy will necessarily depend on cooperation of federal, state, and private landowners. Thus, all cooperators must, from the beginning, be aware of the importance of full involvement of private landowners to the extent they wish to be involved, and further recognize the importance of compatible rural livelihoods and activities, such as ranching and outdoor recreation (including hunting and wildlife watching), and voluntary participation by private landowners in habitat identification, enhancement, and protection, as key to the conservation strategy.

GOAL

The goal of this Strategy is to conserve naturally occurring jaguars in Arizona and New Mexico, and to encourage parallel conservation actions in Mexico, by (a) gathering and disseminating information on status, biology (including habitat use), and management needs; (b) identifying habitat suitable for population maintenance or expansion in Arizona and New Mexico; (c) allowing for innovative and adaptive management; (d) creating strong private-public partnerships; and (e) developing stronger legal disincentives for unlawful take.⁴

The actions under this Strategy will: (a) promote conservation of the jaguar and its habitat; (b) reduce risk of overutilization of the jaguar for commercial, recreational, scientific, or educational purposes; (c) focus appropriate use of existing regulatory mechanisms and provide for increased deterrents to unlawful take of the jaguar; and (d) reduce risk of any other factors affecting continued existence of the jaguar in Arizona and New Mexico.

OBJECTIVES, STRATEGIES, AND ACTIVITIES

⁴For purposes of this document: "unlawful take" shall mean to kill or capture a jaguar without legal authority to do so; "incidental take" shall mean lawful capture that accidentally but not negligently results in death or infliction of debilitating injury that precludes release of the animal; and "take" shall neither be construed nor interpreted as including modification of habitat, inadvertent pursuit of the jaguar, or recreational activities or wildlife or land management actions as may indirectly affect the jaguar.

1. Implementation of the Conservation Strategy.
 - A. This Strategy will be implemented through a Memorandum of Agreement for Conservation of the Jaguar in Arizona and New Mexico (JAGMOA), which will be signed by state and federal cooperators and local and tribal governments with land or wildlife management responsibilities in the area of concern (principally Hidalgo County, New Mexico; and Cochise, southern Pima, and Santa Cruz counties, Arizona) that wish to voluntarily cooperate in conserving the jaguar.
 - B. It is fundamental that the needs of the jaguar must be met in the context of a wide spectrum of other wildlife needs and a variety of land uses on federal, state, and private lands. Thus, it follows that this Strategy must be implemented in complete recognition of those factors, and through close coordination with other current or future planning and management efforts, including federal, state, and private cooperative efforts in ecosystem management, wildlife management, allotment management, etc. Any proposed changes to Allotment Management Plans or other land use will be done in careful and considered consultation, cooperation, and coordination with the lessees, permittees, other involved landowners, and any state or states having lands within the area covered by the proposal, per Section 8 of the Public Rangelands Improvement Act (PRIA) (Public Law 95-514/714/1978, U.S.C. Title 43 §1901).
 - C. Although this Strategy applies to the full historical range of the jaguar in Arizona and New Mexico, it will initially be focused in Cochise, southern Pima, and Santa Cruz counties in Arizona, and Hidalgo County in New Mexico, as those are the primary areas in which jaguars have been confirmed or reported in the past few decades. This restricted geographic approach will allow available resources to be focused in the area in which a substantive return is most likely.
 - D. Participation in developing and implementing this Strategy is strictly voluntary.
2. Establishment of a Jaguar Conservation Team (JAGCT) and an Arizona-New Mexico Working Group (JAGWG).
 - A. The JAGCT will be comprised of one representative from each signatory to the JAGMOA. This is necessary to ensure that members have the authority to carry out the actions to which they voluntarily agree.
 - (1) The two state wildlife agencies and the Service will be known as the

joint leads or primary cooperators in developing and implementing this Strategy.

- (2) Other JAGMOA signatories will be known as cooperators in developing and implementing this Strategy. They will be comprised of state and federal agencies and programs, and local and tribal governments. At a minimum, the cooperators will include the Bureau of Land Management (Arizona and New Mexico), National Park Service, U.S. Forest Service, USDA APHIS-ADC (Arizona and New Mexico), the Arizona and New Mexico State Land Departments, the Arizona and New Mexico Departments of Agriculture, and the counties of Cochise, Pima, and Santa Cruz (Arizona) and Hidalgo and Otero (New Mexico). The Border Patrol and Immigration and Naturalization Service are also desired as cooperators, in regard to their land use activities along the Arizona-New Mexico/Mexico Border that may affect jaguars or jaguar habitat.
- (3) Interested private citizens and organizations will be encouraged to cooperate with the JAGCT by attending its meetings and by participating in voluntary, action-specific agreements to promote jaguar conservation and education activities.
- (4) The JAGCT will be formed as a functional entity on execution of the JAGMOA. It will coordinate and assist in directing the activities outlined in this Strategy. It will also review information provided by interested and affected parties, outline management guidelines, research, and education needs, and identify known and potential funding sources for carrying out this work.
- (5) The JAGCT will meet quarterly, in January, April, July, and October, for the first 12 months of its existence. Thereafter, it will meet at least once annually, and more often as deemed appropriate by the cooperators. JAGCT meetings will be open to the public, with agendas available to the public at least 30 calendar-days in advance, via notice sent to the JAGCT/JAGWG mailing list maintained by the primary cooperators.
- (6) JAGCT meetings will be held in Douglas (Arizona) and Lordsburg (New Mexico) on a rotational basis. In the event that jaguars are found to occur in other areas of Arizona-New Mexico, locations for JAGCT meetings will be re-set to ensure that each general area of occurrence has an equitable share of the JAGCT meetings.

- B. If a jaguar is found residing in or consistently inhabiting areas within Arizona and/or New Mexico, or along the International Border, the state wildlife agencies will make a concerted effort to monitor its movements through the least intrusive, but most effective, means possible. Further, any jaguar captured in a state-permitted trap shall be reported to the appropriate state wildlife agency before release, so a decision can be made as to whether to radio-collar and monitor it.
 - (1) Within 60 calendar-days of execution of the JAGMOA, the JAGCT will establish procedures for handling jaguars that are captured live.
 - C. The JAGCT will, within 90 calendar-days of execution of the JAGMOA, establish and then coordinate and maintain a jaguar sighting report procedure and database that will enable project cooperators and the public to assist in providing information about occurrence of the species. The system will include detailed criteria by which to assign a credibility ranking, so that confirmed records are the primary basis for JAGCT recommendations and actions. The criteria will address such factors as type and quality of sighting (e.g. distinct tracks, clear and well focused photograph, detailed sight record), the observer's experience with jaguars and similar species, weather conditions at time of sighting, total time in which the animal was under observation, etc.
 - D. The JAGCT will, within 12 months of execution of the JAGMOA, compile a draft report on the status of the jaguar in Arizona-New Mexico, on the basis of the scientific literature and all relevant information gathered pursuant to this Strategy. The draft report will be submitted to at least three experts in the field for review, and to the general public for comment.
4. Cooperation with Mexico.
- A. The primary cooperators will ensure that coordination with Mexico occurs within the framework of the annual meetings of the Trilateral Commission, which is comprised of the United States, Mexico, and Canada.
 - B. Through JAGCT and the Trilateral Commission, Mexico will be encouraged to determine the present distribution and status of jaguars and jaguar habitats within its boundaries, and to identify possible jaguar travel corridors into Arizona and New Mexico. As relevant information becomes available from Mexico, JAGCT will generate a distribution map to assess the natural recolonization potential for Arizona and New Mexico.

5. Identify, maintain, and promote existing and other suitable jaguar habitats.
 - A. JAGCT members will staff a technical committee to review relevant scientific literature, and to incorporate findings from current jaguar studies, to identify habitat use-patterns, and thus develop range-wide habitat suitability criteria applicable to habitats of northern Mexico and adjacent Arizona and New Mexico. Habitat suitability will vary, depending on recency of jaguar occupancy, prey density, habitat composition, human exploitation, and geophysiological area. Review of scientific literature will begin within 30 calendar-days of establishment of JAGCT, and shall be completed within 90 calendar-days.

These habitat suitability criteria will be essential to determining the importance of habitats in northern Mexico and adjacent Arizona and New Mexico, and to identifying areas in Arizona and New Mexico that are, or might become, suitable for occupancy by jaguars.

- B. Cooperator reviews to determine impacts of proposed projects and activities on jaguars and jaguar habitats:
 - (1) Within 30 calendar-days of accepting the above-mentioned review of the available scientific literature, the JAGCT will:
 - (a) Provide each land management agency cooperator with guidelines for conducting an assessment of the impacts of its current and planned actions on the jaguar and its currently known or suspected habitat in Hidalgo, Cochise, Pima, and Santa Cruz counties.
 - (b) Provide each cooperator with a completion deadline for its assessment, not to exceed 90 calendar-days, as appropriate to the total area and activities to be evaluated.
 - (c) For its assessments, the Arizona State Land Department will use the project specific notification/response process currently in use by its leasing and sale administrators.
 - (2) Within 90 calendar-days of completing its initial assessment of current and proposed activities, each cooperating land management or wildlife agency will evaluate the potential impacts on jaguars and jaguar habitat of each new project proposed to be carried out within Hidalgo, Cochise, Pima, and Santa Cruz counties. These evaluations

will be submitted to the JAGCT for review, but may be carried out and reported in conjunction with Section 7 consultations on other species, or as separate documents.

- (3) The JAGCT will respond in writing to the above-mentioned reports within 60 calendar-days of receipt, with recommendations on how to address any impacts or concerns.
- C. Beginning not later than 12 months after establishment of JAGCT, AGFD and NMGFD will coordinate with federal land management agencies, state land department, and private landowners to conduct jaguar habitat inventories. At a minimum, these inventories will consider population levels of all wildlife likely to be important prey for jaguars, and inter-connecting travel corridors that are or might be important to jaguars.
- Habitat inventories or other studies pursuant to this Strategy shall not occur on private lands without prior permission from the landowner.
- D. Not later than 24 months after establishment of the JAGCT, AGFD and NMGFD will produce state-specific maps delineating land ownership patterns overlaid with suitable jaguar habitat, insofar as such habitat can be delineated at that time. Private lands on such maps will not be identified as to individual owners. These maps will be a primary basis for evaluating constraints to, and opportunities for, jaguar habitat management within each state.
- E. Through JAGCT and JAGWG, AGFD and NMGFD will encourage federal, state, and private land managers to conserve or enhance suitable or potentially suitable habitat, including corridors connecting these habitat blocks, to ensure that the jaguar's current and future habitat needs (including natural dispersal and habitat expansion) are appropriately addressed in Arizona and New Mexico. In doing so, the cooperators will consider state, federal, and private cooperation, funding sources, and availability of suitable habitat.
- F. AGFD and NMGFD will pursue protection and enhancement agreements for suitable jaguar habitat with federal and state land managers and willing private landowners, where such protection will address conservation objectives for the jaguar. Condemnation shall not be used as a land protection mechanism. Examples of voluntary habitat agreements that may be struck are: AGFD Stewardship Agreements; USFWS Partners for Wildlife Agreements; and conservation easements among private organizations and government agencies.

Efforts to design or implement habitat protection or other conservation measures for private lands shall occur only in response to invitation from the landowner(s). Private property owners shall not be involuntarily subject to any such protection or enhancement agreement.

- G. AGFD and NMGFD, in cooperation with the JAGCT and JAGWG, will monitor and identify new, continued, or diminishing threats to jaguar population expansion.
- H. Livestock depredation and control measures.
 - (1) It is understood by all cooperators that predator control activities are subject to a variety of federal and state laws, local ordinances, and oversight by various federal and state land management, wildlife management, and agricultural agencies or programs. Thus, any JAGCT discussions or recommendations regarding predator control must be carefully coordinated with those entities.
 - (2) Private property owner claims for compensation for livestock lost to jaguar depredation will be referred to the Malpai Borderlands Group for payment from a fund established for that purpose. Procedures for confirmation of losses to be recommended for compensation will be established by the JAGCT within 60 calendar-days of execution of the JAGMOA.
 - (3) Within 60 calendar-days of execution of the JAGMOA, APHIS-ADC in Arizona and New Mexico and the New Mexico Department of Agriculture will complete and submit to the JAGCT a risk assessment documenting: all use of M-44s in Cochise, Pima, Santa Cruz, and Hidalgo counties over the past five years; the number and species of felids taken by such methods; the amount of area worked in those counties; and expert opinion on what baits would be most effective in conjunction with M-44s and least likely to attract jaguars. The results of this assessment will be used by the cooperators to determine whether additional guidelines and/or mitigation measures for use of M-44s by APHIS-ADC personnel and/or private M-44 applicators should be implemented within the range of the jaguar.
 - (4) For purposes of predator control in Hidalgo, Cochise, Pima, and Santa Cruz counties, employees supervised by APHIS-ADC will not use leghold traps with a jaw spread larger than a #3 Victor. The #3 Victor and equivalent or smaller leghold traps are too small to hold a

jaguar.

- (5) In the event that APHIS-ADC agents kill, or cause debilitating injury that precludes successful release of, a jaguar during lawfully authorized predator control activities: the incident shall immediately be reported to the primary cooperators; the capture method resulting in such take will cease immediately within five miles of the take location and within five miles of any other location of a confirmed reliable jaguar occurrence within the preceding six months; and, APHIS-ADC will consult with the primary cooperators to determine how to proceed and whether additional guidelines and/or mitigation measures should be established for use of such methods in Cochise, Pima, Santa Cruz, and Hidalgo counties.
 - (6) Each state wildlife agency, in cooperation with the JAGCT and the JAGWG, will coordinate with the Arizona and New Mexico Departments of Agriculture, APHIS-ADC, and the County Extension Services of Arizona and New Mexico to review wildlife depredation control measures practiced within Hidalgo, Cochise, Pima, and Santa Cruz counties to ensure that they do not compromise jaguar occurrence in, or population expansion into, Arizona and New Mexico.
6. Promote scientific jaguar management and public education.
- A. The JAGCT will work toward providing an improved and sound scientific basis for jaguar management and an avenue for enhanced technical information exchange. Toward that end, it will establish a non-cooperator affiliated Jaguar Scientific Advisory Group (JAGSAG) to review its survey and research findings and its management recommendations. In establishing the JAGSAG, the JAGCT will give preference to:
 - (1) Credentialed scientists who have published peer-reviewed professional journal articles on their studies of the biology and conservation of the jaguar or other large carnivores; and
 - (2) Persons with relevant expertise in livestock management, if livestock management practices and/or depredation are addressed in the JAGCT's management recommendations.
 - B. The JAGCT will promote public support of jaguar conservation through development and distribution of informational and educational material (see examples below). Jaguar conservation efforts must have the support of an

informed public throughout the species' range in Arizona, New Mexico, and Mexico. Public support will enhance funding opportunities and facilitate implementation of this Strategy. The public that will be targeted for information and education efforts will include wildlife viewers, hunters, ranchers, farmers, other private landowners, conservation groups, and local governments.

- (1) All educational materials developed by or for the JAGCT shall be:
 - (a) Reviewed by professional educators with appropriate expertise, the JAGWG, and/or a subcommittee established by the JAGCT; and
 - (b) Approved by the JAGCT.
- (2) Specific information and education actions that will be taken include:
 - (a) AGFD and NMGFD will increase promotion of their 24-hour "hot lines" (1-800 numbers) for reporting wildlife violations, and rewards for information that leads to convictions. Private donations will be sought to supplement the rewards offered by the state agencies for convictions in cases of unlawful take of jaguars.
 - (b) The Arizona Game and Fish Department, Defenders of Wildlife, Arizona Cattle Growers' Association, Malpai Borderlands Group, and any other group that desires to participate will fund and produce a scripted slide show on jaguar conservation.
 - (c) AGFD and NMGFD will, at a minimum, produce and distribute: a jaguar conservation brochure, for distribution through hunting license vendors and other outlets; a jaguar fact sheet summarizing the status of the species and its conservation needs; a "no open season" advisory in annual hunting regulations booklets; a periodic newsletter on the JAGCT and related activities; a World Wide Web home page status summary; jaguar conservation articles for their agency magazines; and a segment on the jaguar conservation effort for the *Arizona Wildlife Views* television show.

7. Increase legal protection.
 - A. Within 12 months of execution of the JAGMOA, AGFD and NMGFD will each initiate attempts to increase their state legal disincentives for unlawful take of jaguars. In both states, these actions will, at a minimum, include recommending civil damage assessments comparable to or in excess of current civil penalties under ESA. They may also include recommending increased criminal penalties (fines and prison terms) for unlawful take.
 - B. Within 60 calendar-days of execution of the JAGMOA, the Arizona Game and Fish Department will consider whether changes are needed in A.R.S. 17.239 to preclude legal killing of jaguars as stockkillers.
 - C. Within 60 calendar-days of execution of the JAGMOA, the Service will consider whether listing the jaguar via the "similarity of appearance" clause of ESA (Section 4(e)) is appropriate. Such listing would allow invocation of the civil and criminal penalties under Section 9 of the Act for unlawful take, but would not provide for designation of critical habitat or invoke other provisions of ESA.
8. Evaluation of progress and accomplishments.
 - A. In January of each year following execution of the JAGMOA, the Directors of AGFD and NMGFD will jointly issue a written report on activities implemented to date to conserve the jaguar. The report will be submitted to the Service, and made available to all interested parties. Within 60 calendar-days of receipt of each report, the Service will inform the states in writing of any areas in which progress is not sufficient to warrant continuation of this Strategy. If such deficiencies are identified, within 90 calendar-days of notification the primary cooperators will jointly determine whether to implement mutually acceptable curative measures.

LITERATURE CITED

- Arizona Game and Fish Department. 1988. Threatened native wildlife in Arizona. Arizona Game and Fish Department Publication, Phoenix, Arizona.
- Arizona Game and Fish Department. in prep. Wildlife of special concern in Arizona. Arizona Game and Fish Department Publication, Phoenix, Arizona.
- Bailey, V. 1905. Biological survey of Texas. *North American Fauna* 25:1-222.
- Bailey, V. 1931. Mammals of New Mexico. *North American Fauna* 53:1-412.
- Baird, S.F. 1859. Mammals of the boundary. *In* United States and Mexico boundary survey under the order of Lieutenant Colonel W.H. Emory. Washington D.C. Vol. 2, part 2:1-62.
- Barber, C.M. 1902. Notes on little known New Mexican mammals and species apparently not recorded from the territory. *Proceedings of the Biological Society of Washington* 15:191-193.
- Brown, D.E. 1983. On the status of the jaguar in the Southwest. *Southwestern Naturalist* 28:459-460.
- Brown, D.E. 1987. El tigre. *Rocky Mountain Sportsman* 2(1):48-51,78-79.
- Davis, G.P. Jr. 1982. Man and wildlife in Arizona: the American exploration period 1824-1865. N.B. Carmony and D.E. Brown (eds.). Arizona Game and Fish Department, Phoenix, and Arizona Cooperative Wildlife Research Unit, University of Arizona, Tucson.
- Emory, W.H. 1857. Report on the United States and Mexican boundary survey. Vol. 1. Senate Ex. Doc. No. 108, 34th Cong., 1st Session Washington: A.O.P. Nicholson, Printer.
- Findley, J.S., A.H. Harris, D.E. Wilson, and C.Jones. 1975. Mammals of New Mexico. University of New Mexico Press, Albuquerque. 360 pp.
- Glenn, W. 1996. Eyes of fire: encounter with a borderlands jaguar. Printing Corner Press, El Paso. 28 pp.
- Goldman, E.A. 1932. The jaguars of North America. *Proceedings of the Biological Society of Washington* 45:143-146.

Hall, E.R. 1981. The mammals of North America. Second edition. John Wiley and Sons, New York. 2:1037-1039.

Halloran, A.F. 1946. The carnivores of the San Andres Mountains, New Mexico. Journal of Mammalogy 23:75-82.

Hoffmeister, D.F. 1986. Mammals of Arizona. Arizona Game and Fish Department and University of Arizona Press, Tucson. 276 pp.

Lange, K.I. The jaguar in Arizona. Transactions of the Kansas Academy of Science. 63(2):96-101.

Lowery, G.E. 1974. The mammals of Louisiana and adjacent waters. Louisiana University Press, Baton Rouge. 565 pp.

Merriam, C.H. 1919. Is the jaguar entitled to a place in the California fauna? Journal of Mammalogy 1:38-40.

Nelson, E.W. and E.A. Goldman. 1933. Revision of the jaguars. Journal of Mammalogy 14:221-240.

New Mexico Department of Game and Fish. 1996. List of threatened and endangered species. Amendment No. 1 19 NMAC 33.1; 31 January 1996.

Nowak, R.M. 1973. A possible occurrence of the jaguar in Louisiana. Southwestern Naturalist 17(4):430-432.

Nowak, R.M. 1975. Retreat of the jaguar. National Parks and Conservation Magazine 49(12):10-13.

Nowak, R.M. 1991. Walker's mammals of the world (Vol. II, Fifth Edition). The Johns Hopkins University Press, Baltimore.

Nowak, R.M. 1994. Jaguars in the United States. Endangered Species Technical Bulletin 19(6):6.

Quigley, H.B. and P.G. Crawshaw, Jr. 1992. A conservation plan for jaguar *Panthera onca* in the Pantanal region in Brazil. Biological Conservation 61:149-157.

Rabinowitz, A.R. and B.G. Nottingham, Jr. 1986. Ecology and behaviour of the jaguar (*Panthera onca*) in Belize, Central America. Journal of the Zoological Society of London 210:149-159.

Secretaría de Desarrollo Urbano y Ecología. 1991. Acuerdo por el que se establecen los criterios ecológicos CT-CERN-001-91 que determinan las especies raras, amenazadas, en peligro de extinción, o sujetas a protección especial y sus endemismos, de flora y fauna terrestres y acuáticas en la República Mexicana. Diario Oficial de la Federación. Mayo 17 de 1991. pp. 7-35. México, D.F.

Secretaría de Desarrollo Social. 1994. Norma Oficial Mexicana NOM-059-ECOL-1994, que determina las especies y subespecies de flora y fauna silvestres terrestres y acuáticas en peligro de extinción, amenazadas, raras y las sujetas a protección especial, y que establece especificaciones para su protección. Diario Oficial. Mayo 16 de 1994. pp. 2-60. México, D.F.

Seymour, K.L. 1989. Mammalian species *Panthera onca*. American Society of Mammalogists Species Accounts No. 340:1-9.

Strong, W.D. 1926. Indian records of California carnivores. *Journal of Mammalogy* 7:59-60.

Swank, W.G. and J.G. Teer. 1987. A proposed jaguar country management plan. Unpubl. report funded in part by Safari Club International, Tucson, Arizona. 113 pp.

Swank, W.G. and J.G. Teer. 1989. Status of the jaguar-1987. *Oryx* 23:14-21.

U.S. Fish and Wildlife Service. 1972. List of endangered foreign fish and wildlife. *Federal Register* Vol. 37 No. 62, Thu. March 30. p. 6476.

U.S. Fish and Wildlife Service. 1975. Reclassification of the American alligator and other amendments. *Federal Register* Vol. 40 No. 188, Fri. September 26. pp. 44412-44423.

U.S. Fish and Wildlife Service. 1979. Endangered and threatened wildlife and plants; U.S. populations of seven endangered species. *Federal Register* Vol. 44 No. 144, Wed. July 25. p. 43705.

U.S. Fish and Wildlife Service. 1994a. Endangered and threatened wildlife and plants; Proposed endangered status for the jaguar in the United States. *Federal Register* Vol. 59 No. 133, Wed. July 13. pp. 35674-35679.

U.S. Fish and Wildlife Service. 1994b. List of endangered and threatened wildlife and plants. U.S. Government Printing Office. 42 pp.

Weber, W. and A. Rabinowitz. 1996. A global perspective on large carnivore conservation. *Conservation Biology* 10(4):1046-1054.

Appendix F: Conservation Assessment



Spencer 11.

Jaguar Conservation Assessment

How and why it was developed

By Judy Keeler

November 1, 2002

In March of 1996, a great deal of both excitement and fear were felt in many small rural communities when a jaguar was sighted in the Peloncillo Mountains in Southeast Arizona. This sighting created excitement, not only on a local level, but on a national and international level. Soon, articles on the jaguar sighting began to appear in the *New York Times*, *Wall Street Journal*, *Smithsonian* magazine, and as far away as Japan.

Originally listed as endangered from the U.S. and Mexican border south into Central and South America (on March 30, 1972), very few people thought they would ever see a jaguar in the United States. Since the jaguar is normally found in tropical areas, many people did not think a jaguar would like to live in the desert if he happened into the area.

On August 3, 1992, the US Fish and Wildlife Service (USFWS) received two petitions to list the jaguar as endangered in the United States. One petition was from an instructor and his students from the American Southwest Sierra Institute, the other from a group called Life Net. These two organizations felt the U.S. still had habitat suitable for jaguar, and it should be listed as endangered in the U.S.

Following the first sighting of the jaguar in March of 1996, a second sighting of the rare jaguar occurred in the Baboquivari Mountains of Arizona on August 31, 1996.

After the second sighting, the Southwest Center for Biological Diversity filed suit against the US Fish and Wildlife Service, in September of 1996, to finalize the listing for the jaguar, along with four other species. This suit seemed to seal the animal's fate to be listed.

The local residents felt excited by the sightings because no one could even remember seeing a track of the rare and elusive animal, much less taking pictures of it. They felt fear because the animal was petitioned to be listed as endangered.

Soon, organizations representing local businesses began scrambling to reduce any negative impacts that might be caused by listing the jaguar as endangered in the U.S. Many feared a lot of regulations would be imposed on hunting and ranching businesses that might further jeopardize their ability to earn a living for themselves.

The Cochise-Graham Cattle Growers Association took the lead in working with the US Fish and Wildlife Service to conserve any other jaguars that might wander into the area. They also hoped to work with the Arizona Game and Fish Department to develop a conservation agreement in an attempt to keep the animal from being listed.

In a letter dated September 25, 1996, the local cattle growers asked their state organization, the Arizona Cattle Growers, to support their resolution to work with the Arizona Game and Fish Department in pursuing a state and regional conservation plan for jaguars. They also asked to be involved in developing the conservation agreement and its implementation when developed.

Other organizations followed their lead, asking for involvement in the conservation agreement. A flurry of activities soon followed. Several drafts of the conservation agreement were faxed to government agencies and nongovernmental organizations for their input. The final plan was completed March 24, 1997.

On January 15, 1997, as a result of all the interest in developing a conservation agreement to protect the jaguar, the Arizona Game and Fish Department and the New Mexico Department of Game and Fish requested the US Fish and Wildlife Service to reopen the public comment period for the jaguar so they could finalize the conservation assessment and strategy for their respective states. It was hoped that listing the jaguar as endangered could be avoided by completing the agreement in a timely manner.

Meetings were held in Douglas and in Tucson, Arizona, and in Lordsburg, New Mexico, over a period of several months to receive public comments on the conservation strategy and on whether the jaguar should be listed as endangered by the USFWS.

Many public comments were received by the Service, both for and against listing. Based on these comments, and the lawsuit by the Center for Biological Diversity, the Service listed the jaguar as endangered throughout the U.S. on July 22, 1997. In their listing document, they stated that the Conservation Agreement should have many positive benefits for conserving the jaguar. However, they felt that since the conservation measures were to be done voluntarily, it might take some time to realize the benefits to the level in which the jaguar was no longer in danger of extinction through all or a portion of its range.

Additionally, the Service felt they had the statutory, or legal, responsibility to list the jaguar based on biological considerations and their analysis of threats. They did feel, however, the Conservation Agreement could serve as the template for those protections that would be necessary for the conservation and recovery of the jaguar.

Many of the small, rural communities were disappointed the Service had decided to list the jaguar. However, many individuals and organizations, both supporting and opposing the listing, had committed to develop a plan that would conserve and protect the jaguar, while at the same time, protecting their livelihoods. Thus, a partnership of varied interests began working together.

Today, the group is still meeting. They don't always agree what measures should be taken to protect the jaguar, or whether jaguar habitat actually exists in the U.S., but they do agree the jaguar should be protected when it chooses to visit here.

Appendix G: Resource Trunks



Feline resource kits (inventory)

May 2003

Each resource kit includes:

- Jaguar skull (replica)
- Mountain lion skull (replica)
- Bobcat skull (replica)
- Domestic cat skull
- “Biotic communities of the Southwest” [map of vegetative communities], David E. Brown and Charles H. Lowe
- *Borderland Jaguars*, David E. Brown and Carlos A. Lopez-Gonzalez [2 copies per trunk]
- *Eyes of Fire*, Warner Glenn [15 copies per trunk]
- *Tracking the Felids of the Borderlands*, Jack Childs [2 copies per trunk]
- *Onza! The Hunt for the Legendary Cat*, Neil B. Carmony
- *Eyewitness Books: CAT*, by Dorling Kindersley
- Video: “Eyewitness: Cats”, by Dorling Kindersley
- Video: “Cats: Caressing the Tiger”, by National Geographic
- Video: “Jaguar: Year of the Cat”, by NATURE
- Highway maps of Arizona and New Mexico
- *Arizona Atlas and Gazetteer* and/or *New Mexico Atlas and Gazetteer*

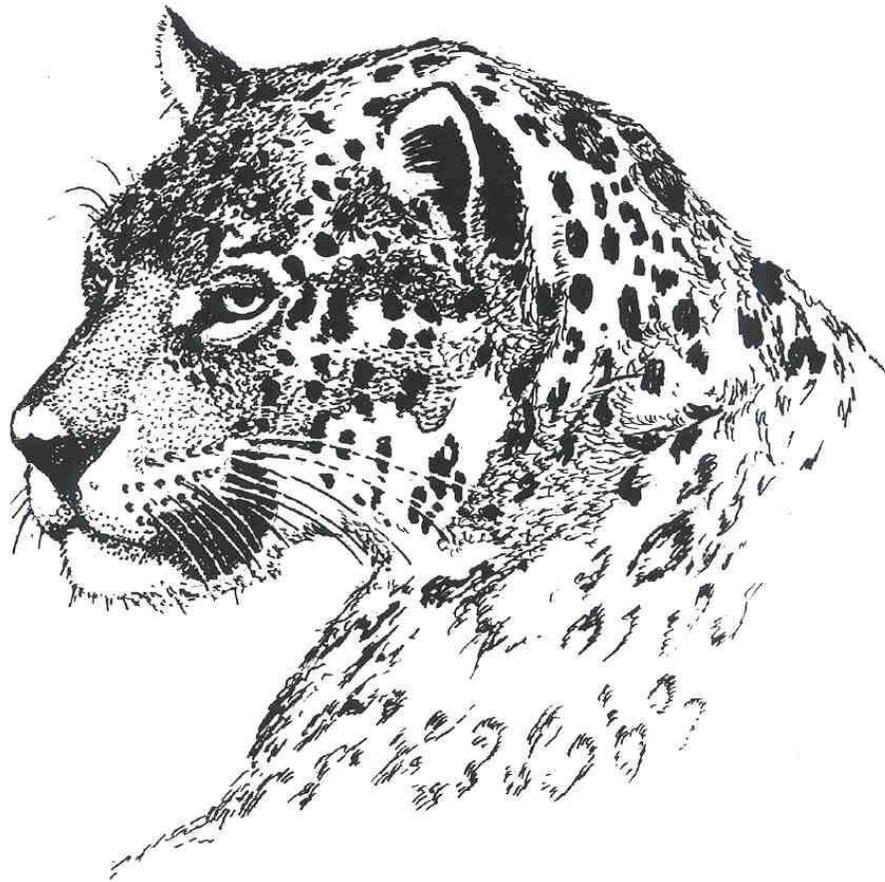
Location of Felines Resource Kits (as of July 15, 2003) - Arizona:

- All regional and headquarters offices of Arizona Game and Fish (visit www.azgfd.gov for exact locations)
- Nimon Hopkins EE Resource Center, Douglas AZ
- Clifton Ranger District/NFS, Clifton AZ (c/o Melanie Fuller)
- Washington Elementary School, Phoenix AZ (c/o Margery Webb)
- Pearce Elementary School, Pearce AZ (c/o Jean Fields)
- Defenders of Wildlife, Tucson AZ (c/o Scotty Johnson)
- Douglas High School, Douglas AZ (c/o Science Department)
- Borane Middle School, Douglas AZ (c/o Bill Kimble)
- USDA, Phoenix AZ (c/o Dave Bergman)

Location of Felines Resource Kits (as of July 15, 2003) – New Mexico:

- Hatch Middle School, Hatch NM (c/o Kim O’Byrne)
- APHIS – Wildlife Services, Las Cruces NM (c/o Alan May)
- Project WILD office/NM Game and Fish, Santa Fe NM

Appendix H: *Rohonas* Summary



Spencer 11.

***Rohonas* and Spotted Lions: The Jaguar and the Native People of the American Southwest**

Steve Pavlik

(Reprinted here with permission of the author)

The jaguar has long been an important animal to the Native people of the American Southwest. At a prehistoric site called Pottery Mound in New Mexico, a magnificent painting of a jaguar appears on the wall of a *kiva* – a special room used for ceremonies. The jaguar in this painting is portrayed anthropomorphically - that is, with human qualities. He is shown wearing a quiver of arrows and chasing a bird, probably an eagle. This site was the home to a people called the Anasazi and was occupied between the years AD 1300 to 1475. At another prehistoric site located at Hueco Tanks in Texas, a people known as the Mogollon painted a picture of a jaguar on the walls of a rock shelter. This jaguar is unusual in that it wears a curving cone-shaped hat. Another Mogollon rock art painting of a jaguar, this one wearing a collar, can be found at nearby Fort Hancock, Texas, at a site appropriately known as “Jaguar Cave.” The Hueco Tanks and Fort Hancock sites have been dated at approximately AD 450 to 1400.

Jaguars are also a part of the traditions of many contemporary Indian tribes in the Southwest. Among the Pueblos of the Rio Grande River in New Mexico – descendants of the Anasazi – the jaguar is known as the *rohona* – and is believed to give magical powers to the hunters of these people. Jaguars also appear in kiva paintings of the Hopi Indians in northern Arizona, another Pueblo tribe. In the early 1900’s, Hopi hunters killed a jaguar near the Grand Canyon.

Among the Navajos of the “Four Corners” region – the place where the states of Arizona, Colorado, New Mexico and Utah come together – the jaguar is known as the “Spotted Lion.” Jaguars appear in numerous Navajo stories and are considered a friend and companion to Mountain Lion and Wolf. Jaguars also appear in several Navajo sandpaintings – pictures made of colored sand by Navajo medicine men and used in healing ceremonies.

Jaguars also appear in the culture of the Apache Indians, a tribe related to the Navajos. One Apache outlaw was said to possess “Jaguar medicine.” After killing a man he once boasted, “I made jaguar medicine on him and grabbed him like a jaguar and killed him. I was like a jaguar!” Two of the last known jaguars in Arizona were killed in 1963 on or very near the White Mountain Apache reservation. Local Indians now know the one location as “Jaguar Point.”

The Tohono O’odham of southern Arizona know the jaguar as *ooshad* – the “spotted cat.” Sometimes they also call the jaguar *tigre* after the Spanish name for the animal. The Tohono O’odham have always had the greatest respect for the jaguar and seldom hunted it. If a man killed a jaguar, he risked contracting a sickness that would require an all-day

ceremony to cure. People who live in the more remote areas of the Tohono O'odham reservation continue to report occasionally seeing jaguars.

In Mojave mythology Jaguar is called *Hatekule* and is considered to be the younger brother of Mountain Lion. He possesses supernatural powers and can fly through the heavens, travel the underworld, and transform himself into other forms, including that of man. He is also credited with having created deer, and after having done so, taught the people how to hunt them.

There are other American Indian tribes that also possess jaguar knowledge. For all of these peoples all living things are connected, and thus all have importance. Consequently, the jaguar is, and will always remain, an integral part of the culture of many Native people of the Southwest.

[Summary of "Rohonas and Spotted Lions: The Historical and Cultural Occurrence of the Jaguar, *Panthera onca*, among the Native Tribes of the American Southwest," *Wicazo sa Review* 18, No. 1 (Spring 2003): 157-75.]

Appendix I: Jaguar Pamphlet



Spencer 11.

Jaguars

once ranged from southern Argentina, up along the coasts of Central America and Mexico and into the southwestern United States as far north as the Grand Canyon. In



Arizona and New Mexico, these majestic cats were found in virtually every type of habitat, from desert grasslands to montane-conifer forests. But by the 1900s, jaguars had largely disappeared from the United States, driven south of the border by development and hunting.

Loss of habitat and illegal killing continue to threaten jaguars throughout their entire range. The U.S. Fish and Wildlife Service (FWS) listed jaguars outside the United States as an endangered species in 1972. The species was protected under the Convention on International Trade in Endangered Species (CITES) in 1973. In 1997, with enough solid biological evidence to indicate that the Arizona and New Mexico borderlands are a legitimate part of the jaguar's range, FWS listed jaguars as endangered in the United States. This status guarantees protection for jaguars that cross into the United States from northern Mexico.

A Jaguar Conservation Team made up of land-owners, ranchers, citizen groups, scientists and state and federal agency representatives from New Mexico, Arizona and Mexico is working to develop a jaguar conservation plan. But they need your help to identify suitable habitat and cross-border migratory routes.

This pamphlet was produced with the support of the the Arizona Game and Fish Department, Defenders of Wildlife and the U.S.D.A. Forest Service.



www.fs.fed.us



www.defenders.org



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WANTED:

Information

leading to the protection and conservation of jaguars along the Arizona-New Mexico borderlands



Jaguar (*Panthera onca*)

Have you seen this animal?



J. CHILDS, JAGUAR CONSERVATION TEAM

Jaguars are found in habitats ranging from mountainous spruce-fir forests to lowland thornscrub deserts.

Throughout the past 100 years, jaguars have been consistently documented in the borderlands of Arizona and New Mexico. To develop a sound plan for protecting and conserving jaguars in the United States, the Jaguar Conservation Team needs more information about jaguars in the borderlands — information you can help provide.

If you see a wild jaguar, please note as many details as possible and promptly call the appropriate state agency. Your observations may prove to be a valuable contribution to jaguar conservation and help to preserve a precious part of America's wildlife heritage.

Jaguar Spotting: What to Look For

Jaguars are large, muscular cats with relatively short, powerful limbs and deep-chested bodies. Adults measure six to eight feet from head to tip of tail. Average weights are 200 pounds for adult males, 150 pounds for adult females and 80 to 100 pounds for juveniles. Stunningly beautiful, jaguars are cinnamon-buff in color with many black spots often in the form of broken circles or rosettes. An all-black, or melanistic, phase also occurs.

Jaguars are easily distinguished from mountain lions (pumas), the only other big cats found in the borderlands, by their pronounced spots.

Jaguars are shy and elusive animals and generally travel at night. They are at home in a variety of habitats, from high spruce-fir forests of the mountainous "sky-islands" to the lowland thornscrub deserts. Their habitat preferences in the United States are not well-documented and may be determined as much by the availability of food and water as by habitat type.



Jaguar vs. Puma Tracks

	FRONT	HIND
Jaguar: Foot pads broad, not indented at top, toe pads rounded.		
	← 4.8 inches →	← 3.7 inches →
Puma: Top of foot pad indented, toe pads tapered, almost pointed.		
	← 3.4 inches →	← 3.2 inches →

To Report a Jaguar Sighting

If you see a jaguar or signs of jaguar activity:

1. Note the exact location. Be as specific as possible.
2. Note the coloration, size, posture and behavior of the animal.
3. Look for tracks, scat, hair and other sign. Make a tracing of a track, if you can do so without destroying it. Collect hair and scat samples for analysis by wildlife officials.

4. Report the sighting immediately to:

Arizona Game and Fish Department
602-789-3573
or
New Mexico Department of Game and Fish
505-522-9796.