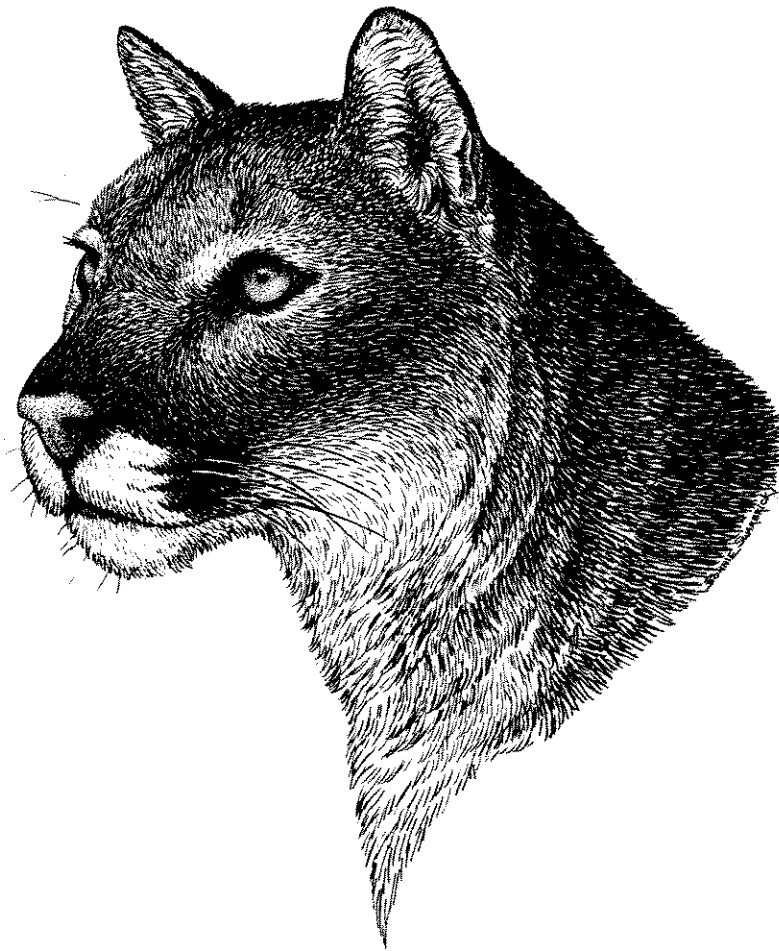


# **Proceedings of The Third Mountain Lion Workshop**



**December 6 - 8, 1988  
Prescott, Arizona**

**Arizona Chapter, The Wildlife Society  
Arizona Game and Fish Department**

**Proceedings of  
The Third Mountain Lion Workshop**

**December 6 - 8, 1988  
Prescott, Arizona**

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**December 1989**

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## Acknowledgments

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The steering committee gratefully acknowledges the assistance of the many people who assisted in making this conference a success. In particular we would like to thank Bill Carrel for attending to our audio-visual needs, Norris Dodd (President, Arizona Chapter, The Wildlife Society) for his assistance in organizing the effort, Patty Woodruff and Jeannie Shaw for assembly and typing of manuscripts and use of their printing and data processing facilities, and finally Lisa Schiavo, Brian Wakeling, and Cindy Brandt for their tireless attention to the registration table.

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# Welcoming Address

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*Duane L. Shroufe, Director  
Arizona Game and Fish Department  
Phoenix, Arizona*

As Acting Director of the Arizona Game and Fish Department, let me welcome you to Arizona and to our Territorial Capitol City. I can see already from the diverse geographic representation here, that this is likely to be both a productive and broad attack on the problems of mountain lion management.

I would like to begin by first giving some recognition to groups sponsoring this conference. The Arizona Chapter of the Wildlife Society has over the past 20 years or so initiated an increasing number of special interest workshops. They have conducted or sponsored workshops in communications, telemetry methods, a snag management symposium, a javelina management workshop, a southwestern deer management workshop, a wildlife law enforcement workshop, and one dealing more specifically with the problem of commercialization of wildlife.

The Arizona Game and Fish Department, as the other sponsor of this meeting, has attempted to cooperate in the efforts of this professional group and others in promoting a better understanding of the problems of wildlife and fisheries management. Thus, our involvement in this particular workshop.

We have been also working with other conservation groups such as the Arizona Riparian Council. In cooperation with this group the Department is currently producing a video program on riparian management issues and general ecology. In cooperation with The Nature Conservancy we are also acquiring habitat for threatened or endangered species as well as acquiring unique habitats themselves.

But, back to the business of this conference. It is obvious from the representation here that many of you have rather specific agendas with regards the mountain lion. I would urge you to take the opportunity to listen carefully to what is presented here in the way of information, issues, and philosophies in reaching your own conclusions about how the lion should or should not be managed. You have assembled here presumably the best experts in the U.S. on the biology and management of this valued species.

The mountain lion is many things to many people. To the deer hunter and the ranch manager it is a predator affecting populations of other valuable ungulate resour-

ces. To the sportsman the lion is an occasional, highly valued trophy big game animal. To the naturalist, hiker, photographer, and conservationist, the lion is a living symbol of wilderness. Although seldom seen, its very presence is enough to give that wilderness experience added dimension. To the economically stressed livestock operator, the lion is but one more factor affecting his ability to make a living. To the wildlife manager or the law enforcement officer the lion is occasionally a potential threat to public safety.

How can the species possibly be managed in the presence of so many conflicting interests? It is possible, if these groups can come together as you have here, and agree at least on one set of principles. The problem then becomes one of building a management model that rests on these principles. The model must, however, provide a balance in management decisions based on appropriately weighted analysis of the important human and biological factors involved. That is your task as experts.

In closing, I would especially like to address those of you who are the real lion experts. Many of you have worked with this species at very close range -- capturing, handling, radio collaring, locating, observing. I get the impression that there is a tendency for many biologist to take on the characteristics of the species itself -- solitary, quiet, mainly non-vocal. If we as resource managers are to produce well accepted, biologically sound management plans for this species, we must have your involvement at the management planning level. You also need to export what you know about mountain lions through every available medium. What you say or write may not be new information, but it still needs to be said repeatedly in popular articles, conferences, radio/television appearances, and schools. The need is to achieve a better informed constituency and, consequently, a better base of support for management programs. This is done by you who are already recognized as qualified to speak about mountain lions.

On behalf of our Department, and the Arizona Chapter of the Wildlife Society, we wish you much success in your very busy agenda. We will look forward to the products of this workshop in helping our agency solve the many faceted problem of mountain lion management.

## Begging The Question: What Is Mountain Lion Management?

*Susan C. Morse*  
*Professor of Natural History*  
*Burlington College*  
*Burlington, Vermont*

I've sure enjoyed learning about the mountain lion over the years, and my wanderings have been wonderfully enriched by growing friendships with Harley Shaw and so many others interested in lions. And, I've learned much by reading the various research publications authored by so many of you at this conference.

Like yourselves, I've appreciated both the pleasure and privilege of being out there -- of time spent studying wildlife, marveling at the rugged and exquisite beauty of the wildlands in which they live. And, I'm sure that I don't have to remind you how immensely satisfying it is to share in what for brevity's sake I'll describe as "human animals, assisted by dogs, horses, and mules, searching for lions." Each of us has shared in the magic -- the country, the early morning anticipation, the human searchers, searching an impossible, magnificent country, looking and listening for lions -- and the hounds, hopefully trailing them. And at the end of it all, the rest and companionship at the conclusion of a hard day.

In all humility, I'd like to take advantage of the variety of these experiences, coupled with the perspectives which I'm invariably influenced by as a naturalist, a generalist, if you will, and beg the question -- what is wildlife management?

Management means a lot of things to a lot of us. Management requires that we protect as well as use natural resources, with the future as well as the present in mind. Management requires that we police human interactions with natural resources and, where appropriate, protect property and provide for human safety. Management requires that there be ever-continuing field based research efforts enabling us to understand natural resources better, their place in the scheme of things, and the human-caused pressures which affect their status now and in the future. Increasingly, however mirage-like at times, management also engages us in a consideration of values, values inherent in the natural world itself. Such values transcend human uses, have absolutely nothing to do with economic or political systems, know no state or international boundaries, are not solely biological in nature, nor are they adequately described by science. These values are somehow synonymous with the best in us, the excitement, joy, sharing and peace that we experience when we're out there in a wild land that is healthy and clean.

Mirages too often vanish, and as we speed down the highway, the vision is gone. What remains is where

we've been, and what we're doing to the world around us. What we see, instead, is the latter twentieth century, where wild habitats and populations are shrinking, demanding our immediate and crucial research attention. We find that people and their property need protection from occasional wildlife offenders, where wildlife need protection from human offenders, where game and non-game species alike require management in order to perpetuate healthy populations for the enjoyment of all of us.

These are some of the immediate concerns of management. What are some of the problems? Wildlife management agencies are inadequately funded. Wildlife management goals are difficult to grasp, sometimes to justify to an increasingly urbanized populace. The complexity of the overall issue of world wildlife conservation is huge. In the alarming context of global habitat destruction and species extinction, our efforts suffer most at our hand when we can't even agree on the magnitude of the problem. Wildlife managers, past and present, have described pieces of the problem. Aldo Leopold said it most simply, "... wildlife management is comparatively easy; human management is difficult." John J. Craighead and colleagues in their monograph interpreting grizzly bear habitat described what might be the crux of the problem; herein we might just as well substitute the words mountain lion for grizzly bear.

"In wilderness is the preservation of the grizzly. If the human species cannot preserve the grizzly bear, it probably cannot preserve itself; for the type of human behavior that will permit the extinction of the grizzly will also permit the extinction of mankind. The motivation is an evolved irreverence for life and life systems, so deep seated in our biological past that neither human intellect, religion nor culture has yet substantially curbed it."

The Florida panther is probably one of the most endangered mammals in the world. Caught in a dangerous crossroad of the latter twentieth century, the panther's dilemma is sadly symbolic of the enormity of the problem. These few remaining creatures embody the urgency of *all* wildlife management, for no matter how abundant or seemingly stable, *all* wildlife and wildlands face an uncertain future at best. I'm reminded of the observations of the thirteenth century Spanish rabbi who observed that Noah's Ark couldn't possibly have been big enough to hold two representatives of every species. God must have worked a miracle to get them all in. Similarly, today's

wildlife managers must reckon with an ever-shrinking ark of wildlife refuge in a sea of human demands. Too often, we count the species, two-by-two, and come up with zero. No matter how we figure it, zero is the wrong answer.

Henry David Thoreau left us with an intriguing question when he stated, "In Wildness is the preservation of the world." Could he have foreseen the continuing ruination of forests, and with them wildlife habitats--the cleared-over, logged and eroded landscapes of nineteenth century New England, eventually spreading westward to include today's global cutting of nearly 1,000 acres of rain forest within the span of time that it will take for me to share these comments? Could he have imagined the forces which would drive the current rate of plant and animal extinction, where one generation could eliminate forever one tenth of the world's species, or our human overpopulation which is projected to double in our lifetime? Was his disappointment in the nineteenth century political status quo reason enough to worry for our future -- leaders and followers alike, who choose to ignore worldwide environmental disasters which await us all, regardless of gross national products? Whatever happened to the *Global 2000 Report*? And how is it that various public natural resource managing agencies are so often working to the detriment of each other's goals? Why do fundamental management priorities, coupled with the critical continuity of research efforts, have to flip-flop with the whims of political change. Even when we would seem to know better, our weakness is the same today as it was in Henry's era. He ruefully recognized the dominion of the dollar over the values in the latter nineteenth century, and so it is today, as we are destined to fail in what we do. We simply cannot hope to manage healthy wildlife populations if their habitat is to be continually assaulted by our various demands. Thoughtful and effective wildlife management requires that our agencies, universities, and independent researchers assume strong leadership roles now in a crucial, local and global resource planning process, and firmly draw the line on "development" before it is too late.

American Nobel Prize recipient for literature, William Faulkner, said, "The greatest single tragedy for mankind is a universal fear so long sustained by us that we can even bear it." In this age of the atomic bomb, there is indeed an underlying fear, confusion, and sense of hopelessness in an imperfect system. For those who attempt to serve as stewards of natural resources, ours is a double measure of pain. For every precious moment we cherish in the natural world, we spend many darker moments mourning its piecemeal destruction. We observe the destructive fulfillment of too many unfulfilling prophecies, that two, five, or ten decades from now life will be the same, that famine, war, and injustice will mar the accomplishments and hopes of the human animal, that environmental pollution and global habitat destruction will eclipse the survival of all that lives.

If there is hope at all, I'd like to believe it can be found in another prophecy articulated by the well-known

American poet, Robert Frost. He was asked to comment on the contributions of the twentieth century. He said, "About half of life can't be made a science of, can't ever be. We're going to learn a great deal more about that before we're through this period. That's what we'll be known for." Wildlife managers, caring stewards of our natural resources, can serve a larger cause. We must be humble to the task, however, for the plants and animals of the planet have much to teach us. If we listen, we find that we are stimulated in both body and spirit. Curiously, we find that we are made most human--discovering in ourselves the uniquely human capacity to appreciate and love the "wildness" of our plant and animal neighbors on the planet, to value these qualities, and to project to our caring into the future. Lest we think this an impossible dream, we have only to remind ourselves, as Aldo Leopold has, of former changing attitudes towards human slaves. This moral maturation allowed us to emotionally identify with and ultimately protect, the freedom, liberty, and pursuit of happiness, which we now recognize as the equal rights of all men, women and children. The "wildness" we love in the land and its wildlife is ultimately and, perhaps most profoundly, a way of thinking--a clue, perhaps, to understanding what Thoreau meant when he proclaimed, "In Wildness is the preservation of the world."

Where does the lion fit in? As wildlife managers, we have the privilege and responsibility of embracing an ever-enlarging vision of things, even as our specialties require fine focus. Indeed, we must be zealots of the cause, and actively seek to bridge the gap between what our culture believes in and believes that it knows, to what we will come to know, and come to believe in, in the future. We must give voice and actuality to Aldo Leopold's conservation ethic, a management which is defined by caring, a management which alone will guarantee the survival of lions and all that lives.

# **State and Provincial Status Reports**

*Matt Peirce, Session Chairman  
Wildlife Manager  
Arizona Game and Fish Department  
Wickenburg, Arizona*

## Cougar Hunting Regulations and Harvest in Alberta Between 1973 and 1987

*Martin G. Jalkotzy*

*P. Ian Ross*

*Arc - Associated Resource Consultants Ltd.  
Calgary, Alberta, Canada*

A cougar licence has been required to hunt the species in Alberta since 1973. Mandatory registration of all cougar kills has been in place since then. Residents, non-residents, and non-resident aliens are allowed to purchase one cougar licence per year. There are no restrictions on the number of licences sold. Bag limits have remained at 1 cougar per licence holder per year. Several changes to the cougar regulations have been adopted during the period 1973 to 1987. Season length has been reduced substantially. Between 1973 and 1977, the winter season (with dogs) was 50 to 60 days; between 1981 and 1987, it was about 30 days. The fall season (no dogs), which was between 81 and 100 days between 1973 and 1978, was eliminated in 1985. Use of all-terrain vehicles to hunt cougars was also reduced between 1973 and 1987.

An average of 30 cougars was legally shot each year in Alberta between 1973 and 1987. Variability in the annual harvest appeared to be linked to differences in snow conditions during each hunting season. Poor snow conditions led to reduced harvests, and increased snowfall usually resulted in more cougars harvested. Harvests declined during the years immediately following reductions in season length. However, harvests always rebounded the following year. Snow conditions did not correlate consistently with the harvest. In many Wildlife Management Units (WMU's), 1 or 2 years of relatively high harvests were followed by reduced harvests for at least 1 year.

The cougar harvest in Alberta is concentrated in the southern third of the foothills and mountains along the Continental Divide. Within this southern area, the harvest was very patchy; a few WMU's provided the majority of the harvest, while others appeared to be hunted less. Ease of motorized access seemed to be an important influencing factor. WMU 304/305, which is an island of cougar habitat surrounded by agricultural land, has recorded the highest harvests in the Province during the last decade. Poor snow conditions in some years in southern WMU's open to cougar hunting resulted in a redistribution of the cougar harvest to more northerly WMU's where snow conditions were better.

Between 1978 and 1987, the adult male sex-age group and the independent juvenile and subadult male sex-age group comprised 31% and 16%, respectively, of the aged harvest. In the Sheep River study area population, these same 2 sex-age groups represented about 20%

and 10% of the population. It would appear that cougar hunters in Alberta select for male cougars. The sex ratio of the harvest in WMU's 302, 304/305, and 400, the 3 most heavily harvested WMU's in the province, was different from the ratio in all other WMU's open to cougar hunting. Subadult males were shot most frequently in WMU's 302, 304/305, and 400, whereas adult females were the most often harvested sex-age group in the rest of the Province. A reduction in season length in the southern foothills led to an increased number of females taken in those WMU's. A similar reduction in season length in more northerly WMU's did not result in similar changes. These differences probably reflect the poorer snow conditions in the southern foothills and the resulting fewer opportunities to hunt cougars during a shortened season.

# Status of Mountain Lions in Arizona

John S. Phelps  
 Arizona Game and Fish Department  
 Phoenix, Arizona

## INTRODUCTION

Prior to 1947, the mountain lion was considered to be an undesirable predator and was unprotected. Government hunters and trappers pursued it just as they did the wolf prevailed, although at least 2,400 Arizona lions were killed between 1918 and 1947.

Prior to 1947, the mountain lion was considered to be an undesirable predator and was unprotected. Government hunters and trappers pursued it just as they did the wolf and grizzly. Unlike these other large carnivores, however, the lion prevailed, although at least 2,400 Arizona lions were killed between 1918 and 1947.

In 1947 efforts to eliminate the lion in Arizona were further encouraged through establishment of a bounty paid by the state. This bounty was funded until 1968, varying in amount between \$50 and \$100 per lion killed. In 1968, changing public attitude toward the cat resulted in the bounty law being modified to require hunters to relinquish their animal if they chose to collect a bounty. Between 1947 and 1969, aver 5,400 lions were killed in Arizona.

In 1970, the state legislature classified the lion as a big game species, transferring responsibility for its management to the Arizona Game and Fish Department. A tag was required to kill a lion, and a limit of 1 lion per hunter per year was established by the Arizona Game and Fish Commission. The bounty remained on the books but was not funded. Even today the bounty regulation continues to exist, though it has not been funded for nearly 20 years.

In acknowledgment of lion (and bear) depredations on livestock the Arizona Legislature created ARS 17-302 in 1970, which allows ranchers to protect their livestock

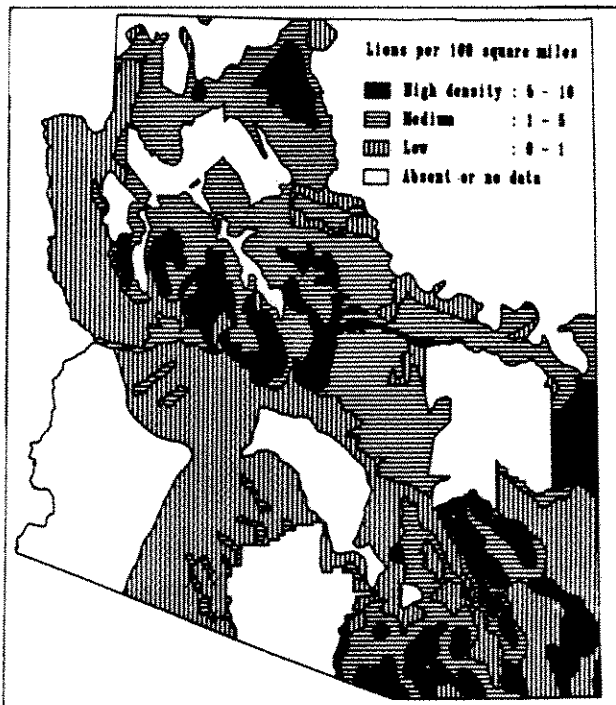


Fig. 1. Statewide distribution of mountain lions in Arizona.

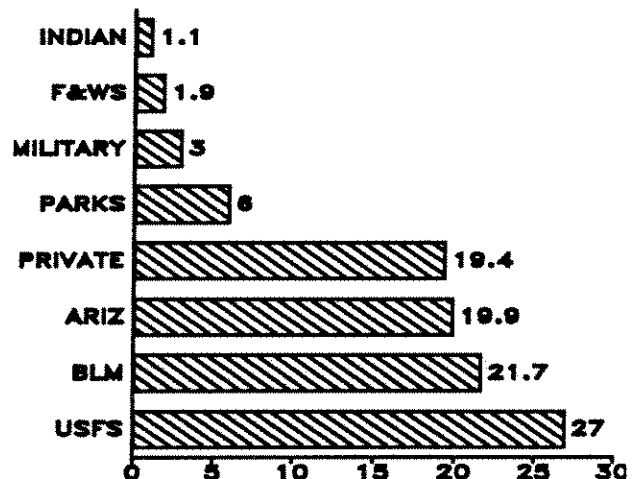


Fig. 2. Ownership of Arizona mountain lion range (percent).

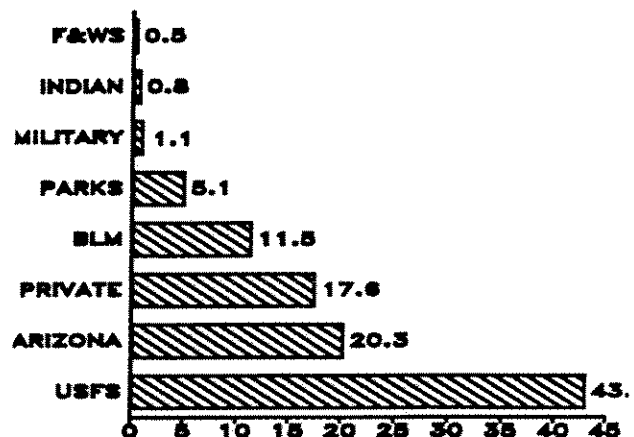


Fig. 3. Distribution of Arizona mountain lions (percent).

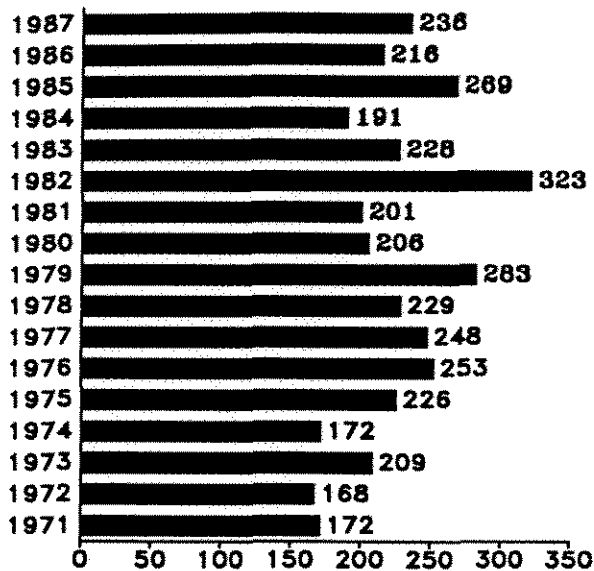


Fig. 4. Summary of Arizona mountain lion harvest.

from lions and bears by killing offending or potentially offending animals.

**CURRENT STATUS**

**Population Levels**

Arizona's mountain lion population is estimated to lie between 1500 and 2500 individuals. Lion density varies from 0 to 10 per 100 square miles depending on habitat quality. The Yuma mountain lion (*Felis concolor browni*) is recognized by the Arizona Game and Fish Department as being a low density population and as having a very restrictive distribution.

**Mountain Lion Distribution**

The mountain lion is found nearly statewide (Fig. 1). While the distribution of lion habitat follows the ownership pattern of Arizona lands closely (Fig. 2), the population distribution deviates from this pattern due to differences in habitat quality (Fig. 3).

**Management Problems**

In the late 1970's the Department started its strategic planning process for big game and one of the strategies was to improve the information necessary to manage the mountain lion. The plan took effect in 1980. At that time the Department estimated a statewide population of 2,100.

Beginning in 1981 the mandatory checkout of lions killed by hunters was required by the Game and Fish Commission. Prior to this, our only available data had been from questionnaires mailed to hunters buying lion tags. For 1 year hunters were required to submit the lower jaw of the animal killed for aging, but this was discon-

tinued due to inaccuracies of the aging technique. No reliable method is available for aging wild mountain lions.

In 1984, a questionnaire was prepared jointly by the Department and the Arizona Cattle Growers Association in an effort to determine the number of lions killed under ARS 17-302 and to assess the rate of rancher's compliance with the reporting requirements of this law. The results are discussed below.

In 1985 and 1986, a survey team from the Research Branch of the Department made trial track counts on 144 routes in 22 management units. The purpose of this effort was to assess the feasibility of track counts as a tool in monitoring lion population trends. Concurrent with these track counts, ranchers were interviewed to attain a better view of the distribution of cattle losses to lions in the state.

In 1987, partly as a result of the above track counts, lion seasons were shortened to 6 months in the forested areas on the Mogollon Rim. Pursuit of lions with dogs was allowed during the other 6 months, but killing of lions was prohibited.

Since 1970, when the lion became big game, to the present, over 6,400 lions have been killed, mostly by sport hunters (Fig. 4).

In 1988, the legislature lifted the cap on tag fees from \$1.50 to \$11.00 (\$150 for non-residents). The Commission has not had time to notice and act on the recent legislative change. It is expected the tag will go to \$11.00 for 1989 and subsequent years.

**RESEARCH**

As a result of its new management responsibility for lions, the Arizona Game and Fish Department initiated a mountain lion research project in 1971. The first phase of this project was carried out on the Spider and Cross-U Ranches northwest of Prescott. Project goals were to measure mountain lion densities in good lion habitat and to determine the relative amount of natural and domestic prey in diets. This project lasted until the spring of 1976, and in 1977 an additional 3 years of field study were begun on the North Kaibab, in conjunction with mule deer research already in progress. Results of these 2 studies are summarized below.

During the 5-year study on Spider and Cross U Ranches, the population of lions was estimated to be 10 resident adults on 175 square miles. Kittens and transient lions on the area brought the population to a average total of 18-20.

Diet of lions on these ranches consisted of approximately 65 percent mule deer and 30 percent cattle (nearly all calves). Rabbits, pronghorns, and javelina made up the other 5 percent of the diet.

Resident male lions on the area were found to have territories of 100-150 square miles. Home areas for females covered 20-50 square miles. The ranches were closed to lion hunting during the 5 years of study, and very little natural mortality of lions was observed on the area. After the study was complete and the area was reopened to hunting, the wildlife manager for the area

documented an average take of 10 lions/year off the 2 ranches for a period of 5 years.

Mountain lion density was found to be somewhat lower on the North Kaibab study area. This was mainly due to the fact that lions split their usage of the area between summer and winter range, hence simply required more habitat to survive. Summer and winter ranges of the lions tended to be contiguous.

Mule deer were the principal food of the North Kaibab lions, but cattle were seldom taken. This was at least in part due to the fact that calves were available in a much lower ratio relative to deer numbers on the Kaibab than had been the case on the Spider and Cross U ranches.

The lion population declined drastically over the 3 years of study on the North Kaibab. This was due to a combination of lack of replacement by young, natural mortality, and hunting. We documented 2 cases of adult lion deaths due to starvation and disease on the Kaibab, something we had not observed on the Spider study area. We also observed a movement of approximately 60 miles by a young lion leaving the Kaibab. It is believed the decline in lions was related to a previous decline in their principal food source - mule deer. Recruitment suffered because the females could not feed their young or themselves.

The deer herd began to increase immediately after the lion population crashed. Studies of predator-prey relationships have shown that predator populations are maintained by the prey population, only significantly impacting the prey during a decline. Thus lions tend to fluctuate as the prey increases or decreases. The rancher questionnaire mailed out in 1984 provided a variety of insight into rancher problems with lions. Perhaps the key findings were the indication by many ranchers that a significant number of lions are killed under ARS 17-302 but not reported to the Department. Their main reason for failure to report these lions was fear of unfavorable publicity or of increased regulation.

The track count study provided hope that a tool for on-the-ground assessment of lion population trends can be developed. It demonstrated that lion densities are consistently greater in some habitats than in others and that they are directly related to mule deer densities in most areas. Highest densities were found in areas with a high chaparral vegetation component; lowest were in the hot, dry southwestern deserts of the state. Areas of coniferous forest along the Mogollon Rim also held low densities.

Interviews of ranchers made concurrently with these track counts demonstrated that highest perceptions of cattle loss on the part of ranchers occurred in habitats where lion densities were highest. These were also the areas where year long cow-calf operations occurred.

A continuation of the development of this technique and development of trained survey teams was a major recommendation of this study.

## ECONOMIC VALUES

Current lion tag prices are Resident \$1.50, Non-resident \$50.00. It is anticipated that these prices will increase in 1989 in response to recent legislation raising the ceiling price of lion tags to \$11.00 and 150.00 for residents and non-residents, respectively. Hunting licenses are also required prior to taking of mountain lions.

Guided hunts are a source of economic benefit and in recent years some non-consumptive users have hired guides in order to photograph lions.

Economic losses due to lion depredation are difficult to assess. In association with 12 lions taken during the 1987-88 fiscal year by The Arizona Animal Damage Control (ADC) program for depredation complaints, \$16,900 in livestock loss was verified by Damage Control Agents. During calendar year 1986 livestock owners with ADC agreements attributed \$170,000 in livestock losses to mountain lions. This would be only a small percentage of all livestock economic losses since most Arizona livestock owners do not have ADC agreements. □

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## Tracking Arizona's Other Big Cat

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*David E. Brown  
Freelance Writer  
Phoenix, Arizona*

Jaguars are still occasionally encountered in Arizona; the most recent kill was in December, 1987. More than 60 of these noteworthy cats are known to have been killed in Arizona since 1900. Because the most recent records are of transient males, most Arizonans do not realize that this animal was formerly a resident of their state. Letters and newspaper articles include accounts of both females and young and there are several reports of multiple kills. The nearest resident population of jaguars to Arizona at present is thought to be in the Sierra Bacatete region of southern Sonora. Overt action is necessary to restore jaguars to the Southwest and a reintroduction is recommended. An expanding prey base of javelina and coati-mundis, reduced livestock pressures, and legal protection would provide improved conditions for jaguars compared with the 1900--1925 period when this species was extirpated from Arizona.

# The Status and Management of Cougar in British Columbia 1988

Daryll Hebert  
 Regional Biologist  
 Ministry of Environment  
 Williams Lake, British Columbia, Canada

The status of cougar in British Columbia has evolved and improved since the bounty era of the early and mid 1900's. The early status and management has been summarized by Dewar and Dewar (1976).

British Columbia contains three subspecies of the North American cougar: (*Felis concolor vancouverensis*) inhabits Vancouver Island and some of the adjacent islands; (*F.c. oregonensis*) occupies the Coast Range and coastal slope area; (*F.c. missoulensis*) occupies the remainder of the province except the Queen Charlotte Islands where there are no cougar; cougar occur only sporadically north of 54 degrees latitude to the Yukon border (Cowan and Guiguet 1973).

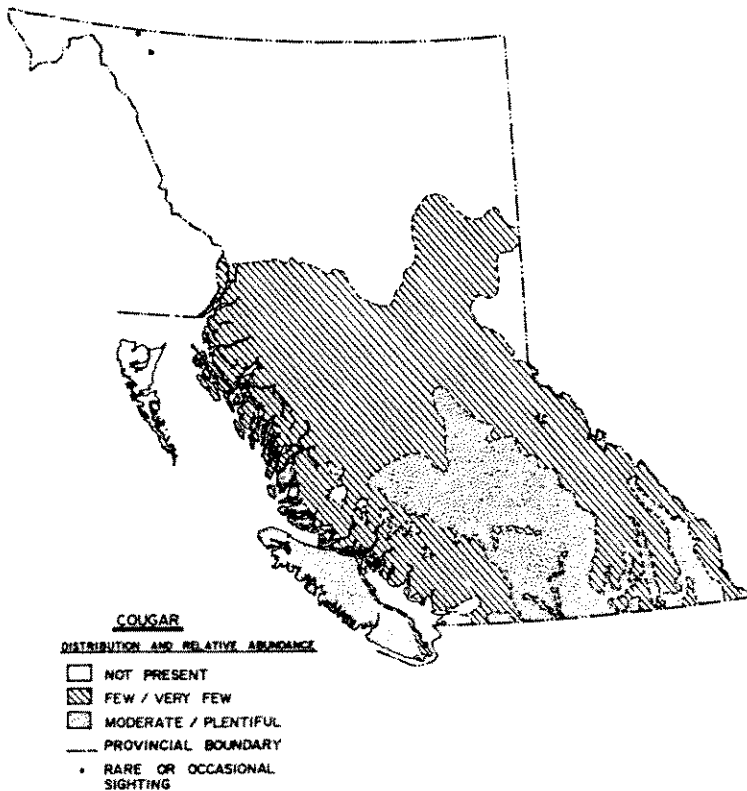


Fig. 1. The distribution and relative abundance of cougar in British Columbia.

Table 1. A historical summary and provincial-state comparison of the cougar bounty system

Cougar Bounty in B.C.	1910-1917
Total Harvest: 1930-1955	13,257, 530/yr.
Harvest in Wash., Ore., Cal.	11,575, 463/yr.
1936-1961	
Cougar Range in B.C.	215,204mi <sup>2</sup> , 557,637km <sup>2</sup>
Range in Wash., Ore., Cal.	220,996mi <sup>2</sup> , 569,815km <sup>2</sup>
Area of Vancouver Island & Interior South Harvest	60-64,000mi <sup>2</sup> , 155-165,760km <sup>2</sup>
	408/yr
	77% of B.C. Harvest
Harvest Density	1 Cougar/147mi <sup>2</sup> , 381km <sup>2</sup>

Table 2. A historical summary of the management status of the cougar in B.C.

Animal Control Officers Implemented	1947
Big Game Status	1966
Initiation of Restricted Seasons	1968-69
Species Tag Introduced	1970
Compulsory Inspection for Cougars	1976
Protection of Females with Kittens	1980
Regional Species Statements	1987-88
Provincial Species Statement	1979, 1988-89
Depredation	10% involved cougar
All Complaints	6% involved cougar

## STATUS

The bounty on cougar continued from 1910-1957 (Dewar & Dewar 1976). During that time the total harvest

of cougar probably exceeded 20,000 animals. In the 25 year period between 1930-1955, approximately 13,257 cougar (all mortality except natural) or 530/year were harvested in B.C. (Table 1). By comparison, during the 25 year period 1936-1961, approximately 11,575 cougar or 463/yr were harvested among Washington, Oregon and California.

The bounty harvest in B.C. occurred throughout 215,304 mi<sup>2</sup> (557,637km<sup>2</sup>) while that from the three U.S. States came from 220,006 mi<sup>2</sup> (569,815km<sup>2</sup>). However, a more realistic evaluation indicates that 77% of the B.C. bounty cougar harvest (10,000/25 year period) occurred on 60,000-64,000 mi<sup>2</sup> (155,400-165,760 km<sup>2</sup>). This equates to a harvest density of approximately 1 cougar per 147 mi<sup>2</sup> (381 km<sup>2</sup>). By comparison, population densities may range from 1/15-31 mi<sup>2</sup> (39-80 km<sup>2</sup>) for females and 1/25-35 mi<sup>2</sup> (65-90km<sup>2</sup>) for males but may vary greatly (Russell 1978).

The status and management of cougar changed considerably between 1947 and 1988 (Table 2). Depredation continued throughout the bounty years to the present. In 1947, animal control officers were implemented to handle these problems. On the average, 10% of the actual depredation involves cougar while 6% of the total number of complaints involves cougar (Fish and Wildlife Branch 1986). Similarly, there were 15 verified cases of cougar attacking humans in B.C. up to about 1976. To date, there have been an additional 2 deaths and 9 attacks on humans.

The cougar achieved big game status in 1966. Thereafter, seasons became more restrictive, tags and compulsory inspection were introduced and females with kittens were protected in 1980. More recently, regional species statements were prepared in 1987-1988 and provincial species statements completed in 1979-1980 will be updated in 1989-1990.

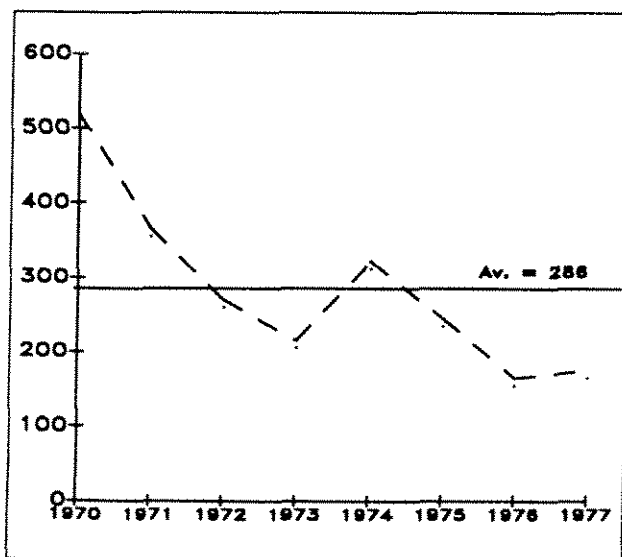


Fig. 2. The estimated resident and non-resident cougar harvest prior to compulsory inspection.

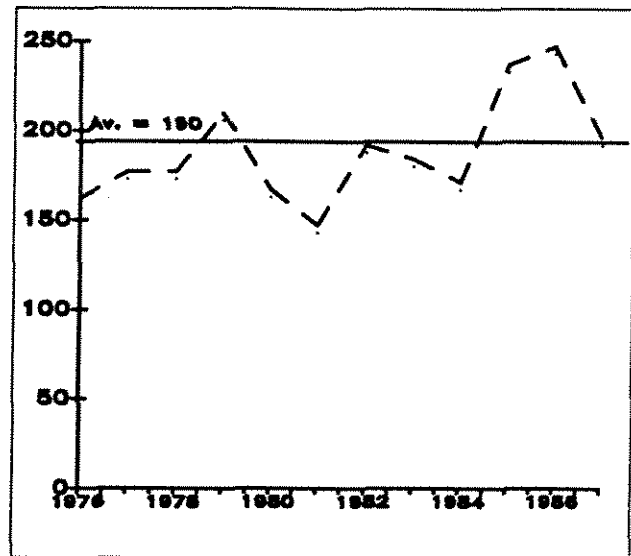


Fig. 3. The number of man caused cougar mortalities (resident and non-resident harvest and problem cougar) during the compulsory inspection period.

HARVEST

The average cougar harvest in B. C. has declined from 530/year during the bounty era to about 190 during the period of compulsory inspection (1976-1988). Between 1957 and 1970 when a species tag was introduced, harvest records for cougar were poor or non-existent. Interestingly, initial attempts to quantify hunter harvest in the early 1970's using the hunter sample, indicated a relatively high hunter harvest in 1970 which declined throughout the 1970's. Although each individual estimate for the early years may have wide confidence limits, the decline is probably significant, producing an average cougar kill approximately half that of the bounty years. During the period of compulsory inspection (1976-1988) (Figure 2), the average harvest (all sources: resident and non-resident harvest, problem animal, random kill) declined 34% to 190. The cougar harvest appeared relatively stable between 1976 and 1984. Mild winters have prevailed throughout B.C. since the mid to late 1970's, with resulting improvement in prey species populations. The increase in cougar harvest between 1985 and 1988, along with increased sightings, problem animals, and general activity suggests that the cougar population is increasing in response to these events.

During the period of compulsory inspection, approximately 151 cougar/yr or 80% of the annual average (190) were killed by resident and nonresident hunters. The total kill for the 12 year period was comprised of 56.3% males and 43.5% females. Resident hunters harvested 82% while non-resident hunters harvested 18%.

With a 6-10% harvest rate, the current proportion of females in the harvest is of some concern. The highest annual harvest in the province occurs in Region I (Vancouver Island - 35/yr), Region IV (East Kootenay - 35/yr)

Table 3. Change in the male harvest during regulation changes in the 12 year compulsory inspection record.

Year	Percent males in harvest	
	Region 4	Region 8
1976-78	59.7	61.4
1978-81	62.6	58.5
1982-84	62.3	70.7
1985-87	61.5	64.8

and Region VIII (Okanagan - 34/yr). Analysis of these data indicate that the female harvest may only vary from 30% to 49%; the resident contribution to this harvest may vary from 46% to 97%. Thus there appears to be only a slight relationship between the proportion of females in the harvest and the contribution of resident harvest pressure, on a provincial basis. The restrictive regulations in Region IV may reduce this relationship due to the protective measures imposed on the female cougar harvest. The three year male harvest averages (Table 3) were calculated for the 12 year compulsory inspection period. There appears to be no increase in the male harvest due to restrictive female harvest regulations.

**SUPPLY**

The provincial cougar population has been estimated qualitatively several times during the past decade and the initial estimate of 2,660 in 1978 (Table 4) was based on three levels of map based densities. Subsequently, subjective estimates of 3,300 and 2,800 were produced in a provincial species statement in 1980 and as a result of a summary of regional species statements in 1988. The estimated harvest rate of 6-10% requires minimum popula-

Table 4. Estimates of cougar population in British Columbia

1. Mapped Density	= 1978
Low Density	= 1/100-150 mi <sup>2</sup> (259-388 km <sup>2</sup> )
Area	= 151,019 mi <sup>2</sup> (391,139 Km <sup>2</sup> )
Max.	= 1,510
Min.	= 302
Aug.	= 906
Moderate	= 1/25-100mi <sup>2</sup> (65-259km <sup>2</sup> )
Area	= 54,493 mi <sup>2</sup> (141,137km <sup>2</sup> )
Max.	= 2,180
Min.	= 545
Aug.	= 1,362
Plentiful	= 1/25mi <sup>2</sup> (65km <sup>2</sup> )
Area	= 9,792mi <sup>2</sup> (25,361km <sup>2</sup> )
Min	= 392
Total:	= 2,660
2. Species Management Plan Estimate - 1980	3,300
3. Regional Management Plan Estimates- 1988	2,800

tions of about 3,166 cougar to sustain average harvests during the compulsory inspection period.

Due to the lengthy sequence of mild winters and increasing prey populations it appears that the provincial cougar population is currently stable or increasing. If the increased cougar harvest of the past three years is a significant indicator, harvest based calculations of population level suggest that there may be a minimum provincial population of 2,280-3,800 cougar.

**HABITAT**

Due to the extensive distribution of cougar throughout the diversity of habitats of North America, there appears to be few specific or critical habitat requirements for this species. In general, the protection, management and enhancement of prey habitat and populations is the main sustaining factor for cougar populations in B.C. and probably throughout North America.

**RESEARCH**

In British Columbia, cougar research has been secondary to most other wildlife management programs in the province. An initial research program on Vancouver Island (Dewar & Dewar 1976) was underfunded, lacked coordination and support by the necessary agencies, and did not produce a final report. More recently, a cougar research program in the East Kootenay Region of B.C. provided information on home range, movements and population dynamics of a cougar population in the Elk Valley (Spreadmore 1988). Similarly cougar research on the Junction Wildlife Management area in the Caribou Sub-region in Central B.C. provided information on home range, movements, seasonal prey selectivity and an approximation of predation rates (Harrison & Hebert 1988).

**DISCUSSION**

Sustainable populations and subsequent harvests of cougar have been maintained in B.C. for approximately 90 years. During that time average harvests have been as high as 530/yr during the bounty years to as low as 190/yr during the current decade. Following the cessation of the bounty, it is likely that the cougar population was at a moderate to low density. At the same time, increasing industrial development, moderate to severe winters, and some overharvest of prey populations served to reduce or limit prey populations and the resultant food supply for cougar. Although cougar management status and programs improved throughout the 1970's and 1980's the cougar population is only now responding to these changes and to the recent mild winters and increased prey populations. If habitat protection and wildlife management programs and mild winters can maintain prey population status, the management regimes currently in place for cougar should benefit and maintain cougar populations throughout the next decade.

## STATUS REPORTS

As is common elsewhere, most estimates of cougar populations are subjective evaluations. British Columbia has not undertaken track transects as a population inventory method nor has it attempted any other quantitative inventory method for cougar. Compulsory inspection and harvest records have served as the main indicator of supply, along with other reports of tracks, sign and sightings. Research programs to date have provided quantitative supply and density estimates for very small, specific areas of the province and are not suitable for extrapolating population estimates.

The attitude toward the cougar has improved tremendously during the last two decades, as witnessed by the significant changes in the regulations governing their status and harvest.

# The Status of Mountain Lions In California

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## INTRODUCTION

Mountain lions (*Felis concolor*) are widely distributed in California. They occupy approximately 80,000 square miles of habitat. Information from field studies indicates that all suitable habitat currently supports mountain lions, although densities vary. The most common element of lion habitat is the presence of mule deer (*Odocoileus hemionus*). Habitat loss in portions of the State is of concern for both mountain lions and their prey species. Lions are economically important in California because of damage to livestock, conflicts with other intensively managed wildlife species and costs associated with State-mandated property damage control programs. The species is socially and politically important, since public attitudes towards lions are often emotional and highly polarized. Historically, politics, more so than biological data, have played the major role in guiding laws and policies governing mountain lion management. Since the early 1960s, public concern for the welfare of lions has resulted in very specific and controversial laws which have not resolved lion management concerns.

Prior to the early 1900s, the mountain lion had no specific legal designation. In 1907, primarily as a result of conflicts with livestock production, the mountain lion was classified by the Legislature as a bountied predator. The bounty system continued until 1963, when it was eliminated based on concern for the program's cost effectiveness. Records indicate that over 12,500 lions were taken during the 56-year program (annual average = 223). In 1963, the lion was designated a nongame mammal. Concern for appropriate measures of protection for mountain lions, as well as the intent to manage the species in conjunction with regulated hunting and livestock damage control, resulted in a proposal similar to programs used in other western states being developed in the mid 1960s. In 1969, the Legislature responded by designating the mountain lion as a game mammal. The Fish and Game Commission was specifically authorized to regulate the take of the species.

In 1972, following only 2 years of regulated sport hunting, during which 4,953 tags were sold and 118 mountain lions were taken, the Legislature enacted the first of a series of laws that created a moratorium on lion hunting. It lasted until 1986, when intense political pressure by groups and individuals interested in preventing sport hunting of lions failed to extend the specially protected mammal status of the mountain lion. Based on a

return to the specific statutory authority which existed prior to 1972, the Department of Fish and Game proposed and the Fish and Game Commission adopted limited sport hunting regulations for mountain lions in 1987 and 1988. In both years, these regulations were challenged in court based on procedural questions related to compliance with the California Environmental Quality Act (CEQA). Court action prevented implementing the subject regulations, and the case is currently being appealed.

## CURRENT STATUS

### Population Levels

The Department of Fish and Game has produced a series of historical population estimates based primarily on opinion of field personnel and analysis of information and data from field studies available at the time. They include: (1) 600 in 1920 (California Department of Fish and Game files); (2) 2,400 in 1972 (Sitton 1973); (3) 2,400-3,000 in 1982 (Weaver 1982); and (4) 4,100-5,700 in 1984 (California Department of Fish and Game 1984). In addition, Koford (1977) estimated the statewide population to be approximately 1,000 animals during the period

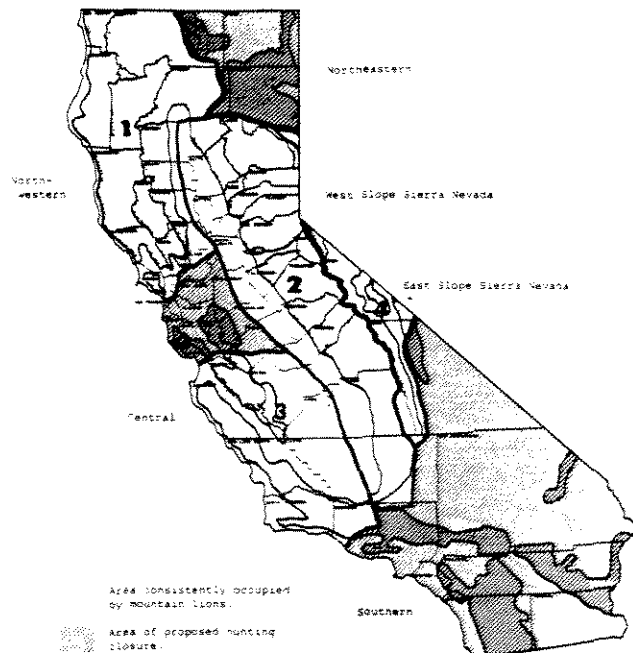


Fig. 1. Mountain range and Management Zones.

1973-1976, based on track surveys and the assumption that lions were resident in only 15,000 square miles of habitat. With the exception of the 1984 estimate, a review of results of intensive field studies suggests that these estimates were probably low (Sitton and Wallen 1976, Weaver 1982).

The best estimate of the 1988 minimum statewide mountain lion population was 5,100. This estimate is based on a minimum area of occupied range of 80,000 square miles (Fig. 1). Lion densities range from less than one per 100 square miles in southeastern deserts to more than 10 per 100 square miles in portions of the west slope of the Sierra Nevada. The higher densities are based on long-term studies using lions captured and fitted with radio telemetry collars. Table 1 provides a summary of mountain lion densities in major ecological regions of the State where intensive field studies were conducted.

**Distribution**

Mountain lions use a wide variety of habitat types in California. They are found from sea level to above 10,000 feet in elevation. The minimum area of occupied mountain lion range was estimated as 80,000 square miles using the results of field studies, verified lion sightings and location of confirmed lion damage to livestock, as well as knowledge of lion habitat requirements. In 1988, the minimum number of adult lions present in major ecological regions was estimated and used as a basis for evaluating a proposed hunting regulation (Table 1). Recent field studies have resulted in increasing the estimated area of occupied range from 70,000 square miles in 1986 (Mansfield 1986) to 80,000 square miles in 1988. This increased estimate reflects an apparent expansion of occupied range, as well as increased and improved survey efforts in recent years. However, some lion habitat is being lost to incompatible land use changes.

Table 1. Mountain lion densities and average number of adult lions estimated in four areas of California in 1988.

	North West	W.Slope Sierras	Central	E.Slope Sierras
Estimated mi <sup>2</sup> of lion range available for hunting	18,612	16,212	7,853	4,230
Adult lion density per 100 mi	6-9	5-10	5-7	3-6
Min. av. adult lions present on range available to hunting	1,116	810	395	126

**MANAGEMENT PROGRAMS**

Since January 1, 1986 mountain lions have been classified as game mammals. State law authorizes the Fish and Game Commission to regulate their take. However, no sport hunting season has been held since 1972. The Department has intensively studied mountain lions since the early 1970s. Field work has been conducted by Department personnel, as well as colleges and universities under specific contracts (Sitton and Wallen 1976, Weaver 1982). Early efforts involved both habitat and population surveys relying on locating lion tracks and other signs of their presence. During the mid 1970s, radio telemetry techniques were applied in a pilot project in Monterey County, which initiated the Department's capture and marking program. A summary of current research efforts is reported in the research section of this paper.

The long-term goals for mountain lions in California are: (1) maintain California's mountain lion populations in a healthy, self-sustaining condition for the future; (2) protect important habitat for the mountain lion and its primary prey, mule deer; (3) manage the mountain lion resource to maximize public benefits and minimize problems and conflicts by recognizing its ecological role and values for both consumptive (sport hunting) and non-consumptive (photography, nature study, etc.) uses, as well as its potential to inflict damage on private property, to limit other managed wildlife and to pose a threat to human safety; (4) establish a long-term mountain lion management program which is generally understood by the public and is based on sound biological information obtained through a practical population monitoring system designed to detect differences in regional populations; and (5) develop and implement appropriate research and monitoring programs to effectively manage the mountain lion as a valuable game mammal. These goals provide basic guidance for the Department's mountain lion management program.

With approximately 50 percent of the State in public ownership, interagency coordination is an important aspect of mountain lion management in California. Cooperative efforts in Department programs have involved the Forest Service, Bureau of Land Management, National Park Service, Department of Defense and Animal Damage Control within the federal government, as well as the departments of Food and Agriculture and Parks and Recreations within State government. Activities include joint efforts to study lion populations, cooperative efforts to control property damage caused by lions and programs to address public safety concerns related to lions.

Since 1971, the Department has attempted to record confirmed mountain lion damage incidents and the number of lions taken under depredation permits. Pursuant to regulations adopted by the Fish and Game Commission, which supersede more liberal provisions in law, Department personnel investigate each incident within 48 hours. No compensation is provided for property damaged by

mountain lions. The emphasis is placed on selectively taking offending animals. The subject regulations provide the following: (1) any lion encountered in the act of injuring, molesting or killing livestock or domestic animals may be taken immediately subject to a report to the Department; (2) the Department may orally authorize the take of a lion if immediate action will assist in taking the lion believed to be responsible; (3) lions may be taken in any manner specified in the permit issued by the Department, except that no poison may be used; (4) both males and females may be taken, regardless of hours; (5) permits are nontransferable, but they may include a designee to take the lion for the actual permittee; (6) all lions taken under permit must be tagged and a report card mailed to the Department within five days; (7) the lion carcass must be provided to the Department within five days, and becomes the property of the State; and (8) permits are valid for at least 15 days, and they may be renewed by the Department.

Since 1971, the number of lions killed under depredation permits has tended to double every five years (Figure 2). During the period 1971-1974, an average of 13 depredation permits were issued, and 4 lions were taken annually. In contrast, during the period 1984-1987, an average of 117 permits were issued and 48 lions were taken annually. Although most property damage involves livestock (sheep, goats and cattle), domestic pets (dogs and cats) are also taken by mountain lions. Confirmed lion damage has been documented throughout much of the occupied lion range in California.

The Department and segments of the public are concerned about actual and potential loss and degradation of habitat for mountain lions and their primary prey, mule deer. Special efforts have been made to identify important

habitat for the State's 104 deer herds. Recommendations regarding land use planning are made to local, State and federal agencies in a direct effort to prevent the loss of habitat for mountain lions and deer. Maps of important deer ranges have been provided to all county land use planning agencies in an effort to prevent the incompatible development of deer and lion habitat.

Another aspect of public concern related to mountain lions involves their role as a major predator of other intensively managed wildlife species. Mountain lion predation on deer, elk and bighorn sheep is of special concern. Segments of the hunting public contend that lion predation on some popular deer herds is preventing those herds from reaching management objectives. Lion predation on recently reintroduced bighorn sheep populations has been documented as a major source of mortality. It may prevent some populations from increasing to sustainable levels. Cooperating land management and natural resource agencies are concerned that lion predation may limit the potential to expand populations of threatened California bighorn sheep, which have been reintroduced at substantial cost to the public.

## RESEARCH

Recent research efforts on mountain lions have been directed to documenting the status of representative populations and their trends in major ecological regions of the State. Intensive efforts involving a total of over 75 radio-collared lions produced basic information on area of occupied range, minimum population densities, birth rates, mortality factors, diseases and parasites, as well as lion-prey interactions and lion use of specific habitat types. Capture and marking studies are on-going in Fresno, Kern, Mono, Monterey, Orange, Placer, San Diego, Santa Clara and Sierra counties. Topics being investigated include long-term lion population trends, the influence of lion predation on selected deer and bighorn sheep populations, home range overlap between individual lions, methods of estimating lion population densities, habitat use by lions and factors contributing to lion depredation on livestock.

In addition, a cooperative study involving the Department, Orange County and the University of California, Berkeley, was initiated in 1988 in response to concerns for public safety in local wilderness parks following two incidents where children were seriously injured by mountain lions. This project is intended to provide basic ecological information related to lions and the environment on and adjacent to park facilities in Orange County. The information obtained over a two-year period will be applied to administering wilderness park use in the future.

In 1985, the Department developed a management plan for the Foresthill Divide area of Placer County, which had a history of livestock damage resulting from mountain lions which had not been controlled by taking the offending animals on depredation permits. The State law in effect at the time specifically authorized the Fish and Game Commission to approve the plan and the

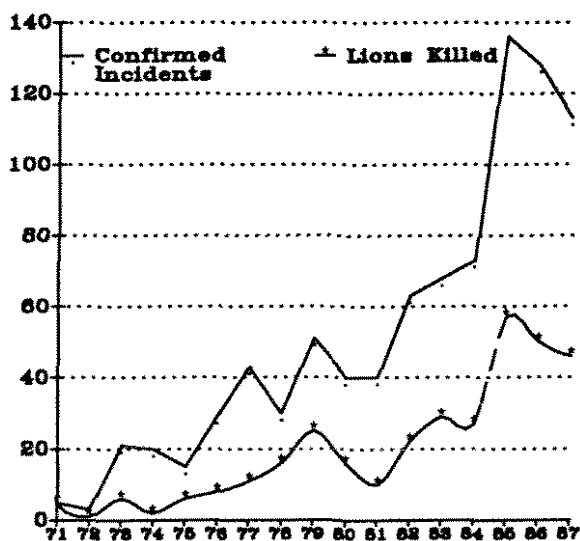


Fig. 2. Confirmed number of livestock damage incidents and mountain lions killed in California during the period 1971 through 1987.

Department to implement it with the objective of alleviating damage to livestock while maintaining a viable mountain lion population. This plan proposed the taking of up to five lions from the 130 square mile area under an applied research program which monitored the lion population. Emphasis was placed on removal of mature male lions which occupied areas used by sheep during a 90-day summer grazing period. In 1985, four mature male lions were taken prior to damage occurring, and one mature female was taken on a depredation permit following confirmed damage to six sheep in a single incident. In 1986, no lions were taken under the plan, and one radio-collared female was taken on a depredation permit after she had killed a single sheep.

The proposed five-year applied research project was halted in 1987 by a court order, based on the expiration of specific statutory authority in 1986. The action was filed by a group of local citizens opposed to the take of mountain lions. The project was effective in meeting its goal of reducing livestock damage by at least 50 percent. In the 4 years (1981-1984) prior to implementation of the plan, an average of over 33 sheep was lost annually to lion damage in the area. During the 2 years in which the plan was implemented and during the following year (1987), summer lion population estimates ranged from 24-27 individuals using the 130 square mile area.

A host of other questions and concerns related to mountain lions have been identified, but not yet scientifically evaluated. They include the potential for regulated sport hunting of lions to reduce mountain lion conflicts with livestock damage and other intensively managed wildlife, effects of specific land use changes on lion populations adjacent to urban areas, lion-prey relationships in areas where the reintroduction of native ungulates has expanded the prey base and their seasonal distribution within lion habitat, as well as the basis for some lion populations to be made up of both resident and migratory individuals. Although a mountain lion population model has been developed (Barrett 1987), it requires validation with additional empirical data from both hunted and unhunted populations.

### ECONOMIC VALUES

Since lions have not been legally hunted since 1972, no recent data are available for the economic value of this potential consumptive use. In 1988, the Fish and Game Commission authorized a limited hunting season with a total of 190 permits in 4 large areas of the State. However, the proposed season was invalidated by court action. It would be reasonable to apply economic values from adjacent states to estimate the potential value of sport hunting in California with a biologically conservative proposal of issuing 190 permits, which would result in an expected take of 20-60 lions.

The economic value of livestock and domestic pet losses resulting from mountain lion damage has not been specifically documented. In recent years, the average annual number of confirmed lion damage incidents was

117. This is a minimum indicator, since a substantial number of incidents are not reported or are investigated after conclusive evidence of lion involvement is no longer obvious due to scavengers or other factors. In addition, the majority of lion damage complaints, as well as lions taken under depredation permits, involve counties which are covered under cooperative State and federal animal damage control programs, which result in a higher level of awareness in those counties. The fact that as many as 66 sheep have been verified as killed by a single lion is one incident indicating that the economic impact to a given livestock producer may be great. Further analysis of the economics of lion damage to private property in California is warranted.

The most obvious nonconsumptive use of mountain lions in California is the pursuit activities authorized by Fish and Game Commission regulation. It involves the ability to pursue mountain lions under a permit so long as the animals are not killed or injured. Permits are valid for a 138-day winter period. On the average, from 80-112 individuals have been issued these permits in recent years. Both professional and amateur photographers are often involved in these pursuit only activities. No specific analyses have been developed to estimate the value of the recreational use of the lion resource.

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# Status of the Mountain Lion in Colorado

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## INTRODUCTION

Historically, mountain lions were most common west of the Continental Divide, but also occurred on the eastern slope of the Rocky Mountains and along the major drainages east to Kansas (Young 1946:16). Eastern slope populations were greatly reduced during the early period of settlement. But around 1900 portions of western Colorado were considered to support the "best populations of mountain lions in the United States" (Armstrong 1972:295). A 227 pound male mountain lion killed by President Theodore Roosevelt in 1901 near Meeker, Colorado remains among the heaviest mountain lions recorded from North America (Young 1946; Anderson 1983). Statewide, mountain lion numbers were believed to have declined since the early 1900's (Armstrong 1972). In 1967, the mountain lion population was characterized as low but stable (Colo. Division of Wildlife 1969).

## CURRENT STATUS

There are no reliable estimates of the total number of mountain lions currently within Colorado. Early estimates ranged from 613 - 726 (Sandfort And Tully 1971:75) To 1,100 - 1,500 lions (Currier 1976:48). Currently, most in-

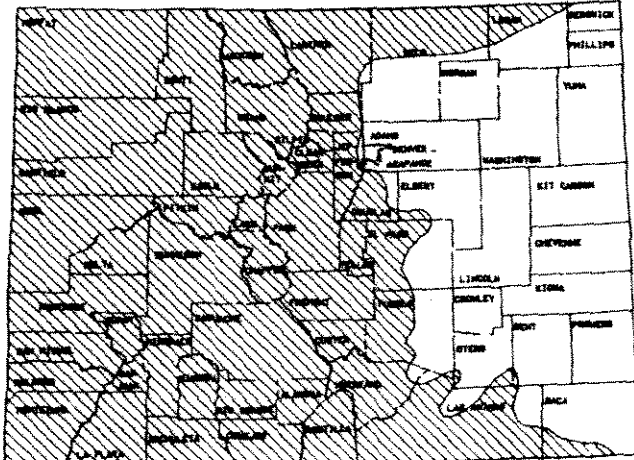


Fig. 1. Stippled area approximates distribution of mountain lion in Colorado. Modified from Sandfort and Tully (1971).

formed opinion, both within the Division of Wildlife and among guides and outfitters holds that mountain lion are increasing statewide. A 1970 approximation of mountain lion distribution included about 66,425 square miles. A 1989 approximation (Fig. 1) included 70,654 square miles or about 67 percent of the total area of Colorado.

## MANAGEMENT PROGRAMS

**Laws And Regulations.** Season dates, manner of take, hunting laws, bag limits, use of dogs and related sport harvest regulations are established annually each spring by the Colorado Wildlife Commission, an eight-member policy and rule-making body for the Division appointed for a four-year term by the Governor.

The current 1988-1989 mountain lion season is nearly identical to that of the past five years; May 1, 1988 through August 12, 1988 and November 15, 1988 through April 30, 1989. A harvest quota system provides nearly unlimited recreational opportunity, but places a maximum limit on the number of mountain lion that may be taken in any Game Management Unit (GMU) or combination of Units. Quotas, which vary from 1 to 30 mountain lions are established in about sixty GMU's. The total harvest quota for 1988 was 334 mountain lion. After obtaining a license, the license holder is required to obtain a free hunting permit valid for up to seven different GMU's. Successful hunters must present the carcass to the Division for inspection and legal seal attachment to the hide or head within 48 hours of take.

As the season progresses, a record of harvest is maintained by GMU, and when the harvest quota is achieved in any GMU, permit issuance is terminated. Permit issuers in that area are notified by telephone that the harvest quota has been reached and that the GMU is closed to further hunting. The hunter may then receive a permit for another open GMU.

Mountain lions of either sex may be taken one-half hour before sunset to one-half hour after sunset by any firearm, crossbow or standard archery equipment. Baiting is permitted but seldom used as most successful persons hunt with the aid of dogs, often using the services of a licensed guide or outfitter. No kittens or mountain lion ac-

## STATUS REPORTS

Table 1. Number of mountain lion reported killed in Colorado, 1916-1965. Modified from Table 1 in Sandfort and Tully (1971).

Years	Div. of Wildlife Services, FWS (a)	Bountied (b)	Licensed Hunters	Av. All Rep. Harvests
1916-1919	35	--	--	11.7
1920-1929	58	15	--	7.3
1930-1939	13	563	--	57.6
1940-1949	34	84(c)	--	11.8
1950-1959	117	503	--	62.0
Totals	257	1165		
1960	6	31	--	37
1961	13	38	--	51
1962	7	34	--	41
1963	12	45	--	57
1964	2	79	--	81
1965	5	64(d)	17(e)	86
Totals	45	291	17	353

(a) Division of Wildlife Services, USF&WS reports based on fiscal year. Data derived from fiscal year reports originating with July 1 for years and periods shown.

(b) Bounties on fiscal year basis.

(c) Data for 1941, 1942, 1943, and part of 1944 incomplete. It is believed the take and bountied numbers were much higher than herein reported.

(d) Bounty law repealed and no bounties paid after June 30, 1965.

(e) Animals taken by holders of mountain lion licenses during the open season extending from October through December 31, 1965.

compared by a kitten may be taken. The mountain lion is the only big game species that does not need to be prepared and used for human consumption.

**Harvests.** Prior to July 1, 1965, the mountain lion was classified as a predator and carried a bounty from 1929 through June 30, 1965. Legislative removal of the bounty and establishment of the mountain lion as a protected big game species, effective July 1, 1965, was followed by Colorado Wildlife Commission annual regulations setting forth bag limits, open areas, season dates and the manner in which the species could be taken by sport hunting. Trapping has not been permitted since 1965, except by Division, USFWS or USDA, Animal, Plant and Health Inspection Service (APHIS) employees in damage control efforts. Minimal numbers of lion killed by federal, State, and private entities from 1916 to 1965 totaled 1,775 (Table 1).

From 1966 to 1987, 4,974 licenses were purchased and a minimum of 1,831 mountain lion were killed by 3,674 sport hunters (Table 2). Percent success during the 1973-1987 period ranged from 28 to 48 percent. A 3-year moving average plot of total harvest and total hunters over time shows a marked increase in both hunters and total harvest from 1973 to 1987 (Figure 2). The upward trend of hunters and harvest, 1973-1980, accelerated in 1980 with the advent of either-sex harvest regulations

Table 2. Mountain lion harvest, hunters, license sales, percent success and recreation days, 1966-1987.

Year	Sportsmen's Harvest (a)				No. Hunters	% (b) Success	Total (c) Licenses	Rec. Days
	Male	Female	Unkn	Total				
1966	?	?	--	47	unk	-	121	unk
1967	?	?	-	58	unk	-	102	unk
1968	16	4	30	50	unk	-	30	unk
1969	31	25	-	56	480	-	36	unk
1970	30	17	-	47	unk	-	30	unk
1971	19	10	-	29	unk	-	36	unk
1972	29	6	-	35	unk	-	72	unk
1973	33	27	-	60	115	52	115	584
1974	27	25	-	52	185	28	185	1314
1975	47	43	-	90	143	63	143	1016
1976	44	21	-	65	152	43	174	1062
1977	44	39	-	83	195	43	225	1331
1978	48	43	--	91	243	37	285	1660
1979	49	25	-	74	209	35	264	1425
1980	41	41	-	82	200	41	280	1565
1981	67	40	-	107	248	43	352	1824
1982	77	60	-	137	327	42	410	2363
1983	69	56	-	125	362	34	453	2606
1984	55	48	-	103	257	40	359	1742
1985	101	54	-	155	363	43	460	2614
1986	61	44	-	105	310	34	386	2232
1987	125	55	-	180	365	48	456	2627
Totals	1013	683	30	1831	3674	-	4974	-

(a) Does not include 92 lions taken by Division, USF&WS, or private individuals under damage control. Harvest regulations were: 1965, 1 lion, either sex; 1966, 3 lions, es; 1967-1970, 1 lion es; all within specified Game Management Units (GMU) and seasons except during 1966 which was statewide and year long; 1971-79, males-only or es within specified GMU and seasons; 1980-87, es in all specified GMU and seasons. Harvest data from mandatory check and independent survey.

(b) Percent success is the harvest divided by number of hunters.

(c) During the period 1967 through 1975, the Division issued a Sportsman's License at \$30.00 for a resident and \$135.00 for a nonresident. This permitted fishing, small game hunting and the taking of deer, elk, black bear and mountain lion on one license with several carcass tags. Data for 1973 through 1975 includes both regular mountain lion license and sportsman's license holders who utilized the mountain lion tag.

statewide, increased kill quotas within many GMU, and an increase in the number of GMU's hunted.

From 1971 to 1979, males predominated in the total harvest, when the kill was limited to male mountain lion on some GMU and either-sex on others, and from 1980 to 1987 when an either-sex regulation applied to all GMU. During the latter period, significantly more males (Chi-square = 39.44,  $P < 0.001$ ) were reported. This differs from harvest sex ratios in other states which generally did not differ ( $P > 0.05$ ) from equality (Anderson 1983:58).

**Long-Term Management Plans.** The past long range or strategic plans of the Division (dated 1974, 1977 and 1983) as well as the draft plan under consideration in 1988 have the same statewide objectives. Those include:

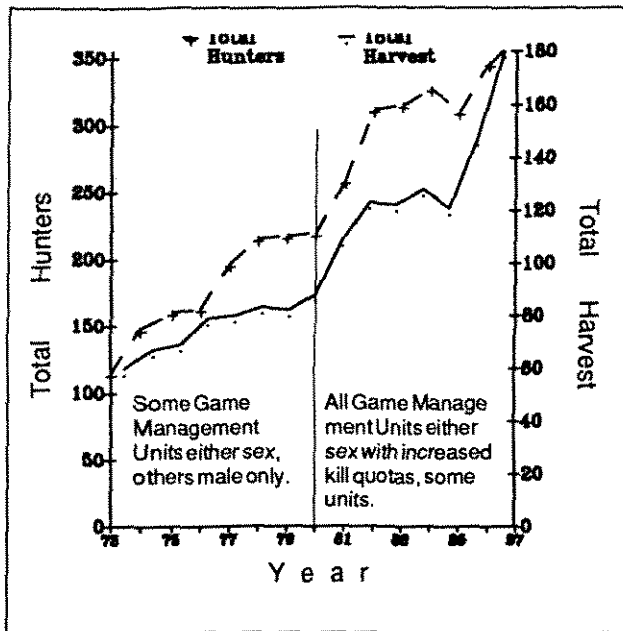


Fig. 2. Three year moving average of mountain lion hunters and harvest in Colorado. Data are from mandatory check and independent survey, 1973-87.

(1) maintain about the same mountain lion population level, (2) increase the number of sport hunters, and (3) provide for an increase in lion harvest.

Management strategies include: (1) maintaining optimum recreational opportunity and maintenance of the population through a controlled harvest quota system by area, (2) reduce damage to livestock by selective removal of problem lions using sport harvest where possible, and (3) inform the public about mountain lion biology, the value of the mountain lion and harvest opportunities compatible with resource capabilities. Continue management and research programs to improve knowledge and management of the species as a harvestable big game resource.

**Depredation.** The state of Colorado became liable for damage to real or personal property caused by mountain lion in July, 1965, when the species was defined as big game. Any person owning property may file a claim for reimbursement with the Colorado Division of Wildlife. A claimant is required to notify the Division of damage within 10 days of discovery so that preventative efforts can be initiated, where possible. This initial notification, which is usually immediate and verbal, must include the location, type, estimated amount of damage, and the date such loss was discovered. A written notice, which is generally submitted at both the start and the end of the damage period, is also required. A proof of loss or affidavit certifying the type, extent and value of damage must be filed on forms provided by the Division within 90 days after the last notice of damage is submitted.

By law it is the claimant's responsibility to prove that he/she suffered damages to the real or personal property designated, and that such damage was caused by moun-

tain lion and the dollar value is equal to the actual value of the property at the time and place of loss as set forth in the claim. The Division pays the claim after an investigation by the Division to determine the cause of injury, damage, or death of livestock and verification of its value. In the case of lambs, the value is based on the market value of the lamb. When a claim cannot be agreed upon, or it is recommended for denial, the claimant is so notified by certified mail with the reason(s) for such recommendation and offered an opportunity to provide additional information at a regularly scheduled Wildlife Commission meeting when claims are considered.

If a settlement offer is not accepted, or if the Commission denies a claim, the claimant may within 60 days file an action for damages and review of the Division's decision in the district court of the judicial district in which the damage is alleged to have occurred. Claims are denied for the following reasons: (1) damage was caused by species other than mountain lion, bear or other big game, (2) no proof or tangible evidence of damage, (3) lack of 10-day notification of damage, (4) submission of claims over 90 days from the occurrence or last notice of damage, (5) no hunting is allowed, or there is an unreasonable restriction on hunting or access, (6) claimant charges a fee in excess of \$25.00 per person, per season, for hunting or access, (7) claimant has refused to accept or use prevention efforts furnished by the Division.

Damage prevention efforts are normally regulated through sport hunting. Under a cooperative agreement with the APHIS, (previously USFWS), depredating lions are taken through the use of steel traps, snares, or with the aid of dogs.

The first claim of \$390.00 for loss of sheep was paid on July 5, 1965. The highest single claim paid was approximately \$10,000.00 for loss of sheep during 1979-1980. At the present time, however, a claim for \$32,000 is pending. In that case, between 350 and 400 sheep were injured or killed by mountain lions during a two-week period in the summer of 1988 in northwestern Colorado. The Division verified \$20,000 in loss and is negotiating the remaining \$12,000. Five lions were taken immediately from 7 known to be present.

**Interagency Coordination.** Other than the damage control efforts planned and carried out with the State Department of Agriculture and the USDA, APHIS and described under "Depredation", there are no special planning efforts with land management agencies or private landowners. Mountain lions are occasionally noted and potential impacts mentioned in required environmental assessments and environmental impact statements especially those related to water projects, transportation, and energy or industrial development. Mitigation for impacts have not been required for any project we are aware of. In a limited number of cases, mountain lion have been considered during land use planning activities by state and county planning and zoning officials.

**Table 3. Claim payments due to damage by mountain lion, 1965-1988.**

Year	No. of Claims	Payment <sup>a</sup>	Average
1965-66	10	\$2,860.00	286.00
1966-67	4	--	0
1967-68	0	--	0
1968-69	4	12,646.44	4,161.41
1969-70	9	5,817.00	646.33
1970-71	5	2,475.00	495.00
1971-72	5	2,748.31	549.66
1972-73	9	3,223.86	358.21
1973-74	11	4,897.34	445.21
1974-75	4	3,498.27	874.57
1975-76	3	2,310.00	770.00
1976-77	6	3,704.00	617.33
1977-78	6	2,396.75	399.46
1978-79	1	225.00	225.00
1979-80	8	22,492.26	2,811.53
1980-81	13	8,928.45	686.80
1981-82	13	13,567.98	1,043.69
1982-83	16	10,917.54	682.34
1983-84	20	17,662.38	883.11
1984-85	17	9,476.94	557.47
1985-86	15	10,515.84	701.06
1986-87	22	22,137.45	1,006.25
1987-88	40	34,245.98	856.15
Totals	241	\$296,746.79	\$ 816.38

(a) Two claims totalling \$24,210 were settled for \$10,390 by arbitration in 1968-1969.

**RESEARCH**

Sheriff (1978) developed a population model which appeared to simulate an actual mountain lion population. Currier (1979) developed 2 (male-female) regression equations using selected physiological and morphological variables to predict age of individual mountain lions. Their usefulness was limited by very low precision. Currier and Russell (1982) described the hematology and blood chemistry of wild and captive mountain lions. Currier et al. (1977) described some population characteristics and the harvest of one mountain lion population. They estimated size of that population using a mark-recapture method but without aid of radio telemetry. Anderson (1983) and Currier (1983) reviewed the literature on mountain lion through about mid-1982. Anderson (1988) made an unsuccessful attempt to assess the effects of sport hunting on a southwestern Colorado population, 1981-88. In that study 57 mountain lions were handled and 49 radio collared animals were aerially located at approximate weekly intervals. Seven resident males and 9 residents females were radio tracked for periods ranging from one to about seven years per individual. Analyses of home range dynamics, survival rates and social interactions are in process.

**Table 4. Mountain lion hunting license revenues and damage claim payments compiled from Colo. Div. Wildlife. files.**

Year	Licenses Sold	License Revenues <sup>a</sup>	Damage Claim Pmts.
1976 <sup>a</sup>	resident 127	\$3,175	\$3,704.00
	nonres. 47	9,400	
	174	12,575	
1977	resident 163	4,075	2,396.75
	nonres. 62	12,400	
	225	16,475	
1978	resident 220	5,500	225.00
	nonres. 80	16,000	
	300	21,500	
1979	reside 191	4,775	22,492.26
	nonres. 73	10,950	
	264	15,725	
1980	resident 225	4,500	8,928.45
	nonres. 55	8,250	
	280	12,750	
1981	resident 280	5,600	13,567.98
	nonres. 72	10,800	
	352	16,400	
1982	resident 320	6,400	10,917.54
	nonres. 90	13,500	
	410	19,900	
1983	resident 350	7,000	17,662.38
	nonres. 103	15,450	
	453	22,450	
1984	resident 268	8,576	9,476.94
	nonres. 91	16,835	
	359	25,411	
1985	resident 336	10,752	10,515.84
	nonres. 124	22,940	
	460	33,692	
1986	resident 317	10,144	22,137.45
	nonres. 69	12,765	
	386	22,909	
1987	resident 334	10,688	34,245.98
	nonres. 121	22,385	
	455	33,073	
	Total residents 3,131	\$ 81,185	
	Total nonres. 987	171,675	
	4,118	\$252,860	\$156,270.57

(a) Effective 1976, non-resident fee increased from \$50 to \$200 and effective Jan. 1, 1979 non-resident fee decreased from \$200 to \$150.

**ECONOMIC VALUES**

From 1976 to 1987 there were marked increases in mountain lion hunting pressure and harvest (Figure 2),

number of damage claims and damage claim payments (Table 3). During that period, damage claim payments exceeded hunting license sale revenues during 1979 and 1987 and overall comprised about 62 percent of total hunting license sale revenues (Table 4). Nonresident hunting licenses included about 24 percent of the total number of licenses sold but accounted for about 68 percent of the total mountain lion hunting license revenues. The annual trend in the percentages of nonresident mountain lion hunting licenses sold was fairly constant; from 19.6 (1980) to 28.8 (1979) with fluctuations in hunting license costs apparently exerting little long-term effect on numbers of licenses sold (Table 4). Perhaps future damage claim payments may be partially offset by increasing nonresident mountain lion hunting license revenues. Increasing statewide harvest of mountain lion does not appear to be a feasible method of reducing damage claim payments statewide.

Currently, hunting licenses are available to residents (\$32.25) and non-residents (\$185.25) at license agents and Division offices throughout the state. Hunting permits, issued free of charge, are available only at Division offices.

Total benefits to the state's economy from direct and indirect expenditures by hunters are estimated to be approximately \$520,000 annually. This figure is based on an average expenditure of \$1,500 per hunter using the last 3-year average of 346 hunters spending about \$212.00 per day over 7.2 recreation days per person. Direct expenditures involve transportation, lodging, meals, guide and outfitting services, hunting dogs and other normal hunting expenses (unpublished data, Colo. Div. Wildl. 1988).

Public interest is relatively high, with numerous inquiries regarding the status, harvest and interesting facts about the mountain lion. Non-consumptive observation, photography or other beneficial uses and enjoyment of this resource is nearly absent due to the nature and habits of this species.

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# Status of the Mountain Lion in New Mexico

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## INTRODUCTION

The present range of the mountain lion in New Mexico includes all areas of the state.

The mountain lion achieved protective status in 1971. Prior to this year the lion was classed as a predator and was unprotected.

In 1988 the New Mexico Game and Fish Department eliminated the last full time depredation officer position. Livestock depredation complaints involving mountain lions and bears are still handled by the Game and Fish by utilizing local houndsmen. Livestock operators that kill an offending animal are required to report the kill to the Game and Fish for verification of the action taken.

## POPULATION LEVELS

The approximate number of lions statewide is 2,000 (Evans 1982). This number fluctuates depending on the interest group you are talking to.

## MANAGEMENT

There are no specific surveys being conducted on mountain lions.

Mountain lion harvest information is collected by means of a pelt tag report. Hunters have five days after harvest or before leaving the state, whichever comes first, to have a hide tag placed on the animal by a Game and Fish officer. (Fig. 1). Lions taken on depredation complaints were also tagged (Fig. 2).

Season dates are currently open from December 1, 1988 through March 31, 1989 and have been a year long season in the past. Bag limit is one cougar. The killing of a female followed by kittens is illegal as is the killing of collared lions in Units 19 and 20.

The New Mexico Game Commission passed controversial commission Order No. 1-85 in January 1985 directing the Game Department to take up to 14 lions a year from five sheep ranches in Management Unit 30. In addition to this order, state law allows livestock owners to kill any lion that has killed livestock but must report such action to the Game Department. The Game Department

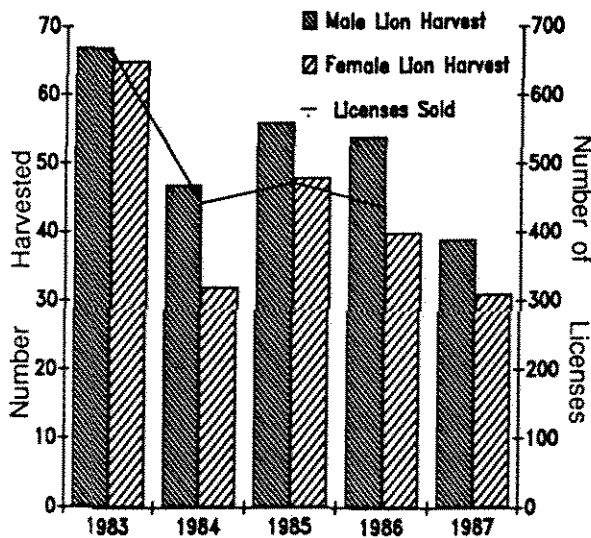


Fig. 1. Mountain lion harvest.

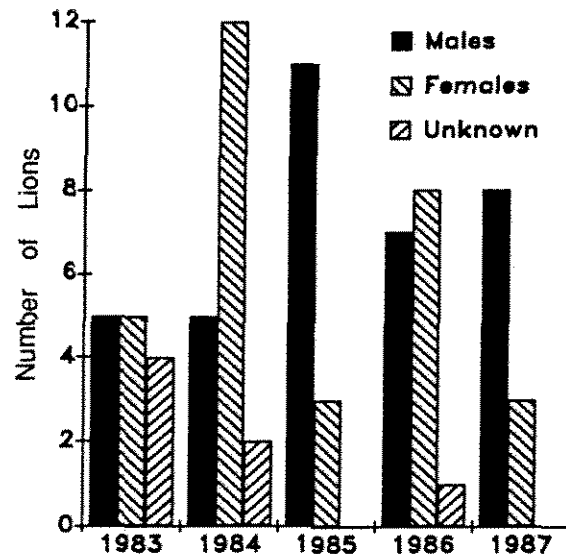


Fig. 2. Mountain lion depredation harvest.

also responded to depredation complaints with full time animal control officers.

As time passed the ranchers wanted more freedom to take lions, enlarge the area to take lions, and increase the number of lions to be taken in an effort to reduce the depredation on sheep. Each request for more freedom was met with equal resistance from animal rights groups to prevent additional control measures. Other groups and individuals also provided requests that varied from requesting the killing of all lions to providing complete protection. After many controversial and emotional meetings the Defenders of Wildlife along with three other organizations and two individuals brought suit against the Game Commission. The Commission was directed by court action not to liberalize the preventive control program. The Commission has not changed the current program, but has extended it until March 1992.

The Department has had two different full time animal control officers working prevention and depredation in Unit 30. Each worked for a year and then moved. We currently have a contract with a private individual and with Animal Damage Control of the U.S. Department of Agriculture to handle depredation complaints and preventive control.

The number of lions taken under the preventive control program was 13 in 1985, 13 in 1986, 14 in 1987, and 14 in 1988. The number of depredation permits issued to take lions after they had killed sheep remained about the same from 1985 through 1988.

The effectiveness of this program is difficult to determine because of the turnover in personnel working the program, changes in ranch operations, changes in ranch ownerships, and the controversial nature of depredation work. The only safe statement is that we currently have

sheep ranches, mountain lions, and an order from the Game Commission to do preventive and depredation work in Unit 30.

## RESEARCH

The New Mexico Game and Fish has entered into a contract with the Wildlife Research Institute to study the ecology of an unexploited cougar population in a desert environment. The project is in the first five year portion of the study.

## ECONOMIC VALUE

Currently the cost of a resident cougar permit is \$10.50 and a non-resident permit is \$51.00 (Fig. 3)

Average yearly income from license sales is \$3,979.50 for residents, \$5,151.00 for non-residents.

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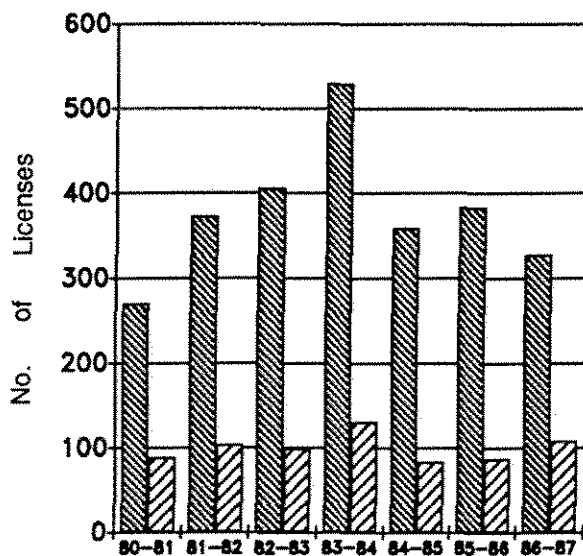


Fig. 3. License sales.

# Status of Mountain Lions in Nevada

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## INTRODUCTION

Records indicate that the mountain lion was an uncommon denizen of the Great Basin before 1920. Hall (1946) found ample data to indicate that the lion was widely distributed by 1936 but did not find much evidence of high densities or for that matter many accounts of the animal in Nevada prior to his studies. Historical records do not provide evidence of high lion numbers. Noxious animals were bountied from 1873 through 1938 to address depredation or perceived depredation. The mountain lion, termed the "California Lion", was intermittently included and then removed from the noxious animal list even though sheep herding was very active in the State.

Mountain lion populations appeared to rise in concert with the mule deer populations that increased dramatically in the 1930's and 1940's. By the 1950's the lion harvest by Animal Damage Control (ADC) had increased from 46 animals killed between 1917 and 1931 to an average of 90 lions per year in the 1950's.

In 1965 the mountain lion was given the status of a game animal. During the mid to late 60's this status did not afford a great deal of protection to the lion, but regulatory mechanisms were in place for more restrictions if they were warranted. In 1968 tags were required

to harvest a lion and in 1970 a limit of one lion per hunter per year was established. Also, in 1970 we began to require a mandatory checkout of each harvested lion.

Lion populations may have declined in the 1970's but by the early 1980's populations were near all time highs.

## CURRENT STATUS

### Population Levels

Mountain lion populations appear to be at or near all time highs. Sight records are very common in many habitat types throughout the State. Mule deer, bighorn sheep, antelope, elk and feral horse populations are all at high levels and provide mountain lion prey.

### Distribution

Hall (1946) reported that 56 lions had been killed in Nevada from 1917 to 1933 by ADC personnel and he doubted that any more than another 56 had been killed by the private sector. Based upon Hall's observations, it would appear that fewer than 6 lions were killed in Nevada per year during this period. The distribution of lion kills and sightings are shown in Figure 1 along with Hall's estimate of potential lion habitat. Figure 2 shows the most current estimate of lion range in Nevada. Ash-

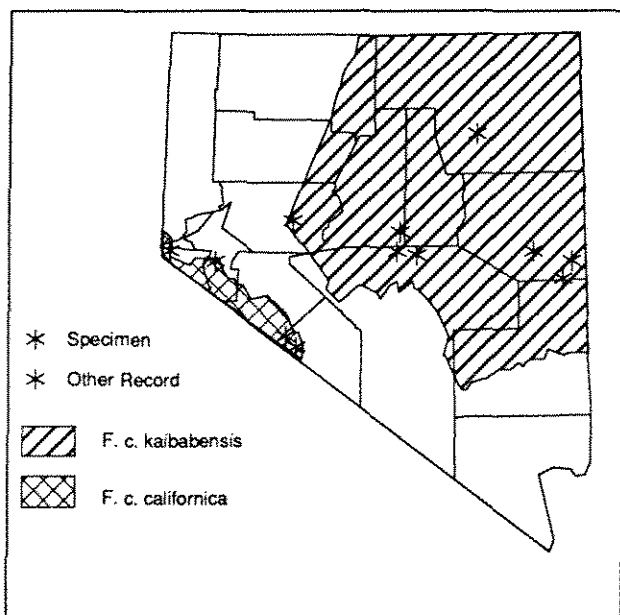


Fig. 1. Mountain lion distribution (from Hall 1946).

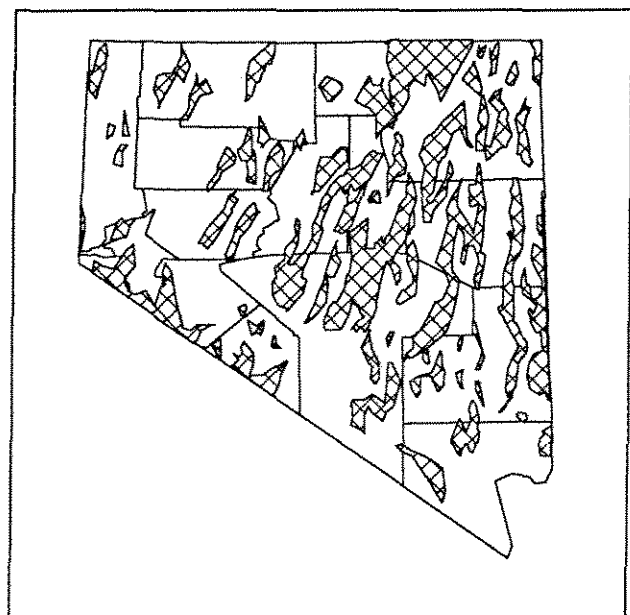


Fig. 2. Current mountain lion distribution.

man et.al. (1983) estimated that 6,042 square miles have high densities averaging 0.04 lions per square mile, and 21,690 square miles have low densities averaging 0.025 lions per square mile.

**Population Estimate**

The lion population for Nevada was estimated by Ashman in 1983 to be 792 lions. Subsequent analyses of lion populations in selected areas indicate that Ashman's population estimates were conservative. An example of the conservative nature of the estimate is drawn from Ashman's estimate of 4 lions in a low density, small western Nevada mountain range. In 1986, six lions were killed in a several week period by ADC personnel in that range and, additionally, sign of one or two lions were recorded in the area after the ADC kill. This area would be subjectively classed as a lower density area, however, the observed density is slightly above Ashman's high density figure of 0.04 lions per square mile. Each area that was intensively evaluated has an estimated density of 0.04 lions per square mile.

**MANAGEMENT PROGRAM**

Nevada has pursued a vigorous management program for mountain lions since 1970. The Department has

conducted significant research, implemented innovative harvest strategies, and addressed depredation concerns and concerns of the hunting and nonhunting public.

**Surveys**

Population monitoring through systematic field surveys has been largely eliminated from the work program in Nevada. Intensive surveys were conducted by various means during the 1970's in a number of mountain ranges. These surveys included scratch site monitoring and track surveys by helicopter or ground vehicle.

**Harvest and Harvest Program**

Nevada monitors and controls harvest by hunt unit and type of harvest for each Management area. The contemporary sport and depredation lion kill for Nevada is depicted in Table 1. Since 1976, lion hunters have been limited by either a total quota or a hunt unit harvest objective. From 1976 to 1980, hunters were limited to a hunt unit in a limited entry hunting situation similar to most trophy big game hunts in the West. The tag quotas were determined after a harvest objective was established and expected hunter success levels were estimated. This system led to some of the lowest harvests experienced in Nevada and essentially failed to meet the objectives of distributing the lion kill among the hunt units.

Table 1. Lion harvest by sex and type of kill.

Year	Type Of Kill											
	Sport Harvest				Animal Damage Control				Total Kill			
	Male	Fem	Unk	Total	Male	Fem.	Unk	Total	Male	Fem	Unk	Total
1969	18	24	0	42	28	19	14	61	46	43	14	103
1970	28	27	0	55	11	9	26	46	39	36	26	101
1971	23	20	0	43	8	10	2	20	31	30	2	63
1972	34	39	0	73	8	5	1	14	42	44	1	87
1973	23	28	1	52	4	7	0	11	27	35	1	63
1974	38	50	0	88	8	4	0	12	46	54	0	100
1975	16	36	2	54	10	10	0	20	26	46	2	74
1976	10	6	0	16	14	5	0	19	24	11	0	35
1977	15	6	0	21	10	7	1	18	25	13	1	39
1978	10	13	0	23	17	7	0	24	27	20	0	47
1979	17	17	0	34	16	8	0	24	33	25	0	58
1980	10	13	0	23	12	11	0	23	22	24	0	46
1981	16	30	0	46	19	3	0	22	35	33	0	68
1982	41	20	0	61	20	17	4	41	61	37	4	102
1983	43	34	0	77	11	10	0	21	54	44	0	98
1984	53	54	0	107	13	12	0	25	66	66	0	132
1985	42	41	0	83	12	16	1	29	54	57	1	112
1986	49	38	0	87	16	9	0	25	65	47	0	112
1987	51	30	0	81	22	15	0	37	73	45	0	118
Total	537	526	3	1066	259	184	49	492	796	710	52	1558
Average	28.3	27.7	0.2	56.1	13.6	9.7	2.6	25.9	41.9	37.4	2.7	82.0

## STATUS REPORTS

In 1980, Nevada modified the hunting system to allow an unlimited number of hunters to purchase a lion tag and hunt in any hunting unit that remained open, initially with number restrictions, and later without hunter number restrictions. Hunting units remain open until the close of the season or until the harvest objective is reached. The mechanics of the hunt involve the following parameters:

1. Development of season dates,
2. Development of harvest objectives by hunting unit(s),
3. A hunting permit system to keep track of hunters,
4. A lion harvest checkout system to tally harvest, and
5. A Unit closure procedure.

The hunting system currently employed by Nevada appears to be well accepted by the hunting public and the non hunting public and allows the agency considerable flexibility for harvest management. Table 2 shows the track record of the hunting system as it relates to harvest and the available resource. Generally, we are satisfied if the harvest meets or falls below the harvest objective. In areas where the harvest exceeds the harvest objective we commonly consider reducing the harvest objective for the subsequent season.

### Regulations

Mountain lion hunting regulations have not changed a great deal during the past 20 years. Major points of Nevada law include the following:

1. Hunters are limited to one lion per year.
2. Females with spotted kittens are not legal.
3. Spotted kittens are not legal.
4. Trapping is not legal.
5. Hunters must possess a tag and a hunting permit for the area hunted.
6. Successful hunters must have their mountain lion validated by a Department of Wildlife representative within 72 hours of the kill.

Table 2. Lion harvest distribution.

Year	Number Of Hunters	Harvest Obj.	Sport Harvest	Areas Meeting Obj.	Areas Above Obj.	Areas Below Obj.
1980	374	56	13	0	0	8
1981	589	135	60	0	0	24
1982	580	135	61	0	2	22
1983	348	173	78	1	2	21
1984	459	183	106	6	1	19
1985	490	195	83	2	3	22
1986	459	197	87	2	0	26
1987	507	206	81	6	0	22
Totals	3,806	1,280	569	17	8	142
Average	476	160	71	2	1	18

7. Handguns, rifles, shotgun, or long bow and arrow are legal weapons.

### Management Plans

The Department completed a Wildlife Policy Plan in 1985 and the *Mountain Lion in Nevada* in 1983. The documents contain the major policy statements that guide the management of lions in Nevada. The policies are:

1. Depredating lions will be removed when necessary to protect private property, human life and wildlife. The Department will cooperate fully with Animal Plant Health Inspection Service (APHIS) Animal Damage Control division to address mountain lion depredation problems;
2. Mountain lion populations will be managed to maintain balance in predator-prey relationships;
3. Mountain lion hunting season will begin on the first day of October.

### Interagency Coordination

The major coordination efforts for lion management in Nevada involve the ADC program. Once each year the two agencies coordinate the permitting process and procedures that allow ADC to handle the depredation program. Generally, representatives from the Law Enforcement and Game division along with Regional personnel attend these meetings.

### Depredation

Federal control programs in Nevada were initiated about 1917 and continue today. Early control work consisted of killing lions when they were located, in association with other control activities or caused a problem. Later, ADC began to kill lions in large numbers in hopes of decreasing the population. During these years private

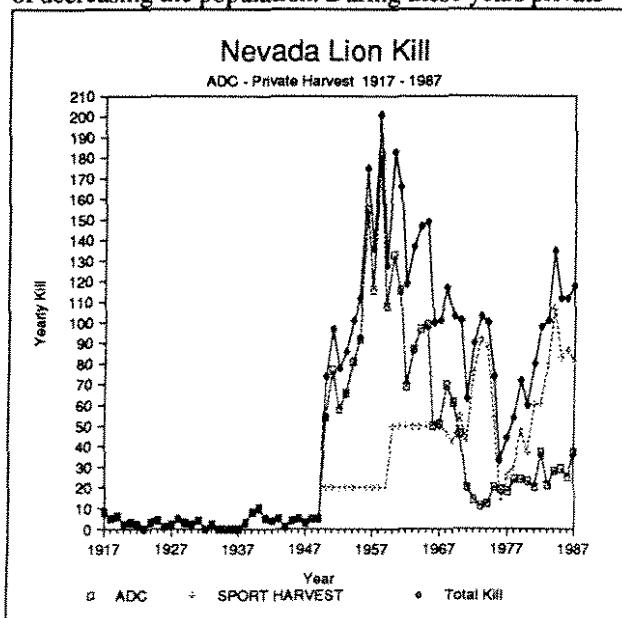


Fig. 3. Nevada mountain harvest by private hunters and ADC.

sport kill was limited but did occur. Finally, in the late 1960's ADC programs again began to concentrate on *problem animal management* rather than population reductions. This practice continues today. Figure 3 shows the long term lion kill by ADC and private hunters.

**RESEARCH**

Nevada is cooperating with California Fish and Game and the U.S. Forest Service on a study being conducted by John Turner of the Ohio College of Medicine. The study is directed towards the reproductive physiology of feral horses with lions as an agent of mortality. The study involves several collared lions and determination of food habits and home range. No other significant lion research is being conducted in Nevada at the present time.

**ECONOMIC VALUES**

A tag and license is required to hunt mountain lions in Nevada. The fees for hunting are \$15.00 and \$80.00 for resident and nonresident licenses, and \$15.00 and \$150.00 for tags, respectively. The total licensing cost for residents is \$35.00 and \$235.00 for nonresidents. This fee includes a \$5.00 nonrefundable application fee for the tag.

The Department has recently completed an economic bulletin on hunting in Nevada, including mountain lion hunting (Kay 1988). The survey included 53 lion hunters that received tags in 1986. All dollar figures cited are converted to a base 1986 dollar. The low percentage of returns may bias the results so we are treating the following data as preliminary; however, the costs and cost breakdown may be valuable from the comparative standpoint. Hunters in Nevada averaged 12 days in the field and spent an average of \$ 1,014.71 for the hunt. The average cost per hunter day was \$221.42 for nonresident hunters and \$52.64 for residents. Hunters reported a hunt success rate of about 28%.

The cost breakdown for lion hunting was somewhat similar for nonresidents and residents. The major costs of the hunt were guide and taxidermy fees, travel, and equipment. In general residents expended 37.4% for guide and taxidermy fees, 35.5% in travel and 12.4% for miscellaneous purchases. Nonresidents expended 31.7% for guide and taxidermy fees, 53.7% in travel, and 7.5% for license and tag.

The net economic value for lion hunters was \$21.15 per day. The nonresident valued the experience at \$27.27 per day and residents at \$18.88 per day. Kay reported the value of a WFUD (Wildlife Fishery User Day) for all hunters is \$42.02. The WFUD value was \$37.04 for residents and \$83.00 for nonresidents per hunter day.

Mountain lion depredation occurs regularly in Nevada, primarily to domestic sheep. ADC reports the following economic losses for the past 5 years.

**LITERATURE CITED**

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Table 3. Number of animals and economic losses from mountain lion depredation.

Year	Lamb	Sheep	Cow	Horse	Pet	Econ. Value
1983	263	134	15	2	0	\$31,461
1984	193	832	00	\$	1	9,040
1985	145	92	1	0	2	\$11,213
1986	202	126	1	0	1	\$23,830















































































































