

Do Mountain Lions Exist in Arkansas?

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Abstract: Surveys covering over 1,161,140 ha in Arkansas from 1988–1991 revealed abundant sign of several native and domesticated mammal species, but none from the mountain lion (*Felis concolor*). Because of our intensive methodology and the equivocal nature of previous documentation, we suggest there are no wild, reproducing populations of mountain lions in Arkansas. Extensive forests in the state, however, may provide suitable habitat for mountain lion reintroduction experiments.

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For at least 2 decades wildlife professionals have debated the existence of mountain lions (*Felis concolor*) in the southeast outside of south Florida (Sealander and Gipson 1973, Downing 1981, Yenke 1982). Claimed sightings of panthers in the southeast outside Florida contributed to the listing of the Florida panther (*F. c. coryi*) under the Endangered Species Act of 1973 (Public Law 93-205) in these areas even though no substantiated physical evidence of their presence existed (Van Dyke et al. 1986). Biologists (R.H. Brocke unpubl. rep., Downing 1981, Yenke 1982) searched for mountain lions in the East without producing irrefutable physical evidence.

In Arkansas, 3 mountain lion carcasses were confirmed between 1949 and 1975; however, the origins of these specimens were not determined. The last indisputable evidence was the carcass of a mountain lion killed in Logan County in November 1975 (Ark. Game and Fish Comm., unpubl. data). Based on reports of vocalizations and sightings, Sealander (1979) believed that mountain lions occurred in 4 areas, were holding their own, and were possibly increasing. In part because of these reports, the Arkansas Game and Fish Commission (AGFC) from August 1988 through June 1991 conducted a field search, led by an experienced

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lion hunter/tracker, for mountain lions and their sign. We describe this survey and evaluate the evidence supporting the existence of the species in Arkansas.

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Methods

We conducted surveys in the western Ozark Mountains north of the Arkansas River, the Ouachita Mountains, the White River National Wildlife Refuge near the confluence of the White and Arkansas rivers, and the Saline and Ouachita river bottomlands in southeastern Arkansas. Study areas were examined from a fixed-wing aircraft in August 1988 before ground surveys began in order to locate topographic features typical of occupied mountain lion range. Potential areas were subjectively considered as large (>20,000 ha), rugged, relatively unfragmented tracts of forest.

Mountain lion tracks, scats, scrapes and kills were searched for along primary and secondary roads, fire lanes, hiking trails, and wildlife trails. Drainages, mountain passes (Young 1946, McBride 1976), cliff shelters, and overhanging bluffs also were searched for sign. Overhanging bluffs protect tracks, scats, and scrapes from weather, and lions habitually deposit droppings or make scrapes at these sites as territorial markers (McBride 1976). These formations were located during aerial surveys, plotted on topographic maps, and were searched. Ground surveys were made on foot, from slow-moving vehicles, or from all-terrain vehicles following methods described by Roof and Maehr (1988). Searches were made during winter (Jan 1989), spring (Apr–May 1989–1990, May–Jun 1990–1991) and summer (Aug 1988, Jun–Aug 1989–1990). During these searches tracks of white-tailed deer (*Odocoileus virginianus*), black bears (*Ursus americanus*), coyotes (*Canis latrans*), bobcats (*Lynx rufus*), and wild hogs (*Sus scrofa*) were recorded.

Approximately 50 plaster casts, scats, and photographs of sign belonging to AGFC were examined. Sighting reports from the last 18 years ($N > 300$) were also reviewed to suggest other survey areas. Approximately 65 sightings reported to the AGFC during the study were investigated by searching for physical evidence in the vicinity of the report and by interviewing the reporting individual when possible. Published modern (after 1950) accounts of mountain lions in Arkansas and elsewhere in the eastern United States were examined and evaluated relative to accepted methods of documentation.

Study Area

The Ozark National Forest covers 447,400 ha of hilly and mountainous upland hardwood forests including 26,720 ha of wilderness (U.S. Dep. Agricul.

1985). Dominant trees include red oak (*Quercus rubra*), white oak (*Q. alba*) and hickory (*Carya* spp.). Shortleaf and loblolly pine (*Pinus echinata* and *P. taeda*) are found along dry ridges on south and southwest slopes. Soils originate from weathered limestone (Morse 1969).

The Ouachita National Forest covers 636,740 ha (24,900 ha in wilderness), is located in 12 west-central counties, and is characterized by east-west ridges, and narrow floodplains. The soils in this area are mostly dry with loamy and clay subsoils derived from sandstone (Morse 1969).

The White River National Wildlife Refuge is located along the Mississippi Alluvial Plain in southeastern Arkansas and was formed by floodwaters of the Mississippi River. Much of this relatively flat area has been cleared for rice fields. Other areas included the Trusten Holder Wildlife Management Area, which borders the southern portion of the refuge, the Mozart Hunt Club located near Snowlake on the southeastern border of the refuge, Felsenthal National Wildlife Refuge, and approximately 510 km² of private timber company land in south-central Arkansas. The Felsenthal National Wildlife Refuge covers approximately 26,000 ha, with only 3,200 ha above water year round. Hardwoods and cypress (*Taxodium* spp.) are the predominant forest types within the area. Extensive primary and secondary roads are found throughout forested Arkansas.

Results

We surveyed over 29,000 km ($\bar{x} = 9,795$ km/yr) of area in which mountain lions had been reported. A total of 1,680 hours ($\bar{x} = 560$ hrs/yr) during the 3-year period was expended in search of sign. No physical evidence of mountain lions was found. Tracks or other sign were recorded 3,234 times for deer, 1,529 times for coyotes, 360 times for bobcats, 121 times for wild hogs, 99 times for black bears, and 29 times for elk (*Cervus elaphus*). These totals likely are conservative because only sign clearly belonging to 1 animal was counted. Tracks of dogs (*Canis familiaris*) were seen frequently but not recorded.

We identified all plaster casts, scats, and photographs held by Arkansas Game and Fish Commission as being from coyotes, dogs, bobcats or black bears. Some evidence, however, was unidentifiable due to its poor quality. Individuals reporting mountain lions made varied descriptions. In some interviews, both the investigators and the observer agreed that a bobcat or some other animal was seen. Other individuals were certain they had seen mountain lions, although many of the animals were described as being black. Over the past 18 years >40% of the reported lion sightings in Arkansas were black and weighed only 14 to 23 kg. (S. Barkley pers. commun.). We examined 3 papers supporting the presence of mountain lions in Arkansas (Sealander 1956, 1979; Sealander and Gipson 1973), and 7 papers that discussed mountain lions in eastern North American (Downing 1981, East 1979, Frome 1979, Yenke 1982, Wright 1948, 1959, 1972), but we believe the data used to identify sign of mountain lions were incorrectly interpreted.

Discussion

Aerial surveys allowed us to identify potential mountain lion habitat, provided broad overviews of topographic features, and helped us plan survey routes. Ground surveys have been useful in detailing temporal and geographic use by mountain lions and yield confirmed sign quickly (Roof and Maehr 1988). An experienced observer can determine if mountain lions are present in a matter of days and an experienced lion hunter with hounds is the best method available (Van Dyke 1983). Investigators for this project had a combined total of >47 years of experience tracking and capturing mountain lions in the United States, Mexico, Central America, and South America.

A mountain lion covering 8 to 24 km/day, leaves approximately 1,560 tracks per km or between 12,500 and 37,500 tracks every 24 hours under ideal tracking conditions. Even if only a few of these tracks were visible, the accumulation of sign could be found by qualified observers. Van Dyke (1983) found that 100% of resident mountain lions, 78% of transient mountain lions, and 57% of mountain lion kittens were detected by track searches. Within occupied range, mountain lions habitually visit areas to make scrapes and deposit scats. This sign withstands weathering better than footprints and is more likely to be found than tracks.

Track counts have been used to estimate relative lion abundance in Arizona (Shaw 1977, 1983, 1988), California (Kutilek et al. 1983, Fitzhugh and Gorenzel 1985), Florida (Belden 1986, Roof and Maehr 1988), Nevada (Ashman et al. 1983), and Utah (Ackerman et al. 1981, Hemker 1982). Searching roads for fresh tracks is also used by mountain lion hunters in western states (Hemker et al. 1986). We used this method with success in South and Central America and in Florida (Roof and Maehr 1988, R.J. McBride unpub. data). Van Dyke et al. (1986) suggested that the effort necessary to detect resident lions in Utah varied from 90 to 360 km/500 km². Our effort covered over 306 km/500 km².

Wright (1959, 1972) suggested that resident mountain lions existed in the East but were undetected because they deliberately avoided roads. However, Belden (1986) and Maehr et al. (1991a) found that Florida panthers consistently used roads and trails just as western mountain lions did (Van Dyke 1983). The notion of adaptive changes unique to the mountain lion in the East is unlikely because Maehr et al. (1991b) found strong behavioral and demographic similarities between Florida panthers and western mountain lions. Apparently, mountain lions exhibit similar behavior patterns regardless of terrain and geographic location.

Most people cannot distinguish mountain lion tracks from those of other species, particularly large dogs (Belden 1978). All track casts we examined that had been previously "verified" as mountain lion tracks were actually from coyote, dog, bobcat, or black bear. Free-ranging dogs and bobcats are common in the East, and their tracks are often misidentified by residents as panther tracks (Nowak and McBride 1974). Most campers and hunters could not identify a lion track among several drawings, nor could they describe its diagnostic features (Van Dyke and Brocke 1987). Wright (1948, 1959) presented photographs he referred to as moun-

tain lion tracks; however, trappers and biologists experienced with mountain lions identified these also as dog tracks (R.H. Brocke, unpubl. rep.). Frome (1979) presented a photograph of plaster casts described as mountain lion tracks, but we identified these also as dog tracks. R. H. Brocke (unpubl. rep.), and Van Dyke et al. (1986), stated that the driving force behind the eastern mountain lion enigma is the misidentification of tracks, imagination, and unsubstantiated sightings.

Many of the reports received by AGFC referenced vocalizations, commonly described as "screams," which were described as "characteristic" by Sealander (1979). Although mountain lion vocalizations cover a range of chirps, peeps, whistles (Bogue and Ferrari 1976) and yowls (Rabb 1959), there is much debate on whether mountain lions do in fact "scream." Grinell et al. (1937) stated that a mountain lion rarely, if ever, screams. Many experienced researchers and professional hunters have never heard a lion scream in the wild (Bruce 1922, Young 1946, Hornocker 1970, Seidensticker et al. 1973, Nowak and McBride 1975, McBride 1976, H.G. Shaw, pers. commun.). Downing (1984:39) considered "screams as the least reliable evidence." Inexperienced individuals may associate a sound with a particular animal without actually observing it. Many of the sounds or calls mistaken for a panther scream may be vocalizations of hawks, owls, coyotes, or mules (Bruce 1925). Using recordings as evidence, Downing (1984) determined that 3 incidences of suspected lion screams were actually gray fox (*Urocyon cinereoargenteus*) vocalizations. With the arrival of the first steamboat and steam locomotive in the West, many people even thought the sirens were cries of the mountain lion (Young 1946). Consequently, screams should not be accepted with the credibility attributed to physical evidence such as clearly identifiable tracks.

Sealander (1956) stated that although factual evidence of mountain lions is often lacking, reports by qualified people cannot be discounted. Qualified people have been considered as being biologists, foresters, naturalists (Belden 1986), and "good observers not likely to exaggerate" (Sealander and Gipson 1973). Anyone can, however, misidentify an animal in the field and Downing (1984) reported that even prominent mammalogists had erred in attempts to differentiate casts of dog and mountain lion tracks. Bruce (1925), a professional lion hunter who killed 149 of them for the state of California, described seeing only 1 mountain lion alive in the woods after searching prime lion habitat for many years later in his life. Many mountaineers who spent their lifetimes in lion country never glimpsed 1 (Bruce 1925). In every instance where Bruce (1925) investigated a reported mountain lion, he found that some other animal had been seen. Van Dyke and Brocke (1987) found that mountain lion hunters averaged only 1 sighting every 9 years without the aid of dogs. We agree with Van Dyke and Brocke (1987) that mountain lion sighting reports should be used only when combined with other irrefutable evidence.

Many reported sightings in the East have been categorized as escaped captive animals. Yenke (1982) stated that there were <70 known captive mountain lions in Florida; however, because mountain lion owners in the state are required to register their pets, we know that there were 300 to 500 lions within the state at that time, and there are now at least this many on file (B. Cook, pers. commun.). The number

of unregistered, captive mountain lions is unknown in Florida, but there are a dozen or more reported escapes annually. Most (>90%) of these are recaptured and returned to their facilities. However, not all accidental escapes or intentional releases are reported (B. Cook, pers. commun.). Five to 10 mountain lions are estimated to escape (or are freed) each year from zoos and private owners in New York alone without being reported (East 1979).

Other indicators of mountain lion presence include road kills, depredation complaints, accidental captures, and poaching. In Florida, where road densities are lower than in Arkansas, 15 Florida panthers were killed on highways between 1979 and 1991 (Maehr et al. 1991a). If potential mountain lion range in Arkansas was occupied, one would expect a higher roadkill rate than in Florida.

Mountain lions frequently kill domestic livestock, and depredation reports are common in western states (Shaw 1977, Suminski 1982). In Texas, where the periphery of mountain lion range abuts sheep range, 2,500 sheep were killed by mountain lions in 1990 (U.S. Dep. Agricul. 1990). In north Florida, Belden (1989) found that introduced mountain lions ate domestic goats and exotic ungulates, even though other prey were available. Maehr et al. (1990) found that wild hog was a primary food item for Florida panthers, and they occasionally ate domestic livestock. Sealander and Gipson (1973) described 4 geographic locations as core areas in which wild mountain lions existed in Arkansas. All were interspersed with cattle, sheep, hog, and goat operations. In Arkansas, coyotes, dogs, and other predators reportedly killed 800 lambs and 200 sheep during 1990 (U.S. Dept. Agricul. 1990), yet no losses were attributed to mountain lions. Further, there has been no confirmed predation by lions on other domestic livestock, exotic ungulates, or game animals in the state.

Fur trapping, hunting with hounds (black bear, raccoon, fox, etc.), and deer hunting are popular and widespread activities in rural Arkansas. These activities produce numerous accidental captures and deaths of mountain lions in western states. Six Florida panthers were illegally killed in the last 2 decades even though they are federally protected. We did not find photographs or other evidence of lions caught in traps or treed with dogs in Arkansas (C. Gibbs, Ark. Trappers Assoc., pers. commun.).

The impetus for our survey and other mountain lion surveys in the eastern United States, was an unending stream of reported sightings. We anticipate a gradual increase in such reports as more urban people engage in rural activities. While sightings will continue to be debated, no conclusive evidence substantiates breeding mountain lions in the southeast outside of southern Florida. By utilizing proven techniques, we were unable to collect any such physical evidence and we conclude there is not a mountain lion population in Arkansas.

Implications

The U.S. Fish and Wildlife Service has placed a high priority on locating potential Florida panther reintroduction sites in the southeastern United States. We

suggest that agencies interested in determining the status of mountain lions for potential reintroduction or in response to public interest consider our approach and the evidence it revealed. Before expending manpower and allocating funds, agencies should first evaluate existing, local historical information relative to mountain lion presence. Second, sightings should not be used to determine the existence of populations unless they are accompanied by substantiated physical evidence. Third, verifiable road kills, depredation complaints, accidental captures, and poaching of panthers are physical indicators that occur in all known mountain lion populations. Finally, the behavior of the species is sufficiently stereotypic to suggest that local populations of mountain lions should not be immune to detection. If the presence of panthers cannot be confirmed, then the suitability of the landscape as habitat can be tested using western mountain lions as surrogates. Similar studies have been conducted or are underway in Florida (Belden unpubl. data). The release of an experimental population of western mountain lions into Arkansas would help managers determine whether forest lands in Arkansas can support them.

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