

**MOUNTAIN LION MANAGEMENT GUIDELINES**  
**for**  
**LION DAU L-21**

Game Management Units  
54, 55, 551, 66, 67  
Southwest Region

Prepared For:  
Colorado Division of Wildlife

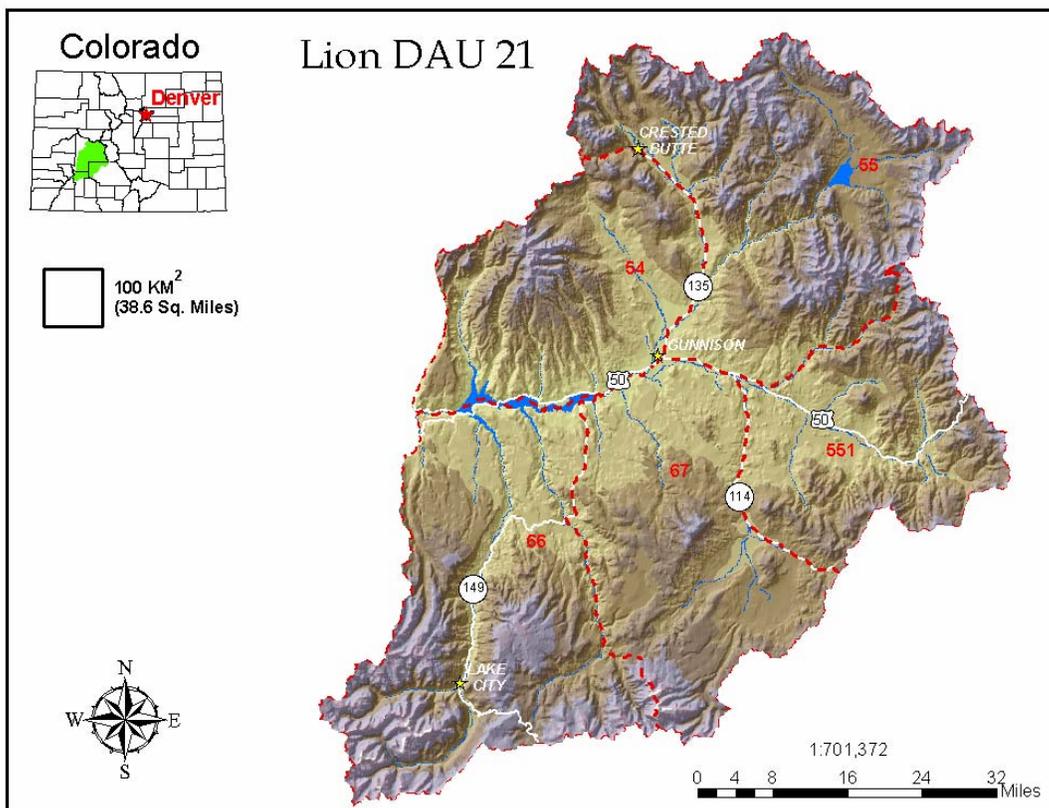
By:  
Brandon Diamond  
Terrestrial Biologist Gunnison, Colorado

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## Description of DAU

Data Analysis Unit (DAU) L-21 consists of the upper Gunnison River Basin and the Lake Fork of the Gunnison River drainage. Portions of Gunnison, Hinsdale, and Saguache counties are represented within the DAU. The unit is bound on the west and north by US Highway 50, Curecanti Creek, the North Fork of the Gunnison River/Gunnison River divide and the Gunnison-Pitkin County line; on the east by the Continental Divide; on the south by the Continental Divide and Hinsdale-San Juan County line; and on the west by the Hinsdale-San Juan County line, Hinsdale-Ouray County line, and the Big Blue Creek/Little Cimarron River divide. Many prominent mountain ranges and wilderness areas occur within the DAU, as well as the largest reservoir in Colorado, Blue Mesa. Population centers in L-21 include Gunnison, Crested Butte, and Lake City (Figure 1).



**Figure 1**

### DAU Boundary Change

DAU L-21 has consisted of Game Management Units (GMUs) 65, 66, 67, 54, 55, & 551. For the purposes of this and future DAU plans, GMU 65 has been removed from L-21 and added to L-22. DAU boundaries are somewhat subjective because animal movements will to some extent be unpredictable. However, it was determined that based on local knowledge of lions in GMU 65 that linking it to L-22 made biological and administrative sense. Therefore, data analyses in this plan do not include GMU 65.

Landownership/Topography

Within the DAU, elevations range from approximately 7,200 feet at Morrow Point Reservoir, to over 14,000 feet on numerous mountain peaks. Variable topographic features including riparian corridors, deep broken canyons, vast sloping expanses of forest, and high elevation subalpine and alpine valleys provide a mosaic of habitats for mountain lions and their primary prey species, mule deer and elk. L-21 encompasses approximately 9,328 square kilometers (3,588mi<sup>2</sup>) and more than 80 percent of the DAU is public land (Table 1). A small percentage of the DAU is administered by the National Park Service at Curecanti National Recreation Area, which consists primarily of Blue Mesa Reservoir.

**L-21**

<b>USFS</b>	<b>BLM</b>	<b>Private</b>	<b>State</b>
<b>5197 km<sup>2</sup></b>	<b>2418 km<sup>2</sup></b>	<b>1609 km<sup>2</sup></b>	<b>104 km<sup>2</sup></b>

**Table 1**

The majority of the land within this DAU is considered suitable mountain lion habitat. Areas such as Blue Mesa Reservoir and concentrated urban areas are not considered suitable lion habitat. Although it is probable that lions cross high-elevation alpine areas periodically while moving between drainages within their overall home ranges, they typically will not spend significant amounts of time hunting in that environment due to the overall lack of suitable stalking cover and comparatively low prey availability. Therefore, those areas above 11,000 feet were not considered high quality lion habitat for the purpose of this DAU plan.

Climate/Vegetation

Diverse habitat types occur within the DAU along an elevational gradient (Table 2). Wetland/riparian areas, irrigated hay meadows, and artificially seeded rangelands occur at lower elevations. The upper Gunnison Basin is a high mountain valley dominated by big sagebrush at lower elevations. Mixed-mountain shrub communities comprised of serviceberry, chokecherry, mountain-mahogany, and oak are found at slightly higher elevations with occasional pockets of aspen, Douglas fir and Ponderosa pine. Higher elevations are dominated by Lodgepole pine and Engelmann spruce/Subalpine fir forests. Large expanses of alpine tundra occur within the DAU at the highest elevations. Annual precipitation ranges from 10 in/yr at lower elevations to greater than 50 in/yr in the higher mountains. The average annual high temperature is 55 degrees F.

**Table 2. ECOLOGICAL TYPES OF THE GUNNISON BASIN (Johnston 2001)**

<b>Zone</b>	<b>Dominants</b>	<b>Elevation on north and east slopes, ft</b>	<b>Elevation on south and west slopes, ft</b>	<b>Soil Temperature Regime(s)</b>	<b>Soil Moisture Regime(s)</b>
Alpine	Gravity and freeze-thaw	>11,800	>12,200 ft	Pergelic,	

	processes, mostly very low herbaceous plants such as curly sedge, alpine avens, tufted hairgrass			Cryic	
Subalpine	Subalpine fir, Engelmann spruce, aspen, lodgepole pine, Douglas-fir, bristlecone pine, mountain big sagebrush, Thurber fescue, planeleaf and Wolf willows, Idaho fescue	9,700-11,800	10,100-12,300	Cryic	
Montane	Douglas-fir, ponderosa pine, lodgepole pine, aspen, Arizona fescue, big sagebrush, Saskatoon serviceberry, blue and serviceberry willows	9,100-10,700	9,400-11,100	Frigid	
Mountain Shrub	Douglas-fir, big sagebrush, muttongrass, Utah serviceberry, Gambel oak, yellow-Geyer-Bebb willows, narrowleaf cottonwood	7,600-10,100		Frigid	
Piñon-Juniper*	Missing	Missing		Mesic	Aridic (Torric)
Foothills-Semidesert Shrub	Wyoming big sagebrush, Indian ricegrass, Needle-and-thread, Rocky Mountain juniper, narrowleaf cottonwood	<8,400		Mesic	Aridic (Torric)

\* Piñon-Juniper is sparsely represented in the Upper Gunnison Basin.

### Prey Species/Abundance

Mountain lions have an array of prey species available to them within L-21. Mule deer and elk are abundant and widely distributed, while moose, bighorn sheep, and pronghorn antelope occur in localized areas. When snow accumulates in late fall, big game populations typically migrate to lower elevations where they will concentrate until spring. Mountain lion movements are dictated by prey availability, and therefore lions will move down in elevation during winter following ungulate herds. Lion diets can also include a variety of small mammals and birds depending on season and availability.

Other carnivores that are found in L-21 include black bear, bobcat, lynx, coyote, and red fox.

### History/Management

As with many predatory species in Colorado, mountain lion management has historically been controversial. In 1881, the state established a bounty system for lions, which was repealed in 1885 but then reestablished in 1929. The bounty system stayed in place until 1965 when mountain lions were reclassified as big game animals (Currier et al. 1977). Currently, the Colorado Division of Wildlife is responsible for mountain lion management in the state, with most management actions focused on providing sustained recreational hunting opportunities while attempting to minimize livestock depredation.

Since before 1980, the primary tool used to regulate lion hunting in Colorado has been the quota system. The quota system is designed to balance a high degree of hunting opportunity with control over the number of animals killed by hunters. DAU's are assigned a numeric quota which represents the maximum allowed hunter harvest throughout a given year. Within the past ten to fifteen years quotas have increased statewide from 382 in 1990 to 790 in 2004. In Colorado, it is illegal for a hunter to take a lion kitten, or a female lion with kittens. Otherwise, a hunter may legally take a mature lion of either sex. Concern has arisen recently that the current quota system may not be guarding against harvest at unsustainably high rates, and that it could allow for high levels of female harvest on an annual basis. A quota system makes this level of removal possible, though improbable. Regardless, some people perceive the quota as our harvest objective and believe failure to achieve it suggests some management failure. Conversely, other publics also perceive the quota as a harvest objective, and as such, irresponsibly high and a clear threat to the long-term sustainability of lion populations.

These concerns are sometimes compounded by the lack of current biological information regarding mountain lion population estimation and demographics. Lions are secretive, solitary animals that inhabit remote country. Presently, no credible and cost effective means of sampling lion populations exists. Therefore, state wildlife agencies have no way of estimating lion populations at local or statewide levels. Research being initiated in southwestern Colorado by the Colorado Division of Wildlife is aimed at improving techniques for evaluating lion population characteristics.

### **L-21 Management History/Statistics**

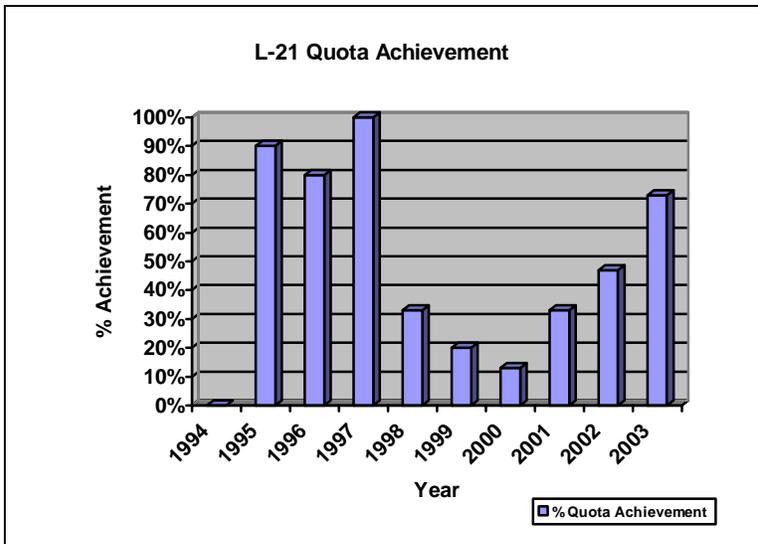
#### *Quotas*

Changes in lion quotas have occurred in L-21 during the last ten years (Table 3). In 1994, the quota was set at 10. In 1998, the quota was increased to 15, and it is currently set at 15 for the 2004 hunting season. Historic quota increases in L-21 were likely based on increased observations of mountain lions and lion sign by hunters, livestock producers, and Division of Wildlife field personnel, as well as a series of years where damage claims for livestock exceeded socially tolerable levels.

**Table 3. L-21 Quotas by Year 1994-2004**

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Quota	10	10	10	7	15	15	15	15	15	15	15

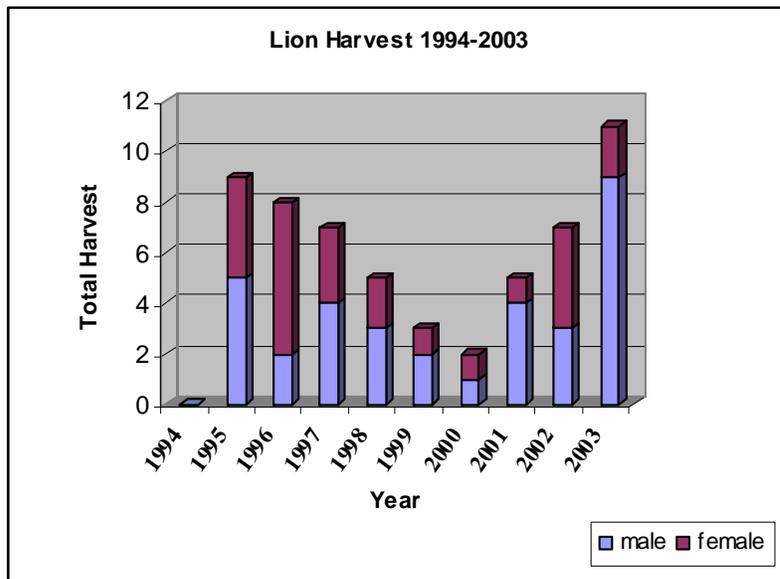
From 1994 to 2003, the average quota achievement (Total Harvest/Quota) was 49%. Over the last five years, the average quota achievement was 37% (Figure 2). Annual hunter harvest may be correlated with many factors, but is not necessarily an indicator of mountain lion densities or population trends. Hunter selectivity and tracking conditions often play key roles in determining annual harvest within a DAU.



**Figure 2**

*Harvest*

Annual hunter harvest in L-21 has also fluctuated since 1994. From 1994-2003, annual harvest has averaged 6 lions. The 1999-2003 annual harvest also averaged 6 lions. No lions were harvested in 1994, while a high harvest of 11 occurred in 2003 (Figure 3). Take of female lions, expressed as a percentage of the total annual harvest, has averaged 38% over the last ten years, and 36% from 1999-2003. Excluding 1994, because no lions were killed that year, the lowest percentage of female lions taken annually by hunters was 18% in 2003, while 75% of the harvest was comprised of females in 1996. There were 57 lions harvested during the last ten years in the DAU, of which 24 were female (42%).



**Figure 3**

## Game Damage

Game damage claims in L-21 have been paid during two of the last ten years. The largest payment of \$1,330 was made in 1996, while no claims were paid during 1994, 1995, or 1998-2003 (Figure 4). The ten year average damage claim payment is \$295. No apparent trend exists in L-21 for lion damage claim payments over the last ten or twenty years. It is likely that many factors contribute to annual lion depredation on domestic livestock, and the Division of Wildlife and Wildlife Services will continue to investigate claims on a case-by-case basis.

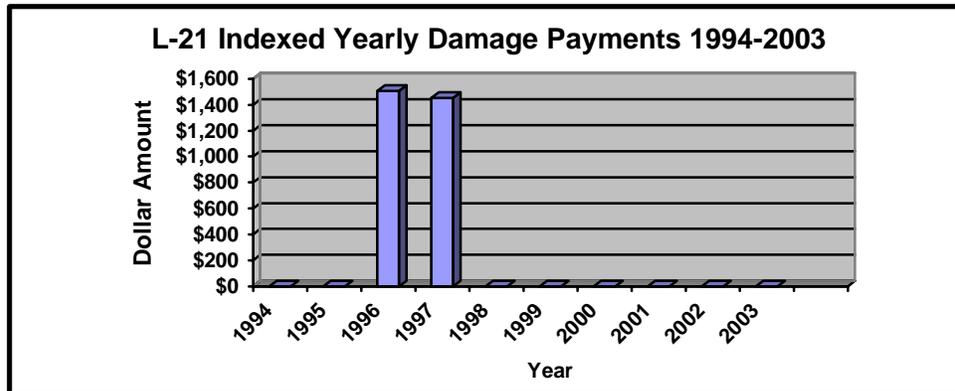


Figure 4

## L-21 Population Projection

A population estimate is derived from sampling some aspect of a population. Because there is no credible and cost effective means of sampling lion populations, there is no way to estimate local populations. Therefore, instead of estimating we project a possible population.

The first step in this process was to select a lion density or density range reported in scientific literature. Mountain lion population and density estimates have been determined using mark/recapture radio telemetry analysis within various study areas throughout the western United States and Canada. Between June 1981 and July 1983, Logan et al. (1986) conducted a study in the Bighorn Mountains of Wyoming to evaluate mountain lion population characteristics. The study area encompassed 741 km<sup>2</sup> on the west slope of the Bighorns and consisted of "rugged, deep canyons separated by broad plateaus and ridges." Elevations within their study area ranged from 4,620-8,250 ft. Ungulate prey species found within the study area included abundant mule deer, scattered elk, and pronghorn. Based on the capture-recapture of 46 mountain lions, snow tracking, radio telemetry, and harvest data, they estimated winter lion densities within the study area to be between 3.5 and 4.6 lions/100km<sup>2</sup>. Plant communities, topographic features, and prey species available in this study area appear to be comparable to those found in the upper Gunnison and Lake Fork River drainages. However, in terms of overall prey densities, lion habitat in L-21 subjectively appears to support a larger ungulate prey base than the Wyoming study area. Therefore, actual lion densities within the DAU are likely at the upper end of the range reported for the Bighorn Mountains in Wyoming.

The second step in projecting the population in L-21 was to approximate the amount of suitable lion habitat within the DAU using Geographic Information System (GIS) software. As previously stated, the majority of L-21 is considered suitable lion habitat. Large bodies of water such as Blue Mesa Reservoir were excluded, as were urban centers and areas above 11,000 feet in elevation. The total amount of suitable lion habitat in L-21 based on this analysis was approximately **7,398 km<sup>2</sup>**.

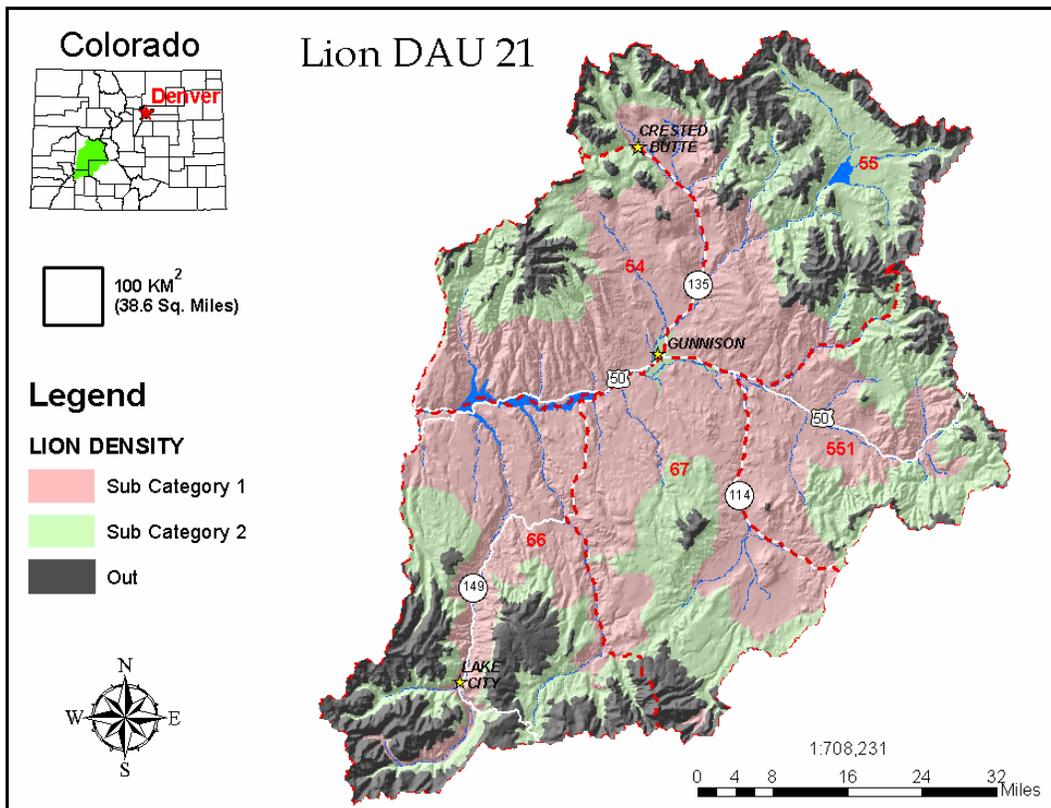
To refine the population projection for L-21, suitable lion habitat within the DAU was divided into two sub-categories which were evaluated during the winter months when big game animals and mountain lions are concentrated at lower elevations. Winter lion densities were applied as follows:

**Sub Category 1-**

Traditional mule deer, elk, & bighorn sheep winter ranges. These areas are considered the highest density mountain lion habitats, and the 3.5-4.6 lions/100km<sup>2</sup> density estimate range was applied.

**Sub Category 2-**

Suitable lion habitats below 11,000 ft that fall outside of traditional mule deer, elk, and bighorn sheep winter ranges. The assumption here is that low density ungulate populations, primarily elk, occur within this band that provide a food source for mountain lions residing at low densities. The lowest density estimate reported in scientific literature was .6 lions/100km<sup>2</sup> for a Utah population (Lindzey et al. 1994). This estimate was applied to the area contained in sub category 2 (Figure 5).



## Figure 5

Applying the reported winter density estimates to these sub-categories yields a projected population range for mountain lions in L-21 (Table 4).

Sub-category 1	4301 km <sup>2</sup>	3.5 lions/100km <sup>2</sup>	151 lions (low)
		4.6 lions/100km <sup>2</sup>	198 lions (high)
Sub-category 2	3097 km <sup>2</sup>	.6 lions/100km <sup>2</sup>	19 lions
			<b>Population Range = 170-217</b>

The upper Gunnison and Lake Fork drainages are considered above average mountain lion habitat in terms of quality and quantity, with abundant prey and stalking cover. A projected population of 170-217 is thought to be a reasonable, conservative estimate of lion numbers in DAU L-21.

From a biological sustainability and wildlife law enforcement standpoint, it is important to understand the sex and age composition of the lion population within a DAU. These characteristics are particularly important for a lion population that is subjected to annual hunting seasons where certain age classes are not legally available to hunters. The lion population in L-21 may be broken into three age classes: adults (males and females at sexual maturity), subadults (independent, non-breeding), and cubs (dependent young) (Logan and Sweanor 2001). Averages derived from research in Alberta and New Mexico describe a lion population as being comprised of 52% adults, 14% subadults, and 34% cubs (Ross and Jalkotzy 1992, Logan and Sweanor 2001). Using these estimates, the projected lion population in L-21 would consist of 88-113 adults, 24-30 subadults, and 58-74 cubs.

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### **Strategic Goal**

Maintain a *stable* mountain lion population in L-21 that accommodates a sustained level of sport hunting and harvest. Lions causing damage or that pose human health or safety risks will be dealt with on an individual basis.

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### **Mortality Objectives**

#### Hunter Harvest Objective

Annual hunter harvest objectives are based on the projected population estimate and demographics. Because cubs are not legally available for sport harvest in Colorado, they must be omitted from the huntable population. After excluding cubs, the huntable population in L-21 would consist of 112-143 lions (adults and subadults). The strategic goal of this plan is to maintain a stable lion population within the DAU. In order to maintain a stable population, research has indicated that an annual removal level of 8-15% would be sustainable based on observed growth rates of intensively monitored lion

populations (J. Apker, 2004 Unpublished CDOW report), and Western Colorado's substantial ungulate prey base. For L-21, given the unknowns about local population vital rates, an annual harvest rate of 10% (11-14 lions), would likely ensure a biologically stable lion population.

### Monitoring

Annual hunter harvest will be monitored and evaluated with subsequent management actions based on two parameters:

1. The 5-year average number of hunter harvested lions should not exceed 14.
2. Female lions should not make up more than 50% of the 5-year average harvest. Management actions may require reevaluation beyond this threshold in order to reduce female harvest.

### Barriers & Strategies

The 5-year average harvest in L-21 of 6 lions is substantially below the harvest objective set forth in this plan despite the yearly quota of 15. Mountain lion hunting is a relatively specialized form of hunting that in most cases requires the use of trained dogs in order to be successful. Many hunters purchase a lion license each year with the intent of opportunistically taking a lion during a chance encounter, but the probability of being successful is realistically quite low because of the cryptic, solitary nature of these animals. Avid houndsmen enjoy pursuing lions throughout the season and not all lions that are caught are killed. Many experienced lion hunters attempt to selectively harvest mature toms. Tracking conditions are also unpredictable and become less favorable during light snow years. For these reasons, it will be difficult to achieve the harvest objective on a regular basis. However, the primary method for removing lions from the L-21 population will continue to be through licensed hunters during the established season.

### Total Mortality Objective

Sources of non-hunter mortality include road-kills and nuisance or livestock depredating lions that must be destroyed. The total mortality objective for L-21 will essentially mirror the hunter harvest objective of 11-14 lions. Non-hunter mortality in this DAU is rare, and has averaged zero over the last 5 years. If the 5-year average total mortality within the DAU exceeds 21 lions (15% of the projected high range huntable population estimate), adjustments may be considered to hunter harvest objectives in order to maintain strategic goal parameters. Total mortality objectives should be achieved using the established mountain lion hunting season structure.

### L-21 Refuge/Source Areas

Of interest to wildlife managers are locations within a DAU that are considered potential refuge or "source" areas for mountain lions. These areas are often inaccessible to hunters, and therefore allow lions to live and reproduce in a virtually undisturbed environment. When lion numbers reach carrying capacity within these source areas animals will disperse into adjacent habitat, maintaining lion densities in surrounding areas. These areas are important to consider as they may influence annual hunter success rates, lion population densities, and achievement of DAU plan objectives locally and in adjoining DAU's. Future analyses of these potential source areas may be

beneficial for lion management throughout Colorado.

While examining lion harvest locations for L-21, potential source and refuge areas may be identified within the DAU. In general, these consist of wilderness and adjacent roadless areas. The West Elk Wilderness and surrounding area, drainages originating from the southwestern flank of the Fossil Ridge Wilderness, and the northeastern portion of the La Garita Wilderness area all may be serving as refuge areas for mountain lions. In most cases, hunters rely heavily on road systems to efficiently search for lion tracks. The lack of roads in these areas paired with extremely rugged terrain has likely contributed to the historic lack of harvest. A source area within the West Elk region may be contributing to L-9 (North Fork Valley and Grand Mesa) lion populations via emigration of juvenile lions. Another area within L-21 that may act as a refuge during the annual hunting season is the Almont Triangle State Wildlife Area. By regulation, the SWA is closed to public access from late December through the end of March. Local lion hunters tend to avoid hunting in the area surrounding the Almont Triangle during the closure because of the potential for dogs to track a lion from adjacent public lands onto the closed area. This SWA is probably not acting as a source for local lion populations, but it may serve as a refuge during the annual hunting season.

It is also worth mentioning that within L-21 sagebrush dominated valleys make up a significant portion of deer and elk winter range. These habitats occur at lower elevations where road access is generally not as limited, but stalking cover for mountain lions is. Lions move through these areas while traveling within their home ranges, but overall densities are lower than areas with more broken topography and tree cover. Lack of historic harvest within these areas is likely due to lower lion densities, and diminished tracking efficiency for hunters. These areas include Gold Basin, Lost Canyon, Cabin Creek, Flat Top Mountain, and the area surrounding Old Agency.

### **Game Damage Objectives**

#### **Objective Level**

No game damage claims have been paid in L-21 during the last five years. However, depredation by mountain lions is unpredictable and has occurred in the DAU periodically over the last twenty years. Using the claims paid during 1996 and 1997 as a reference, a reasonable damage objective level for L-21 would be to maintain the five-year average payment at or below \$2,000 for the DAU. Lions causing damage will be dealt with on an individual basis by Division of Wildlife Personnel and/or a USDA Wildlife Services agent. If livestock depredation is occurring during the annual lion hunting season, licensed hunters may be utilized to assist in harvesting the lion(s) causing damage.

### **Human Conflict Objectives**

In L-21, documented human/mountain lion conflicts are rare to absent during most years. Division of Wildlife field personnel and office administrators report very few concerns and/or complaints regarding mountain lion interactions on an annual basis. Most calls regarding lions that do come through the CDOW Gunnison Service Center are in reference to lion sightings, particularly when they are seen in proximity to human developments. The areas surrounding Gunnison and Crested Butte have experienced significant human population growth during the last ten years and lion sightings are likely to continue as human developments encroach into outlying areas where lions are likely to inhabit. Colorado Division of Wildlife personnel will continue to provide guidance and

site recommendations to local residents to help prevent negative mountain lion encounters. In the event that a lion becomes a threat to human safety, CDOW personnel will take immediate action to kill or remove the offending animal.

### Summary

The projected huntable population of mountain lions in L-21 is 112-143 animals. An annual harvest of 11-14 lions will provide ample hunting opportunity while promoting a biologically stable lion population. Total mortality will be evaluated on an annual basis and management adjustments considered if 5-year average hunter harvest exceeds 14 lions, 5-year average total mortality exceeds 21 lions, and/or females make up more than 50% of the 5-year average harvest. Game damage claims have been submitted in two of the last ten years, and the 5-year average claim amount should be kept below \$2,000. Human development in the DAU continues to occur in outlying areas inhabited by lions. Nuisance complaints have been minimal, but education and guidance by local Division of Wildlife personnel will continue to be important in order to help minimize negative lion/human encounters.

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