MOUNTAIN LION MANAGEMENT GUIDELINES
FOR
Lion DAU L-19

Game Management Units
83, 85, 140, 851

Prepared for:
Colorado Division of Wildlife
Southeast Region

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DESCRIPTION OF DAU, HABITAT, AND PAST MANAGEMENT

Mountain lion Data Analysis Unit (DAU) L-19 is located in south-central Colorado and comprises Game Management Units (GMU's) 83, 85, 140, and 851. It covers 8577 km^2 (3321 $mi.^2$) ranging in elevation from 1,678 meters (3,860 ft.) from where San Francisco Creek flows under Colorado Highway 160 to 4,483 meters (14,345 ft.) at the top of Blanca Peak in the Sangre de Cristo Mountains (Figure 1). Topography ranges from gentle rolling hills to ridges and valleys to steep alpine slopes and cliffs. Precipitation ranges from 50+ cm (20 in.) at higher elevations to less than 15 cm (6 in.) in the lower elevations, mainly in the form of winter and spring snowfall and late summer thunderstorms.

Mountain lion DAU L-19 is bounded on the North by US highway 160, the Alamosa-Costilla County line, Pass Creek Road, and Colorado 69; on the east by I-25, US highway 160, and Colo. 389; on the south by the New Mexico state line; and on the west by the Rio Grande River. Drainages include the Apishapa River, Culebra Creek, San Francisco Creek (Las Animas County), Rio Grande River, Trinchera Creek (Las Animas County), Trinchera Creek (Costilla County), Huerfano River, Cucharas River, Sangre de Cristo Creek and the Purgatoire River.

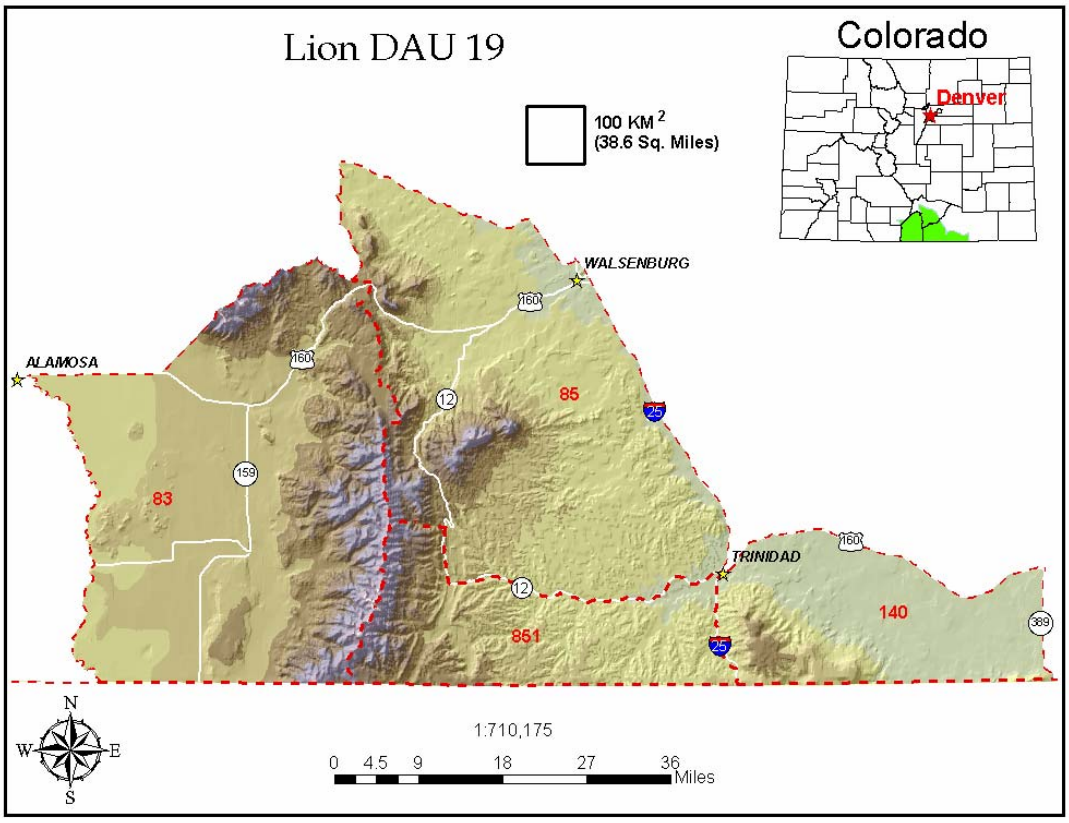

Figure 1. Location and boundaries of Lion DAU 19.

Of the 8577 km^2 in L-19, land ownership is as follows: Private – 7719 km^2 (90%); Division of Wildlife 172 km^2 (2%); U. S. Forest Service - 275 km^2 (3.2%); Bureau of Land Management -112 km^2 (1.3%); Colorado State Parks 43 km^2 (0.5%); National Wildlife Refuge – 43 km^2 (0.5%) and Colorado State Land Board –172 km^2 (2%).

Predominate vegetative communities include alpine tundra, sub-alpine conifer, montane conifer, montane shrub, great basin desert shrub, and plains grassland. Land use is predominately agriculture, with livestock grazing occurring on public and private lands. Irrigated and dry land farming produces grass hay and alfalfa. Early Spanish lands grants resulted in large tracts of land being held by one owner and large ranches still persist. Human occupancy is scattered among river valleys and the large towns of Trinidad and Walsenburg located in GMU's 140, 851 and 85. Recreation is limited to National Forest campgrounds, associated lakes and recreation areas. Currently three ranches located in L-19 are enrolled in the Division of Wildlife's Ranching for Wildlife Program which provides for public recreation and wildlife habitat improvement on private lands. Mountain lion are not a species that is provided for recreation on the enrolled properties, but mountain lion hunting is leased on most of these ranches by private outfitters.

Early 20th century energy development is evident by the presence of large coal mines and numerous coke ovens scattered among the canyons. Coal mining has virtually disappeared from the landscape except for a strip mine in the early stages of reclamation located in GMU 851. Current energy demands for the area include wells in the La Veta area producing CO_2 shipped to Texas oilfields, and coal-bed methane production affecting extensive parts of GMU's 85 and 851.

Due to poor economic conditions within the ranching community, several large ranches have been sold to developers, and communities based on 40 acre lots are quickly impacting large expanses of the region, further reducing mountain lion hunting access. Several area ranches have been placed in conservation easements protecting these areas from future development.

STRATEGIC GOALS

The goal of the CDOW is to maintain a rich, vegetative and wildlife community that is in balance with the available habitat, which will minimize game damage complaints and support a self sustaining mountain lion population. The DAU is being managed for a stable mountain lion population.

POPULATION PROJECTION

No scientific studies to estimate mountain lion populations have been conducted in L-19. In the absence of a science-based population estimate, the mountain lion population of this DAU was projected by applying density estimates from studies in other areas similar to L-19 to the effective mountain lion habitat in L-19. In doing so, we have estimated a population to better determine an acceptable off-take range to maintain the population.

Two scientific studies that were conducted in similar habitat were used to establish a density range for L-19. Ross and Jalkotzy (1992) studied a hunted population in southwestern Alberta from 1981 to 1989. This study estimated the density on winter range (December through April) to be 2.7 to 4.7 lions per 100 km^2 (40 $mi.^2$). Logan et al.

(1986) studied a hunted population of mountain lion in the Bighorn Mountains of Wyoming from 1981 to 1983. This study estimated the density on winter range (late October to mid April) to be 3.5 to 4.6 mountain lion per 100 km^2. The outer limits of the estimated density range from Logan et al. (1986) and Ross and Jalkotzy (1992) were used to construct the preliminary range, 2.7 to 4.7 lions per 100 km^2, for the population. This range was then narrowed to 3.5 to 4.7 lions per 100 km^2 (i.e., moderate to high density) in recognition of the abundance of prey and high quality of lion habitat in L-19.

A GIS analysis of vegetative types was used to determine area of effective mountain lion habitat (Figure 2).

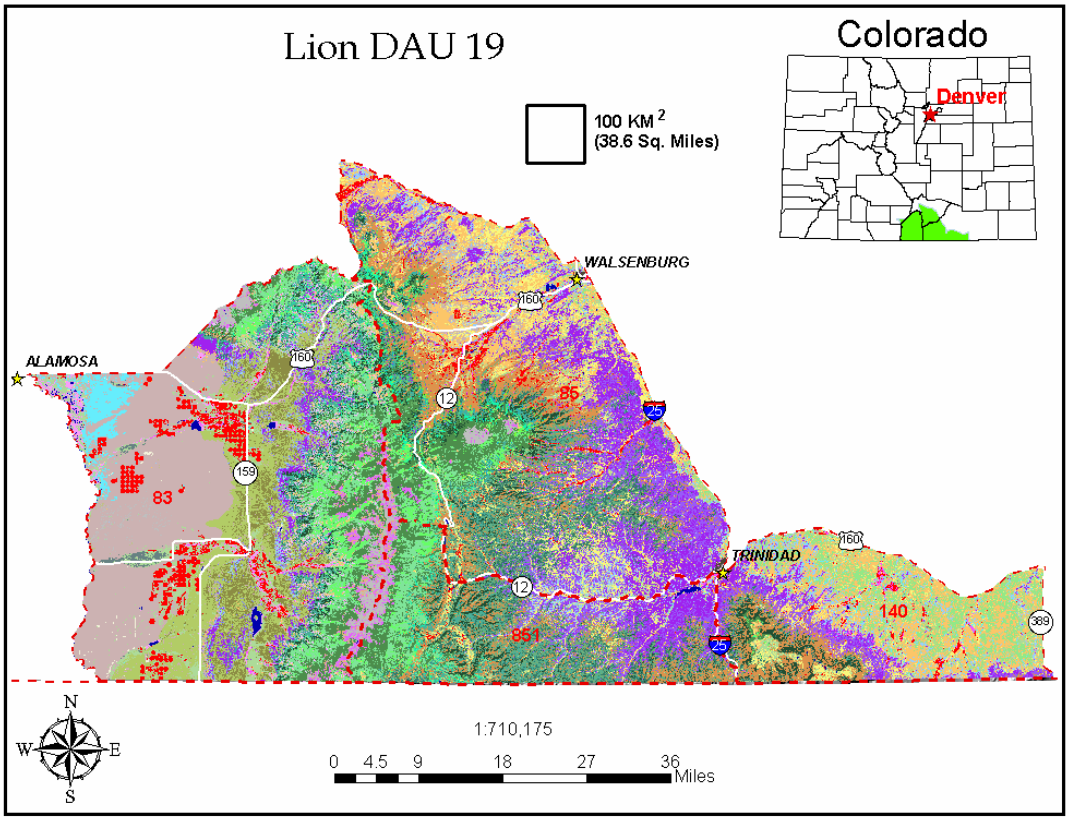

Figure 2. GIS Interpretation of habitat types

Areas that were determined to be very low density habitat such as the rabbit-brush and greasewood flats of unit 83 on the San Luis Valley floor were excluded from the population projection. Urban areas such as the towns of Trinidad and Walsenburg; along with the small portions of units 85, 851 and 140, which contain a grassland dominated landscape, were also excluded from the projection (Figure 3). These areas are not devoid of mountain lion but were determined to be such a low density that it would artificially inflate the population projection. Since most population estimates were based on winter range estimates we also excluded areas with an elevation above 3,350 meters (11,000 ft.). Using these parameters we determined that the effective mountain lion habitat is approximately 6280 km^2.

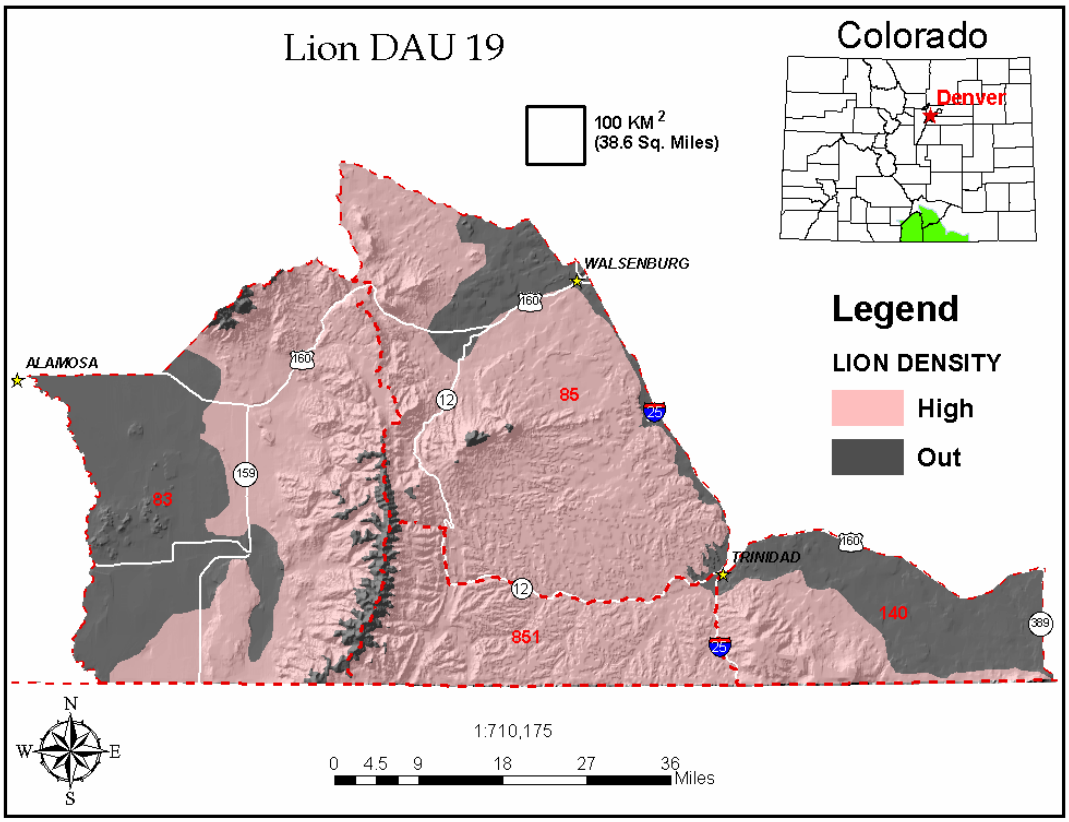

Figure 3. Lion density projection for Lion DAU 19.

Using a the low density population estimate of 3.5 mountain lion/100 km^2 found by Ross and Jalkotzy (1992) applied to the amount of effective mountain lion habitat in L-19 we arrive at a low density population estimate of 220 mountain lion within L-19. Using a high density population estimate of 4.7 mountain lion/100 km^2 found by Logan, et al. (1986) in the Bighorn Mountains in Wyoming to the same amount of mountain lion habitat, we arrive at a high density population of 295 mountain lion within L-19. Thus we project a mountain lion population of between 220 and 295 mountain lion within L-19.

The CDOW has initiated a mountain lion study in 2004. Hopefully, population projections will be further refined from this study to increase our knowledge of mountain lions in Colorado. These population projections will be updated as future information becomes available, with the possibility of raising or lowering the current population projections.
We believe the mountain lion population is closer to the high density population estimate due to the high prey density (especially elk), and the high quality mountain lion habitat found within the DAU.

HARVEST SUMMARY

The hunter harvest in L-19 has ranged from 7 to 38 lions a year over the last 10 years with an average of 22 (Table 1).

	YEAR										10 YR. Total	
GMU	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	Males	Females
83	2/5	3/2	1/10	2/5	6/0	3/2	3/3	2/3	1/1	0/0	23	31
85	8/10	7/5	8/12	3/5	1/4	1/2	6/1	7/5	1/0	2/0	44	44
140	2/2	3/1	1/3	1/0	1/2	2/0	2/2	2/6	1/1	1/4	16	21
851	0/4	7/3	2/1	1/1	9/4	2/0	2/2	2/3	0/2	2/0	27	20
DAU Total by Sex	12/21	20/11	12/26	7/11	17/10	8/4	13/8	13/17	3/4	5/4	-	-
DAU Total	33	31	38	18	27	12	21	30	7	9	-	-

Table 1. Number of mountain lions harvested by sex (males/females) in L-19 by GMU from 1994-2003.

Harvest averaged between 5 and 10 lions a year until 1996 when several new outfitters started operating in the area (Figure 4). In years with good snowfall amounts, hunter harvest has approached the quota limit of 40, and overall has shown an increasing trend.

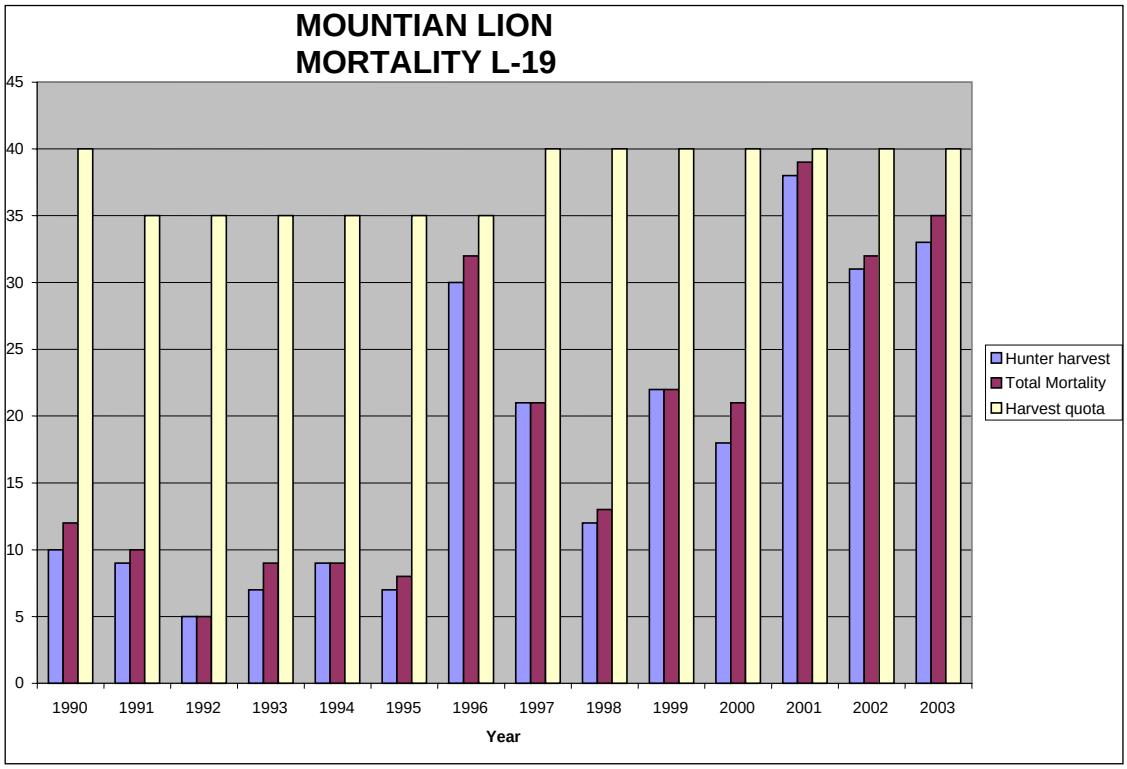

Figure 4. Mountain lion harvest and quotas.

With the increase in harvest, the percentage of females in the harvest has also increased with a high of 68% of the total harvest being females in 2001 (Figure 5). Ten year average percentage of females in the harvest is 50% with a five year average of 54%.

Harvest quotas have remained constant in units 85, 140 and 851 at 30 over the period from 1990-2003. The quota for unit 83 was initially 10 then was dropped down to 5 in 1991. In 1997 the quota was increased back to 10 and remains there in 2003.

Current mountain lion hunting in this DAU remains limited though very good. A number of large ranches have contracted hunting experiences with professional outfitters.

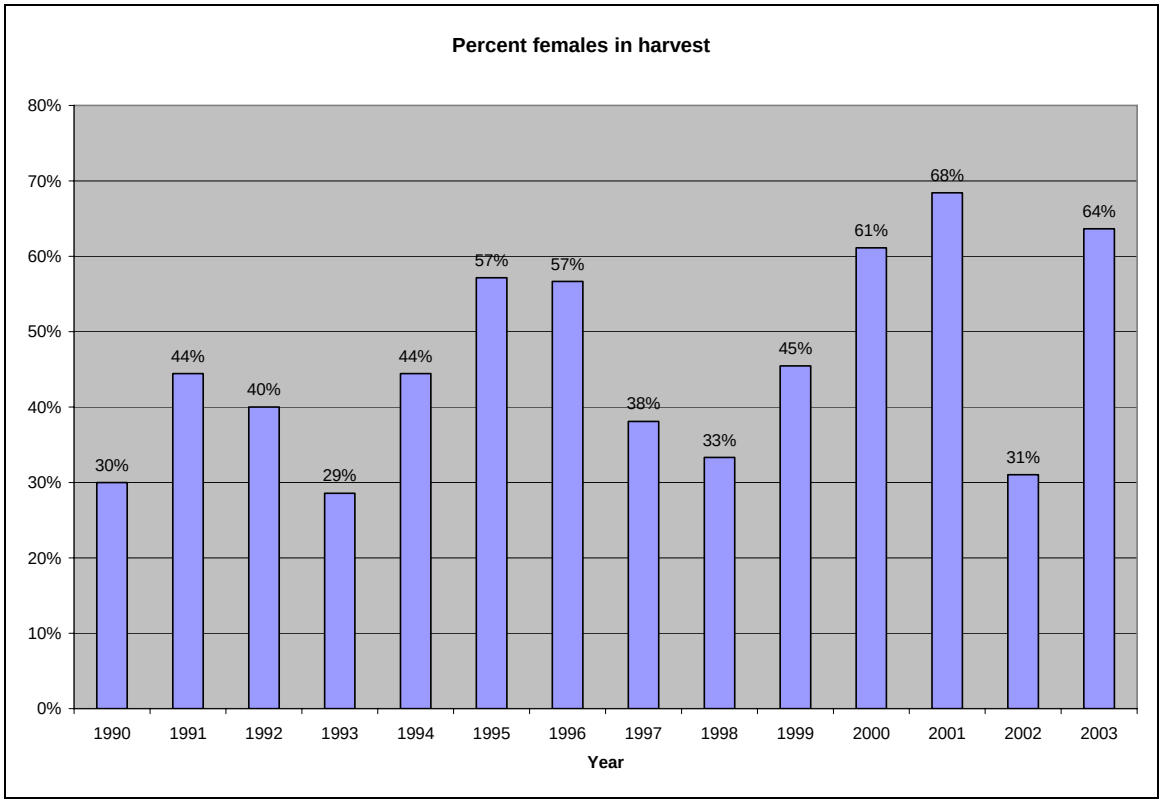

Figure 5. Percent females in total harvest.

ANNUAL OFF-TAKE OBJECTIVE

Since the management objective of this DAU is to maintain a stable population, a sustainable off-take range must be estimated based on the adult population projection for the DAU. We determined age structure of our population projection by applying structures found in current literature to our population projection.

The age structure found in the Logan and Sweanor (2001) study was 56% adult, 10% subadult, and 34% cub. Ross and Jalkotzy (1992) found an age structure of 48% adult, 19% subadult, and 33% cubs. Averaging these results gave us an age structure of 52% adult, 14% subadult, and 34% cubs or stated as a ratio 100 adult: 26 subadult: 35 cub.

Using this ratio we arrive at a low density population composed of 114 adults: 31 subadults: 75 cub, and a high density composition of 153 adults: 41 subadults: 100 cub. Since Colorado regulations do not allow for the harvest of kittens, the harvestable portion of the population is comprised of the adult and subadult portions of the

populations. Therefore L-19 has an estimated harvestable mountain lion population between 145 (low density population) and 194 (high density population).

Experimental removal of adult lions has demonstrated that a lion population following a high rate of removal can show a rate of growth of 28%. This occurred during a year of reduced prey availability from drought and poor habitat conditions (Logan and Sweanor, 2001), showing a great degree of lion population resiliency. Apker (pers. comm.) has suggested that a removal rate of 8-15% of the harvestable population will maintain a stable or increasing population. Since this population is being managed for a stable population, we have determined that the maximum off take should be limited to 15% of the adult population. This gives us an annual off-take range of 22 to 29 mountain lion in L-19.

The 5-year average % of females in the harvest is 54%, with 2003 being 64%, or 21 female mountain lion out of a total harvest of 33. Female harvest has exceeded 50% of the total harvest, 5 of the last ten years and exceeded 60% of the total harvest 3 of the last 5 years. The highest recorded percentage of females in the total harvest peaked in 2001 at 68% (Figure 4). This trend suggests that hunters may have to expend more effort to locate adult male lions for hunter harvest and thus the harvest level experienced over the past 5 years is probably not consistent with maintaining a stable population. If hunter harvest remains high and the proportion of females in harvest continues to exceed 45% of allowable off-take then CDOW will have to reduce the quota to assure that harvest meets population goals.

The CDOW and local hounds-men realize the implications of female harvest and have initiated an education effort to help educate hunters on identifying females while they are in the tree. Their intent is to decrease the amount of females in the harvest and protect that portion of the population.

Other mortality factors including road-kills and damage control have averaged 1.4 puma over the last five years. Current harvest levels have not met quota objectives and the additional mortality has been accommodated by the current quota. With quota numbers being reduced, additional mortality may result in a need to reduce quotas to maintain population objectives. Additional monitoring and possible quota reductions will be required if total known mortality exceeds annual off-take objectives.

DISCUSSION

Mountain lion sightings by field officers and the public are higher then they have been in any of the previous 10 years, and there is no indication that there are fewer mountain lion now than in the last ten years. Published mountain lion population estimates are derived from studies in areas that have a lower prey density, especially a lower elk density than is currently available to mountain lion in L-19. It is possible that mountain lion densities in L-19 are higher than current published population densities. Therefore in projecting the population we used the higher densities reported in literature. We also intend to maintain the population to the best of our ability at current levels. Thus in order to do so and in recognition that there are higher prey densities in L-19 than in other studied populations we propose using the upper end of off-take we would consider allowable for stable-increasing lion population management. The allowable harvest may be adjusted annually when better population estimates become available, total mortality, hunter harvest, and percent female of harvest and mortality are analyzed.

REFUGE AREAS

Using harvest data from 1999-2003, a GIS analysis of harvest locations was performed to establish refuge areas in L-19 (Figure 6). Harvest locations were clustered around the large ranches that allow lion hunting, with a few scattered harvests in other locations. To determine effective refuge areas, each harvest was assigned a buffer associated with the home range of its gender. The buffers were 357 km^2 (138 mi^2) for male lions and 195 km^2 (75 mi^2) for female lions. It was determined that harvest locations, with the associated buffered area, overlapped most of the effective lion habitat in the DAU. Possible refuge areas in L-19 include portions of the Culebra Mountain Range of the Sangre de Cristo Mountains, areas northwest of Trinidad in the canyons west of Interstate 25, and the Silver and Sheep Mountain areas of northern Huerfano County. Portions of these areas were excluded from the density estimate due to low lion densities. Several large ranches in L-19 do not allow hunting, and may provide enough area for several female home ranges. This may provide some level of refuge, but it is not known how effective these areas are with the large home ranges associated with mountain lions.

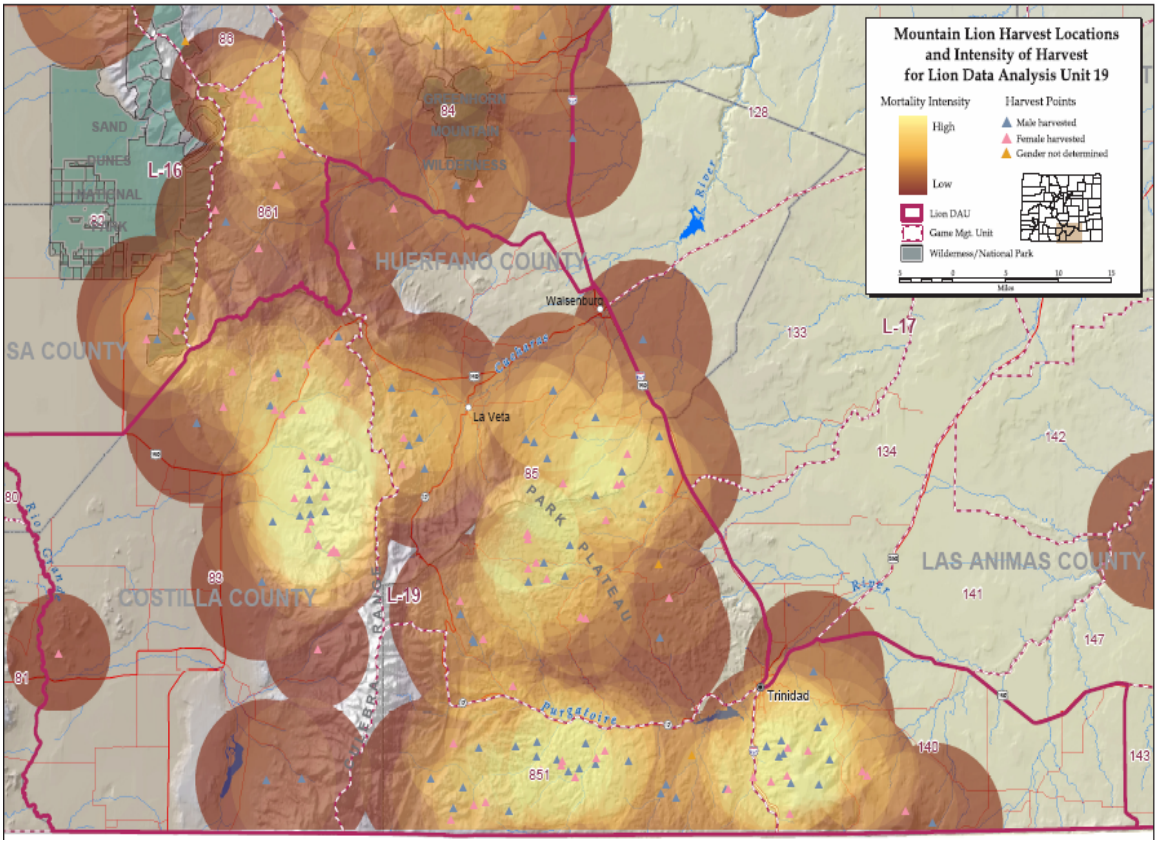

Figure 6. Mountain Lion Harvest Locations and Intensity of Harvest for L-19.

GAME DAMAGE

The increasing population trend from a ranching community to development of former ranches into subdivisions based on 40 acre parcels has led to the increase in “Hobby

Farms" and the loss of historical knowledge on how to coexist with large carnivores. Mountain lion damage has shifted from mainly livestock depredation to alternative livestock including llamas, alpacas, and domestic pets in addition to traditional livestock.

When mountain lions became listed as game animals the Division of Wildlife became financially liable for livestock and agricultural damage caused by mountain lions. The payments have averaged $1440.00 per year (five year average) in L-19 with annual payments following a boom and bust cycle (Figure 7).

Each different mountain lion depredation situation is based on a unique set of circumstances and each requires a different solution. Strategies to reduce mountain lion depredation will be based on education programs. Each event will be handled differently based on the circumstances with several different management strategies concentrating on the offending individual. Strategies include the utilization of Wildlife Services to remove the offending individual, capture and relocation. In situations where there is an open season, strategies may utilize the services of an outfitter with a licensed hunter to remove the individual. This is the preferred alternative.

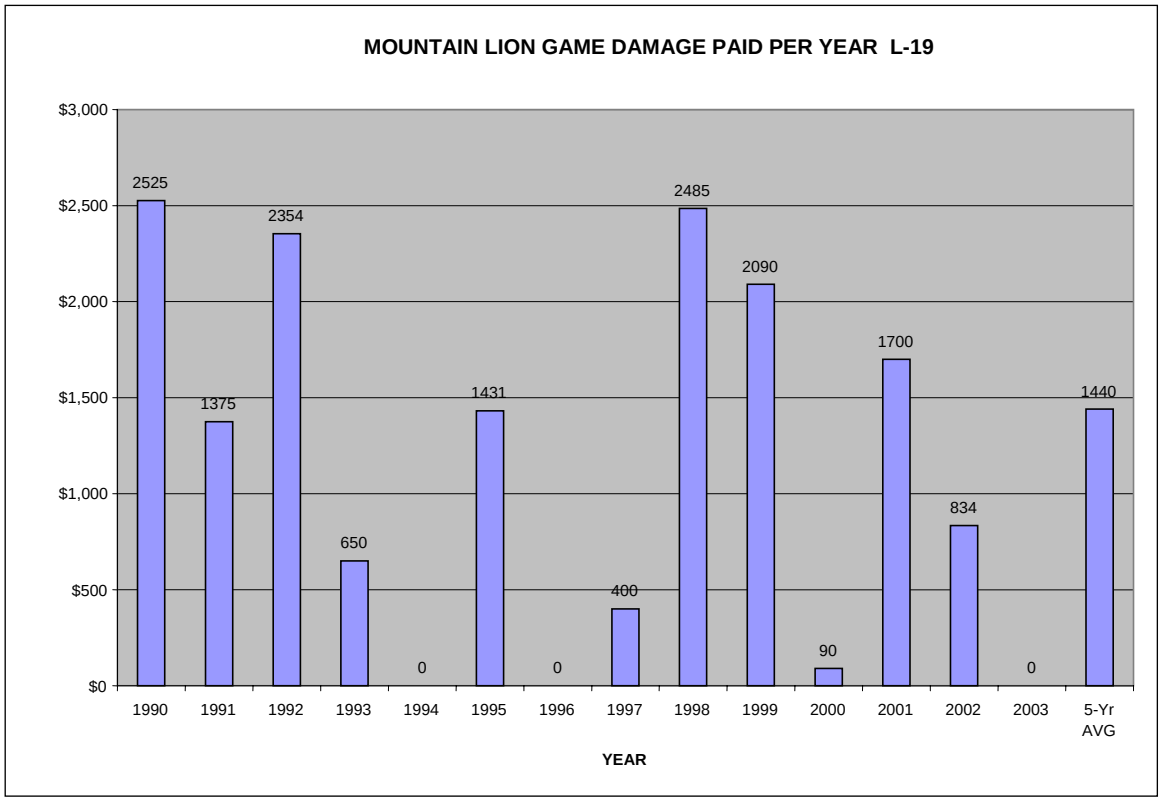

Figure 7. Mountain lion game damage paid by year.

HUMAN/MOUNTAIN LION CONFLICT

Human/mountain lion conflicts are increasing annually due to rapid human population growth along the Front Range, residential encroachment into mountain lion habitat, a growing prey base in rural residential areas, and fragmented land use with the increase of hobby farms.

To provide accurate information to the public, reports of human/mountain lion conflicts should be documented according to current division guidelines. Sightings should be confirmed and if necessary a site visit should be conducted to offer advice and literature. Sightings should be recorded according to area supervisor policy, but should not be documented on a conflict form.

SUMMARY

The goal for L-19, which is supported by public input, is to maintain a stable population. Harvest levels are approaching quota limits as well as showing an increase in females in the total harvest. In an effort to protect the female portion of the population, programs are underway to educate local hounds-men and outfitters on the benefits of harvesting only male mountain lions and methods to identify male lions in the field. The high winter prey base located in this area has the possible effect of a higher mountain lion density than has been found in current mountain lion population studies. This suggests that the mountain lion population is at the higher population densities. Therefore we suggest that an annual off-take range of 15% will allow us to maintain a stable population. Annual review of non-hunting mortality, hunter harvest and percentage of females in the harvest will allow managers to evaluate harvest recommendations within this off-take range.

This DAU plan was based on the best possible information available at the time it was written. However as better techniques and new information becomes available it will be incorporated into the plan.

LITERATURE CITED

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