MOUNTAIN LION DATA ANALYSIS UNIT L-23
MANAGEMENT PLAN

GAME MANAGEMENT UNITS
70, 71, & 711
Dolores-Norwood Area

Southwest Region

Prepared for:
Colorado Division of Wildlife

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Components of a Puma Management Plan

DAUs are assemblages of Game Management Units (GMUs) within which puma occupancy has been mapped. Each DAU has a brief management plan with objectives for hunter harvest, game damage, and human-puma conflict, and objectives are stated as the maximum level on a three-year running average.

I. Biological Basis and Framework for Management in Colorado

Puma Population Estimation (Static)

Colorado does not regularly estimate puma populations because no reliable, cost effective sample based population estimation technique currently exists. A projection of possible population has been made based on densities reported in literature for intensively studied populations. Low and high densities were selected from study areas that had habitat types most similar to Colorado. Densities were then applied by biologists to area of puma habitat within DAUs. Areas not considered puma habitat, such as extreme high elevations, intensively farmed land, cities, highways, or reservoirs, were first deleted. Biologists were allowed to apply more constrained densities based upon their knowledge of prey abundance or relative puma abundance. Finally, biologists were asked to pinpoint the puma density most applicable to DAUs within their management responsibility.

Puma densities are driven by two main factors, abundance of available primary prey and quality of habitat for puma hunting behaviors. Given the temporal and spatial variability of these two factors, complicated time and space models for predicting puma densities have yet to be developed. Therefore, a population estimation method at this time should be static (I.e.: a snapshot in time) and should bracket the population between probable high and low numbers. Therefore, Colorado will use ranges reported from credible scientific literature for intensive mark and recapture studies on puma. When low densities for puma are reported in the literature it is usually from study areas of relatively low productivity in terms of primary prey. Conversely, high densities for puma are reported from study areas that are relatively rich in available primary prey and are relatively densely vegetated and/or have high topographic relief. These characteristics of high prey populations and productivity in productive and diverse habitats are supportive of the primary factors that drive puma densities.

Estimating static population should consider the general make up of a population. For puma this includes adult male, adult female, subadults, and cubs. A simple algebraic equation expresses the population: static population = total adults+ subadults + cubs, and total adults = male adults + female adults

In application, a static population is derived by extrapolating density ranges reported in literature to DAU land area. Two density ranges give high and low end densities. Logan and Sweanor (2001) found density ranged from 2.0 to 4.3 puma/100 km^2 in the San Andres Mountains in New Mexico, whereas Logan, et.al. (1986) found density ranged from 3.5 to 4.6 puma/100 km^2 in the Bighorn Mountains in Wyoming. Therefore, we use a range of **2.0 to 4.6 puma/100 km^2** . Nearly all puma studies have estimated densities on winter range only (winter range of the prey species being used as a surrogate of puma winter range), so the previous density estimates should only be applied to winter range areas.

For estimating the component make up of a puma population, two intensive mark recapture studies have used similar age classifications comparable to harvest data collected in Colorado.

These were both conducted in moderately hunted populations or emulation of hunting effects. The age structure of these studies were 56% adult, 10% subadult, and 34% cubs (Logan and Sweanor, 2001), and 48% adult, 19% subadult, and 34% cubs (Ross and Jalkotzy, 1992, in Alberta). The average of these yield 52% adult, 14% subadult, 34% cub, or stated as a ratio **100 adult: 26 subadult: 65 cub**. In populations that are heavily hunted, one would predict that the relative proportion of adults to be decreased. Conversely, a lightly hunted population should see a larger relative proportion of adults.

Estimating sex composition of the adult population assumes a **1:1 ratio male to female**. This is based upon numerous intensive studies in scientific literature that found no significant difference between the number of adult male and female in the studied populations. Actual data almost always show slightly more females than males in the populations, however this is frequently offset by a lower number of females actually available for breeding.

Finally, local biologists examine the estimated number of puma in DAUs and make adjustments based upon their knowledge of various qualitative habitat conditions. Conditions such as intensive agriculture, subdivision development, prairie, and relative prey density are types of factors that may influence puma populations. Consideration of these numbers in some cases help to tighten the range of the population estimation.

It is important to note that the CDOW does not attempt to quantify habitat quality in any numeric fashion and due to the high cost of implementing intensive mark-recapture does not implement population estimation efforts on regular basis. Information to monitor population trends is gathered via mandatory harvest checks and is analyzed on a DAU basis.

II. Data and trends for the Dolores-Norwood Puma Data Analysis Unit in Colorado

The Dolores-Norwood Puma DAU (L-23) is in southwest Colorado (Figure 1), and includes most of San Miguel and Dolores Counties as well as parts of Montezuma and Montrose Counties. The unit ranges from <6000 feet at the Utah stateline to a few peaks over 14,000 feet. Nearly all of the DAU is considered moderate or high puma density habitat, and there are significant populations of primary prey species deer and elk, and smaller populations of desert bighorn sheep.

Figure 1. Location and mapped attributes of L-23, the Dolores-Norwood Puma DAU. The cross-hatched area is mapped as deer, elk, or desert sheep winter range, and therefore high density for pumas, and other areas up to 11,000 feet elevation are mapped as moderate density for pumas.
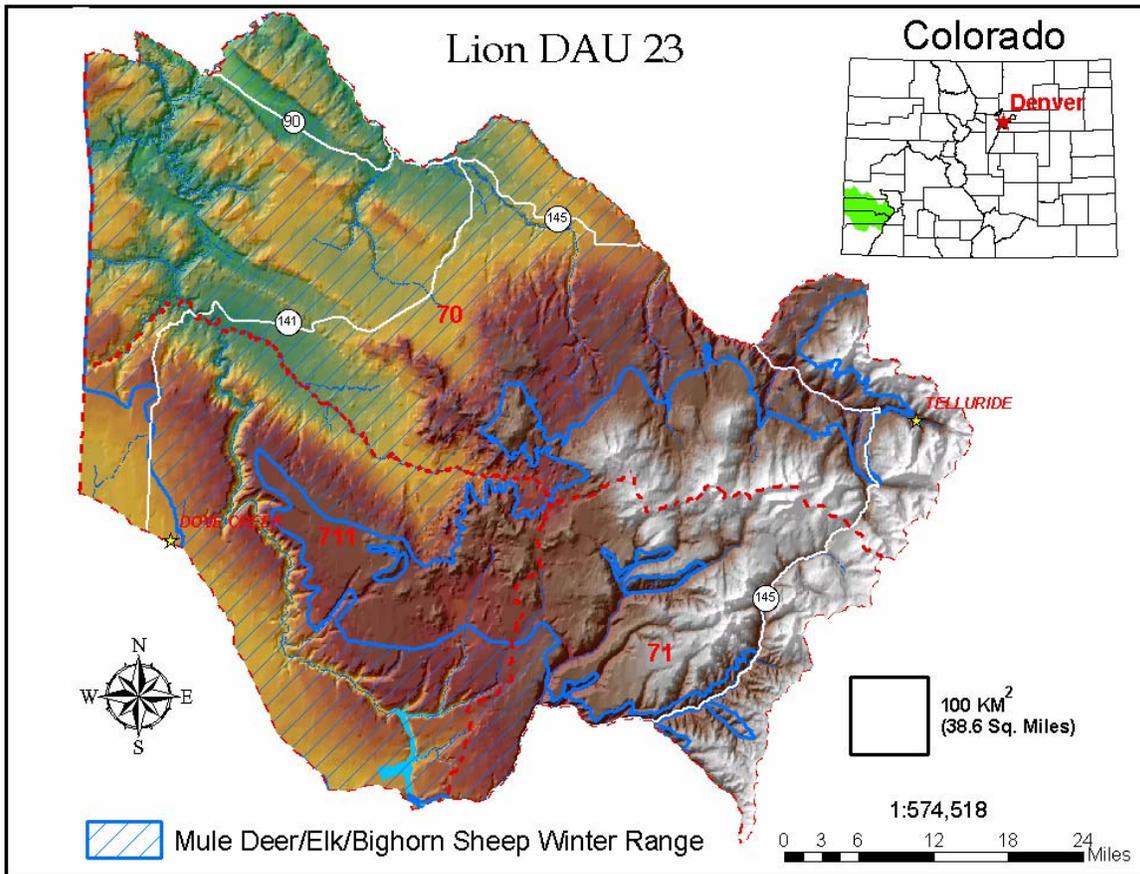
A. Harvest and mortality data and trends

The sport harvest quota has remained the same at 33 since 1998, doubling since 1994, while the harvest has remained in the range of 20-21 usually (Figure 2). Concurrently, the female proportion of the harvest has generally been below 40% throughout the period, except in the period of high harvest in the early to mid 1990's (Figure 3). The age data for these females is unreliable, but high harvest of females, and specifically adult age females, could be used as an indicator that the reproductive segment of the population is being impacted, and therefore the population is being suppressed. Even if the age structure of the harvested females was largely sub-adult, non-breeding females, the recruitment of breeding females is being suppressed.

Figure 2. Puma mortality and harvest quota in DAU L-23.
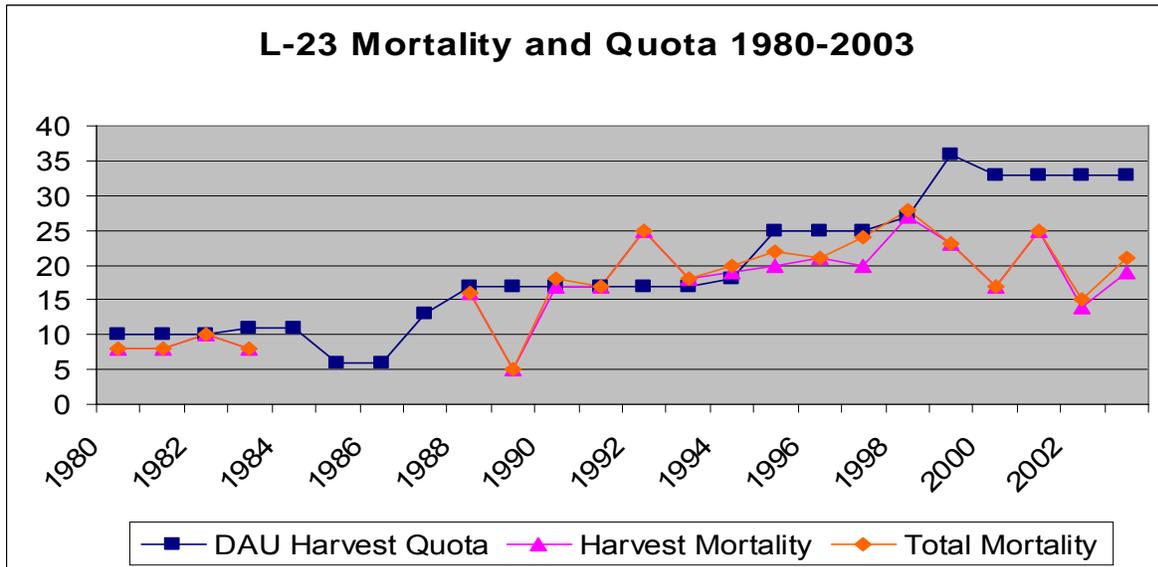
Mortality due to control of depredating puma and other factors (Figure 2) has been relatively low (< 10% of harvest) throughout the period. Likewise, the proportion of females killed in control actions has generally been <50% (Figure 3).

B.   Evaluating the DAU in terms of habitat quality/population density, estimation of puma population

For the purposes of estimating a static puma population in this DAU, we use the density estimates discussed previously, which are derived by averaging the density estimates from surrounding states where intensive studies have been completed. Until information is available from the new study in Colorado, this is the best information available. The range of puma density from these states is 2.0/100 square kilometers in low density to 4.6/100 square km in a high density. This DAU is relatively good habitat for puma (as compared to the broad spectrum of habitats occupied by puma throughout their range), therefore the actual population (density) would be expected to be near the upper density seen in other good habitat areas. Portions of the DAU, however, have been altered or naturally would be expected to have a lower density. Pumas have very large territories, that incorporate a wide variety of habitats and human developments. This procedure results in static population estimates ranging from 141-324 puma in the DAU (Table 1).

Figure 3. Female proportion of harvest and total mortality and quota achievement, L-23.
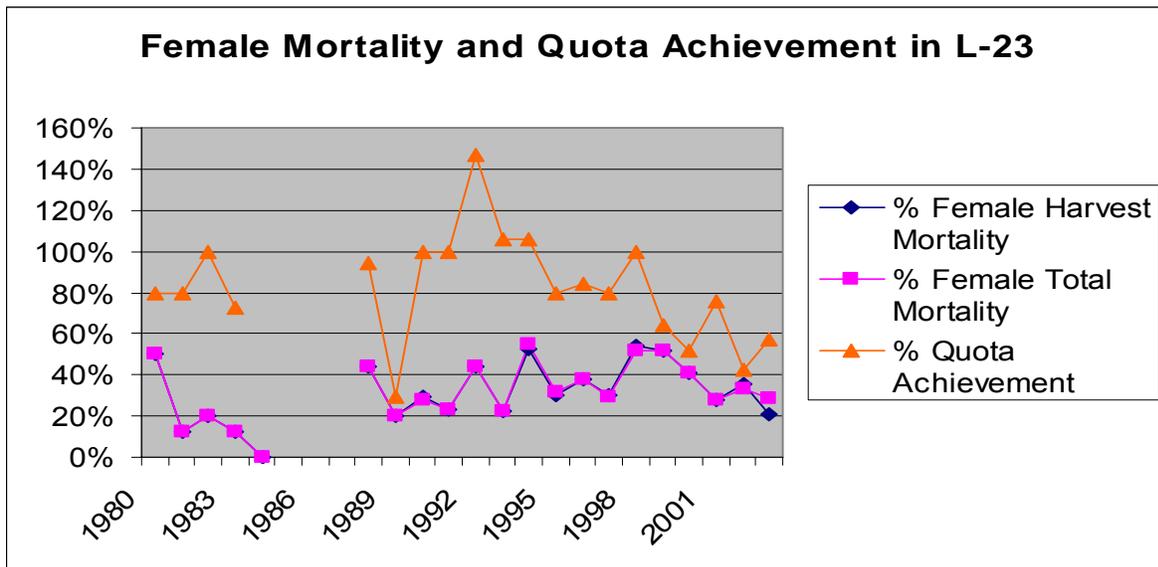
To generate point estimates for the population, rather than the range developed previously, deer and elk winter ranges below 11,000 were mapped as "high density puma habitat (4.6/100km^2)" and all other areas were mapped as "moderate density puma habitat (3.0/100km^2)". This results in an estimate of 233 puma in deer and elk winter ranges and 66 puma elsewhere, totaling 299 puma (Table 1).

Table 1. Low and High density puma population estimates for the Dolores-Norwood DAU of Colorado, L-23.

L-23 Dolores-Norwood Area	Km^2	Relative Puma Density	Low Density (2/100 km^2)	High Density (4.6/100 km^2)
Total for DAU	7038		141	324
Ungulate winter range	4840	High	299	
	2198	Moderate		

Given this range in density projections for the DAU, then that number can be further broken down into approximate numbers of adults, sub-adults, and cubs. This once again uses average proportions derived from various studies conducted in other states and various habitats. These studies have found that adults are 52% of the population, sub-adults 14%, and cubs 34%. Applying these data to the previous population estimates results in the projections in Table 4. Therefore, the puma population in this DAU should be comprised of 73-168 adults, 20-45 sub-adults, and 48-110 cubs. Because the point estimate is over 90% of the upper estimate of the range, the actual population might be expected to be in the upper 25% of these ranges, therefore most likely the demographic breakdown might be 126-168 adults, 34-45 sub-adults, and 82-110 cubs (Table 2).

Finally, based on the long term research conducted in New Mexico through increase and decline phases of puma population and prey densities, Logan and Sweanor (2001) have

suggested several guidelines of acceptable mortality for managing for stable, increasing or decreasing puma populations (Table 3). Some of their guidelines have been modified for application in Colorado because of the significantly higher prey densities found here versus in their study area of the San Andres Mountains (Table 3). For this purpose, the huntable population is comprised of all subadults and all adults, or approximately 160-213.

Table 2. Demographic breakdown of projected puma population in the Dolores-Norwood area of Colorado, DAU L-23.

L-23 Dolores-Norwood Area	Adults	Subadults	Cubs	Huntable Population
Low Density	73	20	48	93
High Density	168	45	110	213
75th percentile	126	34	82	160

Table 3. Guideline removal rates for puma populations under different strategic goals.

Strategic population goal	Permissible removal rates (all mortality)
Increase	8% of huntable population
Stable	15% of huntable population
Decrease	28% of huntable population

An additional consideration is whether any "refuge" areas may exist within the DAU. In order to have population level effects, a refuge must be very large (maybe greater than 1000 km^2), and this size area rarely exists. For the purposes of this DAU Plan, areas that might provide protection (refuge) for one or a few breeding females and a male (greater than 100 km^2) might be considered sufficient to replenish areas temporarily vacant of resident puma. In order to represent these areas, harvest mortality from the mid 1990's to present can be used to determine areas with low harvest where puma would be expected. These areas of low harvest usually occur because of poor access for lion hunters, but may occur for additional reasons. The distribution of harvest in this DAU is fairly evenly distributed in areas considered deer, elk, or bighorn sheep winter range, with concentrations near Norwood, Dry Creek Basin and to the west, Disappointment Valley, and the Dolores River below Dolores. Areas with relatively lower harvest are west of the middle portion of the Dolores River, the Glade, Lone Cone, and west of Telluride. These four areas are widely distributed. The Utah portion adjacent to this DAU is currently heavily hunted. Each of the above four identified areas could be large enough to protect a single resident female, and might function as small refuges to provide for dispersal into more heavily hunted areas.

Game Damage Considerations

Damage payments have averaged $299 (Figure 4) in the last 5 years. This DAU has not had significant numbers of claims in 20 years, usually 0-2 claims per year. In addition, the value of claims has been relatively low, with the last large claim filed in 1996. Since then, the State Legislature limited the State's liability to $5000 per individual unit of livestock loss. The yearly average 1990-2003 is <$1000, and forms the basis for the recommended Management Objective. Damage payments seem to follow a pattern of extreme ups and downs (Figure 2), with most years much lower than a few very high years. A relatively new occurrence is the proliferation of hobby livestock ranches. Relative to more traditional livestock operations, these hobby ranches typically raise smaller breeds of livestock (llama, alpaca, goat, etc). Many times,

these animals are more concentrated and of a higher per unit value. Educating landowners of livestock practices to minimize this potential is the primary means of reducing this type of conflict.

Figure 4. Indexed value of puma depredation claims in L-23, Southwest Colorado, 1990-2003.

Indexed value of depredation claims, L-23
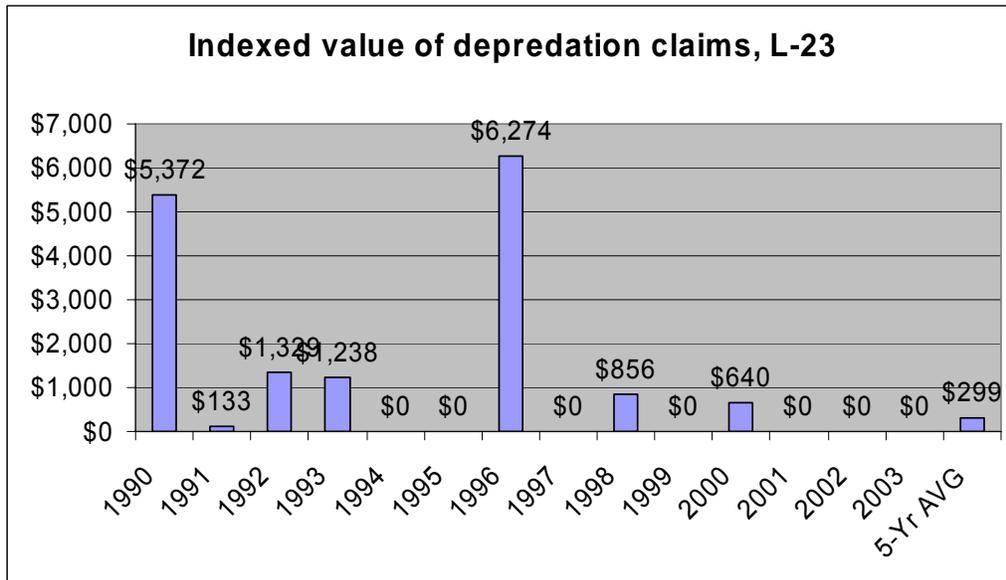
III. *DRAFT* MANAGEMENT OBJECTIVE recommendations for L-23

Sport harvest has averaged 13-14 males, with 5-7 females, through the last 20 years (Figure 2). Historic non-sport harvest mortality has averaged only 1 puma per year, and the proportion of females in the harvest has been below 40% (Figure 3). The trends over the last 5 and 10 year periods are for a very slight increase in males being harvested, fewer females, and therefore a decreasing proportion of females in the harvest.

Population Objective supported by CDOW staff. Stable/increasing population- To manage for a stable or increasing population, the total mortality number should be in the range of 8-15% of the legally harvestable lions, or 17-24. Current total mortality is within this range (20-22), and therefore no change in sport harvest quota <u>may</u> be necessary. Under no circumstances should the 5 or 10 year running average proportion of females in the harvest exceed 50%.

Objectives: total mortality 13-24, sport harvest 11-22, maximum female mortality ≤11

Population Alternative not supported. Suppress the population- Suppression of the population could be warranted if game damage problems were high and/or increasing, or if human-lion encounters were high or increasing. These factors are not present and therefore population suppression is not warranted.

Game Damage Objective. Game damage should not exceed $1000 per year based on a 3-year average. The CDOW will utilize hunters whenever possible to harvest depredating lions.

DWM's and Biologists will continue to inform and educate the public on ways to prevent or minimize losses of domestic animals.

Literature Cited:

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

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Ross, P. I., and M. G. Jalkotzy. 1992. Characteristics of a hunted population of cougars in southwestern Alberta. J. Wildl. Manage. 56(3): 417-426.