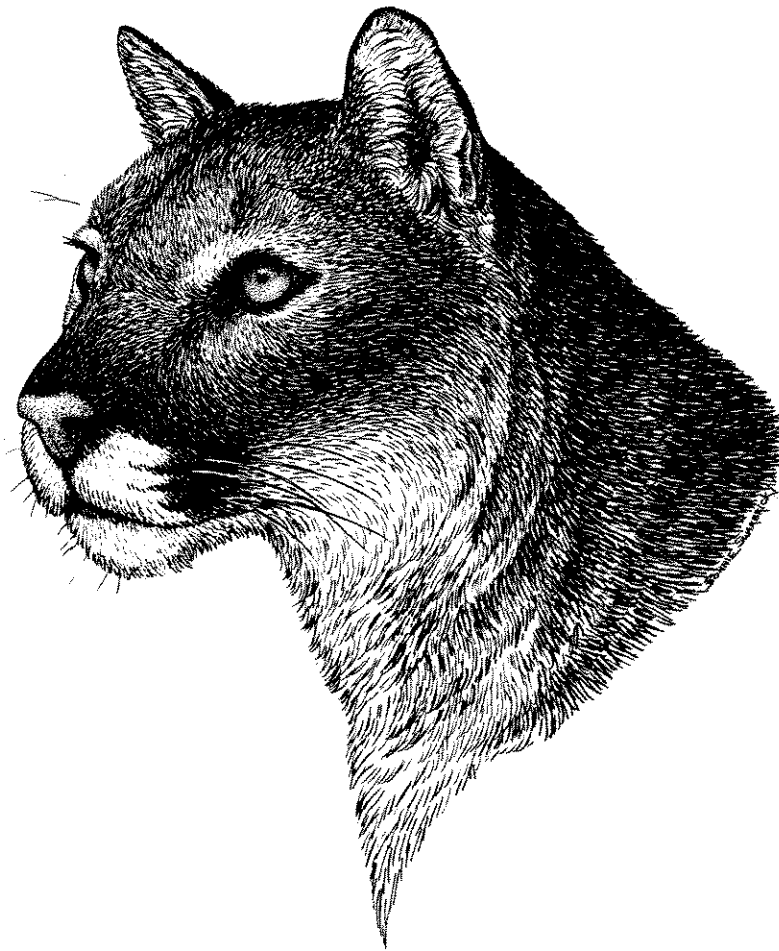


**Proceedings of
The Third Mountain Lion Workshop**



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

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

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December 1989

Acknowledgments

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.

Table of Contents

Welcoming Address	1
Keynote Address	3
State and Provincial Status Reports	5
Cougar Hunting Regulations and Harvest in Alberta Between 1973 and 1987	6
Status of Mountain Lions in Arizona	7
Tracking Arizona's Other Big Cat	10
The Status and Management of Cougar in British Columbia 1988	11
The Status of Mountain Lions In California	15
Status of the Mountain Lion in Colorado	19
Status of the Mountain Lion in New Mexico	24
Status of Mountain Lions in Nevada	26
Status of the Mountain Lion in Texas	30
Status of Cougar in Utah, 1988	32
Status of the Cougar in Washington	35
Status of the Mountain Lion in Wyoming	38
Legal Problems in Mountain Lion Management	41
Mountain Lion Law Enforcement Problems in Arizona	42
Legal Challenge to Mountain Lion Hunting in California	42
Research Reports	43
Preliminary Results: Survey on Mountain Lion Research Methods	44
Population Ecology of Cougars in Southwestern Alberta	47
Predation Rates of Cougar Within the Junction Wildlife Management Area	48
Cougar Ecology in Southeastern British Columbia	48
Method to Standardize the Procedure for Measuring Mountain Lion Tracks	49
Panther Research Update for Southwest Florida	52
Florida Panther Reintroduction Feasibility Study	52
Feeding Ecology of the Patagonian Puma (<i>Felis concolor patagonia</i>) in Torres Del Paine National Park, Chile	53
Dynamics of a Mountain Lion Population in Central Idaho Over a 20-Year Period	54
Demographic, Genetic, and Reproductive Peril of the Endangered Florida Panther (<i>Felis concolor coryi</i>)	55
The Ecology of the Mountain Lion (<i>Felis concolor missoulensis</i>) in the North Yellowstone Ecosystem	56

Mountain Lion Population Dynamics (Utah)	56
Dynamics of Home Range Size of Unhunted Mountain Lions (<i>Felis concolor hippolestes</i>) in Southwestern Colorado	57
Survival in an Unhunted Mountain Lion (<i>Felis concolor hippolestes</i>) Population in Southwestern Colorado	57
Differentiating Mountain Lion and Dog Tracks	58
Population Monitoring and Harvest Strategies65
Why Lions Need to be Hunted	66
Techniques for Monitoring Mountain Lion Population Levels	69
Age Determination in Cougar from Cementum Annuli Counts of Tooth Sections	71
Mountain Lion Density and Movement in the Central Sierra Nevada	72
Movement and Survival of 14 Month Old Orphaned Mountain Lion Kittens	73
A Non Invasive Method For Monitoring Mountain Lion Population Trends in Roadless Areas	73
Managing with Potential for Lion Attacks Against Humans	74
Ecology of an Unexploited Cougar Population in a Desert Environment	77
Results of Facilitated Session79
Summary of Results of Facilitated Sessions	80
Directory of Authors and Attendees84

Welcoming Address

*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

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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

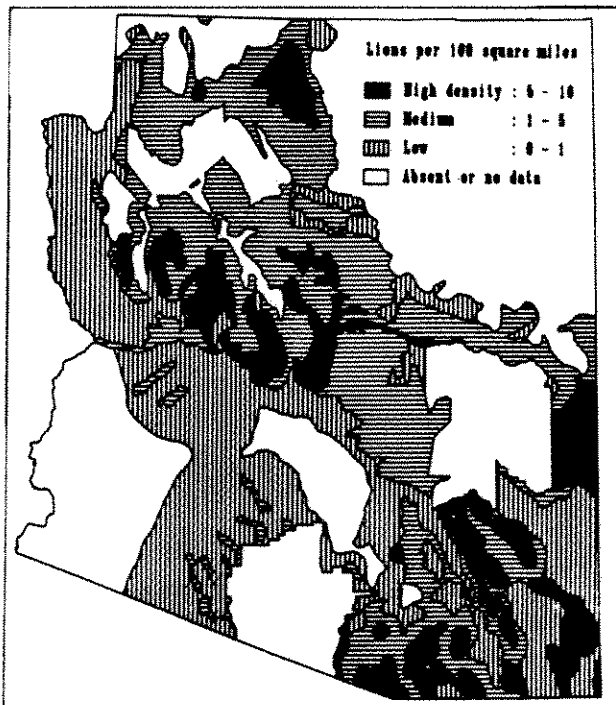


Fig. 1. Statewide distribution of mountain lions in Arizona.

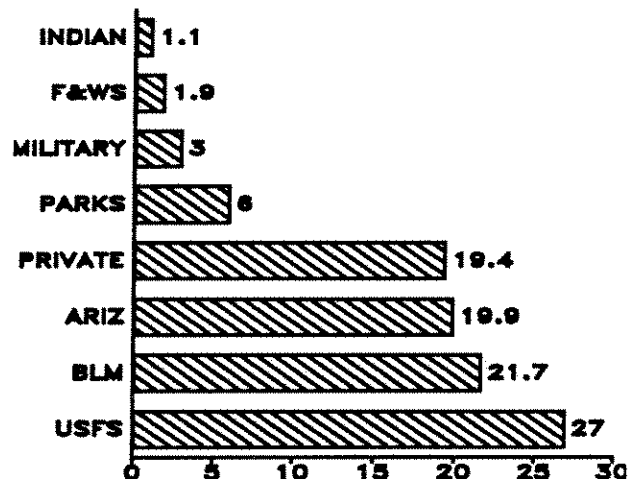


Fig 2. Ownership of Arizona mountain lion range (percent).

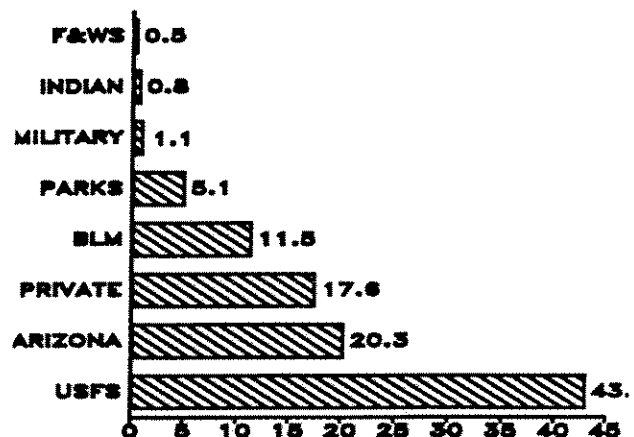


Fig. 3. Distribution of Arizona mountain lions (percent).

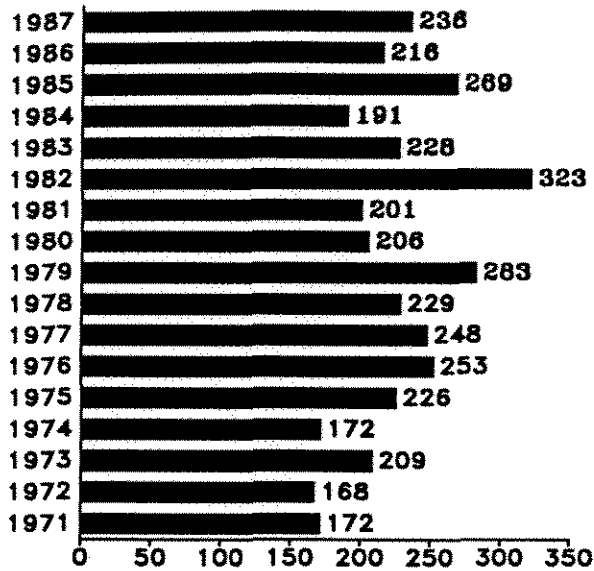


Fig. 4. Summary of Arizona mountain lion harvest.

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. □

Tracking Arizona's Other Big Cat

*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).

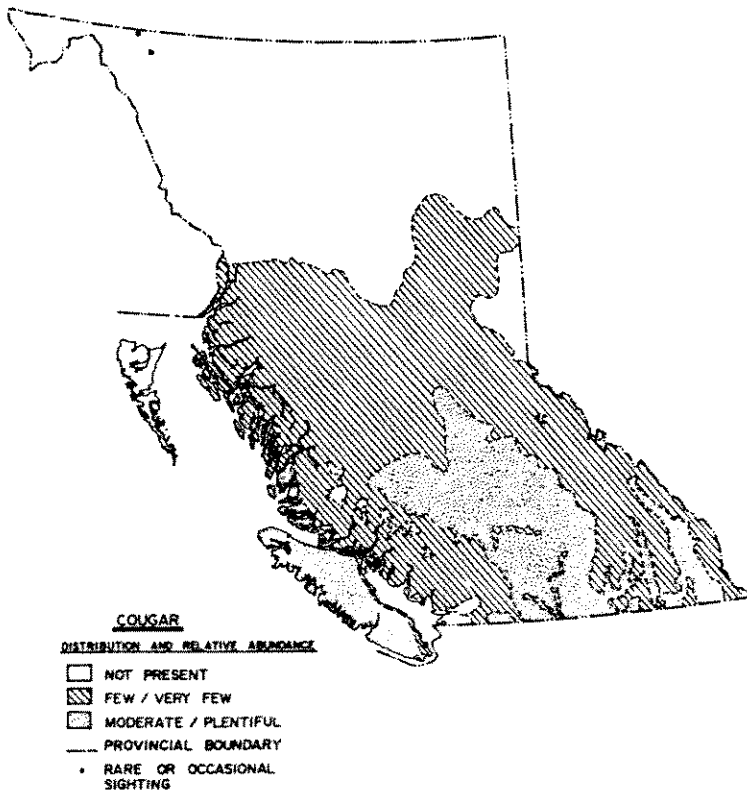


Fig. 1. The distribution and relative abundance of cougar in British Columbia.

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 ² , 557,637km ²
Range in Wash., Ore., Cal.	220,996mi ² , 569,815km ²
Area of Vancouver Island & Interior South Harvest	60-64,000mi ² , 155-165,760km ²
	408/yr
	77% of B.C. Harvest
Harvest Density	1 Cougar/147mi ² , 381km ²

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 mi² (557,637km²) while that from the three U.S. States came from 220,006 mi² (569,815km²). 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 mi² (155,400-165,760 km²). This equates to a harvest density of approximately 1 cougar per 147 mi² (381 km²). By comparison, population densities may range from 1/15-31 mi² (39-80 km²) for females and 1/25-35 mi² (65-90km²) 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.

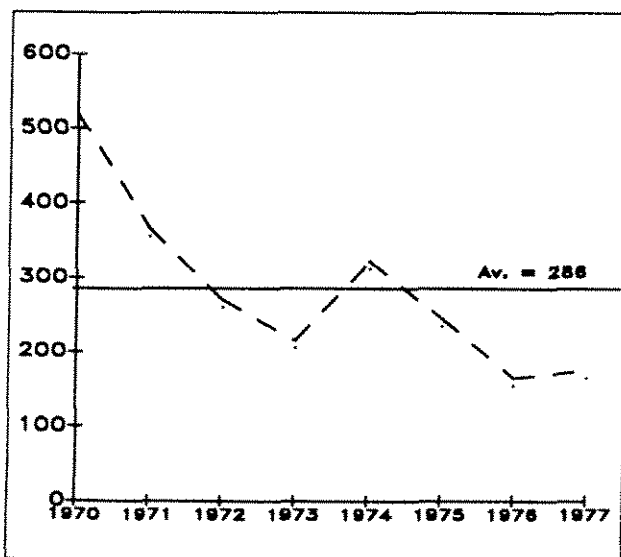


Fig. 2. The estimated resident and non-resident cougar harvest prior to compulsory inspection.

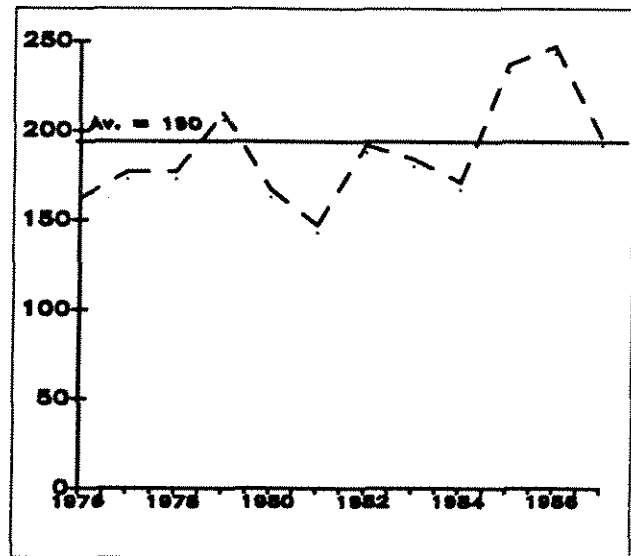


Fig. 3. The number of man caused cougar mortalities (resident and non-resident harvest and problem cougar) during the compulsory inspection period.

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 ² (259-388 km ²)	
Area	= 151,019 mi ² (391,139 Km ²)	
Max.	= 1,510	
Min.	= 302	
Aug.	= 906	
Moderate	= 1/25-100mi ² (65-259km ²)	
Area	= 54,493 mi ² (141,137km ²)	
Max.	= 2,180	
Min.	= 545	
Aug.	= 1,362	
Plentiful	= 1/25mi ² (65km ²)	
Area	= 9,792mi ² (25,361km ²)	
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

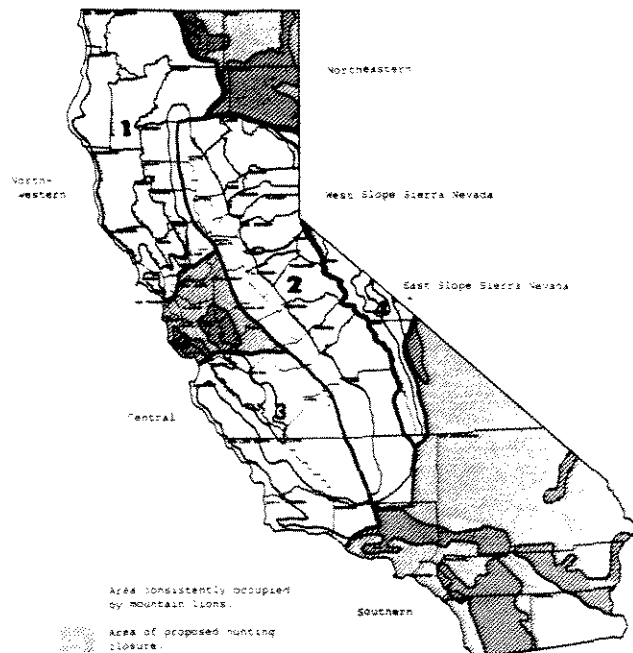


Fig. 1. Mountain range and Management Zones.

