TEXAS PARKS AND WILDLIFE

A Field Guide To

TEXAS

MOUNTAIN LIONS

BY BILLY PAT MCKINNEY
ACKNOWLEDGEMENTS

I wish to thank Texas Parks and Wildlife Department employees Bob Cook, Bob West, Ron George, Matt Wagner, Jack Kilpatric, Bill Russ, Mike Pittman, Tim Bone, Ruben Cantu, Georg Zappler and David Riskind for their assistance and review of this manuscript. Thanks are also due Jimmy Rutledge, TPWD, for his contribution on the biology of the mountain lion and to Bonnie R. McKinney, TPWD, for the time and work she contributed to this guide.
TABLE OF CONTENTS

Introduction ........................................1
Mountain Lion Biology ..............................2
Behavioral Classes .................................4
Aging ................................................5
Tracks ...............................................9
Traveling Patterns .................................12
Scrapes ..........................................12
Scats .............................................13
Kills ...............................................15
Wildlife Predation .................................17
Livestock Depredation .........................17
Nuisance Lions ................................18
Lion and Human Interaction ...................21
Who to Call ....................................inside back cover
Suggested Reading ..............................inside back cover
Rock art depicting large cat and shaman (medicine man) from Panther Cave, Seminole Canyon State Park, Texas. Illustration by Nola Davis.
INTRODUCTION

The mountain lion (Puma concolor), also known as cougar, puma and panther, has been an integral part of the Texas fauna for thousands of years, as evidenced by the paintings and pictographs of Native Americans (see left) and the fossil record.

Lions were once common throughout Texas, but since Anglo settlement, they have mostly been confined to isolated and rugged areas of the state. Lions now appear to be moving back into historic habitats where they have not been documented for well over a hundred years. It is increasingly more important for range and wildlife managers to be able to recognize lion “sign,” in order to monitor populations in a given area. Lions are solitary, secretive creatures. This guide attempts to provide field people with a working knowledge of the mountain lion. It is not intended for the experts, but rather for laypersons in order to provide them with the basics of lion behavior, allowing them to interpret the traces left by the animal.

Mountain lions are controversial animals that often evoke love-hate feelings on the part of humans. Whatever one’s perspective, however, mountain lions are fascinating and little understood animals that play an important role in the Texas ecosystem. The mountain lion is adaptable and can be found thriving in hot deserts, wetlands and high mountains. The challenge for resource managers is to develop a management plan for the lion that will address the concerns of both wildlife and livestock, and that will insure that the lion continues to be an important part of our Texas heritage.
The mountain lion’s scientific name, *Puma concolor*, means cat of one color (Figure 1). Mountain lions are also called pumas, cougars and panthers. They occur in habitats ranging from the southern tip of South America to northern British Columbia, Canada. The subspecies found in Texas is *stamleyana*. Historical data documents the existence of lions in every ecological region in Texas.

Mountain lions are reddish brown to tawny in color. From the tip of the nose to the tip of the tail, males can measure in excess of 7 feet, with females being somewhat smaller. Normal weight in adult males averages 100-150 pounds, and 55-90 pounds in adult females. In the wild, longevity ranges between 10 and 11 years; in captivity, mountain lions have been known to live much longer.

Mountain lions are solitary animals. They are active crepuscularly (mornings and evenings) as well as nocturnally (night). Adult males and females are only together for a 3-to-5-day period during breeding. Lions may breed at any time during the year, but most litters are born in the summer and fall. Females first breed when they are around 2 years of age. Intervals between litters average from 18 months to 2 years. Average litter size is normally 2 to 3 young with as many as 6 young being reported. The gestation period is about 90 days. Female lions pick locations within their home range that offer cover and security for their young. Kittens may be left
unattended for hours at a time while the mother hunts to feed them. Females may leave their kittens in heavy brush, rockslides, caves or overhangs (Figure 2). The growing cubs stay with the female until they are 11 to 24 months of age, at which time they disperse and begin looking for their own range. Dispersal of young lions depends on the distance to unoccupied habitat. Recent research has documented dispersal distance up to 300 air miles from natal (birth) areas. Generally, sub-adult males disperse further than females.

The size of a lion's home range is determined by a variety of factors: prey abundance and availability, topography and other habitat features, and presence of other lions. Male home ranges average 2-1/2 times larger than those of females. The male's range usually encompasses the range of several females. Research has shown some overlap in home ranges of adult males, but normally males do not share ranges. The home range of an adult male may vary from 80 to 200 square miles, while female ranges are normally 20 to 100 square miles. Female ranges tend to have some degree of overlap with those of other females, although they remain solitary.
In Texas, mountain lions primarily prey on white-tailed deer (*Odocoileus virginianus*) and desert mule deer (*Odocoileus hemionus crooki*). Various estimates have been made concerning how often a lion kills a deer, ranging from every 3 to 5 days, for a female raising cubs, to every 5 to 14 days for adult males. Some variability may be attributed to climatic conditions. During hot weather, the kill spoils quickly, making it necessary for the lion to kill more often to obtain fresh meat. In cooler weather, the kill lasts longer, which decreases the frequency of killing. Depending on the abundance and availability of alternative prey items within a particular habitat, lions also prey on javelina (*Tayassu tajacu*), porcupine (*Erethizon dorsatum*), skunks (*Mephitis* spp. and *Spilogale* spp.), other small game and domestic livestock.

**BEHAVIORAL CLASSES**

In order to make competent observations, the field observer should be aware of three behavioral classes of lions. These categories are extremely important when interpreting lion population dynamics.

1. **A transient** is a lion without a home range. This can be a young dispersal-age individual or an older lion that has been displaced. Lions of this class will travel many miles to establish a suitable new range. Young dispersal-age lions need sufficient space in order for them to coexist with other lions. Young lions will sometimes fill a range previously occupied by a resident lion that has died or relocated. This transition period in a young lion’s life is a struggle for survival, since they have not perfected their hunting and stalking skills. They are apt to locate in a livestock area because of the ease of catching prey. Consequently, many are destroyed because of their dependence on livestock. Often, there is conflict between a young lion encroaching on a resident lion’s range. Such an encounter is often fatal to the young individual, but older lions are sometimes displaced by younger, stronger males. Females may also be displaced. Lions face hardships and stress during displacement periods, and few survive long unless there is ample prey and range available.

2. **A resident** is a mature lion that has an established home range. As solitary animals, lions do not defend their home range. However, they will visit and hunt all areas within their established range, and when other lions are encountered, conflicts occur. The abundance of prey will help determine how small or large a home range is.
Resident male lions know the whereabouts of females within their range and will occasionally seek them out. Likewise, resident females are aware of the location of resident males. This awareness is important not only for breeding purposes, but also for the female ready to give birth, since she must protect her young from the males that periodically visit her home range.

3. An immature lion is too young to hunt on its own, and thus depends on the female to provide for it. Young kittens rely totally on their mother for survival. As kittens age, they begin to take small game on their own, but continue to rely on the female for sustenance.

AGING

Classifying mountain lions into age groups has been confusing since there are no set standards. For example, the term “kitten” has been applied to animals ranging anywhere from newborn up to two years in age.

Mountain lions are separated into three general age groups based on a number of different factors (Table 1). Adult lions are divided into five age categories based on tooth wear and condition (Table 2 and Figure 3). Both tables and Figure 3 are reprinted with permission from The Mountain Lion in Nevada, Nevada Department of Wildlife, 1983.
Table 1. General classification of mountain lions by age group.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KITTENS: (0-16 MONTHS)</td>
<td>1. Body weight – up to 32 kg (70 pounds).</td>
</tr>
<tr>
<td></td>
<td>2. Spots on pelage – fading begins by 3-4 months of age.</td>
</tr>
<tr>
<td></td>
<td>3. Dependent on adult female.</td>
</tr>
<tr>
<td></td>
<td>4. Baby teeth present or permanent teeth in the process of erupting.</td>
</tr>
<tr>
<td></td>
<td>5. Even if all permanent teeth are present, canines are not fully grown –</td>
</tr>
<tr>
<td></td>
<td>canine length under 28 mm in males and under 23 mm in females.</td>
</tr>
<tr>
<td>SUBADULT: (17-23 MONTHS; JUVENILE PERIOD IS COMPLETED BUT HAS NOT ATTAINED TYPICAL ADULT CHARACTERISTICS)</td>
<td>1. Body weight – 23-45 kg (50-100 pounds).</td>
</tr>
<tr>
<td></td>
<td>2. Spots on pelage still visible on inside of front legs.</td>
</tr>
<tr>
<td></td>
<td>3. May or may not be with adult female.</td>
</tr>
<tr>
<td></td>
<td>5. Teeth are ivory white – not stained.</td>
</tr>
<tr>
<td>ADULTS: (24 MONTHS OR OLDER)</td>
<td>1. Body weight – 32-68 kg (70-150 pounds).</td>
</tr>
<tr>
<td></td>
<td>2. Pelage has no spots or only very faint spots.</td>
</tr>
<tr>
<td></td>
<td>3. Independent of mother.</td>
</tr>
<tr>
<td></td>
<td>4. Sexually mature – evidence of nursing in females, e.g. large teats (may</td>
</tr>
<tr>
<td></td>
<td>not be evident in young females just entering this age group).</td>
</tr>
<tr>
<td></td>
<td>5. Tooth wear and staining.</td>
</tr>
</tbody>
</table>
Table 2. Age estimation of adult lions based on tooth wear and condition.

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Tooth Characteristics</th>
</tr>
</thead>
</table>
| **2 YEARS OLD** | 1. Canines are white, no stains.  
2. No wear on first and second incisors; third incisor may show slight wear.  
3. Tips of canines show little wear. |
| **3 AND 4 YEARS OLD** | 1. Canines lightly stained.  
2. Slight wear on third incisor at highest point of crown. Area of wear averages 1-4 mm across.  
3. First and second incisors show little or no wear.  
4. Tips of canines show little or no wear. |
| **5 AND 6 YEARS OLD** | 1. Canines show moderate staining.  
2. Third incisor worn to within 1-4 mm of top of first and second incisors.  
3. Incisors #1 and #2 have little to moderate wear along crown.  
4. Tips of canines show obvious wear. |
| **7 TO 9 YEARS OLD** | 1. Canines show dark staining.  
2. Third incisor often worn level with first and second incisors down to 1-4 mm above gum line.  
3. Tips of canines nearly rounded or flattened.  
4. Dentine exposed on incisors. |
| **10+ YEARS OLD** | 1. All incisors worn nearly to gum line, or missing.  
2. Canines worn to a rounded or blunt shape and darkly stained. |
Fig. 3. Frontal view of upper teeth of female and male mountain lion showing age class by relative wear.

Drawing based on illustration from The Mountain Lion in Nevada, with permission from the Nevada Department of Wildlife, 1983.
TRACKS

Lions are rarely seen in the wild, even in areas with relatively high lion populations. The “sign” or traces a lion leaves is the sure way to confirm its presence (Figure 4). Time, wind and rain all deteriorate sign. Therefore, every effort should be made to check on reports of lions as soon as possible.

Lion tracks are distinctive and should not be mistaken for tracks of other animals. One misconception is that lion tracks are larger than dog tracks. Large hunting dogs can make tracks as large or larger than those of a lion. The heel pad of a lion measures 2 to 3 inches in width on the front foot, and 1-3/4 to 2 inches on the hind foot.

A tell-tale characteristic of a lion track is the three distinct lobes and two indentations at the hind margin of the heel pad (Figure 5). The lion heel pad is more full than a dog’s, and the front track is larger than the hind track. The toes of a lion track tend to be teardrop-shaped and widely spaced, whereas the toes of a dog track
are round and narrowly spaced. The front track of a lion is nearly symmetrical, whereas the rear track is slightly smaller in the front. The typical dog track is nearly symmetrical, and there is little difference in size between the front and rear track.

When observing tracks, look for the presence or absence of claw marks. Dog tracks normally show toenail prints. However, lion tracks rarely reveal claw marks, unless the lion is running or has lost its footing. Some hunting dogs won’t leave toenail marks if their nails are worn down or if they are on frozen ground. If claw marks are present, the lion’s will appear sharp and narrow, while the dog’s toenail marks will be broader.

Bobcat (*Lynx rufus*) tracks appear similar to lion tracks, but they are much smaller. The front pad of a bobcat is seldom wider than 1-1/4 inches and the toes are narrowly spaced. A lion kitten track is 1-1/2 inches in width at around 6 months of age, and their tracks are normally found with the adult female’s tracks.

With practice and experience, it is not difficult to pick out a lion track from among many other similar tracks (Figure 6).
Fig. 6. Comparison of tracks by bobcat, coyote, dog and mountain lion. Illustration by Bonnie R. McKinney.
TRAVELING PATTERNS

Lions travel in a deliberate, “businesslike” manner compared to dogs or coyotes (Canis latrans). They seldom run, except when trying to catch prey or escaping their enemies. The nature of a lion is to walk slowly, ever watchful for the opportunity to catch prey. Therefore, most tracks will be a walking track. When walking, a lion travels in a straight line, and its feet are placed firmly on the ground, leaving no disturbance outside the track. The hind foot of a lion registers partially or totally within the front track. Therefore, the hind track is most commonly seen. The walking stride of a lion leaves tracks about 20-24 inches apart.

Lions take the easiest path while making their rounds. The best places to look for lion sign are along trails, roads, natural passes, canyons, senderos and arroyos.

It is easiest to spot tracks while looking into the direction of the sun. Tracks will literally “shine” when the sun reflects on them. Lion tracks, as a rule, don’t make deep marks except in soft material, since their large feet spread the weight out evenly.

Dogs or coyotes usually travel in a lope or trot, and they often stir up dirt. The hind and front tracks don’t overlap with the consistency that lion tracks do. Dogs usually travel without a definite direction, and their tracks often weave back and forth.

SCRAPES

Lions leave scrapes (Figure 7) or “markers” in areas where other lions can locate them. Consequently, the location of scrapes is predictable. Scrapes can be found in caves, on ridge-lines, at junctions in canyons and along trails. A scrape is made by the hind feet in a backwards kicking motion. The two scrape marks are about 6-8 inches in length and parallel to each other. Each scrape is distinguished by a mound of urine-soaked debris towards the back. Generally, males make scrapes, but occasionally females will make scrapes too.

If wild turkeys (Melagris gallopavo) or feral hogs (Sus scrofa) are in an area where a lion is suspected, people may confuse the lion scrape with turkey scratching or hog rooting and vice versa. Lions seldom leave more than one fresh scrape at a site, but
there may be several older ones at the same site, as male lions usually leave a scrape each time they pass through an area. Scrapes can be good indicators of direction of travel since the mound of debris is always at the rear.

**SCATS**

Lion scats are similar to those of a bobcat, but larger (Figure 8). Each dropping is segmented and contains very little vegetable matter. The type of scat indicates the time elapsed since the lion’s last kill. Lions normally feed first on the internal organs of their prey, and scats from this feeding consist mostly of gray matter mixed with some hair. Scats from later feedings consist of bone chips and hair. The last feeding often contains hair only. Grass may also be found in lion scats. Scats can be found under overhangs, near kills and in caves where they will last for many months. Finding scats is one method of determining the presence of lions in an area of low lion populations. Lions will leave scats in arroyos, on trails and near scrapes. There is usually a large concentration of scats around kills.
Fig. 8. Scat comparisons. Photos by Bonnie R. McKinney.
Lions are opportunists, preying on a wide range of animals. As with any carnivore, it is impossible to predict what a lion will prey upon at a given time.

Lions are capable of taking large animals including livestock, but in general, reports of mature cattle and horse kills should be viewed with skepticism. Mountain lions rarely kill animals weighing over 500 pounds.

When investigating a reported lion kill, remember that lions leave an abundance of sign. Look for tracks. Drag marks are a good indication of a lion kill. The drag mark is usually wide and clear if the prey is large, and it is fairly straight from the kill site to the cache area (Figure 9). Lions cache their kills in areas of heavy cover. They often cover their kill with grass, leaves, dirt or other debris, but they do not bury their kill (Figure 10). They often remove the internal organs and cover them up, close to the kill site. Lions frequently uncover their kill and feed, then drag the carcass to another area and cover it again.

Fig. 9. Drag marks made by lion dragging prey – mule deer buck. Photo by Billy Pat McKinney.
Lions stalk their prey. They often kill by crushing their prey’s esophagus, causing suffocation. Another killing technique is biting the neck, thus separating the vertebrae. In some cases, lions bite through the brain case. When investigating a kill, skin back the bitten area and look at the size of the two canine puncture marks. A lion has large canine teeth, and each puncture mark should be about the diameter of a pencil. The bite marks of other predators are much smaller.

Lions are meticulous about their kills compared to other carnivores. The carcass normally remains intact as the lion begins to feed at the shoulders and ribs, eventually moving to the hindquarters and loin area on subsequent meals. Remember, there are exceptions: lions don’t always cover their kill and they don’t always eat what they kill, but they always leave sign. With careful investigation, confirmation of whether the kill was made by a lion or another predator should be possible.

Fig. 10. Mule deer buck killed by lion. Photo by Billy Pat McKinney.
WILDLIFE PREDATION

DEER
Whenever and wherever available, deer are the choice prey for mountain lions. In general, deer kills are made one at a time, but occasionally, females with cubs kill several deer at a time, caching the carcasses in different locations. Lions normally cover deer kills. They will take any deer, regardless of size or sex. Kills may be totally consumed in some cases, leaving little more than a hair-bed and bone chips.

JAVELINA
Lions prey on all age classes of javelina and they often cover these kills. A large percentage of javelina are killed by bites to the brain case. Most javelina kills consist of one animal at a time, and lions often “hull out” this prey, leaving what appears to be a skinned javelina. Lions that prey predominantly on javelinas tend to have a large amount of scar tissue on their chest due to tusk wounds made by javelinas in self defense.

DESERT BIGHORN SHEEP
Lion predation on desert bighorn sheep (*Ovis canadensis*), normally consists of single animals with most of the kill being eaten and the remainder covered. All bighorn age groups are preyed on with more lambs, young rams and ewes taken than mature rams.

SMALL GAME
Lions consume all manner of small game. They especially prey on skunks, porcupines, and rabbits. Sub-adult lions rely heavily on small prey until they are skillful enough to take large game regularly. Lions are able to attain advanced age in areas where small game is readily available, sometimes becoming exclusively dependent on this type of prey.

LIVESTOCK DEPREDATION

SHEEP
Sheep kills are usually multiple. It is not uncommon to find up to 30 sheep killed by a single lion, but normally only one or two sheep are fed on. Lions return to feed on these kills and at the same time may kill more sheep. All age classes of sheep are preyed on with lambs being fed on more than older sheep. Lions do not
cover all their sheep kills, usually only their chosen meals. Some lions become habituated to preying on sheep.

GOATS
Kills are often multiple, but not quite as dramatic as sheep kills. However, kills of five to ten goats at one time are not uncommon. Lions tend to eat more from a goat kill than a sheep kill, and all age classes of goats are taken.

CATTLE
Lions usually kill individual cattle, but multiple kills have been documented. Yearlings and young calves are the primary age group attacked. Kills are fed on and are usually covered. Calf kills have been found that were not covered or eaten. This may have been due to the mother cow’s attempt to fight off the lion. Cattle depredation in Texas is uncommon compared to sheep and goat kills. Cattle and lions coexist with little interaction in many areas.

HORSES
Lion predation on horses has been well documented through the years. Foals, young colts and fillies are the primary prey when available. Their long necks and deer-like size seem to make them very attractive and relatively easy prey for lions. Adult horses are occasionally taken by lions and some may show the scars of an unsuccessful attempt. However, lion predation on horses is not as common as it was years ago. The mechanization of ranching operations has decreased the need for horses, and many ranches are buying fully-grown trained horses instead of raising brood stock.

NUISANCE LIONS

“Nuisance” lions habitually prey on livestock or otherwise interact with humans and require removal. There are many methods to deal with these animals, and it is not always necessary to destroy them in order to solve the problem. Live capture and relocation is a possibility in some instances. However, each case is different and, if a lion has to be destroyed, it should be done in a humane manner.

Trained lion dogs (Figure 11) are an excellent way to capture a problem lion, since little lasting trauma occurs. This is also the only selective method which insures that only the targeted lion is affected. However, it is expensive to train and keep a pack of lion dogs for this purpose.
Leghold snares (Figure 12) work well but should only be employed by professionals. Other species are often caught by mistake and can usually be released unharmed.

Fig. 11. Trained lion dogs holding a lion at bay. Photo by Billy Pat McKinney.

Fig. 12. Leghold snare. Photo by Billy Pat McKinney.
Leghold traps (Figure 13) work well when employed by professionals, but non-professional use often results in capture of non-target species.

![Leghold trap](image)

*Fig. 13. Leghold trap #4-1/2. Photo by Billy Pat McKinney.*

Box traps (Figure 14) have been used successfully by agencies for live lion capture in urban areas. This method works best when employed during cooler seasons, when bait will not spoil quickly. Non-target species can easily be released unharmed.

![Box trap](image)

*Fig. 14. Box trap for live capture. Photo by Ray Skiles.*
LION AND HUMAN INTERACTION

Mountain lions rarely interact with humans; however, with the ever-growing human population, the frequency of encounters between lions and humans in Texas is likely to increase. Many ranchette-type subdivisions and urban fringe areas are expanding into lion habitat. Deer feeding and reduced hunting activity will increase deer populations in these areas, attracting lions. As more people use hiking trails, the potential for lion and human confrontation is also increased. However, the general public should not be alarmed into thinking that mountain lions are a threat to their well being. As stated previously, lion-human interactions are rare.

WARNING INDICATIONS THAT MAY PRECEDE A LION-HUMAN ENCOUNTER

1. A large number of lion sightings in an area frequented by humans.
2. Disappearance of pet cats and dogs from yards.
3. Lions which appear to have lost their normal fear of humans. (In most cases this lion will be a juvenile male or escaped pet).

IF YOU LIVE IN AN AREA KNOWN TO BE INHABITED BY LIONS, THERE ARE SEVERAL PRECAUTIONS YOU CAN TAKE. THESE PREVENTIVE ACTIONS WILL HELP YOU AVOID A POSSIBLE LION ATTACK:

1. Install outdoor lighting in areas where you walk after dark so you can see a lion, if present.
2. Landscape or remove any vegetation a lion could hide in around children’s play areas. Make it difficult for a lion to approach unseen.
3. DO NOT FEED WILDLIFE and do not plant palatable shrubs since this will also attract deer. Remember, predators follow prey.
4. Keep pets under control. Roaming pets are easy prey and can attract lions. If you leave pets outside, confine them to kennels with tops. Store all garbage securely.
5. Children should be closely supervised while playing outside if lions have been seen in the area.
WHAT TO DO IF YOU ENCOUNTER A MOUNTAIN LION

There are no proven actions to minimize an attack if you meet a lion, but reports based on personal observation by people who have encountered lions provide useful suggestions. Remember every incident is different, depending on the specific lion, the particular person and their individual behaviors.

1. If you are in a park or other area where lions are known to be present, hike with others, not alone. If small children are present, keep them close to you and within sight at all times. Carry a sturdy walking stick, it can be used to ward off a lion.

2. DO NOT APPROACH A LION, especially one that is feeding or has cubs. Leave the lion an avenue of escape.

3. STAY CALM, when you encounter a lion. Talk calmly and move slowly.

4. STOP, back away slowly only if you can do so safely. DO NOT RUN AWAY OR TURN YOUR BACK.

5. DO ALL YOU CAN TO APPEAR LARGER by raising your arms. Pick up children to prevent them from running and possibly triggering an attack.

6. IF THE LION IS AGGRESSIVE, throw rocks, sticks or whatever you can get your hands on easily. Wave your arms, brandish a stick, speak firmly and loudly. DO NOT BEND OVER OR TURN YOUR BACK.

7. FIGHT BACK, if a lion attacks you. Lions can be driven off by fighting back with whatever you can get your hands on. Remain standing. If the lion knocks you down, try to get back on your feet.
WHO TO CALL

The Texas Parks and Wildlife Department is responsible for managing, conserving and protecting the state’s wildlife. You can help too.

If you encounter a lion in a park or other public use area, contact uniformed personnel immediately. If you experience an attack, immediately contact your local TEXAS GAME WARDEN, SHERIFF’S DEPARTMENT OR DEPARTMENT OF PUBLIC SAFETY (DPS). For confirmed lion sightings, we encourage you to submit a written sighting report to the address below or call the Texas Parks and Wildlife Department.

Texas Parks and Wildlife Department
Wildlife Division
4200 Smith School Road
Austin, Texas 78744
Phone: 1-800-792-1112

SUGGESTED READING


