

**MOUNTAIN LION MANAGEMENT GUIDELINES
FOR
Lion DAU L-16**

Game Management Units
69, 82, 84, 86, 691 and 861

Prepared for:
Colorado Division of Wildlife
Southeast Region

By:
Allen Vitt
Terrestrial Biologist, Pueblo



DESCRIPTION OF DAU, HABITAT, AND PAST MANAGEMENT

Mountain lion (*Puma concolor*) Data Analysis Unit (DAU) L-16 is located in the northeastern San Luis Valley, Wet Mountain Valley, and the Sangre de Cristo and Wet Mountains and comprises Game Management Units (GMU) 69, 82, 84, 86, 691, and 861 (Figure 1). It covers 9370 km² (3612 mi.²) ranging in elevation from 1,450 meters (4,640 ft.) where the Arkansas River flows under I-25 to 4,483 meters (14,345ft.) at the top of Mount Blanca in the Sangre de Cristo Mountains. Topography ranges from rolling hills to ridges and valleys to steep alpine slopes and cliffs. Precipitation ranges from 45+ cm (18 in.) at higher elevations to less than 15 cm (6 in.) in the lower elevations, mainly in the form of winter snows and spring and summer rains.

Mountain lion DAU L-16 is bounded on the North by US highway 50; on the east by I-25; on the south by Colorado Highway 69, Huerfano County Roads 555 (Muddy Creek Road), 570 and 572 (Pass Creek Road), the Sangre de Cristo Divide, the Alamosa-Costilla County line and Colorado Highway 160; and on the west by Colorado Highway 160 and Colorado Highway 17. Drainages include portions of the Arkansas River, Huerfano River, Grape Creek, St. Charles River, San Luis Creek and Texas Creek.

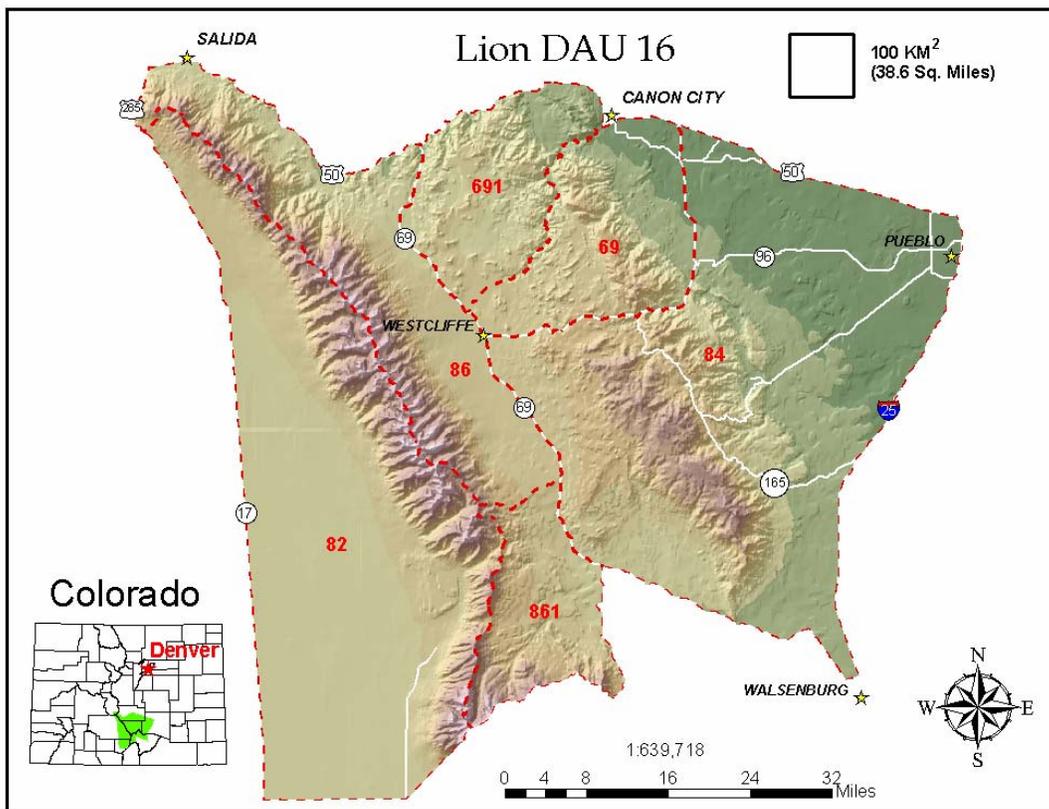


Figure 1. Mountain Lion DAU 16 location and boundaries.

Of the 9370 km² in L-16, land ownership is as follows: Private - 5453 km² (58.2%); State of Colorado (Division of Wildlife, State Land Board, Department of Parks and Outdoor Recreation, Etc.) - 628 km² (6.7%); U. S. Forest Service - 2146 km² (22.9%); Bureau of

Land Management - 993 km² (10.6%); and National Park Service - 150 km² (1.6%). Land ownership in the DAU is shifting from private landownership to the Great Sand Dunes National Park and Preserve and a new National Wildlife Refuge. These changes have not been finalized at the current time and will affect landownership breakdowns in the future.

Vegetative communities include alpine tundra, sub-alpine fir, montane conifer, montane shrub, mountain grassland, great basin shrub, and plains grassland. Predominate land use in L-16 is agriculture with livestock grazing occurring on public and private lands. Irrigated hay meadows are common in the Wet Mountain Valley while row crops are uncommon and generally confined to very small farms at lower elevations. Geologically the Sangre de Cristo range is not highly mineralized. Thus there is currently little mining in the area, although extensive mining occurred in GMU 691 but has ceased since the first part of the 20th century.

Human occupancy is scattered among river valleys and in the major population centers of Pueblo, Canon City, Florence, Salida, Alamosa, Rye, Walsenburg and Colorado City located along the perimeter of the DAU. Cities within the interior include Westcliffe, Silver Cliff, Crestone and Beulah. Human recreation is centered in the San Isabel National Forest and the Sangre de Cristo wilderness areas. Also the Great Sand Dunes National Park and Preserve offer increasing human activity within the region.

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. This DAU is being managed for a stable population.

POPULATION PROJECTION

No scientific studies to estimate mountain lion populations have been conducted in L-16. 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-16 to the effective mountain lion habitat in L-16. 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-16. 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 km² (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 km². 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 km², for the population. This range was then narrowed to 3.5 to 4.7 lions per 100 km² (i.e., moderate to high density) in recognition of the abundance of prey and high quality of lion habitat in L-16.

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

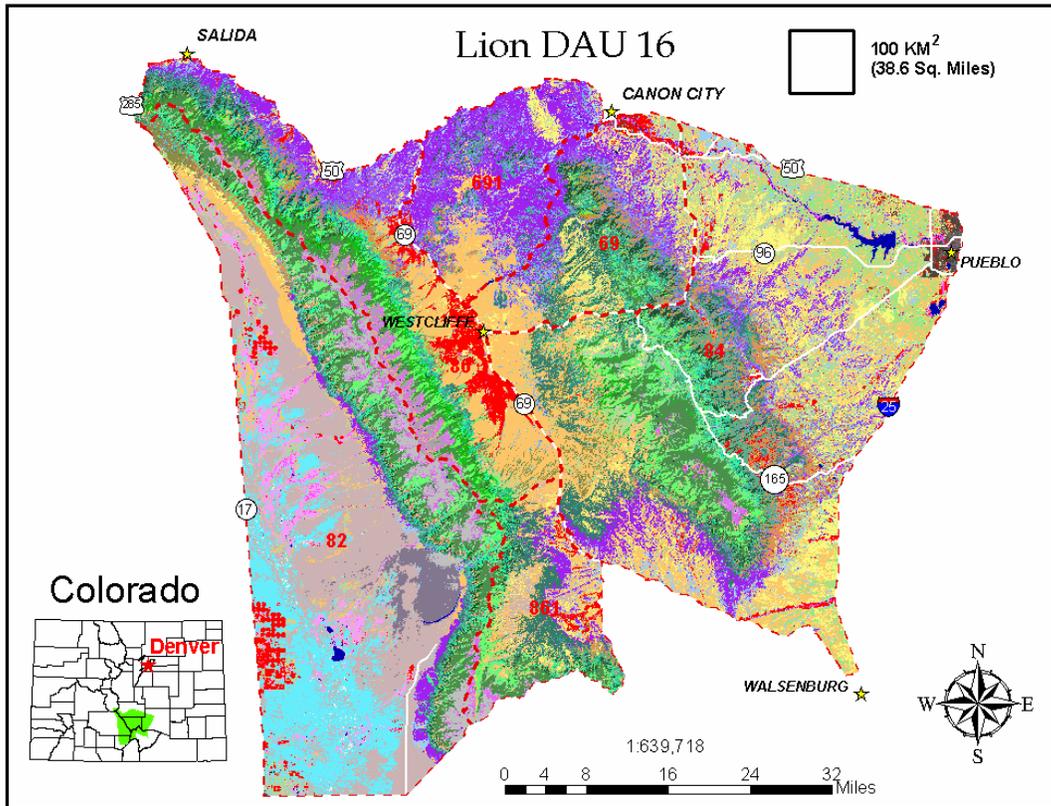


Figure 2. GIS interpretation of habitat types.

Areas that were determined to be very low density habitat such as the rabbit-brush and greasewood flats of unit 82 on the San Luis Valley floor were excluded from the population projection. Urban areas such as the towns Pueblo, Canon City, Florence, Salida, Alamosa, Rye, Walsenburg and Colorado City; along with the small portions of unit 84, which contain grassland dominated landscapes, were also excluded from the projection. 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.) (Figure 3). Using these parameters we determined that the effective mountain lion habitat is approximately 6433 km².

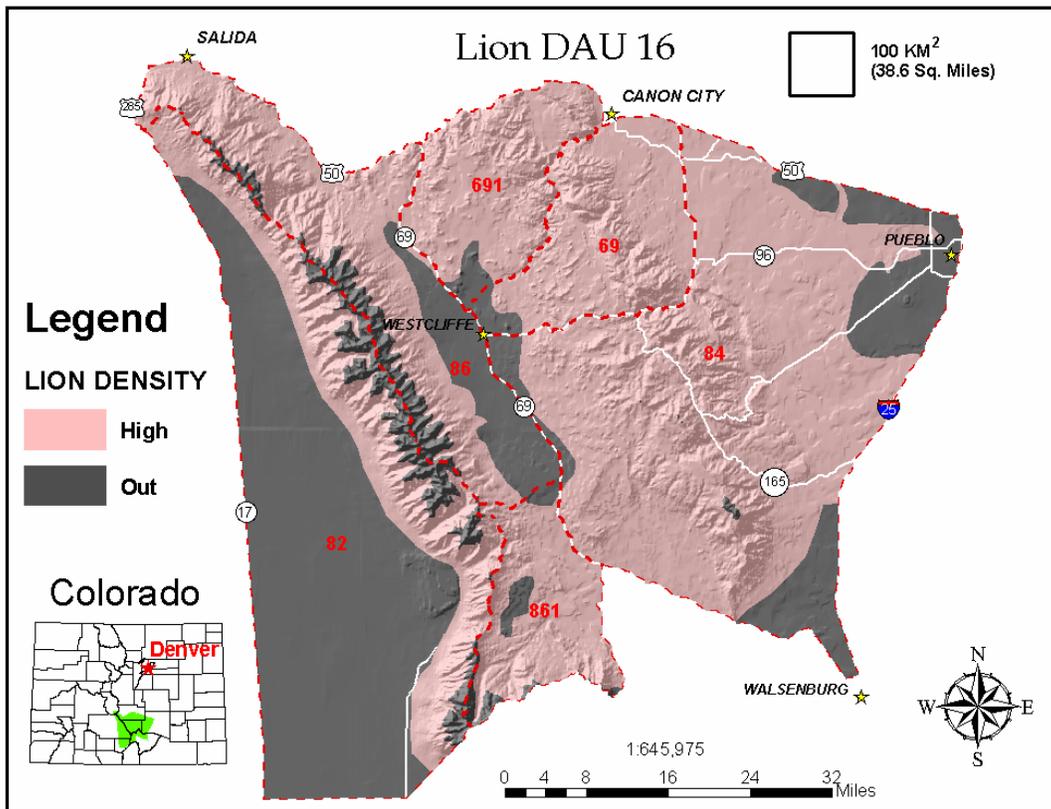


Figure 3. Mountain lion density projection for DAU L-16.

Using a the low density population estimate of 3.5 mountain lion/100 km² found by Ross and Jalkotzy (1992) applied to the amount of effective mountain lion habitat in L-16, we arrive at a low density population estimate of 225 mountain lion within L-16. Using a high density population estimate of 4.7 mountain lion/100 km² 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 302 mountain lion within L-16. Thus we project a mountain lion population of between 225 and 302 mountain lion within L-16.

The CDOW has initiated a mountain lion study in 2004. Hopefully, population projections will be further refined from this study to further 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-16 has ranged from 17 to 28 lions a year over the last 10 years with an average of 23 (Table 1).

GMU	YEAR										10 Yr. Total	
	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	Males	Females
69	3/4	2/2	1/5	1/0	0/4	8/3	7/5	3/3	3/1	3/3	31	30
82	2/0	0/0	2/2	0/1	1/1	0/0	2/2	2/0	1/0	2/0	12	6
84	2/0	4/2	3/4	7/2	3/6	3/3	5/5	2/3	3/2	3/0	35	27
86	5/2	6/6	9/2	5/5	5/5	1/3	2/2	7/5	4/2	7/1	51	33
691	0/1	2/0	0/1	0/0	0/0	0/0	0/0	0/0	1/0	0/0	3	2
861	0/1	0/1	0/5	0/0	1/1	2/0	0/0	0/0	0/0	0/0	3	8
DAU Total by sex	12/8	14/11	15/19	13/8	10/17	14/9	16/14	14/11	12/5	15/4	-	-
DAU Total	20	25	34	21	27	23	30	25	17	19	-	-

Table 1. Number of mountain lions harvested by sex (males/females) in L-16 by GMU from 1994-2003.

The percentage of females in the harvest has remained fairly constant (Figure 4), with the ten year average percentage of females in the harvest being 41% and a five year average of 45%.

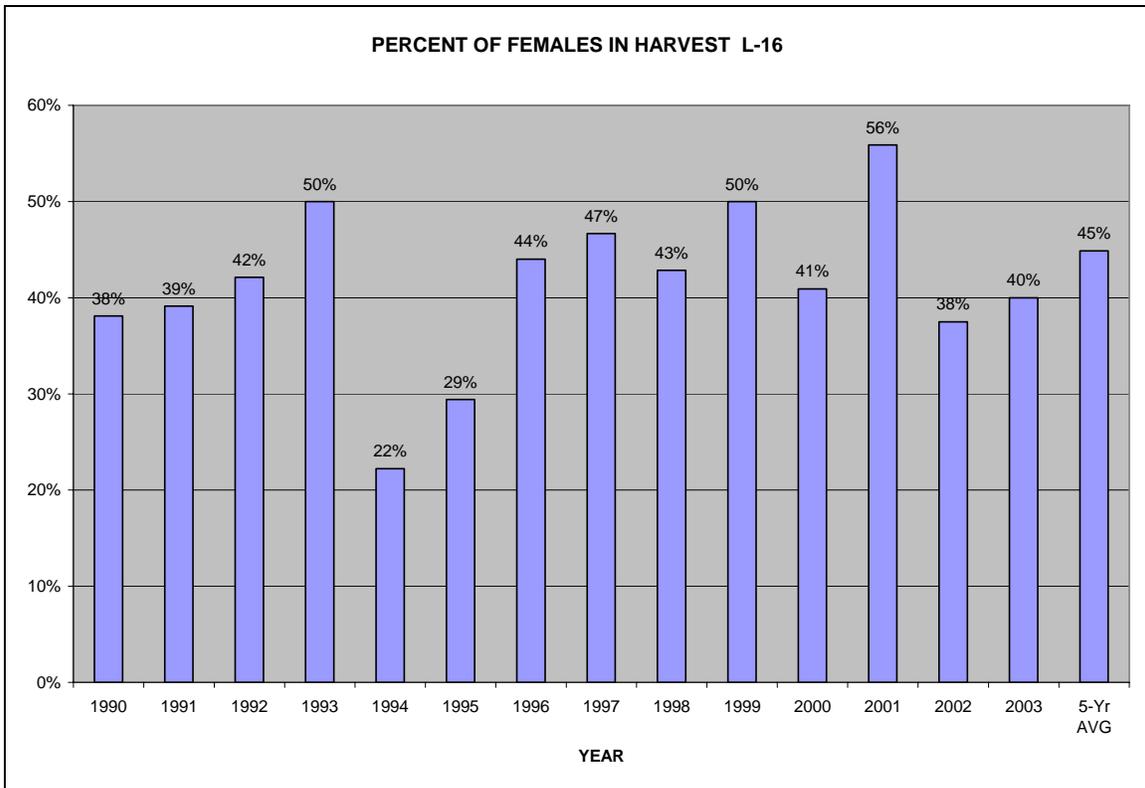


Figure 4. Percent of females in total harvest.

The harvest quota has remained constant in units 82 over the period from 1990-2003. The quota for units 69, 84, 86, 861 was 25 in 1990 and was increased to 40 in 1992. In 1996 the quota was increased by 2 to 42 and remains there in 2003(Figure 5).

Mountain lion hunting in this DAU remains very good with some of the highest mountain lion harvests in eastern Colorado.

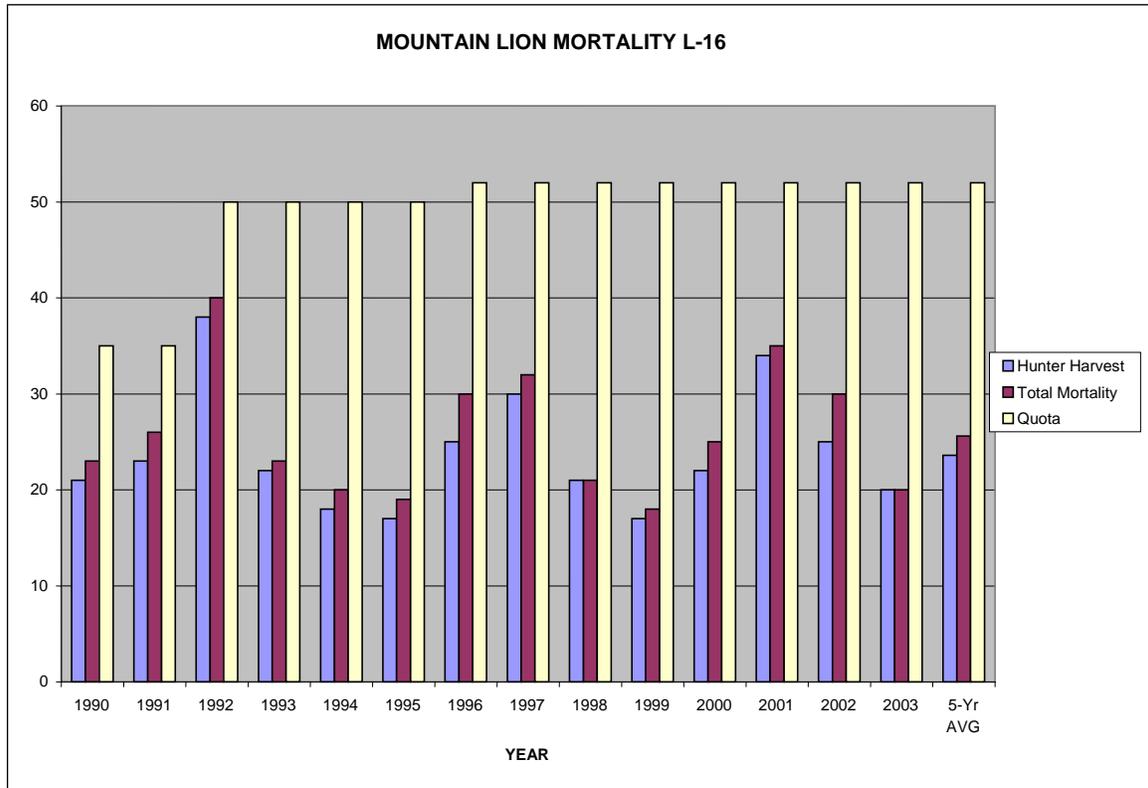


Figure 5. Mountain lion harvest and Quotas.

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 the age 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 117 adults: 32 subadults: 76 cubs, and a high density composition of 157 adults: 42 subadults: 103 cubs. 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

population. Therefore L-16 has an estimated harvestable mountain lion population between 149 (low density population) and 199 (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 harvestable population. This gives us an annual off-take range of 22 to 30 mountain lion in L-16.

The 5-year average % of females in the harvest is 45%, with 2003 being 40%, or 8 female mountain lion out of a total harvest of 20. Female harvest has exceeded 50% of the total harvest, 2 of the last ten years and exceeded 55% of the total harvest, 1 of the last 5 years. The highest recorded percentage of females in the total harvest peaked in 2001 at 56%. If hunter harvest remains high and female percentages climb above 45% of allowable off-take then CDOW may need to reduce the quota to assure that harvest meets population goals.

Other mortality factors including road-kills and damage control have averaged 2.0 mountain lion 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 have increased by 50% over the last 5 years. There is no indication that there are fewer mountain lions 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-16. It is possible that mountain lion densities in L-16 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-16 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 are developed, 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 location was performed to establish refuge areas in L-16 (Figure 6). Harvest locations were clustered along Colorado Highway 50 and the Arkansas River Canyon in areas that have vehicular access, with a few scattered harvests in other locations. To determine effective refuge areas, each harvest location was assigned a buffer associated with the average home

range of its gender. The buffers were 357 km² (138 mi²) for male lions and 195 km² (75 mi²) 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-16 include the Great Sand Dunes National Park and portions of effective habitat along the Wet Mountain Valley.

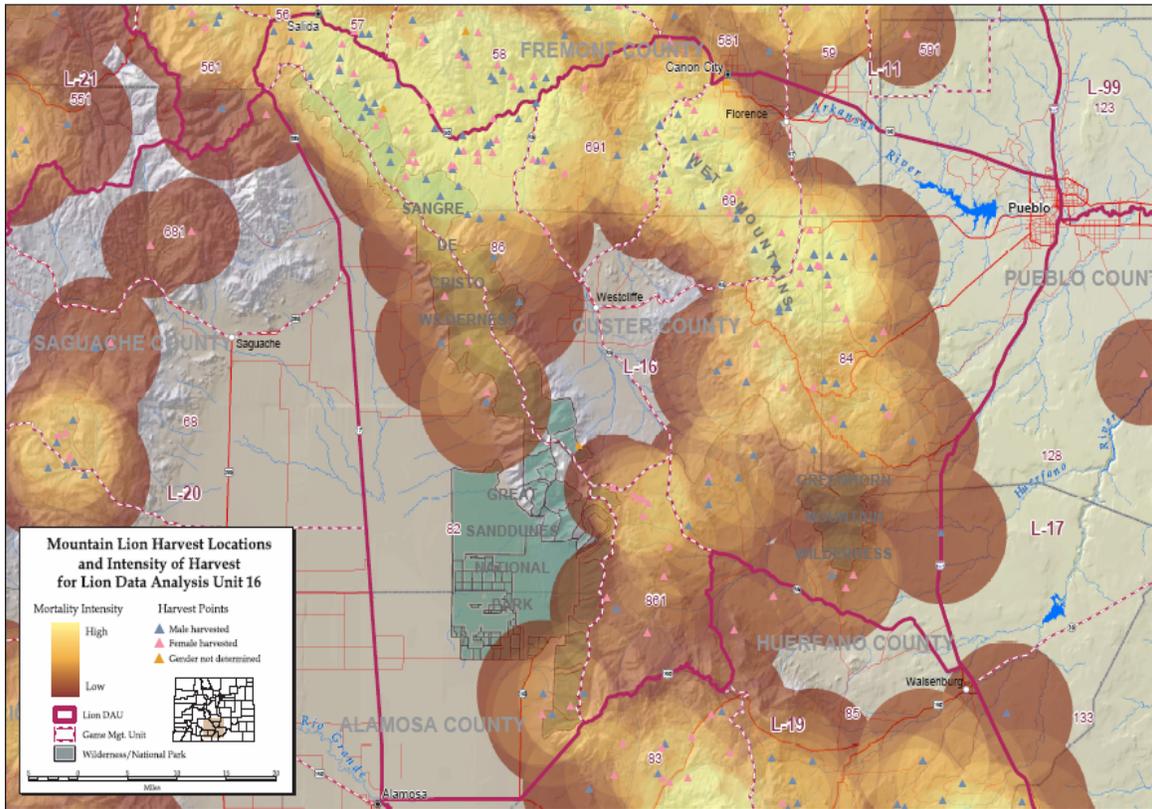


Figure 6. Mountain Lion Harvest Locations and Intensity of Harvest for L-16

GAME DAMAGE

The increasing human demographic 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 predation 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 \$873.00 per year (5 year average) in L-16 with annual payments following a boom and bust cycle (Figure 7).

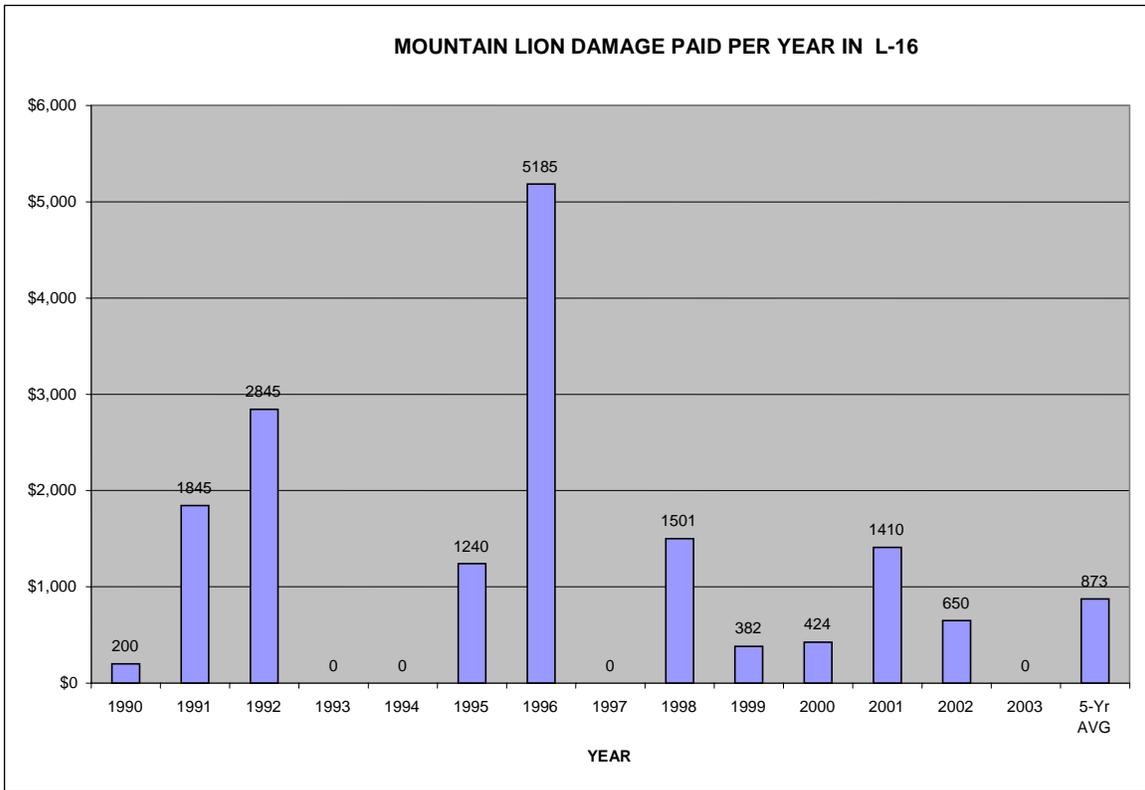


Figure 7. Mountain lion damage paid per year

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 educational 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.

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. Long term documentation of human/mountain lion conflict does not exist or is inaccurate due to variable reporting rates.

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-16, which is supported by public input, is to maintain a stable population. Harvest levels have remained static with no average increase in female harvest implying that current harvest levels are sustainable over the long term. 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 and 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

Logan, K.A., L.L. Irwin, and R. Skinner. 1986. Characteristics of a hunted mountain lion population in Wyoming. *Journal of Wildlife Management* 50(4):648-654.

Logan, K.A. and L.L. Swenar. 2001. *Desert mountain lion: evolutionary ecology and conservation of an enduring carnivore*. Island Press. Washington, DC, USA.

Ross, P.I. and M.G. Jalkotzy. 1992. Characteristics of a hunted population of cougars in southwestern Alberta. *Journal of Wildlife Management*. 56(3):417-426.