

# MOUNTAIN LION DATA ANALYSIS UNIT L-11 MANAGEMENT PLAN

## GAME MANAGEMENT UNITS

48, 49, 50, 56, 57, 58, 59, 481, 500, 501, 511, 512, 561, 581, 591

Prepared for:  
Colorado Division of Wildlife

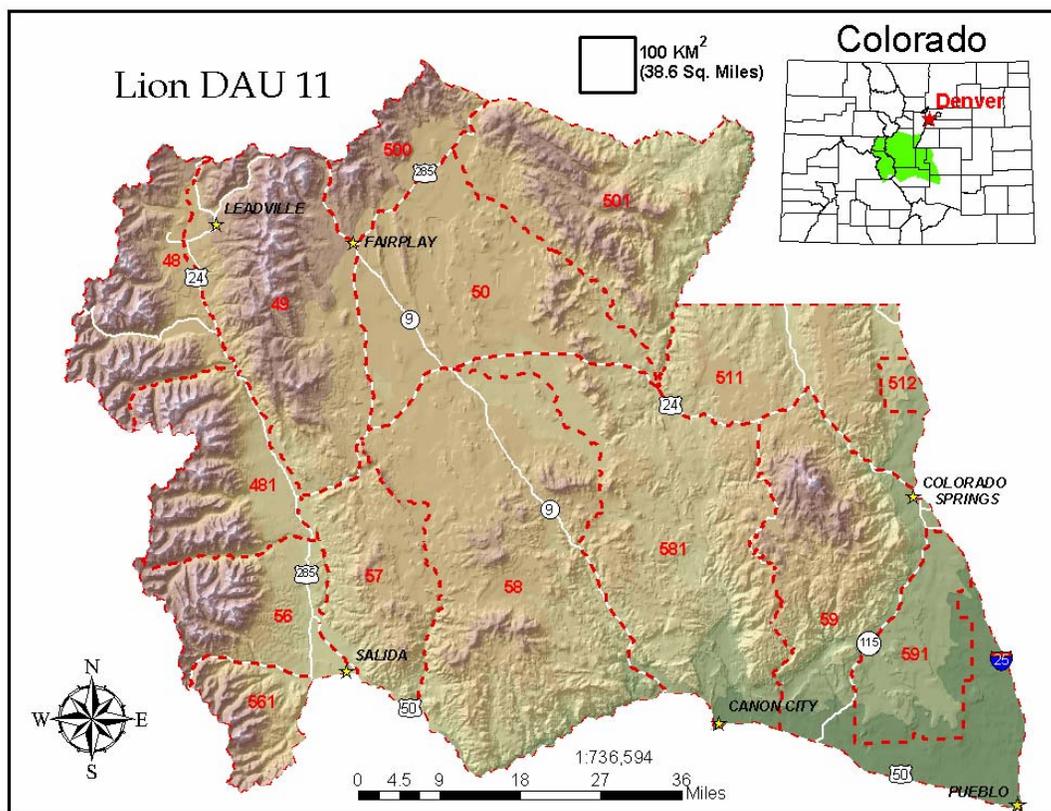
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## **DESCRIPTION OF DAU, HABITAT AND HISTORICAL MANAGEMENT**

Mountain lion (*Puma concolor*) data analysis unit (DAU) L-11 includes all of Teller, Lake and Chaffee counties and portions of El Paso, Pueblo, Fremont, Park, Saguache, and Jefferson counties in central Colorado (Figure 1). The overall area of the DAU is approximately 14,087 km<sup>2</sup> (5,439 mi<sup>2</sup>). This area includes the metropolitan Colorado Springs area and associated urban interface.

Vegetative communities within the DAU are varied and correspond to a wide range of elevations. The western extent of the DAU contains high altitude elevations exceeding 14,000 feet and is associated with sub alpine and alpine vegetation. The north-central portion of the DAU includes South Park associated with high meadow grasslands. The southern portion of the DAU in the Arkansas River valley is composed of pinion/juniper vegetation. Additional vegetative communities include gamble oak, mountain shrub, and aspen. The land ownership within the DAU is mixed with 2,350 mi<sup>2</sup> (41.0%) private, 2,171 mi<sup>2</sup> (37.9%) United States Forest Service, 634 mi<sup>2</sup> (11.1%) Bureau of Land Management, 323 mi<sup>2</sup> (5.6%) State of Colorado, 5 mi<sup>2</sup> (0.1%) United States Fish and Wildlife Service, 243 mi<sup>2</sup> (4.2%) Department of Defense, and 9 mi<sup>2</sup> (0.1%) National Park Service.



**Figure 1. Mountain lion DAU L-11 in Colorado**

### **Key Management Issues**

There are two primary management issues in L-11. The most important is to maintain a biologically sustainable lion population while accounting for multiple uses. Humans

possess a variety of values for mountain lions (Zinn and Manfredo 1996). Therefore, management decisions must account for these multiple values and include an assessment of harvest, human conflicts and game damage. Public open houses were held in Colorado Springs, Salida, Canon City, and Hartsel to gather public comment about the management plan for L-11. Comments were submitted in writing both at the open houses and by mail. Most comments supported continued hunting and some comments regarded an excess of lions that should be controlled through harvest. Other comments urged the importance of better population information about mountain lions. Refer to Appendix A for actual comments. The second management issue includes the necessity of public education about mountain lion biology, management and successful coexistence. Increased residential development throughout L-11, especially Colorado Springs and the surrounding areas, has increased the incidence of human/mountain lion interactions. Therefore, an effort must be made to inform residents about mountain lions.

### **STRATEGIC GOALS:**

The overall goal of the CDOW is to maintain a healthy, self sustaining mountain lion population that is in balance with available habitat. In addition, to minimize game damage complaints and maintain an environment that supports a rich, vegetative and wildlife community that will support a self-sustaining mountain lion population. Based on this overall goal and input from the public DAU L-11 is to be managed for a stable mountain lion population.

### **MANAGEMENT OBJECTIVES:**

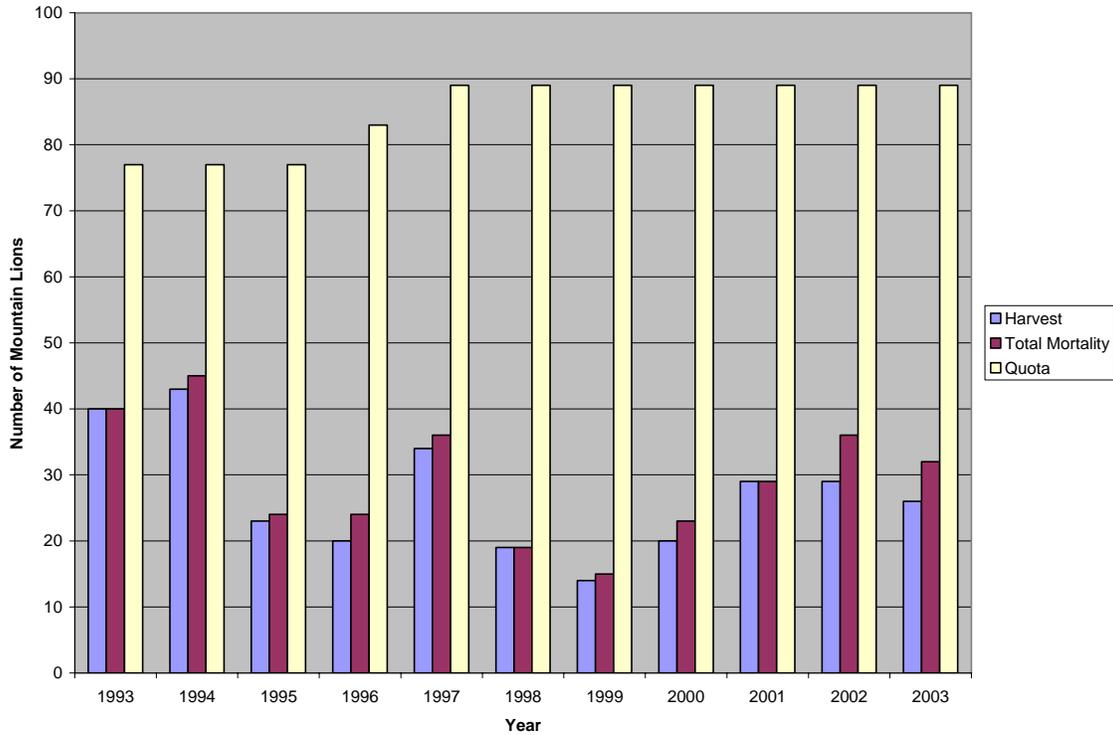
#### **Historic Information**

##### **Mortality**

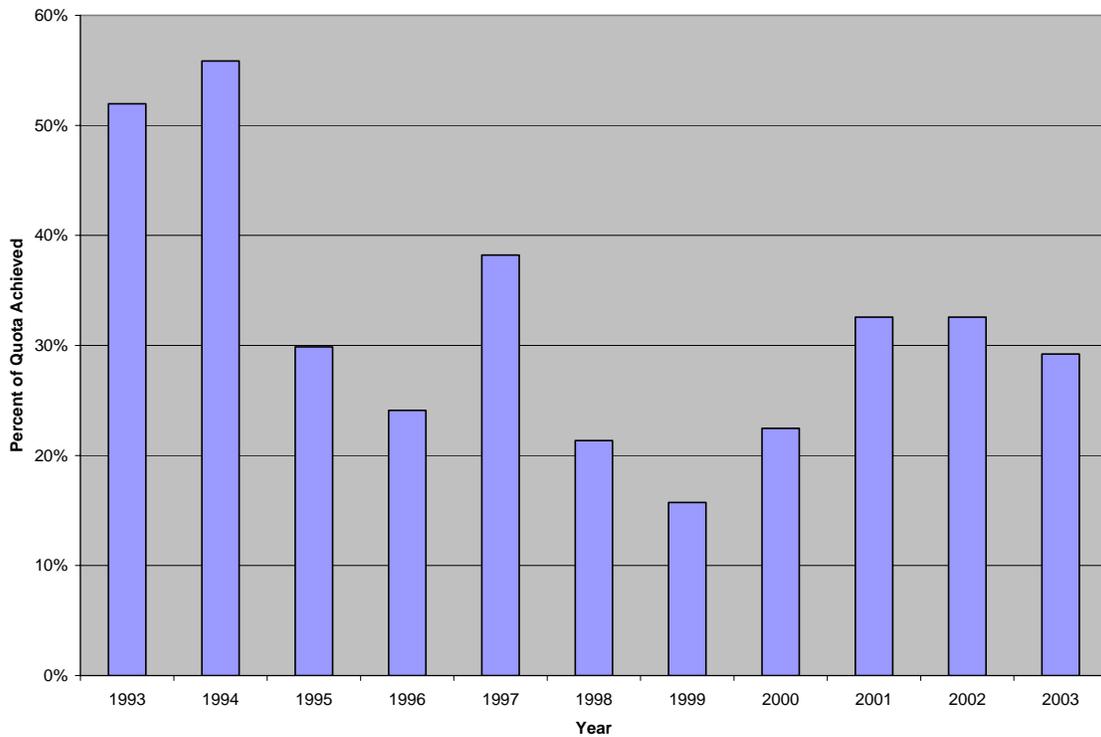
Harvest is the largest source of documented mountain lion mortality in L-11. Mountain lion hunting season is open from January 1<sup>st</sup> through March 31<sup>st</sup> and from the 1<sup>st</sup> day after the close of the regular deer and elk seasons to December 31<sup>st</sup>. The number of mountain lions that can be harvested is regulated by a quota, which reflects the maximum number of lions that can be harvested in L-11. This quota is divided among the game management units (GMU's) in L-11 (Figure 1). The harvest quota of mountain lions in L-11 has changed through the years. From 1993-1995 the quota was 77 mountain lions, 1996 the quota was 83 mountain lions and from 1997-2003 the quota has remained constant at 89 mountain lions (Figure 2).

Historically, hunter harvest has been determined by winter snow conditions. Harvest goes up in years with more snow and goes down in drier years. Quotas have traditionally been set above expected harvest levels to allow more harvest in the occasional years that receive more snowfall resulting in increased hunting opportunity.

The number of mountain lions harvested has varied through the years, but from 1993-2003 the lion quotas have never been reached (Figure 2). The percentage of quota achievement averaged 27% for the last 5-years and averaged 32% for the past 11-years (Figure 3). Mountain lion harvest has also varied among the different GMU's within L-11 with GMU 58 having the largest harvest over the past 10 years (Table 1). The closest year that mountain lion harvest came to reaching the quota from 1993-2003 was in 1994 when 56% of the harvest quota was achieved with the harvest of 43 mountain lions in L-11.



**Figure 2.** Mountain lion harvest, total mortality and harvest quota in L-11 from 1993-2003. Total mortality includes both harvest and other documented mortalities such as road kills and control kills.

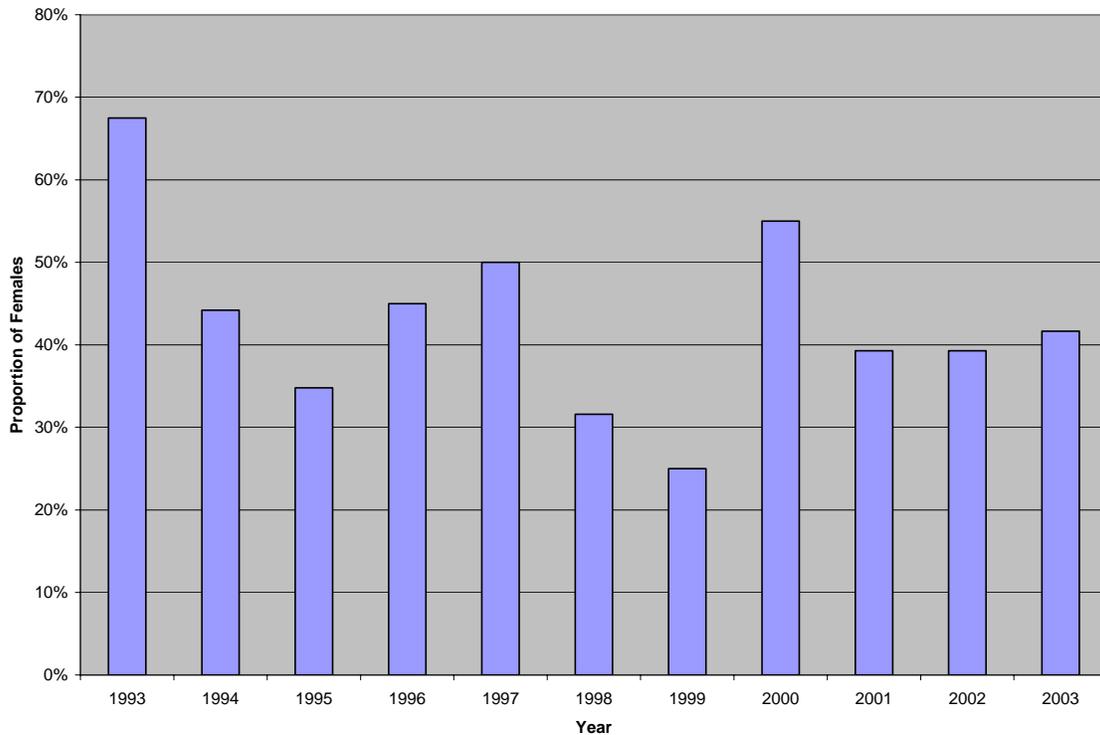


**Figure 3.** Percent of the mountain lion quota achieved from 1993-2003 in L-11.

**Table 1.** Number of mountain lion harvested by sex (males/females) in L-11 by GMU from 1994-2003.

GMU	Year										10 Yr.Total	
	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	Males	Females
48	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0	0
481	0/1	1/1	0/0	0/1	0/0	0/0	0/0	0/1	0/0	0/0	1	4
56	0/0	0/1	1/1	0/1	0/0	0/0	0/0	0/0	0/0	1/1	2	4
561	0/1	1/0	2/0	0/2	0/0	1/0	1/0	1/2	0/0	2/0	8	5
49	1/2	2/0	1/0	1/0	3/0	1/0	3/1	2/0	0/0	2/2	16	5
57	1/0	0/2	1/0	0/2	1/0	1/1	3/4	1/2	0/0	3/2	11	13
58	2/5	6/4	4/8	5/2	2/1	3/3	3/3	2/1	4/3	7/2	38	32
581	2/0	2/0	5/0	1/1	3/0	3/0	3/4	3/2	5/0	2/6	29	13
59	2/3	3/0	1/0	1/1	2/0	2/1	1/0	1/0	3/2	3/3	19	10
591	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0	0
511	4/0	1/0	2/1	0/0	2/0	0/1	2/1	0/0	1/2	1/2	13	7
512	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0	0
50	0/0	0/2	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1/0	1	2
500	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0	0
501	2/0	1/2	0/2	1/0	2/0	2/0	1/2	1/1	2/1	2/1	14	9
<b>Total DAU by sex</b>	<b>14/12</b>	<b>17/12</b>	<b>17/12</b>	<b>9/10</b>	<b>15/1</b>	<b>13/6</b>	<b>17/15</b>	<b>11/9</b>	<b>15/8</b>	<b>24/19</b>	-	-
<b>DAU Total</b>	<b>26</b>	<b>29</b>	<b>29</b>	<b>19</b>	<b>16</b>	<b>19</b>	<b>32</b>	<b>20</b>	<b>23</b>	<b>43</b>	-	-

Mountain lion population modeling suggests that the harvest of female mountain lion is the most sensitive indicator of changes in mountain lion population size. Therefore, it is important that the proportion of females in the harvest be monitored. The proportion of female mountain lions in the L-11 harvest has varied from 25% to 68% in 1993-2003 with the highest proportion of 68% in 1993 (Figure 4). Current CDOW management direction includes monitoring the proportion of female harvest, and that if the proportion of females in the harvest exceeds 50%, then the harvest should be further analyzed to determine if reductions in harvest should occur to reduce both the number and proportion of females killed in the DAU. The proportion of female mountain lions in the L-11 harvest has averaged 40% for the past 5-years and 43% for the past 11-years. Therefore, current female harvest proportions are acceptable for a stable or increasing population objective.



**Figure 4.** Proportion of female mountain lions in the harvest in L-11 from 1993-2003.

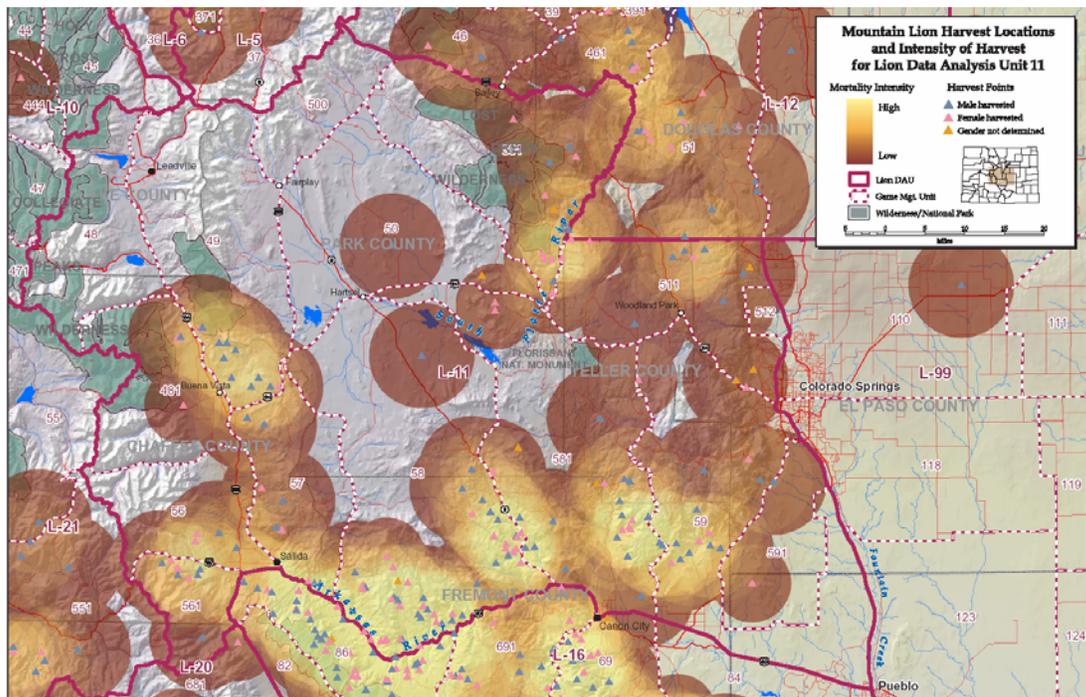
### Refuge Areas

Logan and Sweanor (2000) suggest that a sustainable lion harvest is supplemented by refuge areas where no harvest is occurring. A spatial quantification of these refuge areas was made using harvest locations from 1997-2002. These harvest locations were buffered by the home range (male 357 km<sup>2</sup>; female 195 km<sup>2</sup>) according to the sex of the animal harvested. Refuge areas were then classified as areas outside of these buffered harvest locations (Figure 5). Over 50% of the DAU had low to no harvest during 1997-2002. Those areas provide functional refuges from harvest that contribute lions to the population in areas with higher harvest intensities.

The presence of these refuge are a result of areas having very little to no road access to facilitate hunting, high human residential densities which prohibit the running of lions by dogs and/or low lion densities which attract little hunter interest.

Areas supporting medium to high lion densities while having no or very low harvest include the Front Range of El Paso, Teller and northeastern and eastern Park counties (high human residential densities). In addition, southern Park and northern Fremont counties (low road densities limit hunter access) and western Chaffee County (private lands and rugged terrain hinder hunting with dogs) have no hunter harvest. The absence of harvest within these areas with high to moderate lion densities serve to supplement lion populations in close proximity where harvest is occurring.

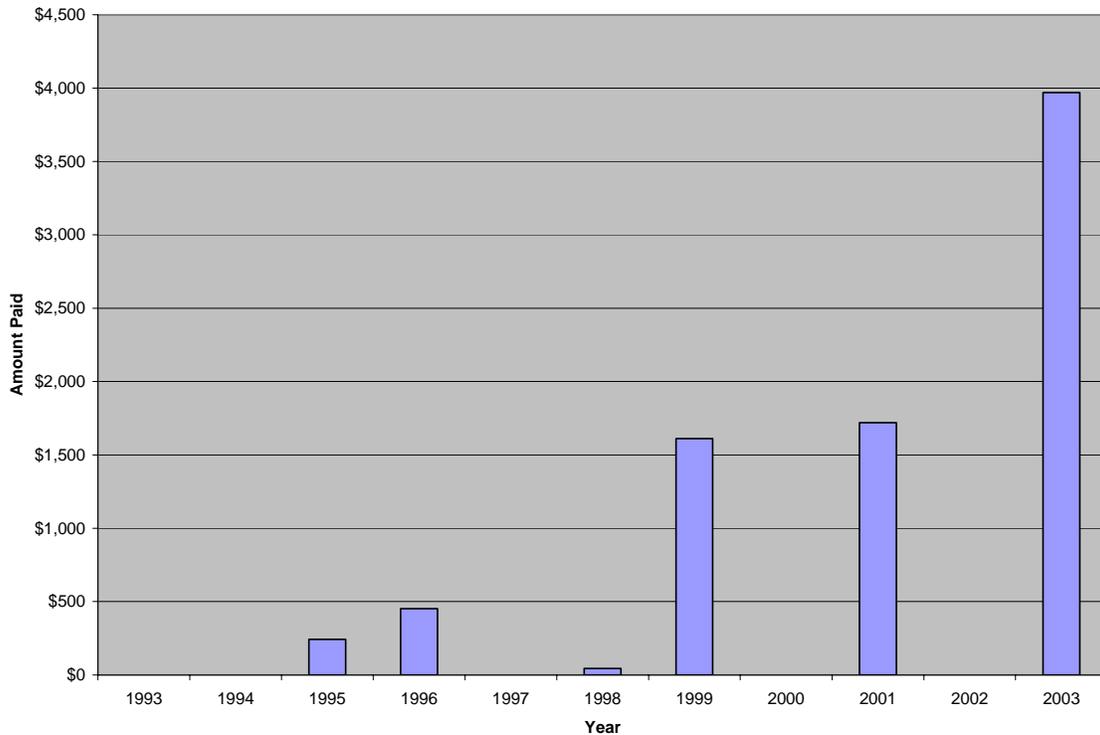
Low lion populations occur in central Park county, northwestern Pueblo county and the higher elevations of Lake and Chaffee counties. Lion populations in these areas are low enough that they probably provide little supplement to the adjacent areas of higher harvest.



**Figure 5.** Home range buffered mountain lion harvest locations and intensity of harvest, 1997 through 2002 for L-11.

### Game Damage

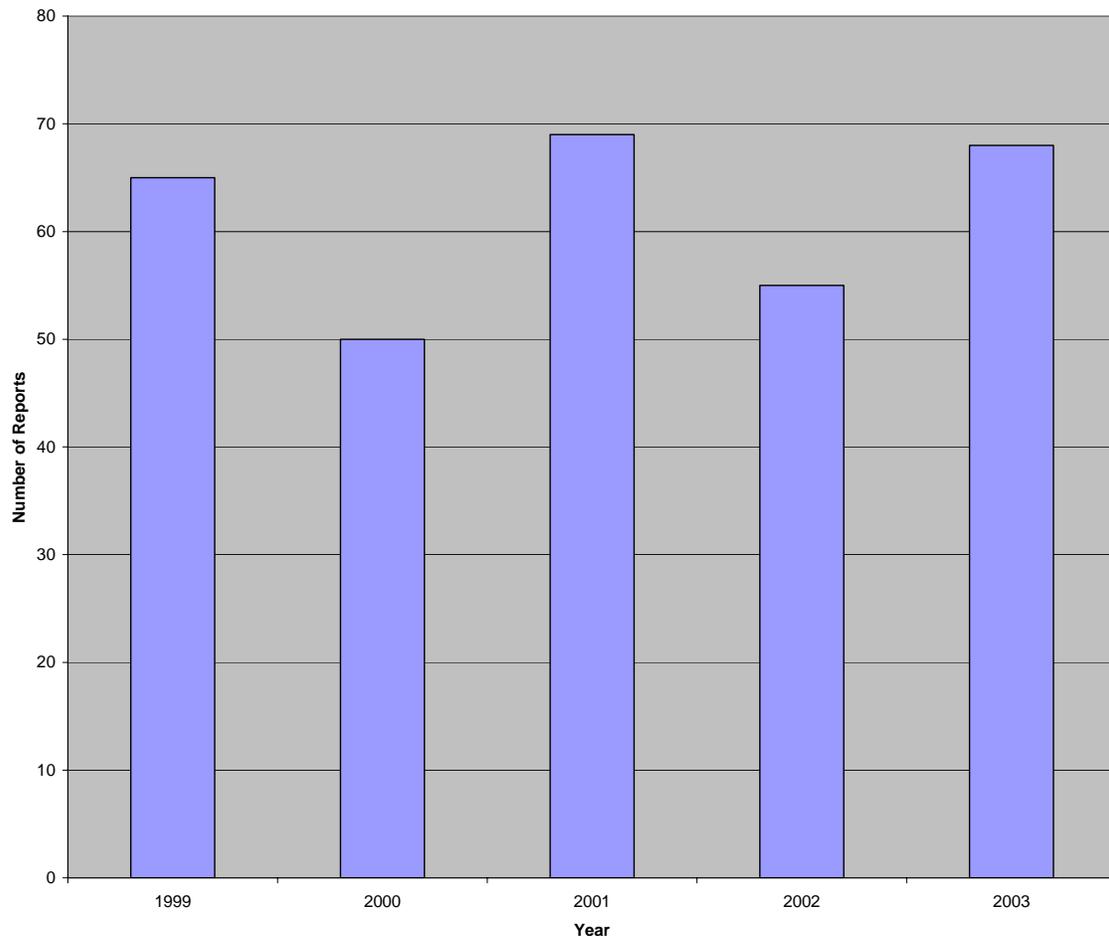
The diet of the mountain lion consists of a variety of prey species, which have been documented to occasionally include domestic livestock. Colorado Division of Wildlife statute 33-3-104 establishes the liability of the state for damage documented and confirmed as mountain lion damage to livestock. The number of game damage claims attributed to mountain lions in L-11 and the amount paid from these claims from 1993-2003 has varied from 0 claims up to 3 claims totaling \$3,970 in 2003 (Figure 6). The monitoring of game damage claims will continue and hunter harvest will be encouraged in situations where lions are causing damage during the hunting season.



**Figure 6.** Indexed amount (\$) of mountain lion damage claims paid in L-11 from 1993-2003.

### Human / Mountain Lion Conflict

Humans possess a variety of values towards mountain lions. A survey conducted by Zinn and Manfredi (1996) showed that the majority (approximately 80%) of Colorado Springs residents surveyed possessed a positive attitude towards mountain lions. However, these positive attitudes changed when the question pertained to the surveyed resident's attitude when the mountain lion was in close proximity to their home with approximately 40% having a positive attitude toward such an occurrence. Since 1999, the number of mountain lion reports has varied with the largest number in year 2000 with 64 reports (Figure 7). These reports range from mountain lion sightings to complaints including depredations of domesticated pets. Education of the general public about mountain lions in L-11 has occurred for many years. This education will continue in the future to inform the public about mountain lion biology, management, and ways to successfully coexist.

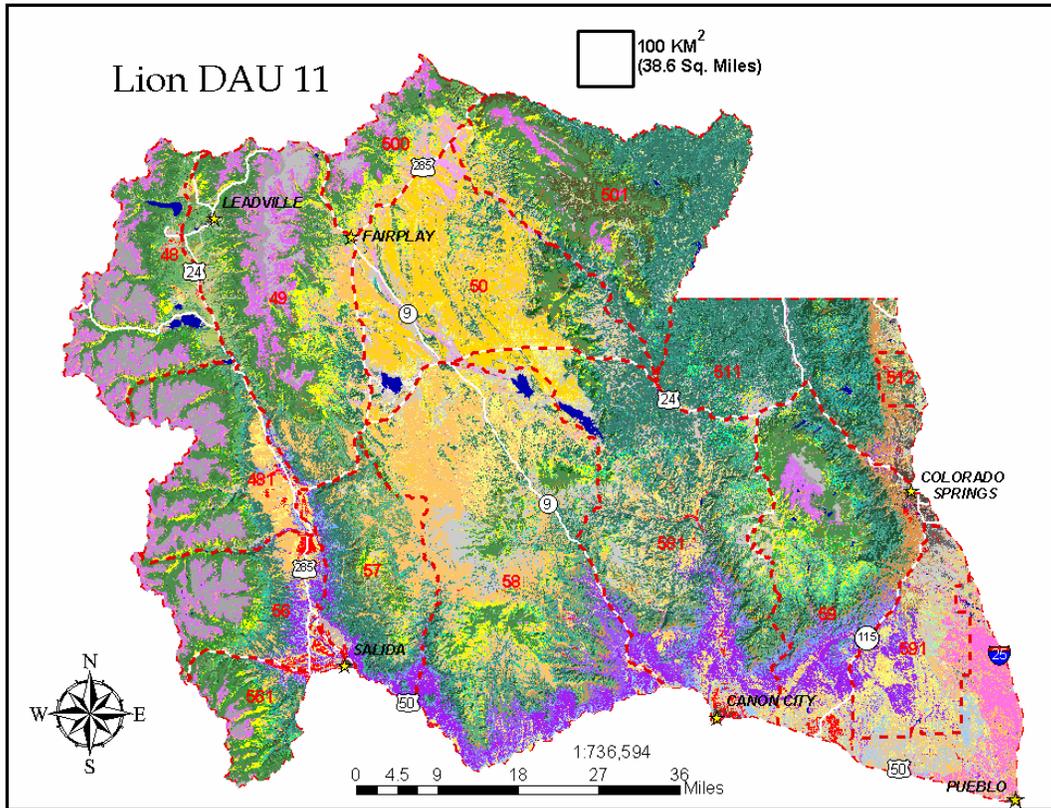


**Figure 7.** Number of mountain lion conflict reports taken by the Colorado Springs office of the Colorado Division of Wildlife from 1999-2003.

**PROCESS**

Currently, no research is being conducted in L-11 to estimate mountain lion abundance. Therefore, we projected the mountain lion population using available mountain lion habitat and density estimates from the scientific literature. Hemker et al. (1984) found that lion densities were limited by mule deer (*Odocoileus hemionus*) populations in a Utah study area. Much of the previous research estimating mountain lion density has not evaluated prey densities as they correspond to mountain lion population densities. Therefore, a correlation between prey densities in research studies and prey densities in L-11 are not possible. However, vegetation classifications in previous research projects are similar with the vegetation in L-11 and these measured densities were used for population projections.

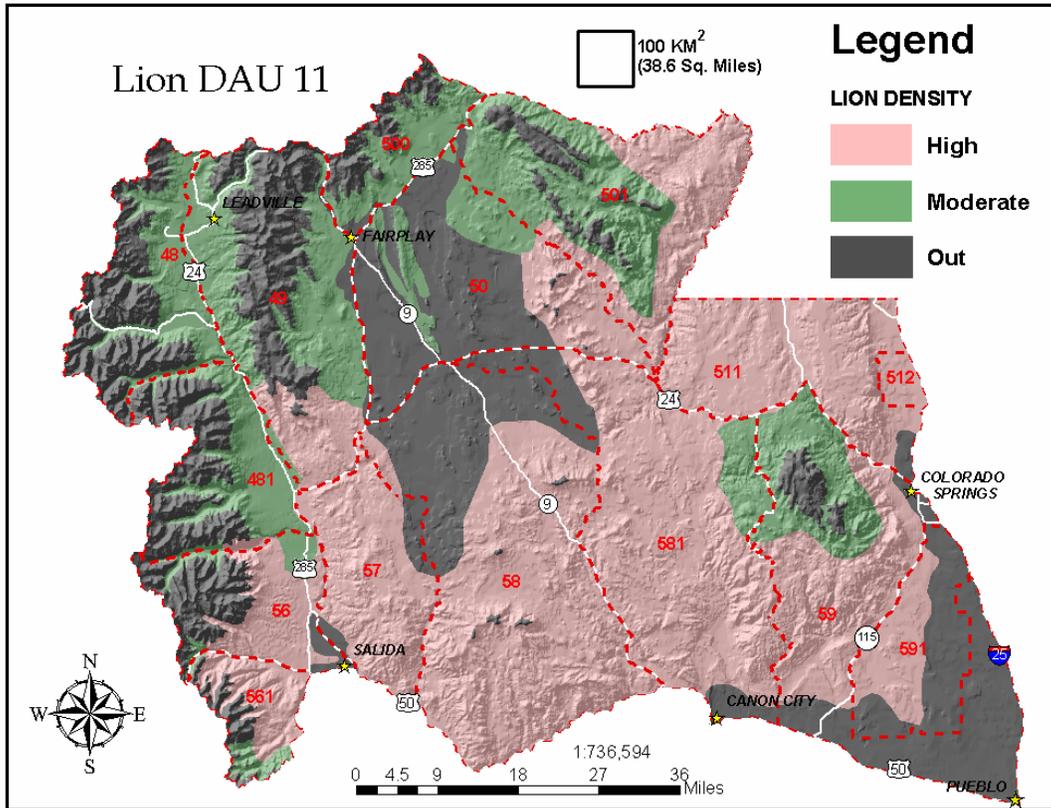
L-11 is a large DAU and has a variety of vegetative types (Figure 8). Therefore, we did not use a single mountain lion density to project the population size in L-11. Rather, we divided L-11 into two habitat types, high elevation habitats and foothills habitats. In addition, we excluded the grasslands, urban areas and areas above 11,000 feet in elevation.



**Figure 8.** Vegetative types in mountain lion DAU L-11.

Much of the area in L-11 is composed of foothills vegetation types that include pinion/juniper, ponderosa pine (*Pinus ponderosa*), and gamble oak (*Quercus gambelii*). Ross and Jalkotzy (1992) measured lion densities for a hunted mountain lion population in a foothills life zone to be a maximum of 4.5-4.7 lions/100 km<sup>2</sup> for one year in their Alberta, Canada study area. Therefore upper and lower bounds of this density estimate were used for purposes of population projection in the foothills vegetation types. We refer to the lion density in these foothills areas as high lion density areas in Figure 9.

The western boundary of L-11 is the continental divide, which is associated with high elevation vegetation including spruce/fir (Figure 9). In addition to the spruce/fir vegetation in L-11 we also included some ponderosa pine and lodgepole pine (*Pinus contorta*) at higher elevations. Spreadbury et al. (1996) found mountain lion densities of 3.5-3.7 lions/100 km<sup>2</sup> in a rugged study area that included the continental divide in southeastern British Columbia. In addition, Spreadbury et al. (1996) found that elk (*Cervus elaphus*) was the most common ungulate in their study area. Also present were mule deer, bighorn sheep (*Ovis canadensis*), and mountain goats (*Oreamnos americanus*). These prey species are also consistent with the prey species found in the high elevation areas of L-11. We used the upper and lower bounds of the mountain lion density found by Spreadbury et al. (1996) in our population projections for high elevation areas. We refer to the high elevation habitats as moderate lion density areas in Figure 9.



**Figure 9.** Projected mountain lion density in L-11 related to foothills (high lion density) and high elevation (moderate lion density) vegetative communities.

Areas in L-11 that are not believed to be primary lion habitats were excluded. These included alpine areas above 11,000 feet in elevation, grassland vegetation of South Park, the riparian and agricultural lands around the city of Salida, and the grassland and agricultural lands around Canyon City extending northward to Colorado Springs (Figure 9). These are areas in which lions are sighted, but we believe the core of mountain lion home range is not likely to occur in these areas. Dickson and Beier (2002) found that mountain lion home ranges overlapped, but did not totally reside in grassland habitats.

After applying the amount of area in both categories of vegetation to the density estimates, we projected the population at 431 to 452 mountain lions in L-11. Kittens cannot be legally harvested in Colorado. Therefore, we subtracted kittens to derive a harvestable population. Ross and Jalkotzy (1992) found that kittens and dependent juveniles on average comprised 33% of the population. Applying this percentage to our population projections, we find that between 289 and 303 mountain lions are legally harvestable.

## **MORTALITY OBJECTIVES:**

### **Management Strategy**

We will set our mortality objective at or below 15% of the projected population. Hunter harvest will be monitored and harvest quotas will be adjusted as needed to account for non-harvest sources of mortality. We will closely monitor the harvest of female mountain lions and account for this information in setting harvest quotas. As population

information specific to Colorado becomes available through scientific research it will be applied to make more rigorous decisions about management of lions in L-11.

### **Total Mortality Objective Range**

For our population management objective of a stable mountain lion population in L-11, it is suggested that the total mortality not exceed the populations' rate of increase. Logan and Sweanor (2001) found that a lion population in New Mexico to have an 11% rate of increase. Currently, the rate of increase of mountain lions in L-11 is unknown, but the densities of prey in L-11 are believed to be substantially higher than that in Logan and Sweanor's study area. Therefore, a mortality level of 15% in L-11 is considered sustainable (Apker, pers comm.). Applying this mortality level to the projected population range of 289 to 303, would equate to an average mortality of 43 to 45 lions per year for a stable population.

### **Hunter Harvest Objective Range**

For the large geographic size of L-11 the number of non-harvest mountain lion mortalities is low. The average non-harvest mortality in L-11 has been 3 lions for the past 5 years. Subtracting this average from the total mortality objective results in 40 to 42 mountain lions that can be harvested per year in L-11.

### **Barriers and Strategies**

Increased development and urbanization will continue to be a barrier in obtaining the mortality objective in L-11. These factors result in increased human/lion conflict, other causes of mortality such as road kills and decrease geographic area in which lions can be actively hunted. The Division of Wildlife will continue to provide comments on developments and continue to educate the public about the biology and management of mountain lions.

### **Monitoring**

There is currently a mandatory registration of all harvested mountain lions and many non-harvest mortalities are also checked by CDOW personnel. This mandatory registration and checks of non-harvest mortalities provides an opportunity to collect biological information such as age and sex. Collecting this biological information can help us to better understand the age and sex structures of harvested and non-harvest lion mortalities and will be used to monitor mountain lion mortality.

Proportion of females in the harvest has been monitored for a number of years as an indicator of over harvest. This monitoring will continue and will be used to make decisions about future harvest quotas.

### **PUBLIC COMMENTS**

In addition to the public open houses that we held in a scoping exercise to gather public input on the lion DAU plan (referred to at the beginning of the plan), we also sent out copies of the lion DAU plan to those publics whom participated in the public meetings and other interest groups. We provided a comment period for the draft DAU plan from 23 July – 13 August 2004. Written public comments from this period are contained in Appendix B.

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