MOUNTAIN LION DATA ANALYSIS UNIT L-22
MANAGEMENT PLAN

GAME MANAGEMENT UNITS
40, 60, 61, 62, 64 & 65
Southwest Region

Prepared for:
Colorado Division of Wildlife

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DESCRIPTION OF DAU, HABITAT AND PAST MANAGEMENT

Located in southwestern Colorado, mountain lion Data Analysis Unit (DAU) L-22 is comprised of Game Management Units (GMUs) 40, 60, 61, 62, 64 and 65 and encompasses 10,935 km^2 (4,222 $miles^2$) (Fig. 1). Portions of Montrose, Delta, San Miguel, Ouray, Gunnison, and Mesa Counties make up the DAU. The DAU includes many prominent geographical features including the Uncompahgre Plateau, Pinion Mesa, Paradox Valley, the west side of the Gunnison Gorge, and the northern San Juan Mountains. All or parts of the Uncompahgre Wilderness Area, Mt Sneffels Wilderness Area, Lizard Head Wilderness Area, Black Canyon National Park, and the Colorado National Monument occur within L-22. Elevation varies from less than 4,600 feet along the lower Dolores River to over 14,300 feet at Uncompahgre Peak. Major drainages include the Uncompahgre, San Miguel, Dolores, and Gunnison Rivers.

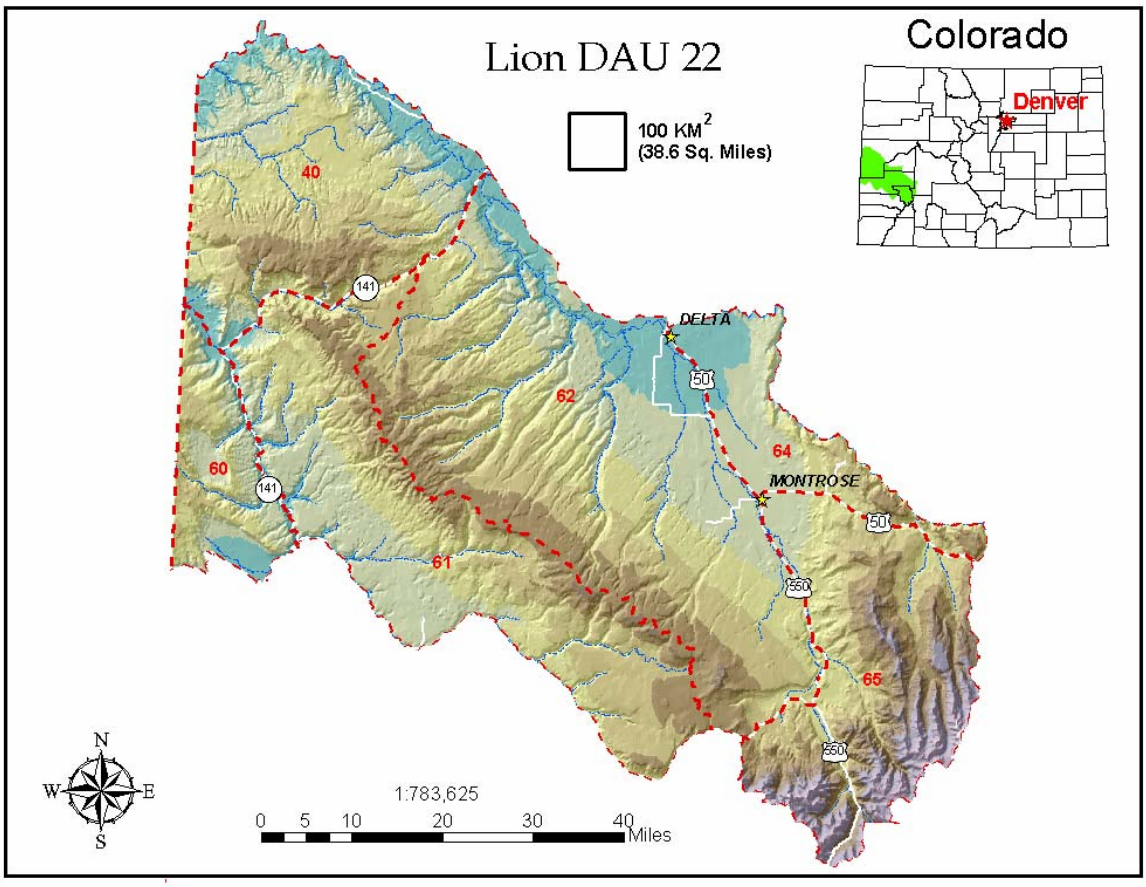

Figure 1. DAU L-22.

Boundaries of L-22 were changed in 2004 by adding Units 64 and 65 to the DAU. Addition of these units was based primarily on deer and elk movement patterns that indicate greater connectivity of these units with the Uncompahgre Plateau than with the North Fork or Gunnison Basin units. Lions hit by cars on US Hwy 550 between Montrose and Ridgway and on US Hwy 50 east of Montrose suggest that lions follow similar movement patterns.

Land ownership in L-22 is 38% BLM, 33% private, 28% USFS, 1% National Park Service, and < 1% state (Figure 2). Rapid development in high quality mountain lion habitat is occurring around Montrose, Ridgway, Telluride, Ouray, Pinion Mesa, and Gateway. Much of the Uncompahgre Valley north of Montrose is irrigated agricultural land and is intensively farmed for sweet corn, alfalfa, onions and other commercial crops.

DAU L-22 supports large populations of mule deer and elk. L-22 posthunt deer and elk numbers in 2002 were estimated to be approximately 55,000 and 20,000, respectively. In addition, an estimated 300-400 bighorn sheep occur in L-22 including desert bighorn sheep in Units 40 and 62, and Rocky Mountain bighorn sheep in Units 64 & 65. A small number of pronghorn reside in Unit 62. Estimated ungulate prey density across the whole DAU based on estimated posthunt deer, elk, and bighorn sheep populations in 2002 was almost 11 animals per km^2 (28/mi^2)of winter range.

Much of L-22 is considered to be good to excellent mountain lion habitat with a high degree of topographic relief and a diversity of plant communities ranging from desert shrub to alpine tundra. The DAU includes many deep, rugged canyons and large areas of pinyon/juniper woodlands and mixed mountain shrub/Gambel oak.

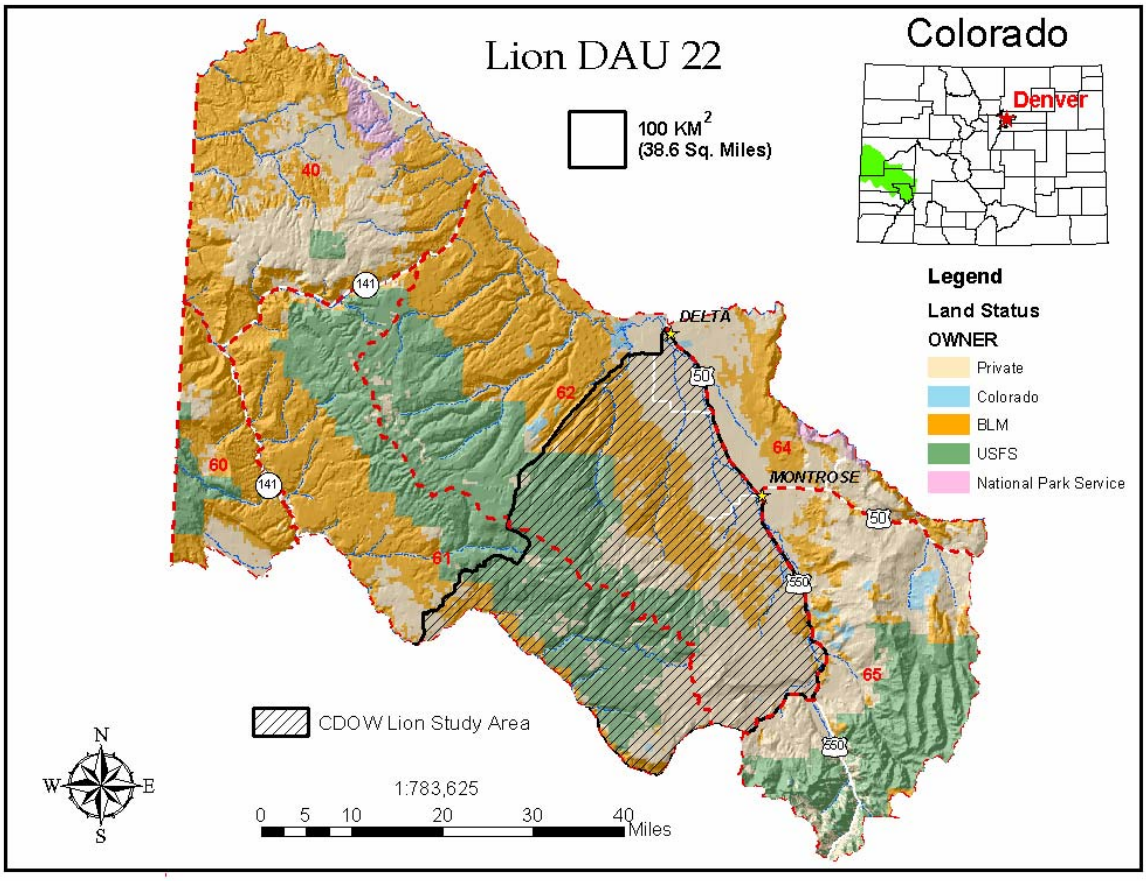

Figure 2. Land ownership and the CDOW lion study area in DAU L-22.

CDOW Lion Study

CDOW is planning to begin a mountain lion study in the southern parts of Units 61 and 62 in November 2004 (see Fig. 2). The purpose of this study is to quantify various lion population parameters and evaluate methods for monitoring lion population status. The study will involve 5 years of protection followed by 5 years of liberal harvest. The study area includes approximately 850 mi^2 in L-22 and approximately 60 mi^2 in L-23 (Unit 70). The area is bounded by CO Hwy 384 at Delta, 25 Mesa Road and USFS road 503 to Nucla, CO Hwy 97 to CO Hwy 141 to CO Hwy 145 to Placerville, CO Hwy 62 to Ridgway, US Hwy 550 to Montrose, and US Hwy 50 to Delta.

Between November 11, 2004 and March 31, 2009 the study area will be closed to all mountain lion hunting and pursuit. In addition, all of Units 61and 62 will be closed to the sport harvest of collared or ear-tagged mountain lions from this study. Any lion in the study that is depredating on livestock or presenting a risk to human safety will be managed on a case-by-case basis as has been the CDOW policy in the past.

Quota & Harvest History

From 1929 to mid-1965, mountain lions in Colorado were classified as a predator and a bounty system was used (Anderson et al. 1992). In mid-1965 mountain lions were reclassified as a big game animal in Colorado and subsequently a quota system was adopted to manage harvest, a mandatory check system was initiated to monitor harvest, and the state became liable for damage to real or personal property caused by mountain lions.

From 1980-2003, the annual quota in L-22 ranged from 14 in 1981 to 66 in 1996-2003. During this same period, annual harvest ranged from 10 in 1981 to 48 in 1994. Harvest usually closely followed the quota until 1995 when the quota was raised to 63 (Fig. 4). Quota achievement decreased from an annual average of 86% from 1990-1994 to 45% from 1999-2003 (Fig. 5).

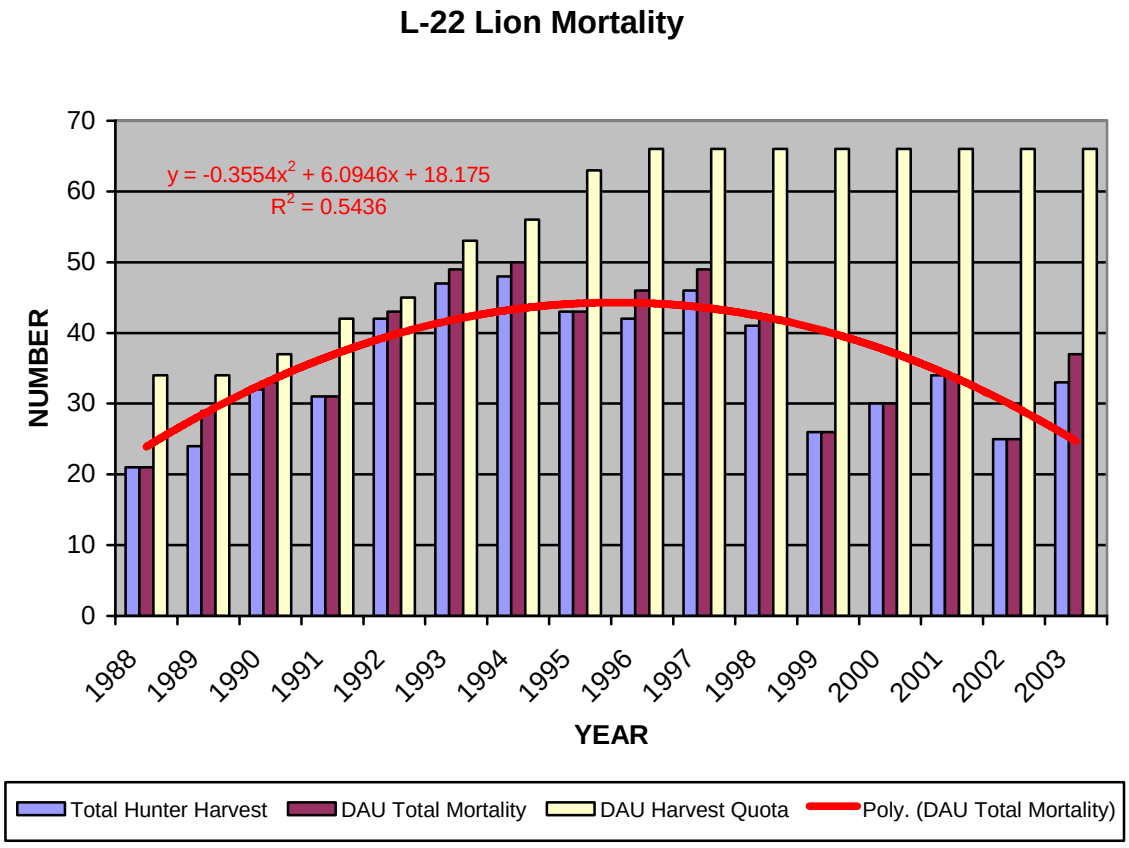

Figure 3. Hunter lion harvest, total lion mortality, and harvest quota for DAU L-22, 1988-2003.

Three year (2001-2003), 5 year (1999-2003), and 10 year (1994-2003) average annual harvests were 32, 30, and 38, respectively. Harvest and total mortality peaked between 1992-1998 (Avg harvest = 44; Avg total mortality = 46). The increase in harvest up to the mid-1990's followed by a decline in harvest concurrent with an increase in quotas suggests that the high harvest in the mid-1990's might have suppressed the lion population in L-22. From 1981-1988, Unit 62 was closed to sport hunting of mountain lions while a mountain lion study was being conducted (Anderson et al. 1992). The high harvests in L-22 during the 1992-1998 period are largely due to high harvest in Unit 62 that might have resulted from a carryover of lions from this study period (Appendix 1).

Lion hunting success is very dependent on snow conditions and a succession of mild winters between 1999 and 2003 could have also reduced harvest success during this period.

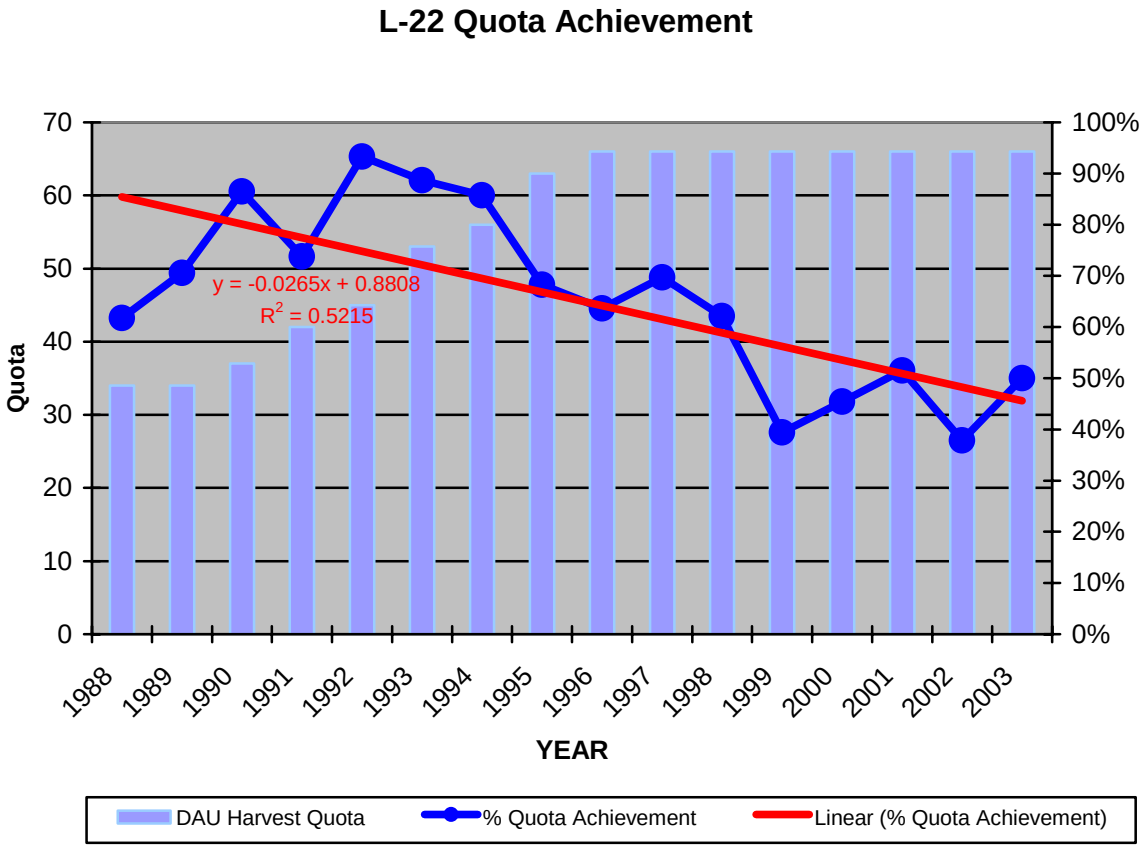

Figure 4. Percent quota achievement and fitted trend line for DAU L-22, 1988-2003.

Between 1989-2003, 96% of the known mortality was from harvest (544 lions), 2% was from control kills of depredating and nuisance lions (10 lions), and 2% was from other mortality (e.g., road kills) (13 lions). On average, non-harvest mortality has accounted for 1.5 lions per year.

There has been a slight upward trend in the percentage of females in the harvest from 1988-2003. Based on regression analysis, this increase in females in the harvest has gone from a predicted value of 39% in 1988 to 47% in 2003. Three year (2001-2003), 5 year (1999-2003), and 10 year (1994-2003) average female harvest percentages were 46%, 46%, and 45%, respectively.

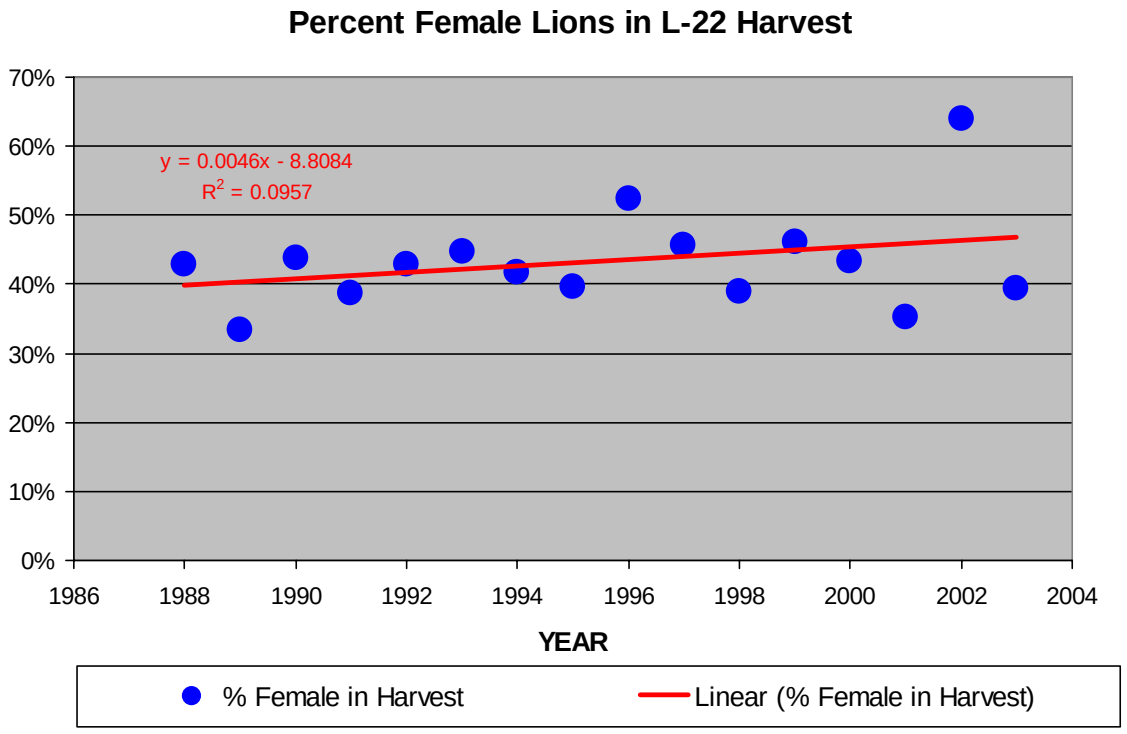

Figure 5. Percentage of female lions in the harvest and fitted trend line for DAU L-22, 1988-2003.

Between 1992-2003, individual units in L-22 contributed to the overall harvest as follows: Unit 40 (13%), Unit 60 (7%), Unit 61 (33%), Unit 62 (27%), Unit 64 (10%), Unit 65 (9%). All units in L-22 have shown a decreasing harvest trend with the exception of Unit 61 which has shown a slight increase (Table 1 and Appendix 1). This trend could indicate a movement of lions into Unit 61 from surrounding GMUs during the winter months. The majority of the elk on the Uncompahgre Plateau and the majority of deer on the north half of the Plateau winter in Unit 61. Unit 61 is a popular unit to hunt because of the large amount of public land, good road access, and the general south facing aspect that results in less snow accumulation.

Table 1. Harvest trend, quota achievement trend, and % female in harvest trend for each GMUt in L-22 and for L-22 total, 1989-2003. No change = <5% change, Slight = 5-25% change, Moderate = 26-50% change, Large = >50% change.

GMU/DAU	HARVEST TREND	QUOTA ACHIEVEMENT TREND	% FEMALE IN HARVEST TREND
40	Slight Decrease	Moderate Decrease	Moderate Increase
60	Moderate Decrease	Large Decrease	Moderate Decrease
61	Slight Increase	No Change	Moderate Increase
62	Large Decrease	Large Decrease	No Change
64	Large Decrease	Large Decrease	Large Decrease
65	Slight Decrease	Moderate Decrease	Moderate Decrease
	Large Increase up		

L-22	to 1995; Large Decrease After 1995	Large Decrease	Slight Increase

Between 1997 and 2003, 56% of the lions killed in Unit 61 were reported to have been taken within the boundaries of the proposed CDOW mountain lion study area. During the same time period, 49% of the lions killed in Unit 62 were reported to have been taken within the boundaries of the study area. For the entire DAU, 28% of the known mortality occurred within the study area boundaries from 1997-2003.

Damage & Nuisance History

Since 1965, CDOW is statutorily liable for damage to real and personal property caused by mountain lions. Sheep depredation is the primary damage caused by mountain lions in L-22 (Fig. 6). From 1995-2003, depredation on sheep accounted for 58% of the damage payments; depredation on cattle accounted for 2%; and depredation on other livestock (primarily camelids) accounted for 40%. During this period, 2 to 13 claims were approved per year (Avg = 6/yr). An average of $5,172/yr was paid by CDOW each year from 1995-2003 for lion damage in L-22. The 5 year average (1999-2003) claim amount indexed to base year 2000 was $6,360/yr. Claims for camelids are infrequent but can carry a high dollar value per animal. In 2001, Colorado's statutory liability for bear and lion damage to livestock was limited to $5,000 per animal and payments for damage to personal property was limited to property used in the production of agricultural products.

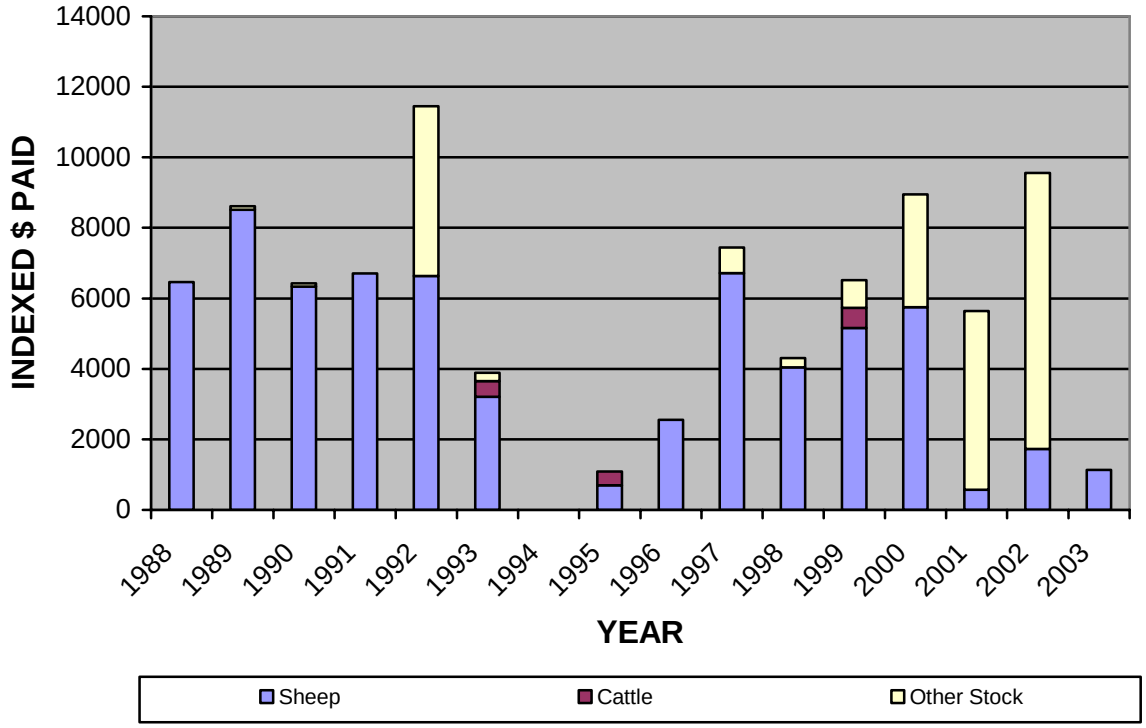

Figure 6. CDOW payments for lion damage in DAU L-22 indexed to base year 2000. Data prior to 1995 do not include Units 64 & 65.

ISSUES

Public issues surrounding mountain lion management in L-22 include concerns about (1) maintaining adequate lion hunting opportunity, (2) preventing overharvest, (3) lion predation suppressing big game populations, particularly mule deer, (4) lion depredation on domestic livestock, and (5) human and pet safety. The primary purpose of this plan is to balance Issues No. 1 and No.2.

Issue No. 3 is not supported by available data from L-22. The Uncompahgre Plateau (Units 61 and 62) has been the focal point for mule deer research in Colorado since 1997. This research has involved over 1,200 radio-collared does and fawns and has indicated that mountain lion predation is not a major factor limiting the deer population on the Uncompahgre Plateau (Bishop et. al 2003, Pojar and Bowden 2004, B. E. Watkins, Unpublished data). These studies have found that approximately 4% of adult does, 4% of fawns over 6 months age, and 3% of fawns between birth and 6 months of age are killed by mountain lions. Overall, 75-88% of the non-hunting mortality in does and fawns in these studies has been due to causes other than lion predation (e.g., coyote predation, malnutrition, disease, vehicle collisions, fences). The impact of lion predation on adult buck survival in L-22 is unknown.

Issues No. 4 and No. 5 are only indirectly addressed by this plan because relationships between lion density and livestock depredation or human conflicts are not well established. This management plan will not restrict the removal of individual lions depredating on livestock or lions that pose a threat to public safety. There has never been a documented lion attack on a human in L-22 and loss of pets to lions is uncommon.

STRATEGIC MANAGEMENT GOALS

The strategic goal for DAU L-22 is to maintain a stable mountain lion population by managing sport harvest. L-22 is one of the leading DAUs in the state for lion harvest and the CDOW will manage the lion population for sustainable hunter harvest. Past and current damage claims, nuisance complaints, and human safety concerns in L-22 do not justify suppressing the lion population. Individual offending lions will continue to be managed on a case-by-case basis.

POPULATION PROJECTION

Estimating lion population numbers is very difficult due their low density, large home ranges, and secretive nature. The CDOW does not currently have the ability to accurately estimate mountain lion populations over large areas. In lieu of population estimation, wildlife managers must rely on population projections using density information from other locations published in the scientific literature. These density estimates were derived from mark-recapture studies using radio-collared lions. Population projection is accomplished by mapping lion density polygons (e.g., high, medium, low, and zero density zones) within the DAU based on lion habitat suitability and prey density. Density estimates that appear most applicable to each density polygon are then selected from the literature and applied to each area and a total lion population is projected.

Lion habitat in L-22 was classified into four different density zones using information in CDOW's Wildlife Resource Information System (WRIS). Areas above 11,000 feet in elevation were considered to be zero density areas and were excluded from the analysis. The remaining area amounted to 10,624 km^2 of potential lion habitat (97 % of the DAU).

High density mountain lion areas corresponded with previously delineated deer, elk, and bighorn sheep winter ranges based on WRIS data (7021 km^2) (Fig. 7). High density areas primarily represent pinyon/juniper woodlands, mixed mountain shrub/Gambel oak/ponderosa pine, and agricultural-wildland interphase areas. A spatial analysis of lion harvest in L-22 indicated that approximately 95% of the lion harvest between 1997 and 2002 occurred in the area classified as high density lion habitat.

The Uncompahgre Valley, from approximately 5 miles south of Montrose to Delta, and desert shrub areas along the Gunnison River were classified as low lion density (913 km^2) zones. Much of this area is characterized by irrigated agricultural lands, urban and rural development, or Mancos shale foothills. Although no sport harvest has occurred in these areas in recent years, they were not omitted as potential lion habitat based on occasional confirmed lion sightings, road-kills, and control kills that have occurred in the Uncompahgre Valley. The Uncompahgre Valley also supports a sizeable resident deer population, especially along the Uncompahgre River, that could provide a prey base for lions.

All remaining areas below 11,000 feet in elevation that were not classified as high or low density were classified as moderate lion density (2690 km^2). These areas are generally above 8,000 feet in elevation and are typically covered by aspen and spruce/fir forests. Although WRIS big game winter range does not occur in the moderate density zone, a considerable number of elk can winter in this zone during mild to normal winters. Approximately 5% of the lion harvest from 1997-2002 occurred in this zone. Hunter access during the lion hunting season is limited in this zone due to snow.

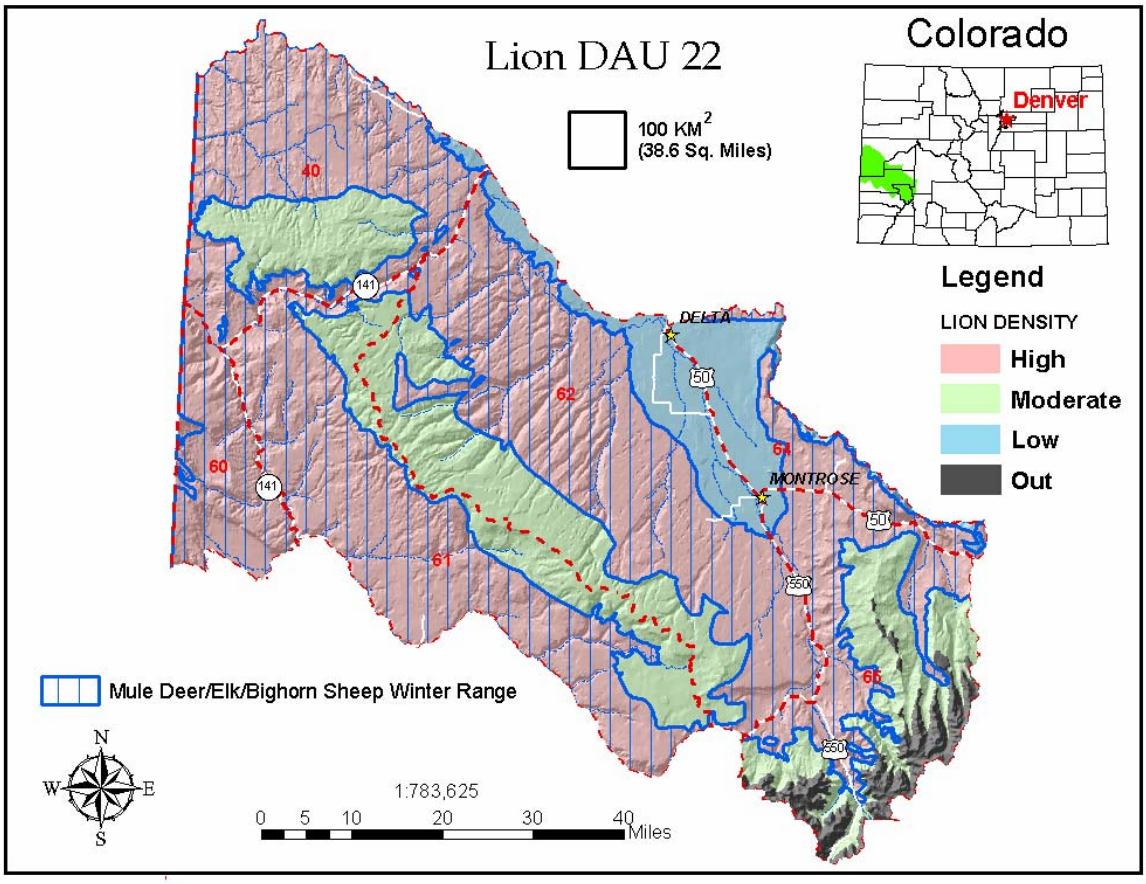

Figure 7. L-22 big game winter range and lion density zones used for population projection.

The next step in projecting the population is to select credible, representative density estimates reported in the scientific literature and apply these to each density polygon. Lion densities reported in lion habitat in western North America, usually determined on winter range, have varied from 0.6 to 4.7 lions per 100 km^2 (Logan and Sweanor 2000). Anderson et al. (1992) reported a minimum lion density of 1.1 lions/100 km^2 in Unit 62 in 1987. However, the authors point out that this estimate is certainly low because it is only based on the number of lions radio-collared and uncollared lions were observed. Lion densities estimated in Wyoming (Logan et al. 1986), Alberta (Ross and Jalkotzy 1992), and New Mexico (Logan and Sweanor 2001) appear to be the most applicable to L-22. Based on these studies, high lion density was considered to have 3.5 to 4.6 lions/100 km^2, moderate density was considered to have 2.5 to 3.4 lions/100 km^2, and low density was considered to have 1.7 to 2.4 lions/ km^2. Applying these densities to the habitat polygons results in a projected lion population in L-22 of 329 to 435 lions.

Based on available evidence, L-22 appears to have considerably higher prey populations of deer and elk than the study areas cited above. Therefore, it is reasonable to assume that the habitat might support a lion population more towards the upper end of the projected population range. Using lion densities of 4.6/100 km^2 for high density,

3/100 km^2 for moderate density, and 2/100 km^2 for low density results in a point projection of 422 lions of all ages.

The final step in projecting the population is to calculate a population structure. Studies of hunted lion populations in New Mexico (Logan and Sweanor 2001) and Alberta ((Ross and Jalkotzy 1992) reported that cubs made up, on average, 34% of the population. On this basis, the adult and subadult population in L-22 would range between 217 and 287 with a point projection of 279.

MORTALITY OBJECTIVE

Harvest Potential

The rate of population growth documented in lion populations can be used as the basis for establishing the level of sustainable off-take due to hunting and non-hunting mortality. Although annual population growth rates as high as 28% have been documented in previously hunted lion populations after they are protected (Logan and Sweanor 2001), most reported population growth rates have been considerably lower. Logan and Sweanor (2001) found the annual rate of population growth in a mountain lion population in the San Andres Mountains in New Mexico (an area of low to moderate prey density) was 11% and suggested that this rate could be used as a basis for estimating the sustainable off-take if a lion population does not appear to be declining. If population status is unknown (almost all cases), Logan and Sweanor (2001) recommended 8% harvest of the adult male segment of the population and no harvest of females as initial, maximum harvest rates.

Based on a review of the literature, the CDOW has recommended an annual off-take rate within the range of 8-15% of the projected adult and subadult population to manage for stable lion populations (J. Apker, 2004 Unpublished CDOW report). The CDOW also recommends keeping the proportion of females in the harvest below 50% to maintain adequate recruitment of young into the population.

For the purpose of this plan, 12% was selected as the preferred sustainable off-take rate of the projected adult and subadult population. Although it is possible that a higher harvest rate might be supported, 12% represents a conservative compromise given many unknowns. For example, in addition to known mortalities, unknown mortality undoubtedly occurs in L-22. Natural causes of mortality include intraspecific strife, infanticide/cannibalism, disease, and starvation; in some studies these causes have contributed significantly to overall mortality (Logan & Sweanor 2000). In addition, an unknown number of illegal kills can also contribute to overall mortality (Anderson et al. 1992).

Using a 12% mortality rate, the allowable annual off-take would be in the range of 26 to 35 adults/subadults with a point projection of 33. Based on harvest mortality making up 96% of total known mortality, annual sport harvest off-take would be 25 to 33 with a point projection of 31. In comparison, the 3 year, 5 year, and 10 year average annual harvests for L-22 were 32, 30, and 38, respectively.

Refuge Areas

Lion harvest is well distributed throughout DAU L-22. Based on an analysis of lion harvest locations between 1997 and 2003, no large areas (i.e., > 1000 km^2) exist within the DAU where net lion production would regularly be expected to exceed human-caused lion mortality and thereby serve as a consistent source of dispersing lions for other segments of the metapopulation. Smaller areas within the DAU (100-250 km^2) where hunting is restricted due to hunting closures, travel limitations, or private land that could potentially serve as minor source areas include Black Canyon National Park and the Gunnison Gorge area, the area in and around Colorado National Monument, the high San Juan Mountains including the Uncompahgre Wilderness, and private land on the south end of the Uncompahgre Plateau and in the Cerro Summit and Cimarron areas. Based on their large home range sizes, these areas could provide refuge to only a few lions.

Management Objectives

Management objectives for L-22 are 1) to maintain the annual off-take between 26-34 lions per year on a 3-year average and 2) to manage for less than 50% of the harvest to be made up of female lions on a 3-year average. Three year averages were selected to allow for more responsive management in relation to the CDOW lion study. If annual known mortality exceeds 35 lions on a 3 year average or females make up more than 50% of the harvest on a 3 year average, quotas will be reduced. From 2005 to 2009, the annual off-take objective for L-22 will be reduced proportional to the percentage of the DAU off-take that has occurred in the proposed lion study area between 1997 and 2003 (i.e., 28%). During this period the objective will be to maintain the annual off-take between 19-24 lions per year on a 3 year average. This off-take objective will include control kills within the study area but will not include capture and handling related mortality as a result of the lion research. If off-take exceeds this objective on a 3 yr average, quotas will be reduced accordingly in the remainder of the DAU.

The allowable annual off-take objectives could change if significant changes occur in the ungulate prey base or better information becomes available for projecting the population and calculating sustainable off-take.

SUMMARY

The objective for L-22 is to manage for a stable lion population. The calculated sustainable, annual harvest off-take in L-22 is projected to be between 25 to 33 adult and subadult lions. This is lower than the average high harvest (44/yr) that occurred between 1992-1998 which might have suppressed the population and been supported by carryover of lions resulting from previous low quotas and an 8 year lion hunting ban in Unit 62. The average L-22 lion harvest for the last 5 years (30/yr) falls within the calculated sustainable annual harvest off-take.

During the CDOW lion study on the Uncompahgre Plateau from 2005-2009, the annual off-take objective will be 19-24 lions on a 3 year average. Lion density is expected to increase on the south half of the Uncompahgre Plateau as a result of a planned hunting closure in the study area and a high rate of dispersal of males out of the study area is anticipated. In 2010, it is planned that the study area will be opened to liberal harvest of lions and the annual off-take objective will be adjusted accordingly. Information from the study up to that time will be used to guide subsequent off-take recommendations.

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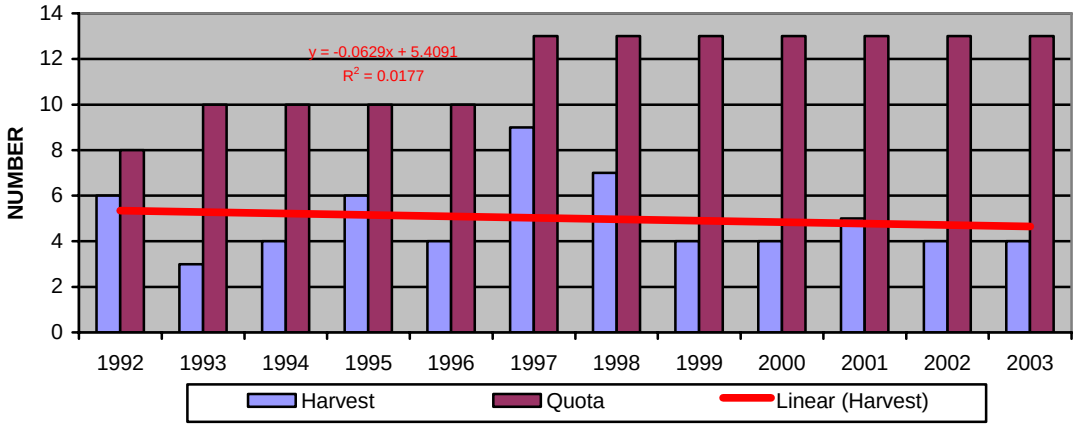
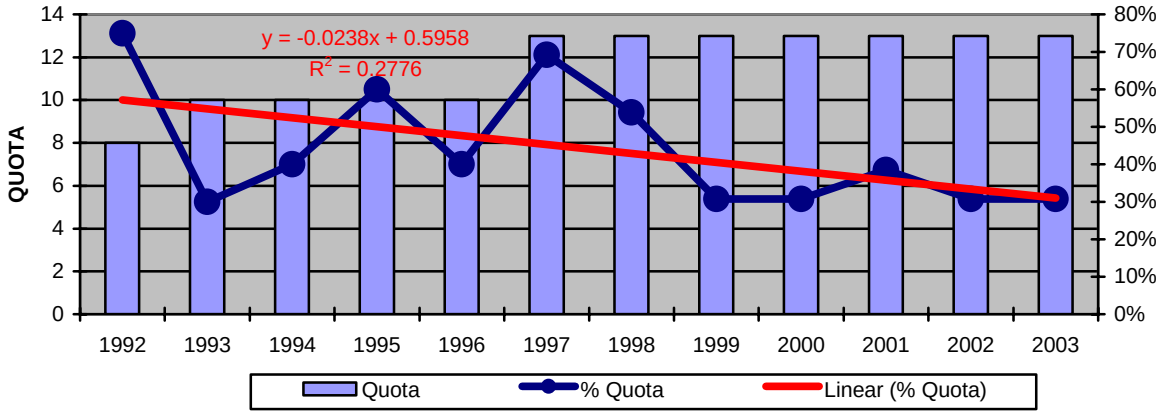
APPENDIX 1

L-22 Lion Harvest, Quotas, Quota Achievement, % Females in Harvest for each Unit, 1989-2003.

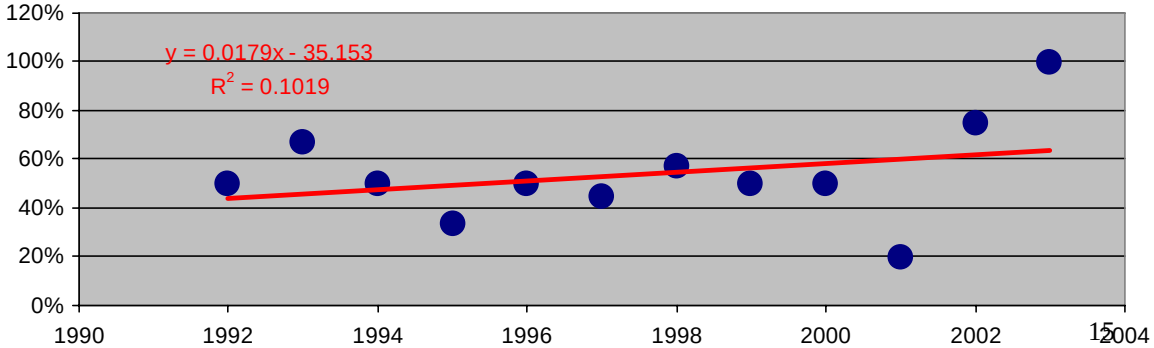
Unit 40 Lion Harvest



Unit 40 Quota Achievement



Unit 40 % Female in Harvest



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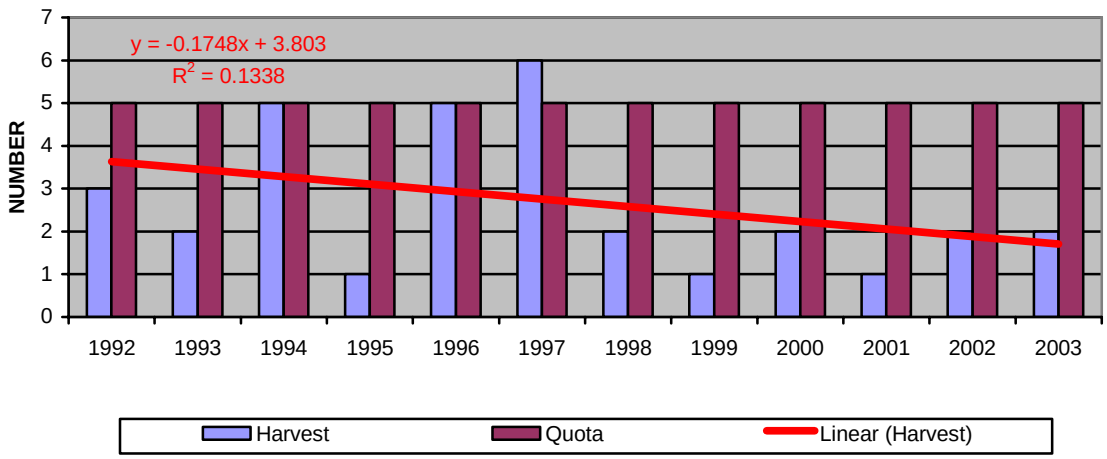

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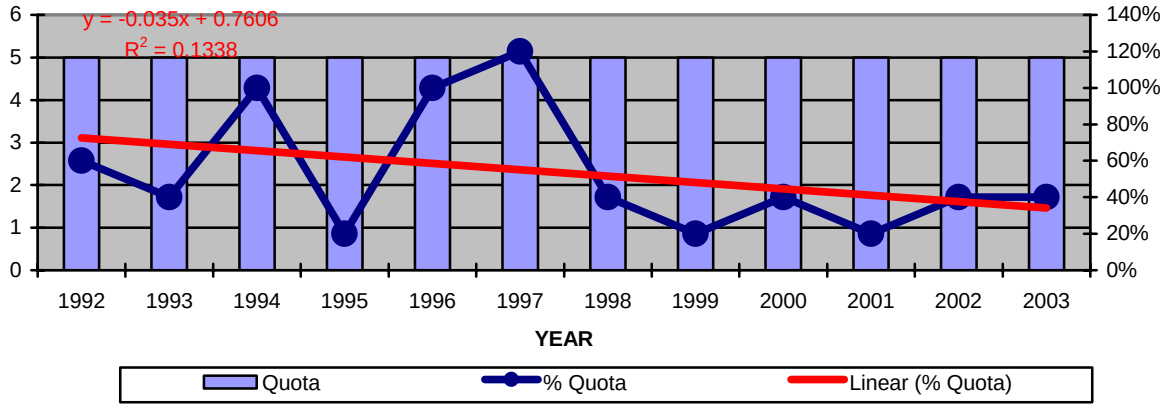
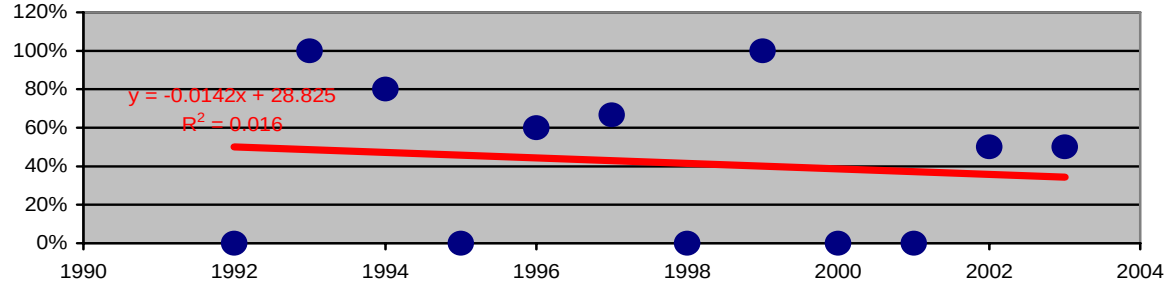


Unit 60 % Female in Harvest



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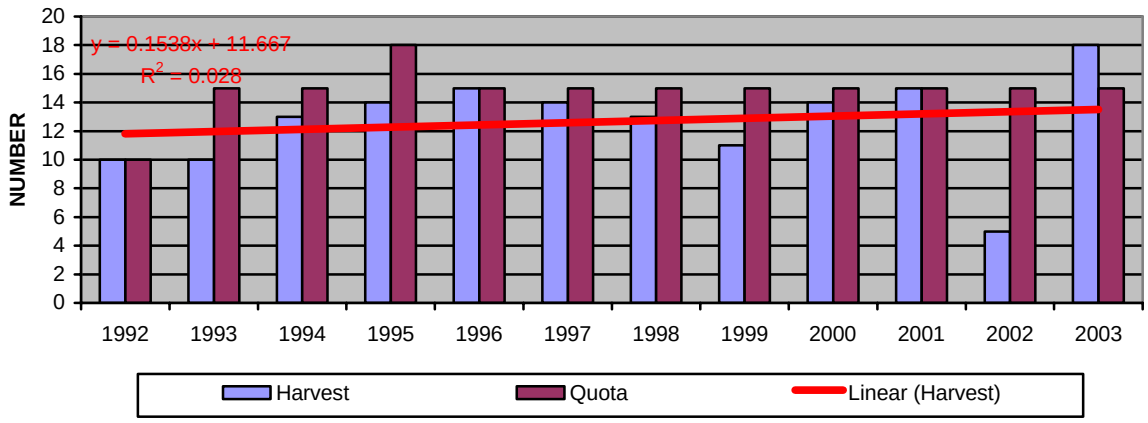
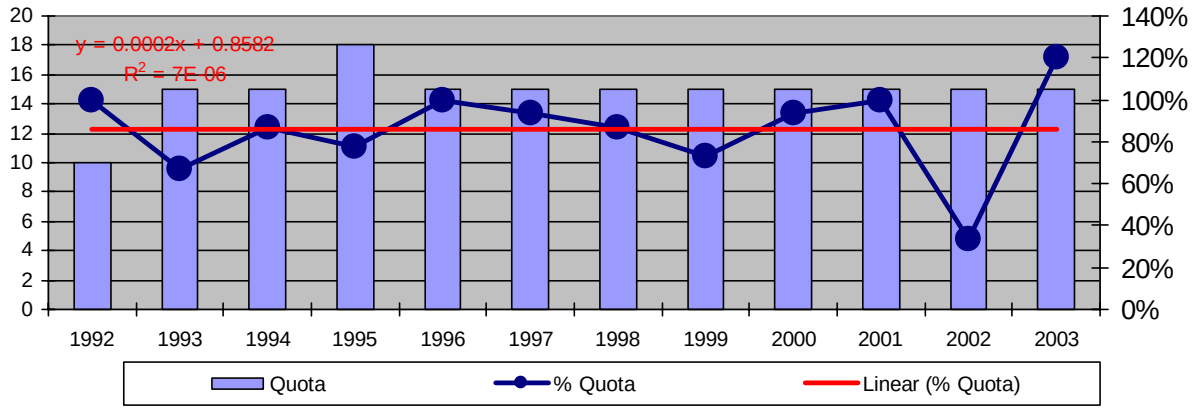
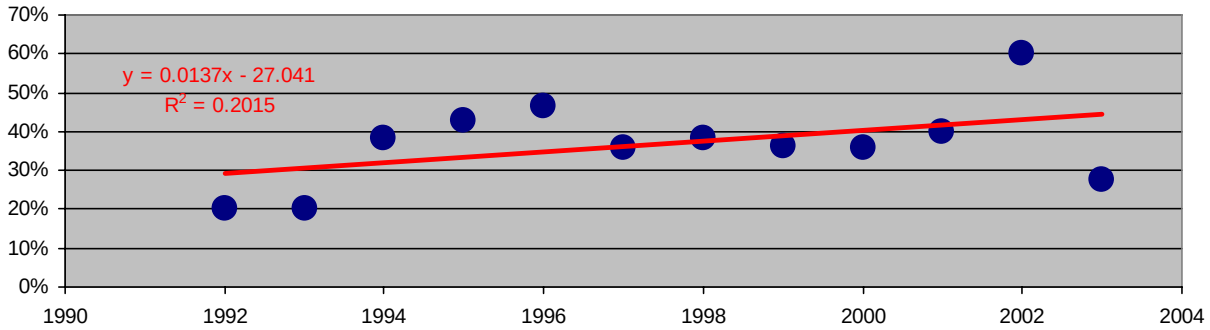


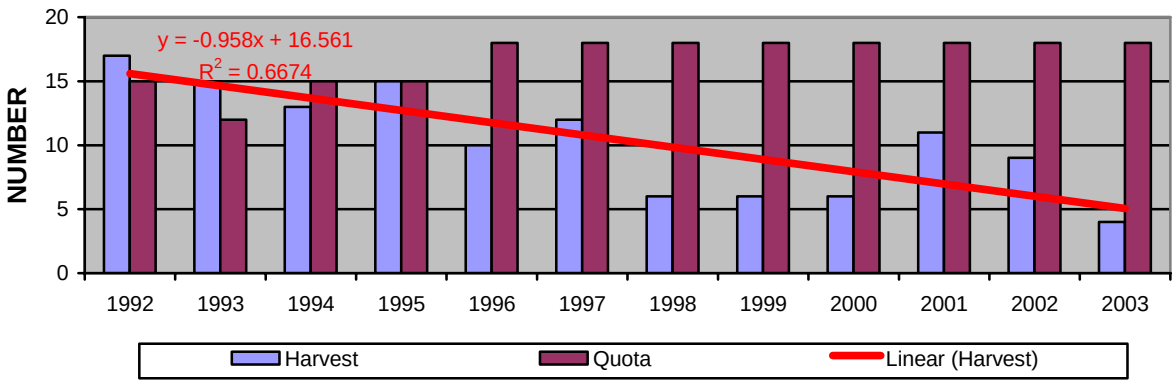
Unit 61 Quota Achievement



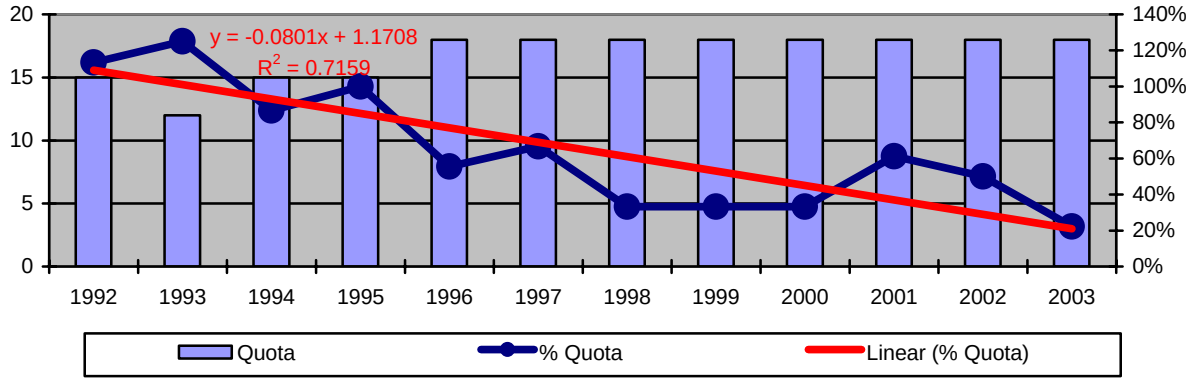
Unit 61 % Female in Harvest



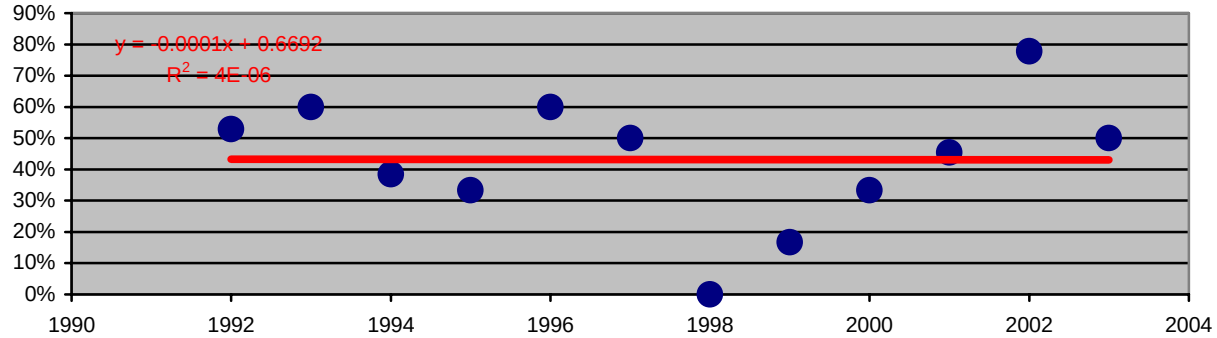
Unit 62 Lion Harvest



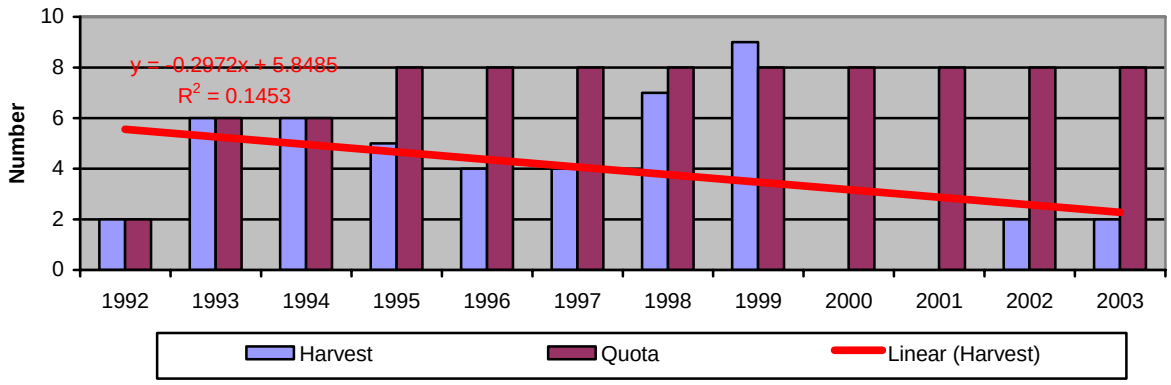
Unit 62 Quota Achievement



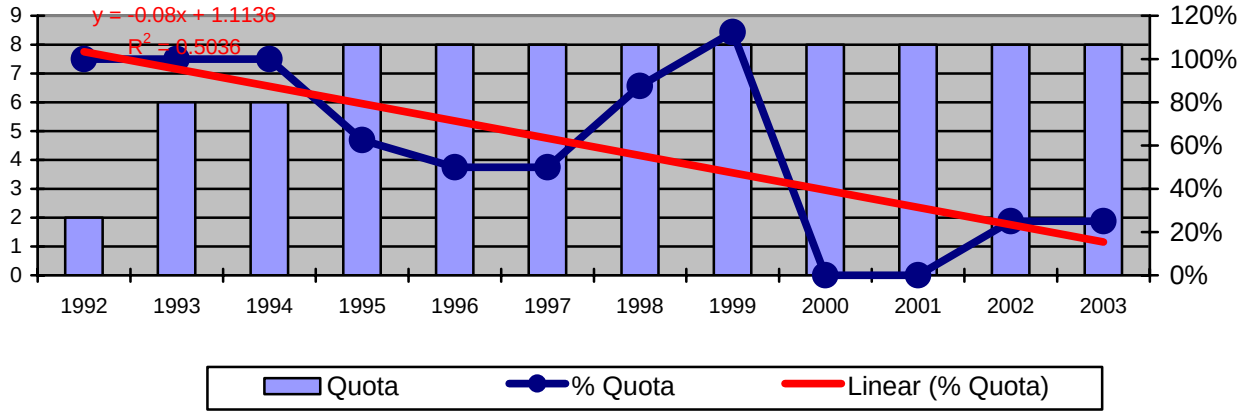
Unit 62 % Female in Harvest



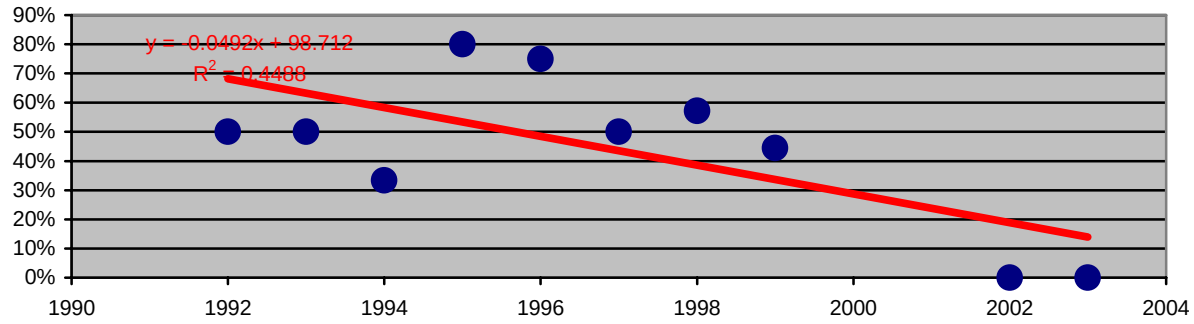
Unit 64 Lion Harvest



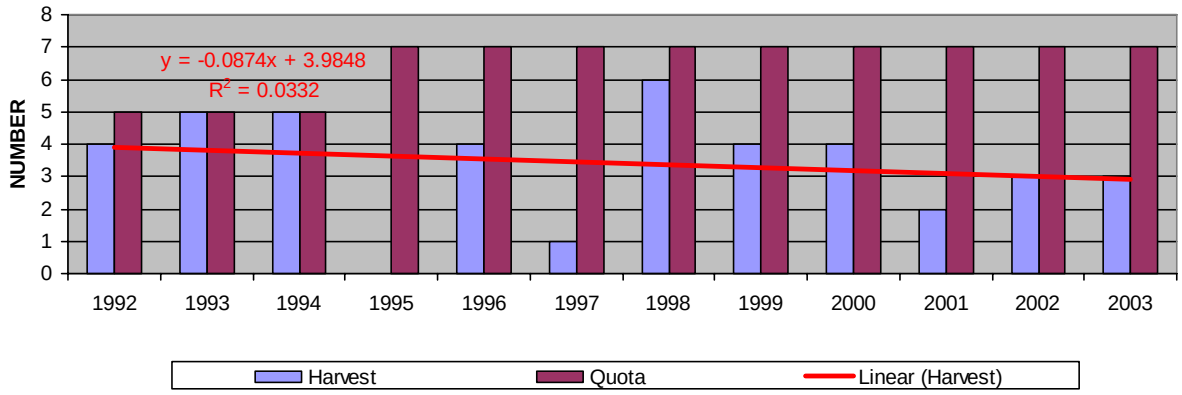
Unit 64 Quota Achievement



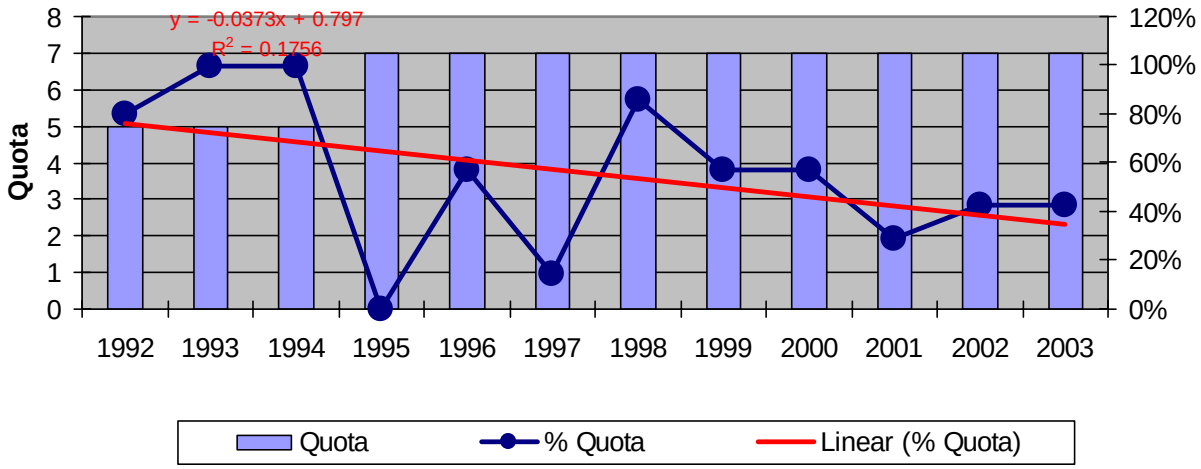
Unit 64 % Female in Harvest



Unit 65 Lion Harvest



Unit 65 Quota Achievement



Unit 65 % Female in Harvest