MOUNTAIN LION MANAGEMENT PLAN

2002 - 2010

Edited by:
Jon Rachael and Steve Nadeau

With assistance from:
Wayne Wakkinen
Jeff Rohlman
Neil Johnson
Bruce Palmer
Daryl Meints
Brad Compton
Tom Keegan
Mike Scott
Michael Gratson

Idaho Department of Fish and Game
600 South Walnut Street Box 25
Boise, Idaho 83707

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In Memory of Michael Gratson,
Who died in a helicopter wreck in the Lochsa Country December 2001
while researching and developing
a technique to count mountain lions.

He was a great researcher and friend.

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FOREWORD

This mountain lion management plan charts the course for the Department of Fish and Game during 2002 – 2010 to manage Idaho's mountain lion populations and to provide recreational opportunity, maintain healthy lion populations, and provide for human use and products.

This plan presents the Department's management philosophy and technical approach regarding mountain lion management. Additionally, the major issues facing the Department are defined and strategies for discharging our statutory, professional, and moral responsibilities to manage this resource are explained. The Idaho Department of Fish and Game will do its best to conserve Idaho's mountain lion resource for the benefit of present and future Idahoans and visitors to the state.

INTRODUCTION

This document is the plan of the Idaho Department of Fish and Game (hereafter called the Department) for assessing and managing the many and varied impacts of people on mountain lions and their habitats. The statutory responsibility for the Department to conserve, protect, perpetuate and manage all wildlife within the state of Idaho is stated in Idaho Code, *Section 36-103*.

The reason for this management effort is to ensure long-term annual returns from the mountain lion resource to the citizens and visitors of Idaho wherever and whenever possible. Most of the

efforts described in this plan are intended to maintain current mountain lion populations in most areas, while attempting to stabilize harvest.

There is an array of benefits that can accrue from a mountain lion population, including direct harvest; recreational opportunity; appreciative use; and social, cultural, scientific and genetic values. These varied benefits are not always compatible; and therefore, decisions regarding their relative importance are often open to challenge. With the cooperation of interested citizens, the Department looks forward to working with all concerned to ensure the future of the mountain lion in Idaho.

MOUNTAIN LION MANAGEMENT PLAN

Public Input

A concerted effort was made by the Department to involve the public and any interested organizations in determining the philosophy of this management plan. The Department examined a range of management approaches for this plan. These included an option similar to the present management scheme under which lions would be managed to maintain their current distribution throughout the state. Female quotas would be used where necessary to maintain lion populations at desired levels. A second option allowed for significant reductions in mountain lion numbers in selected areas while maintaining current densities in others. A third option allowed very liberal harvest throughout the state that would have resulted in a significant reduction in both numbers and distribution of lions. Details of the options were presented in brochures and on the Department's website, advertised through various media statewide, and discussed at 9 open houses and 1 focus group. Comments were received from 462 individuals, including 209 mountain lions hunters.

Following a discussion of the results of public comment on management options, the Idaho Fish and Game Commission (Commission) directed the Department to proceed with the option similar to the present management scheme. The Commission's intent was that we maintain the existing distribution of mountain lions throughout the state and attempt to maintain the current level of recreational opportunity for hunting this valuable big game species. However, the Commission was clear that their intent was not that mountain lions be maintained at high levels throughout the state. Rather, the selected option maintains the distribution of lions throughout the state while allowing sufficient management flexibility to regulate lion densities as appropriate for specific areas.

Department staff presented a draft plan to the Commission in March 2002. Following a public comment period, Department staff reviewed input and made appropriate revisions to the draft. The Commission again directed staff to obtain final public comment on the draft. Sixty members of the public responded by either attending and commenting at 9 public open houses (13), commented on our website (14), or wrote letters or emails (33). The Commission adopted this DRAFT version of the Department's mountain lion management plan in July 2002.

Background

The legal status and public perception of the mountain lion in Idaho has changed with the times. Settlement of the West in the late 1800's and early 1900's brought thousands of horses, cattle, and sheep to ranges formerly occupied by bison, bighorn sheep, pronghorn antelope, elk and deer. Mountain lions and other predators such as the wolf, coyote, black bear, and grizzly bear were perceived as significant threats to livestock and human interests and were systematically destroyed. Between 1915 and 1941, hunters employed cooperatively by the State, livestock associations, and the Federal Government reportedly killed 251 mountain lions in Idaho; the take by private individuals is unknown. During the period 1945-1958 bounties were paid for mountain lions in Idaho with an annual average of 80 mountain lions turned in for payment. The 1953-54 winter period yielded the highest recorded bounty harvest of 144 mountain lions.

Mountain lion hunting for sport became increasingly popular after 1958. Average annual sport harvest was estimated at 142 mountain lions from 1959 through 1971. During this period there were no restrictions or regulations on the harvest of mountain lions and an estimated 300 mountain lions were harvested during the 1971-72 season.

As a result of decades of unregulated harvest, mountain lion distribution and numbers declined in many accessible areas. Research on mountain lion predation, population dynamics, and social organization in the Big Creek drainage of the Frank Church River of No Return Wilderness from 1964-1973 added significantly to our knowledge as well as changing and enlightening many public perceptions and attitudes regarding this predator. This new knowledge and concern over the status of the mountain lion population resulted in legislation, implemented July 1, 1972, reclassifying the mountain lion as a big game species. Reclassification allowed the Department to regulate mountain lion harvest for the first time. Some units in the state were closed to mountain lion hunting, while the remainder allowed harvest of one per year per hunter during a short season. Since 1973 there has been a mandatory check of harvested mountain lions, and a mountain lion tag has been required since 1975.

Mountain lion populations and distribution, as measured by harvest data from the mandatory check, increased under this management strategy and in response to increasing deer and elk populations (Fig. 1). The Department responded to the improved status of the mountain lion population by extending seasons to allow for more hunting and recreational opportunity. The 1973-75 3-year average of 80 mountain lions harvested annually increased to an average of 206 per year for the 1983-85 period, and 497 per year from 1993 to1995. The highest 3-year average

annual harvest of 738 mountain lions occurred from 1996 to1998. The highest single season harvest occurred during the 1997-1998 season when 798 mountain lions were harvested (Fig. 2).

Mountain lions are currently managed to provide continued recreational opportunity for hunting and non-hunting resource users. The increasing popularity of the mountain lion as a big game animal; its vulnerability to hunters using trailing hounds; concerns of orphaning of kittens as a result of hunting; and the mountain lion's appeal to non-hunting users as a large predator, an integral component of our natural environment, and a symbol of America's diminishing wild lands, has combined to create competition and controversy among user groups. The Department recognizes and addresses these conflicting demands and concerns in this planning document.

Life History and Biological Considerations

Female mountain lions become sexually mature and breed as early as 20 months of age, but first breeding may be delayed until age 5 depending upon social status and whether or not the female has established a home range. Kittens are produced every second or third year thereafter. Litter size varies from 1-6, but 2 and 3 kittens are most common. Young remain with their mothers for 17-22 months and may be self-sufficient at 10-15 months of age. Mountain lions may breed at any time of year in Idaho, although the peak of births is in spring. Thus, at any time of year, an adult female may have kittens or yearlings dependent upon her for food and survival. If an adult female is killed, chances of survival for her offspring are greatly reduced.

Female mountain lions, especially those with kittens, tend to be easier to find and kill than males. A female must continually return to her kittens, and in so doing, leaves many tracks in a localized area. Adult females are also subject to more stress and risk of injury than males because they must hunt and kill large, potentially dangerous prey animals at more frequent intervals to successfully rear their kittens. However, typically females are smaller than males and are passed up by many houndsmen.

Mountain lion populations consist of resident adult males and females, transient males and females, and kittens of resident females. Home ranges are maintained by resident lions but not by transient lions. Home range size varies by sex and age of the lion, reproductive status, season of the year, and distribution and density of prey species. Resident lions maintain contiguous but fairly distinct home ranges in winter and summer. There is usually little overlap of resident male home ranges; however, each male home range may overlap more than one female home range. Home ranges of resident females overlap to varying degrees; usually female progeny will share

some part of their maternal home range. Home range boundaries are maintained by mutual avoidance and marking by scrapes and scent marks. This form of home range maintenance serves as a mechanism to limit population density.

Population density and age composition are affected by exploitation rates. Mountain lion populations in remote areas will usually have low exploitation rates, low population turnover, a greater proportion of resident lions, and an older age composition. Areas that are easily accessible have higher exploitation rates, high population turnover, a greater proportion of transient lions, and hence younger age composition. Research on exploited populations adjacent to stable, lightly hunted areas, indicates mountain lion populations comprised primarily of young (4 years and younger) individuals may reach higher densities than populations with a large percentage of mountain lions in the 5-year and older age classes due to disruption of the self-spacing aspects of mountain lion social organization. Only uniform, heavy exploitation over the entire range will depress the number of mountain lions in these situations.

Predator-Prey Relationships

Mountain lions in North America have evolved to prey on moderate-sized mammals. In areas where a variety of prey types are available, deer and deer-sized prey appear to be the staple in lion diets. Larger prey such as adult elk and smaller prey such as a variety of rodent and bird species are also regularly taken. These facts alone, that mountain lions prey on ungulates and that ungulates are likely the staples diet for lions in many areas, do not answer the question of the impact of lion predation on ungulate populations. Is the impact large, moderate, or trivial? How does the impact of lion predation vary with environmental conditions? In the long-term evolutionary scale of thousands of years, the continued coexistence of mountain lions and ungulates is evidence enough that lion populations generally do not depress ungulate metapopulations to the point where they become extirpated or extinct. However, due to predation, lions have likely contributed to the fleetness, wariness, size, shape, behavior, and social adaptations of our native ungulates.

The shorter-term ecological-scale impact of mountain lion predation on ungulate populations in Idaho likely varies with the species of prey, their numbers and recent population trends, lion numbers, the types and abundance of other prey, and the types and abundance of other predators such as wolves, coyotes, black bears, man, and grizzly bears. These vary with habitat and land use characteristics, climate and weather, and hunting pressure, among other influences.

The potential impacts of mountain lions on ungulate prey can be characterized or understood in a number of ways. When lions are not limiting ungulate populations (reducing average population size), they take only prey that would otherwise die from other means. For example, deer or elk may be in such poor condition that many would starve during most winters if they were not taken by lions, or in such poor condition that they would contribute little to population growth (very low pregnancy rates), if lions or other predators did not take them. When lions limit ungulate populations, they take prey that would generally otherwise live and add to population size and growth. But the important question is when and where is lion predation additive.

This additive impact of mountain lions may also be better understood by understanding changes in the percentage of the ungulate prey population taken (that would otherwise live to contribute to population growth) in relation to changes in ungulate density (over time). If lions take greater percentages of (fit) deer or elk at larger deer or elk population sizes and smaller percentages at lower population sizes, lions will tend to move ungulate populations toward equilibrium. Thus, predation by lions can be prey density-dependent and help stabilize an ungulate population. Another possibility is that there may be no relationship between predation rate by lions and ungulate population density; lions may simply reduce the average size of an ungulate population by a trivial, moderate, or large amount. Or, a third possibility is that there may conceivably be an inverse (destabilizing) relationship whereby lions take greater percentages of (fit) prey at lower densities and smaller percentages at high densities. The latter predator-prey relationship is unstable since greater predation at decreasing prey population size could conceivably result in extirpation. Or, it could result in a failure of predators to keep ungulates below the nutritional capacity of the habitat and ungulate populations may erupt to very high densities and later crash due to food shortages. Also, there may be time lags in the relationship between percent predation and ungulate densities. In general, research indicates that when ungulates are at or near habitat carrying capacity, predation can have little impact or may help stabilize ungulate populations. When ungulates are well below habitat potential, typically following a harsh winter, predation can regulate production and may cause ungulate population declines.

The form the relationship between lion predation and ungulate populations take, whether lions “stabilize” (“regulate”), “destabilize”, or only limit prey populations, and (importantly) how strongly these links are, depends on the species of prey, their numbers and recent population trends, predator numbers, the types and abundance of other (mainly ungulate) prey, and the types and abundance of other predators. For example, alternate prey may conceivably “buffer” primary prey against strong lion predation, lion predation rates today may conceivably depend on ungulate

densities some years ago, and in the face of high lion numbers lion predation rates may conceivably be low due to direct or indirect interactions with other predators.

Wildlife managers and the public need to expect different impacts of mountain lions on ungulates under differing sets of circumstances. The form and strength of relationships between lion predation and ungulate populations have major implications to both lion and ungulate management. Identifying and understanding these relationships in areas with different complements of ungulates, predators, and habitats will help us better manage this wildlife.

Habitat Management

Mountain lions occupy a wide range of habitats in Idaho defined by vegetative structure, topography, prey numbers, and prey vulnerability. The energetic needs of female lions with kittens limit viable populations to areas with sufficient numbers of deer and elk. Human activities have and will continue to affect the quantity and quality of mountain lion habitat by directly and indirectly altering the structure of vegetative communities and altering the number and distribution of prey animals. Thus, land use or habitat management practices that impact ungulate prey will also impact mountain lions. Road construction and improvement likewise increases mountain lion vulnerability by increasing access into previously remote or inaccessible ungulate winter ranges.

The future of mountain lions in Idaho depends upon the retention of sufficiently large habitat "reservoirs" that are managed for (i.e. strict harvest regulations) or naturally contain low road densities and limited access. These areas provide resident mountain lion populations increased security and reduced vulnerability. Travel corridors connecting these and less remote areas must also be present to facilitate dispersal to provide a continual supply of young lions to repopulate adjacent habitats that are more easily accessed and heavily exploited. Any permanent reduction of habitat will result in reduced mountain lion populations, particularly deer and elk winter ranges lost to industrial, residential, and recreational development.

HUNTING SEASONS AND MANAGEMENT STRATEGIES

Hunting Seasons

The Department uses a combination of general seasons and quota systems throughout the state. Quota systems have been instituted when it appears, through an examination of past harvest data and in light of perceived population trend, that an area will not support a general season. General

seasons assume that because the mountain lion population has sustained a given harvest level over a period of years, it will be able to continue to do so in the future. This may be a valid assumption if hunter numbers, hunting effort, harvest techniques, and environmental conditions remain relatively unchanged. However, we know this is often not the case. For example, in 1989, 3,435 mountain lion tags were sold (1,240 individual tags plus 2,195 tags issued as part of the resident Sportsman's Package). In 1999, 17,816 mountain lion tags were sold (2,425 individual tags, 15,391 as part of the Sportsman's Package), representing a 518% increase over the last 10 years (Fig 3). Although we do not know how many Sportsman's Package tag holders actively hunt mountain lions each year, survey results indicated approximately 16% of these tag holders specifically hunted for mountain lions in 1999. Additionally, the Sportsman Package creates a large pool of potential lion hunters, particularly if they should encounter a mountain lion incidental to a hunt for another species such as deer or elk during the fall big game seasons.

Current seasons in Idaho open on either August 30 or September 15. Seasons run until March 31, (April 30 in 3 units) for a period of 182 (or 197) days. In 2 units that are under investigation for low bighorn sheep productivity and where mountain lions are being targeted for reduction, the lion harvest season remains open until June 30. In some areas with female quotas, the season is terminated for all harvest when the female quota is reached prior to the calendar date closure. In other areas, beginning with the 2001-hunting season, the season remains open for male harvest after the female harvest quota has been reached. Most harvest occurs in late fall and winter after snowfall provides optimal conditions for hunting with hounds.

Although the number of avid mountain lion hunters in Idaho is relatively small compared to hunters of other big game species in the state, mountain lions are considered by many to be a highly valued big game animal. During the 1998-1999 season, an estimated 5,100 hunters spent 39,500 days hunting lions in Idaho. Maintaining hunting dogs throughout the year is both expensive and time-consuming. Consequently, many people who kill mountain lions do so over someone else's dogs. The requirements for possessing a Hound Hunter permit have changed over the last 3 years, and Idaho currently requires anyone who owns dogs used to pursue mountain lions, handles dogs that are being used to hunt mountain lions, or harvests a mountain lion with the use of dog (except clients of licensed outfitters), to have a valid hound hunter's permit in possession. Hound hunter permits were sold to 3,173 resident hunters and 115 nonresident hunters in 2000 (Fig. 4). Most mountain lions are taken for their hides, but some are eaten. Idaho does not require the salvage of meat of a harvested mountain lion. Many avid mountain lion

hunters hunt primarily for the chase and/or to photograph mountain lions and seldom kill those they tree. Hound hunting accounted for 79% of the mountain lions harvested during 1990 – 2000.

With a few exceptions in the Clearwater Region, hound hunting is not permitted in an area during an open centerfire rifle season for deer or elk. However, some incidental mountain lion harvest occurs during the deer and elk seasons. Incidental harvest accounted for 15% of the mountain lions harvested during 1999 – 2000. Incidental harvest of mountain lions by deer and elk hunters occurs more frequently in north Idaho than in the rest of the state.

Management Strategies

Hunting is an important factor influencing size, growth rate, and composition of Idaho's mountain lion population. As such, the Department must set season lengths, dates, bag limits, and regulations for harvesting mountain lions that will achieve management goals and objectives. A management strategy to maintain mountain lion populations is based upon sustained yield harvesting in which harvest rate is equal to the annual rate of recruitment. Dispersal is another important factor that must be considered in the harvest of mountain lion populations. A given population contributes individuals to and receives them from adjacent populations through dispersal. When mountain lions are removed from a population, lions dispersing from adjacent or nearby populations fill vacant home ranges. Isolated populations can have difficulty maintaining themselves if local harvest rates exceed recruitment and dispersal from nearby populations is reduced due to high harvest. It is therefore necessary to harvest lions at a rate that is low enough to provide for an adequate number of dispersing individuals. In cases of isolated populations, quotas can be used to ensure the continued existence of a population.

This Mountain Lion Management Plan will strive to provide a diversity of recreational opportunities for both consumptive and non-consumptive use. Some areas are expected to maintain relatively high densities of mountain lions because of access difficulties and/or inefficiency of hunting these areas with hounds. These areas will provide a source of animals for dispersal into adjacent populations. In some areas that have experienced low elk calf-cow or deer fawn-doe ratios, mountain lion populations will be intensively harvested as part of an adaptive management strategy to examine the impacts of predation on ungulate populations. Long harvest seasons, 2-lion bag limits, reduced-priced tags, and extra nonresident hound hunter permits are being offered to increase harvest in these units. Other areas will continue to be managed under a sustainable harvest strategy to provide maximum hunter opportunity while maintaining a healthy mountain lion population. Harvest levels and trends, age structure of harvested lions, and other

indices of mountain lion abundance will be used as guides to establish appropriate hunting seasons.

MANAGEMENT TOOLS FOR REGULATING MOUNTAIN LION HARVEST

A number of regulatory tools are available to wildlife managers that can have varying impacts on mountain lion harvest. Mountain lion harvest can be regulated by controlling access to mountain lion habitat, controlling season timing and length, setting harvest quotas, controlling hunter numbers, changing bag limits, or restricting methods of take. Each of these tools has its advantages and disadvantages.

Access Restrictions

Road closures and access management strategies designed to provide more escapement and reduce harvest vulnerability of elk and deer also reduces harvest vulnerability of mountain lions, particularly if the closure extends through the winter months. Area closures around deer and elk winter ranges and feeding sites to limit disturbance to wintering big game animals provide security for mountain lions if these areas also have restrictions for mountain lion hunting activity. Closing specific roads or drainages to mountain lion hunting has not been used as a management strategy in Idaho. It could be used in areas close to large population centers, areas with easy access to mountain lion habitat, or isolated mountain ranges to limit harvest in areas with heavy hunting pressure. Another option that may merit consideration is a rest-rotation system where areas or management units showing evidence of excessive harvest could be closed or rested for a period of years to allow the mountain lion population to recover while hunting is continued in adjacent areas.

Season Timing and Length

Mountain lion harvest is directly related to the frequency of snowfall and the length of time snow covers deer and elk winter ranges. Winters with frequent snowfall and long periods of snow cover create optimum conditions for mountain lion hunting with hounds. When this situation develops, hunter interest and participation peak in comparison to light participation and harvest in low snowfall years. Thus, harvest can be highly variable from year to year due to weather influences. When seasons are very short, changes in season length and timing can strongly influence lion harvest by adding or removing opportunity during optimum hound hunting periods (primarily December and January). Conversely, when hound seasons already include the prime hunting period, additional hunting opportunity during sub-optimal periods such as spring or early

fall generally has very little effect on lion harvest. A harvest strategy of shortening the season by reducing the number of hunting days or a calendar date that closed the season prior to good snow tracking conditions in some years would have the effect of reducing harvest, but it could also eliminate most hunting opportunity in some years. Because current seasons are very long and most harvest occurs during the middle of the season when good snow conditions exist, seasons would have to be reduced significantly to have any measurable impact on harvest.

In the past, the harvest season was followed in some units by a 2-to 4-week dog training season to allow houndsmen training and conditioning opportunities for their dogs as well as enjoy non-consumptive use of the resource. Because of currently long seasons throughout the state, most dog training seasons have been eliminated. In many areas with a female quota, however, a training season continues until the season closure if the female quota is reached prior to that date. The dog training seasons are not entirely non-consumptive. Physical injury to a mountain lion may result from prolonged or frequent chases. Small kittens are also vulnerable to being killed by pursuit hounds, just as they would be during the regular harvest season.

Quotas

The quota system likely provides managers the best opportunity to achieve management objectives by setting sex-specific harvest limits and reducing the potential for overharvest resulting from favorable snow years or increases in hunter effort. The quota system is also very appropriate for restricting harvest and managing mountain lion populations in areas with easy hunter access or isolated habitats that have low interchange with other populations.

Some concerns with the quota system include difficulty for inexperienced hunters to differentiate between male and female lions if separate quotas exist; competition among hunters for a limited number of lions may result in taking the first available lion, potentially causing more young and female lions to be killed; unpredictable season lengths causing problems for outfitters who have booked clients; notification of the hunting public that the quota has been met and the season closed; and unreported mountain lion kills or kills reported in the wrong unit to prevent the closing of the season.

Determining the appropriate level to set quotas can be difficult. Often biologists are required to make decisions about population trends based primarily on perceptions gained through contact with local hunters or field reconnaissance and a limited amount of harvest trend data. However mortality databases, houndsmen/hunter surveys, conflict/sighting records, and limited ongoing

research are providing increasingly more information for evaluations. The Department hopes to continue refining the process of meshing experience, intuition, and science for determining appropriate mountain lion quotas.

Controlled Hunts

Controlling hunter numbers through a permit drawing process has the advantage of reducing potential hunter competition and allowing the opportunity to pass up smaller lions for larger males. Restricting permit levels limits total harvest but does not give the more precise harvest control of a quota system. Hunting opportunity is reduced by the permit system due to the limited number of permits, but the uncertainty of quota system season closures would be avoided.

Bag Limits

Finally, mountain lion harvest can be manipulated by changing the number of lions that may legally be taken by one hunter during a year (bag limit). The pool of effective lion hunters is limited to those people who either have hounds or who are able to hunt with someone else who has hounds. When the majority of this limited pool has taken a lion, but more harvest is desired, little additional harvest can occur that year unless the bag limit is increased. This is particularly true in remote backcountry areas where very few people hunt with hounds. Idaho currently allows a two lion bag limit in such areas. In a similar vein, Idaho allows the use of nonresident deer tags to tag a black bear or mountain lion.

Methods of Take

Most mountain lions are currently killed in conjunction with the use of hounds. Hound hunting accounted for 79% of the mountain lion harvest from 1990–2000, while incidental harvest accounted for 15% of the kill, and still/stalk hunting accounted for 4%. Because most lions are taken with the assistance of trailing hounds, regulations that impact hound hunting tend to strongly influence mountain lion harvest. Regulations that limit or expand the number of hound hunters, such as resident/nonresident hound hunter permit quotas, tag quotas, or controlled hunts, can be expected to change harvest. Eliminating mountain lions seasons during other big game seasons could result in a relatively small reduction in harvest. Eliminating hound hunting could result in a large decrease in mountain lion harvest. However, increased incidental or still/stalk hunting would replace a substantial portion of the kill. For example, hound hunting was eliminated in Washington as a result of a public referendum in 1996. The annual average harvest of mountain lions in the previous 5 years (1991–1995) when hounds were allowed was 174. Seasons were lengthened and tag prices were reduced in an effort to continue to put hunting

pressure on mountain lions. In 1998, 132 mountain lions were harvested, and in 1999 harvest levels exceeded the 1991-1995 averages when 184 mountain lions were killed without the aid of dogs (Wash. Dept. Fish and Wildl. 1999).

While currently allowed during most of the lion season, to minimize conflict with deer and elk hunters, hound hunting is not allowed during general big game rifle seasons. Allowing hound use during the general deer and elk seasons would not likely increase lion harvest appreciably because early and mid-fall periods generally do not have optimum conditions for hunting with hounds, and because many hound hunters would probably be reluctant to hunt when many other people are afield. Other possible methods that could be regulated to increase or decrease harvest include trapping (currently not legal for sport harvest of mountain lions in Idaho) and allowing or disallowing the use of electronic calls to attract lions to the hunter.

Management Information Requirements

Mountain lion management in Idaho is faced with the problem of balancing recreational demand and harvest. This includes depredation harvest with size and productivity of the population, as well as addressing the concerns of non-consumptive and preservationist/protectionist-oriented individuals and organizations. Ideally mountain lion management is guided by a set of goals of which attainment is monitored by how well certain established objectives are met. The objectives must be measurable with acceptable degrees of precision and accuracy and monitored over time to detect changes in the population. Wildlife managers would ideally like to know population size, age and sex composition, age-related productivity of the female portion of the population, and age and sex-related mortality. These are extremely difficult to measure and monitor in mountain lion populations.

Estimating population size is difficult because of the mountain lion's secretive nature, nocturnal habits, and relatively low population density. Data on population size and composition in Idaho are available only for a few, fairly small areas during years in which long-term research was conducted, primarily employing mark-recapture and radio telemetry techniques. Such studies are costly, time-consuming, and impractical on a large scale for management purposes, but have provided necessary baseline information that many states have adopted in terms of age and sex composition related to population trend. Extrapolating the population density from localized studies to similar habitat types with similar management strategies may have merit, but to extrapolate them to a broader regional or statewide basis cannot be done because of differences in environmental factors and management practices.

Attempts to provide indices of lion population size or trend using track counts on ground transects or routes have been made in other states, mainly in the desert southwest. Accuracy and sensitivity of track count trends to changes in population size and composition are generally unknown, although work in Utah and Arizona reported positive correlations between track counts and lion population size. Recent work has also investigated different sampling schemes of track count routes in relation to ability to detect population change, accuracy, and precision.

Harvest data and the frequency of depredations have also been used to monitor changes in mountain lion populations. However, because these parameters also change in response to many other variables besides mountain lion population density, and their sensitivity to change has not been validated, they should not be used alone as the basis for management decisions. Combined with other information, they provide some indication of long-term trends.

The Department uses the mandatory check and report system to collect data on harvested mountain lions. The mandatory check program requires successful hunters to check the hide and skull of their mountain lion at a Department office or checkpoint within 10 days of the kill date. This provides a measure of the age/sex composition and a minimum harvest estimate. However, the harvest is not often representative of the age and sex composition of the population because of hunter selectivity. Because of the small sample sizes of mountain lions checked from some units, it is necessary to pool the data from several units to form Data Analysis Units (DAU's) to analyze harvest data.

Age structure, or a change in age structure over time, of harvested mountain lions is often considered an important population statistic for assessing harvest rate. Since 1985, the Department has collected a canine (C^1) tooth-drop measurement of harvested mountain lions to assess age structure of the harvest and monitor exploitation rates. Mountain lions brought in for the mandatory check were assigned to one of three age categories (K-3, 4-7, and 8+ years of age) based on the tooth-drop measurement. A shift in age distribution to a higher proportion of younger animals in the harvest can be interpreted as a result of increased exploitation. It could also be interpreted as a harvest from an area receiving many dispersing young animals, or that the birth and/or survival rate of a given lion population has increased. Herein lies the problem with age ratio data; without additional data relative to birth and survival rates, age ratio data can be interpreted several different ways. And, if we have rate of increase data we would not need age

ratios. This does not mean that a sudden change in age ratios should be ignored, but rather that more information is needed to determine what has happened.

In light of improvements in cementum analysis techniques (Trainer and Matson 1988), Idaho began extracting premolars (P^1) from harvested mountain lions to provide additional information on age structure and to evaluate the reliability of the tooth-drop measurement. A total of 468 lion teeth collected during the 1998-1999 harvest seasons were aged by cementum analysis. Ages from these mountain lions were compared with their corresponding tooth-drop measurements. The relationship between cementum age and tooth-drop measurement had low predictive capabilities (R^2 = 0.001, P = 0.569). Additionally, using tooth-drop measurement to place individual lions into 1of 3 age categories, 0-3, 4-7, and 8+, was only correct 19%, 55%, and 21% of the time, respectively.

The poor relationship between tooth-drop and cementum age is probably the result of measurement error due to inconsistent technique. The Department has used a variety of personnel and public to collect the tooth-drop measurement through the years. Lack of adequate training and/or attention to detail most likely resulted in inaccurate measurements.

Given the unreliability of the tooth-drop measurement to accurately assess age, the Department will continue collecting premolars for cementum analysis. The poor relationship between tooth drop and cementum age analysis also make interpretation of past age distribution data from the harvest invalid.

Population reconstruction and cohort reconstruction from harvest data (minimum estimated population size) has been attempted by some neighboring states. However, population estimates using this technique are generally made for populations for prior years and then mathematically modeled “into the future” to provide current estimates. Again, accuracy and precision of population reconstruction and modeling mountain lion populations are generally unknown and require age and sex composition of harvested lions.

Two recent developments in the field of population estimation that may have application to mountain lion population management needs include aerial detection of tracks in snow and mark recapture techniques using DNA samples. DNA samples from bears and lynx have been obtained by capture, fecal samples, or “hair or tissue grabbers” in multiple mark-recapture episodes to make population estimates. DNA from mountain lions could conceivably come from captured

lions (e.g., “treed”, but released, by hound-hunters), from scat on transects, or from hair or tissue obtained at scent-visitation stations. DNA samples may also be used to provide minimum population sizes to index populations.

Recently, population size estimates with estimates of precision have been made for mountain lion, wolverine, wolf, and lynx populations based on aerial surveys of tracks in snow. In brief, sampling units are delineated within Game Management Units and assigned broad lion density estimates (high, medium, low; based primarily on occurrence of winter prey of lions [typically deer and/or elk]). These strata are sampled with different intensity to provide better estimates of precision. In gently rolling or flat country, transects are flown with a helicopter after a fresh snowfall and detected lion tracks are followed forwards and backwards to obtain a track length (a length parallel to a baseline and perpendicular to transects). It is easy to understand that longer track lengths would have a greater probability of being detected on transects. The number of lions detected, their age composition, and mean track lengths are used to compute population estimates with confidence intervals. This methodology is being further developed for lions in Wyoming.

A modification of this technique was tried during a 13-hour survey of lions in a 340-mi^2 portion of the Lochsa drainage in the Clearwater Region (approx. 1/3 of GMU 12), where terrain is rugged and timbered. Instead of transects, unique-shaped polygons that follow elevation contours were flown after a fresh snowfall and, again, tracks were followed forwards and backwards to record which sample polygons lions entered and exited. The polygon approach may have more appeal in rugged, timbered terrain because tracks may be easier to detect in areas (polygons) rather than along long lines (transects) and transects can be difficult to fly using some aircraft (up and down contours rather than along contours). Results from the Lochsa lion survey showed promise, although increased precision would be necessary (increased sampling intensity, hour flown) and bias is unknown. These aerial surveys of tracks in snow currently assume sightability of tracks in sampled units is 100%, but sightability models could be developed if this assumption is untrue. However, the technique is fairly expensive and is dangerous because of the low elevation flying and aerial tracking.

Economic Considerations

Economic values for mountain lions have increased dramatically since the bounty years. In 1953-1954, the state paid a high of $8,500 for 144 mountain lions harvested (average = $59.02 per

lion). Presently, many sportsmen are willing to pay over $3,000 for outfitter fees, plus additional expenses (license, tag and transportation) for an opportunity to hunt a mountain lion.

Data on license and tag sales provided by the Idaho Outfitters and Guides Board and from Department records indicate that 756 hunters spent nearly $400,000 ($580,000 in 2002 dollars) hunting mountain lions in Idaho in 1983. At that time fees charged for licenses, tags, and outfitters amounted to $158,000 while the remainder was spent on taxidermist fees, travel within the state (four-wheel drive, snowmobile, small aircraft) and other miscellaneous expenses. Mountain lion tag sales have more than tripled since 1983. Although no recent economic surveys of mountain lion hunting have been conducted, the 1988 mountain lion season was estimated to contribute approximately 1 million dollars to the economic activity in the state, and tag sales and hunter participation have continued to increase since that time.

History of Lion Harvest from 1973 to 2000

Mountain lion harvest has steadily increased since 1973 when mandatory reporting of harvest was initiated. The 1973-75 three-year average of 80 mountain lions harvested annually increased to an average of 256 per year for the 1983-90 period (Fig. 2). During the 1991-1995 planning period, statewide harvest objectives were set at a maximum of 250 lions. Female quotas were initiated in many units statewide. Population densities and distribution continued to expand, as did harvest. During the 1991-1995 planning period, harvest increased 70% to an annual average of 436 lions. Harvest increased another 61% from 1996 through 2000 when annual harvest averaged 702 lions statewide. Harvest over the last 20 years peaked in 1997-1998 season, with 798 lions.

Research being conducted in the Clearwater Region identified predation by lions and bears to be the primary proximate factor in elk calf mortality from 1997-2001. Just 5 to 15% of the radio collared calves survived the first year of life with lion predation in the study area comprising about 30% of the calf mortality. Because elk numbers declined dramatically in portions of the Clearwater during the mid-1990's, the Commission directed staff to increase harvest of bears and lions to try and improve the calf survival in the Clearwater. Harvest seasons were extended, bag limits were doubled, tag prices were reduced, tag options were increased (e.g. nonresident deer tag can also be used for bear or lion), nonresident hound permits were increased for the backcountry units, and the Department emphasized harvesting more bears and lions in and near the study area.

During the late 1990's and through 2000, the Commission also directed staff to increase lion hunting opportunity where possible statewide, particularly where lions may be negatively impacting elk and deer populations. Season structure was changed to allow harvest of lions starting August 30 in most areas of the state and extending to either March 31 or April 30.

The density of lions, number of hound hunters, and snow conditions are the main factors limiting lion harvest. Annual fluctuations are typically a result of snow conditions. Long- term trends however, typically reflect changes in lion and hunter populations. The upward trend of the last 2 decades indicated lion and hunter population increases. However, despite more liberal seasons and bag limits, the trend over the last 3 years has been downward, possibly reflecting a decline in lion numbers in some areas. Therefore, it is critical to monitor lion harvest trends to identify possible changes in lion populations.

Mandatory reporting of harvested lions has been required since 1973. Tooth drop was used as a measurement to place harvested lions within age categories. More recently, lion pelts were also tagged. Starting in 2001, pulling of a premolar tooth was required for aging purposes; and due to poor quality of the measurements, tooth drop was no longer taken.

Mountain Lion Management in Neighboring Western States and Provinces

British Columbia and 5 of the 6 states surrounding Idaho all have harvest quotas or controlled hunts for managing harvest of mountain lions (Table 1). All have more conservative seasons than Idaho. This will continue to focus attention and pressure on Idaho's mountain lion population because of our long and comparatively unrestricted seasons.

Table 1. Mountain lion season structure and harvest for Idaho and other western states/provinces.

STATE/ PROVINCE	HARVEST SEASON DATES	2000 MANAGEMENT	2000 HARVEST	DOGS
British Columbia	9/15-3/30	Some harvest quotas and general season	379	Yes
Idaho	8/30 – 6/30	Unlimited tags; Female quotas; 2nd tags available	686	Yes
Montana	10/22-4/14	Harvest quota w/subquotas by sex	561	12/1-4/14
Nevada	10/1-4/30	Harvest quota	204	No
Oregon	08/1-5/31	Quota by zone 2 lion bag in some zones	135	No
Utah[a]	12/15-6/4	Harvest quota w/ female subquota	455	12/15-6/4
Washington	8/1 – 3/15	General hunt	295	Maybe. 74 Hound permits proposed in areas w/ safety concern.
Wyoming[b]	9/1-3/31	Harvest quota and/or Female subquota	200	Yes

a Some units open year-round.

b Several units open year-round to address depredation concerns.

British Columbia

Cougar management in British Columbia entails the protection and maintenance of existing cougar populations, with due consideration for human safety and the legitimate protection of domestic stock. British Columbia considers the cougar an integral and important part of the wildlife of British Columbia. The cougar's importance is two fold: (a) As a legitimate form of outdoor recreation for the hunter and non-hunter alike; and (b) As a regulator of its major prey populations.

British Columbia does not consider cougars to limit big-game populations. That is, they believe cougar predation on deer, wild sheep, moose, elk, or mountain goats does not set an upper limit

on the population size of the prey. However, predation has several beneficial effects upon prey population:

(A) Predation by cougars tends to force a constant redistribution of wintering game herds on winter range. The presence of a cougar on the winter range does not frighten game, but when a kill is made the game animals usually move a short distance away from the kill site. This prevents the concentration of animals on a localized food supply.

(B) Cougars provide a culling effect, particularly in deer herds. British Columbia recognizes that cougars have a tendency to kill older deer and very young deer. These are generally the age groups where food shortages, starvation, and disease take a toll, and predation tends to remove some of these animals. However, it must be stressed that cougars do not invariably select the weak and the sick. Many deer in prime condition are killed by cougar predation.

(C) The sum benefit is that of prey population regulation. Animal populations have the ability to rapidly increase and exceed the land's capacity to support them. Predation is one factor that has, through the long history of evolution, acted to control natural populations. The relationship between the cougar and its major prey populations is no exception.

The hunter has, in part, reduced the necessity for the predatory activity of large cougar populations to help regulate most of British Columbia's big-game populations. However, to maintain the several natural predator species, including the cougar, restricted hunting seasons and bag limits have been designed to allow room for man and the wild predators. Regulated game seasons and a lowered cougar population should work together to control populations of big-game animals throughout British Columbia.

Cougar season structure varies throughout British Columbia, but most units allow hunting either from mid-November to mid-February or from mid-September to the end of March. The annual bag limit in most areas is 2. Some hunt units have female quotas that can close the season earlier than the calendar date, but most units have no quotas. The use of hounds is allowed throughout the province to harvest cougars. Province-wide harvest peaked in 1997 when 496 cougars were killed. Harvest increased from the early 1990s (90-93 average = 246) to the late 1990s (96-99 average = 478). Harvest in 2000 was 379.

Montana

Montana's program is derived from a mountain lion management environmental impact statement (EIS) adopted in June 1996. The EIS considered four alternatives from no hunting to decreased lion populations; the chosen alternative emphasizes regional management authority based upon habitat capabilities. Montana has no formal criteria for establishing harvest quotas. Rather, each local manager establishes quotas based upon interpretation of the harvest age structure and apparent local trends in lion populations. Other potential indicators of population status include long-term harvest trends, incidental lion sightings, human/lion conflicts, depredations, and the number of lions treed per chase during dog chase seasons. Montana chose not to use monitoring parameters similar to those for black bear (median age by sex) because: "*Equivalent research is not available for mountain lions, and, because of reproductive and social differences between black bears and mountain lions*, (such parameters) *may not be applicable.*" However, if research did succeed in identifying such parameters, they would be utilized for setting management objectives. Montana has embarked on a three-year research project in the Garnet Range with the intent of trying to develop lion population trend monitoring techniques.

Lion take is regulated in groups of from 1-6 game management units by harvest quotas. About half of the 70 management groups have separate female and male quotas; the remainder have total harvest quotas, or total harvest with female sub-quotas. When a quota or sub-quota is filled, the lion take season closes upon 24 hours notice, but the chase season continues. A few hunting districts have special draw permits; these hunters may continue to hunt and take a lion even after the quota is filled. Montana Fish, Wildlife & Parks (MFWP) may initiate closure when it is anticipated the quota may be reached within the 24-hour closure period. Hunters can call regional offices or a statewide 800 number for current quota status (updated by 1:00 PM daily). Hunters must personally report their kill within 12 hours by calling the appropriate regional office during working hours or a statewide number after hours/weekends. They then have 10 days to personally present the hide and skull in the appropriate region for inspection and tagging. (Under special circumstances, hunters may be given authority for an out-of-region check.) MFWP issues a "Trophy License" upon check-in. In prior years, skulls were sent to the MFWP lab for cleaning and aging, then returned to the hunter. Now, a tooth is pulled at the time of check-in. Hide tags must remain attached until the hide is tanned. Skull tags must remain attached for at least one year.

The bag limit is one lion per year. Females with kittens may not be taken. Spotted juveniles may not be taken. If a lactating female is taken, she must be backtracked and the kitten(s) turned over

to MFWP within 24 hours. Mountain lion licenses are only available through the headquarters office; applications must be postmarked by August 31. Persons handling dogs in the field are required to have a mountain lion license and a free hound handler permit (except licensed outfitters and guides). Hound handler permits must be obtained by August 31. The statewide fall lion season coincides with deer and elk seasons; no dogs are allowed. The fall season in a district closes if the harvest reaches 20% of the winter quota. The fall harvest is subtracted from the winter quota. The winter season (dogs allowed) is December 1 through April 14. If a harvest quota is reached, the take season closes but the chase season continues through April 14. Lion hunting and chasing is open one-half hour before sunrise to one-half hour after sunset.

Hunter orange is required for mountain lion hunters. A hunter must take MFWP to the kill site if requested. Two-way communications may not be used to hunt big game animals. (May be used for safety or other legitimate purposes. Hunters may radio-track their hounds.) Aircraft may not be used to locate big game animals and hunt them within the same hunting day. Fifty-five percent of Montana lions have Trichinella spp.; varying from 70% in the northwest to 48% in the southwest, and 15-18% in central Montana.

Oregon (Goals)

- Recognize the cougar as an important part of Oregon's wildlife fauna, valued by many Oregonians.
- Maintain healthy cougar populations within the state into the future.
- Conduct a management program that maintains healthy populations of cougar and recognizes the desires of the public and the statutory obligations of the Department.

Introduction of problems and history of cougar management was reviewed. A life history, population characteristics, food habits, and modeling and research population summary was included to set a basis for management.

A detailed review of the history of cougar management in Oregon followed including how the controlled hunts system worked.

Tag number determination

This was determined by considering past harvest rates, the sex and age composition of that harvest, the number of damage complaints, number of cougar taken to control damage, estimated natural mortality, and the number of sighting reports received over time.

They also used a study in northeast Oregon to determine cougar density and productivity information when recommending tag numbers. For example, results of the study suggest that an average of one sub-adult cougar is recruited into the population each year for every adult female cougar in the population. They estimate the average female home range size and amount of overlap, and estimate the annual recruitment rate. They use this and the above factors, as well as harvest data and success rates.

Concerns and Strategies

They listed several concerns and strategies. These include research needs, illegal hunting, potential for cougar conflicts and injury, erratic nature of harvest and dependence on weather, citizen concerns of hound use, habitat concerns for prey species, and the fact that cougar populations may reduce local prey populations to very low levels. They state that the Department will manage for healthy populations of *all* big game animals.

Utah

Utah had a general season on mountain lions until 1990 when increased hunter pressure resulted in implementation of a limited-entry permit system (controlled hunts) statewide. In 1997, a harvest objective (total quota) management system was implemented in 14 of 30 management units. Currently the state is divided into 46 units, with 30 being managed as controlled hunts and 16 as general hunts with total quotas. Parameters used to evaluate population status and trend include the percent females and percent sub-adults in the harvest, hunter success, and average age of mountain lion in the harvest. Beginning in 1995, a tooth has been collected from each cougar harvested.

Population census techniques that have been tried in different parts of Utah:

1. Track surveys
2. Scent-station visitation rates
3. Indices of catch per unit effort
4. Capture-recapture estimates

Performance Targets

1. The percent of animals in harvest 6 years of age or older averages 15% or greater.
2. Total adult survival of 65% or more.

3. The percent of females in the harvest is less than 40%.
4. The number of cougar treed per hunter day averages 0.38.
5. Reduce the number of units being managed by a predator management plan.

    In 1996, predator management plans were prepared for 15 units where prey populations were at least 50% below target levels and not increasing.

Washington

Washington recently drafted an environmental impact statement for cougar management in the state. Most of this information was taken from that draft.

Cougar Management Units

Cougars are managed in Washington on a Cougar Management Unit (CMU). These areas were based on ecoregions and groupings of game management units. Nine CMUs have been designated in Washington.

Hunting Seasons

Cougar hunting seasons were established in 1966. Early seasons were year-long. A limit of one cougar per year was established in 1973. In 1987 a permit-only cougar system was initiated. The number of permits issued started at 170 in 1987 and was increased to 506 in 1966. In 1996, 3,970 applicants applied for the 506 permits. As a result of a public referendum in 1996, the use of hounds was no longer allowed. Hunting seasons were changed to a statewide general season running from August 1 to March 15. Two cougars may be taken during a hunting season. Hunting season regulations for cougars are set for a 3-year period.

Hunting Fees

Washington sells a package black bear/cougar license that entitles the bearer to harvest one black bear and one cougar. Current cost (2000) is $20 for a resident license, $200 for a non-resident, $10 for a youth, and $10 for a disabled veteran. This fee includes all necessary licenses and tags. A second cougar tag is available for $10 for a resident, $100 for a non-resident, $5 for a youth, and $5 for a disabled veteran. A cougar tag is also part of all deer and elk packages.

Harvest Levels

Data used by Washington to assess the status of the cougar population includes hunter success rates, hunter effort, hunter efficiency, sex composition and median age of the harvest, and

nuisance cougar complaints. All hunters, successful or not, are required to return a harvest report card.

In 1999, 295 cougars were harvest in Washington. The 5-year average (1995-1999) was 224. From 1990-1996, females averaged 44% of the harvest, the median age of females was 4.9 years old, and the median age of males was 5.5 years old. Age is obtained from cementum analysis.

Population Estimates and Population Models

Two methods are used to estimate the current cougar population in Washington. The first is a simple estimate based on habitat availability and reported cougar density from various studies. This method estimates a cougar population of 2,566 in Washington.

The second relies on sex and age ratio, cohort reconstruction, and simulation modeling. Three age-ratio methods are used to estimate adult mortality, including the Burgoyne estimator, vertical, and horizontal life tables. Juvenile (kittens and 1-year olds) mortality rates are estimated from comparisons of adult female productivity from the literature and age 2 adults from life table reconstructions.

POP-II, POP-III, and PUMA models are used to estimate the cougar population, incorporating survival estimates from reconstruction and reproductive rates and litter size from the literature. The minimum adjusted population estimate for 1989 was 2,100 cougars. Projections through 2000 show cougar population increasing about 1.5% per year with an estimated cougar population of 2,347 in 1996.

"Problem" cougars

Washington has a Cougar Response Plan that department personnel are directed to follow when responding to human safety and property concerns. Washington Department of Fish and Wildlife (WDFW) recently established a 1-800 "Dangerous Wildlife Hotline" for the public to use to report problem animals, primarily black bears and mountain lions. The WDFW Commission recently authorized the use of hounds to remove up to 74 cougars in 17 game management units with the highest number of public safety complaints. The use of hounds is authorized in areas that have at least 4 human safety, pet, and/or livestock problems or 7 cougar sightings and nuisance reports in a year.

Wyoming

The current Wyoming Mountain Lion Management Plan is a draft dated October 1997. This draft will not be submitted to the Wyoming Game & Fish Commission for final approval until an ongoing research project on mountain lions is completed. The anticipated completion date for the research is 2002. Although the Commission has not granted formal approval, the Department has implemented many aspects of the plan.

Like many of the other western states, management of mountain lions in Wyoming has gone from extremely liberal to more conservative through time. Bounty payments were common during the late 1800's and early 1900's. Beginning in 1973, mountain lions were reclassified from predator to a trophy game animal with the first lion-hunting season established in 1974.

The management plan outlines issues, alternative strategies to resolve the issues, and a preferred alternative with supporting rationale. Issues included: 1) public attitudes and values, 2) issues management, 3) adequacy of management database, 4) harvest strategies, 5) hunting with hounds, 6) habitat protection and management, 7) illegal losses, 8) mountain lion damage, 9) managing mountain lion/human interactions, 10) economic impacts to users, 11) information and public education, and 12) future research needs.

Currently, the state is divided into 5 Lion Management Units further divided into 27 hunt areas. Management Units are believed to encompass population centers. The current harvest framework generally includes a general season from Sept. 1 to March 31 with total and/or female subquotas by hunt area. Two hunt areas have a year-round season to address depredation concerns. Wyoming currently allows hunting with hounds. However, no pursuit-only season is offered. The State's Trophy Species Section first prepares annual quota recommendations after summarizing all statewide mortality data by sex and age class. These recommendations are submitted to the individual regions for review, which may make different recommendations through a justification report. The final recommendation is then presented to the Commission for approval. The management plan does not identify target objectives or other quantitative measures of performance.

Population data is primarily limited to harvest data gathered from mandatory check of harvested lions. Other forms of mortality are also collected (i.e. depredation, road kills, etc.). Information from harvested lions includes: harvest date, location (legal description, UTM, and hunt area), sex, lactation status, estimated age, number of days spent hunting, whether or not dogs were used, and

number of lions observed while hunting. These data are "cautiously" used to assess: population status, the age and sex structure of harvested lions, the distribution of lions killed, effort expended per lion harvested, and to account for and set mortality quotas. Additional information on effort is collected by mailing surveys to lion hunters annually.

Wyoming determines lion age by evaluating presence/absence of the canine ridge and tooth wear patterns. Individual animals are classified as juvenile, young adult or old adult. During the 1994-1995 harvest season, Wyoming Game & Fish personnel used cementum analysis to determine ages of harvested lions. Duplicate teeth were submitted to Matson's Laboratories (Milltown, MT) to test for the relative precision of the technique. According to the management plan, the mean age of teeth analyzed by both parties differed significantly and therefore the department concluded that cementum analysis was unreliable.

The management plan indicates that a protocol governing mountain lion/human interactions is being drafted.

MOUNTAIN LION MANAGEMENT GOALS 2002-2010

- Maintain mountain lion populations in Idaho at levels sufficient to assure their future recreational, ecological, intrinsic, scientific and educational values, and to limit conflicts with human enterprise and values.
- Maintain a diversity of sport harvest opportunities for mountain lion.
- Be responsive to human conflicts, livestock depredations, and prey population objectives.
- Research and develop better mountain lion population-monitoring tools.

STATEWIDE MANAGEMENT PHILOSOPHIES

Mountain lions are a valued native big game species in Idaho. Mountain lion populations will be managed at densities designed to:

- Meet social demands and statutory requirements for the perpetuation of mountain lions in Idaho.
- Maintain mountain lions at or near their current distribution throughout the state.
- Meet demand for a diversity of hunter opportunity.
- Allow a balanced maintenance of management objectives for both cougars and ungulate prey species.

- Reduce potential risks to human safety. There have been few cougar/human interactions in Idaho that have resulted in serious injury. The Department will intensify monitoring of reported interactions and respond appropriately.
- Reduce or maintain low levels of livestock depredations.

STATEWIDE MANAGEMENT POLICIES

- Continue to maintain viable populations of mountain lions in Idaho.
- Where feasible, rely on sportsmen to take mountain lions to meet wildlife management objectives.
- Continue to oppose the use of bounties as a predator control measure.
- Continue to oppose the use of sterilization or birth control as a wild animal population regulation measure.
- Continue to gather harvest data via the mandatory check.
- Continue to cooperate with livestock interests, the Idaho State Animal Damage Control Board, and Wildlife Services of the Animal and Plant Health Inspection Service, United States Department of Agriculture to minimize and document livestock depredations.
- Utilize standardized guidelines for determining the appropriate level of Department response to mountain lion conflicts with humans and/or livestock.
- Utilize a standardized reporting procedure for documenting human/mountain lion conflicts.
- Continue to protect young mountain lions and adult females accompanied by young.
- Continue to allow the use of trailing dogs.
- Limit the number of nonresident hound hunter permits issued statewide. Some areas that fail to achieve desired lion harvest despite liberal hunting regulations may be exempt from the nonresident quota. Resident hound hunter permits will not be limited.
- Encourage the selective harvest of males. Harvest data over the last decade indicates approximately equal harvest of male (~55%) and female (~45%) mountain lions. Adult males' territories typically overlap female territories by approximately 1 to 3. Additional harvest of males, to a point, and a reduction in the harvest of females would likely reduce orphaning of juvenile mountain lions. This would maintain recreational opportunity without reducing productivity of the population. The Department will maintain the current mandatory check of all mountain lions and encourage the selective harvest of males.

- Prohibit the use of trailing dogs when a general firearm (excluding muzzleloader) season for deer or elk is open in the area to be hunted, with some exceptions.
- Follow Department Policy for Avian and Predation Management (August 2000) to address concerns about excessive impacts of mountain lion predation on prey species. This policy prescribes the decision-making criteria and procedures to follow in choosing to implement a predator management program within a given area, either to meet human safety and livestock concerns or to meet prey species management objectives. For example, in areas where survival or recruitment of game animal populations is chronically low and management plan objectives have not been or cannot be met and where there is evidence that predation is a significant factor, a predator control plan may be initiated. Where deer and elk populations are below objective and predation is determined to be a significant factor, actions may be taken to reduce lion populations.

MANAGEMENT STRATEGY

Regional wildlife managers will establish goals for a preferred range of mountain lion harvest in each game management unit or Data Analysis Unit (DAU). Initially harvest goals will be designed to maintain harvest levels on a 3-year running average that are at or above the 3-year average harvest for the 1990-1992 big game seasons for each DAU, except in areas where other factors or circumstances justify a different goal (e.g., harvest seasons are deliberately liberalized to reduce the lion population or where the deliberate reduction of a lion population or maintenance at a lower level makes it untenable to continue to reach the harvest levels attained between 1990–1992). Wildlife managers may recommend quotas (female quotas or total quota) to regulate harvest at desired levels through the annual regulation setting process. Harvest goals will be based upon trends in past harvest data, mountain lion population dynamics, harvest vulnerability, and the desired level and composition of harvest (e.g., % males ≥5yrs old) over a 3-year average. Lions killed for depredation purposes and road kills will not be included in the unit harvest or counted against a quota. Only those lions harvested legally or illegally, including "self- defense" kills, are counted against the quota. If a quota is instituted, the take season will close when, either the total quota, female subquota, or the established closing date is reached, whichever comes first. However, take seasons MAY be established in units with female quotas so that the take season remains open for males ONLY after a female quota has been met. The closing date for take seasons in units with quotas will be March 31 if the quota is not reached. If the harvest quota is met and the harvest season is closed, a dog-training season will open. If a dog-training season is opened, it will close March 31.

Several criteria will be used to indicate need for management changes to increase or decrease harvest, including:

- Trends in total lion harvest over a period of several years. Lion harvest in any single year can be highly variable depending upon weather conditions. Generally, a period of 3-5 years is required to recognize an overall pattern of declining, increasing, or stable trend in mountain lion harvest.
- Trends in sex and age structure of harvested lions over a period of several years. Recent research in Wyoming (Anderson and Lindzey, in prep.) indicates that a population decline can be evidenced by a reduction in juvenile harvest, an initial increase followed by a reduction in adult male harvest, and a steady increase in adult female harvest. As a general rule, when populations are harvested more intensively, the proportion of young animals and females in the harvest increases because males and older animals become less available in the population. Conversely, a relatively light harvest rate will allow hunters to be more selective and will tend to produce a harvest composition weighted more toward males and older animals. Variable weather patterns, particularly during winter, can produce strong variations in mountain lion reproduction and survival rates that can cause changes in harvest sex and age structure in subsequent years. A period of 3-5 years is required to recognize an overall pattern of declining, increasing, or stable trend in the sex and age structure of harvested lions. Managers will monitor trends in sex and age (e.g., % yearlings, % subadults, and % ≥5 yrs old) composition of harvest over time and evaluate this composition information in conjunction with other population trend indices to guide decisions about status of the lion population and the appropriate management prescription.
- Trends in catch/effort by houndsmen over a period of several years. Increases or decreases in the number of lions treed per day of hunting may reflect changes in lion population numbers. The hound hunter permit will be retained to allow the Department to monitor hound hunting participation and facilitate collection of information on treeing rates through use of voluntary logbooks.
- Trends in the number of incidental mountain lion sightings. As mountain lion numbers increase, chance encounters between mountain lions and humans remain uncommon, but tend to increase in frequency.
- Trends in the number of livestock depredation problems and/or human-lion conflicts near residential areas. As mountain lion numbers increase, lions may begin to occupy marginal habitat areas that frequently place them in conflict with people or livestock.

- Apparent lion-related declines in prey populations that are below management objectives.

Because all of these indicators are highly variable and all can be strongly influenced by factors independent of the trend in mountain lion numbers, not one of these criteria is alone sufficient to indicate the need for a management change. Instead, wildlife managers must weigh the preponderance of evidence from all indicators when recommending future management strategies.

Additional management strategies to stabilize overall harvest rates:

- One mountain lion bag limit per calendar year. Second lion bag limits may be implemented in units where the management objective is to reduce mountain lion numbers.
- Maintain a uniform statewide opening date of August 30 with a closing date of March 31, except where the objective is to increase lion harvest to reduce the lion population.
- Maintain a quota on nonresident hound hunter permits to regulate hunting pressure. As other western states initiate more restrictive mountain lion seasons (closed seasons, shortened seasons, quotas, controlled hunts) Idaho will receive more pressure from nonresident houndsmen. The Department will limit the number of nonresident hound hunter permits, excluding nonresident outfitters, to 70 per year, except where additional lion harvest is desired to reduce the population.

DATA ANALYSIS UNITS

Compared with other big game species, relatively few mountain lions are harvested each year. The number harvested from each big game management unit seldom exceeds 15 and is more commonly in the range of 0-10. Such small sample sizes make harvest and population trends, age structure, and distribution difficult to interpret for a given unit. For the purpose of this plan, Idaho's big game management units were divided into fifteen management areas called Data Analysis Units (DAU) to improve sample sizes for data analysis capabilities (Figure 6).

Units were combined into DAU's based upon season structure, similar habitat types, habitat security, accessibility, mountain lion vulnerability, lion population density, prey species availability, and often similarity to elk zone designation. Relating lion harvest and population

structure to elk objectives may assist management of predator/prey relationships and help achieve elk objectives as well as lion.

RESEARCH NEEDS

The most pressing need to improve mountain lion management is for more reliable indicators of lion population trend. Existing population trend indicators rely on information from mountain lion harvest, which can be strongly influenced by factors other than population trend. Therefore, trends in total harvest and sex/age structure of the harvest may imprecisely reflect changes in mountain lion numbers. With expensive and time-intensive capture and marking efforts, lion numbers can be estimated in a limited geographic area. However, no proven methods exist to measure mountain lion density or relative changes in density across the large areas required for wildlife management application.

The reestablishment of wolves in Idaho in 1995 will have unknown implications for mountain lion populations. Wolves may function as direct competitors with mountain lions and displace lions from areas where they currently exist. Wolves may also depress lion density by reducing the prey base upon which lions depend. Mountain lions often remain in the vicinity of a large animal kill for several days, returning periodically to feed on the carcass. If wolves discovered the kill, they could consume the remainder of the carcass or drive the lion away, in either case depriving the lion of a food source. Wolves are also known to reduce coyote densities, which could reduce lion-coyote competition for smaller prey items. Finally, wolves may well displace more prey animals into the steeper, more rugged habitats suitable for lions and their prey stalking technique. Wolves have also been documented displacing lions from kills. Currently, we do not know which of these effects may predominate, nor do we understand the cumulative impact of the relationship between wolves and mountain lions.

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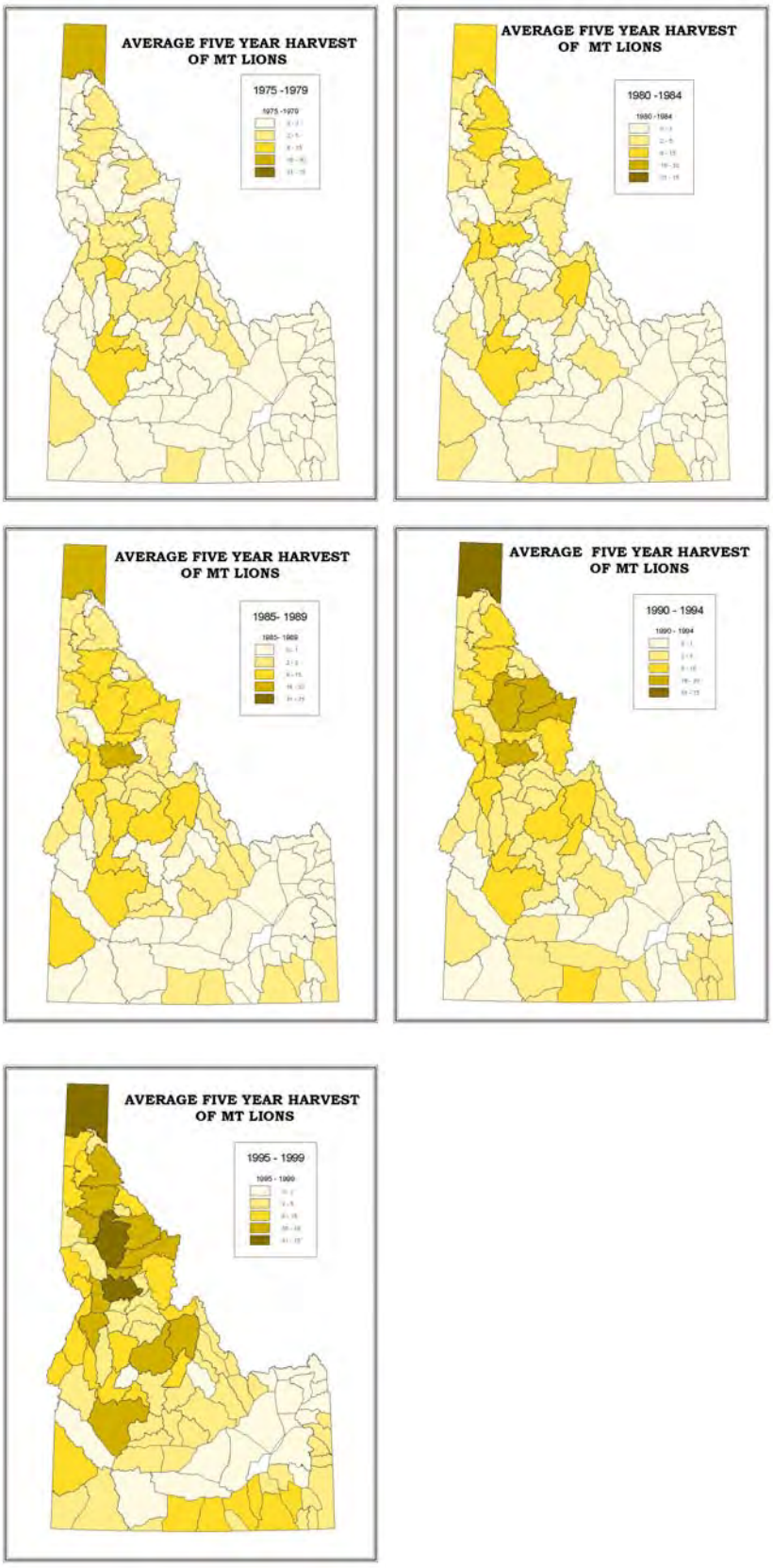


Figure 1. Five- year average mountain lion harvest by game management unit, 1975-2000.

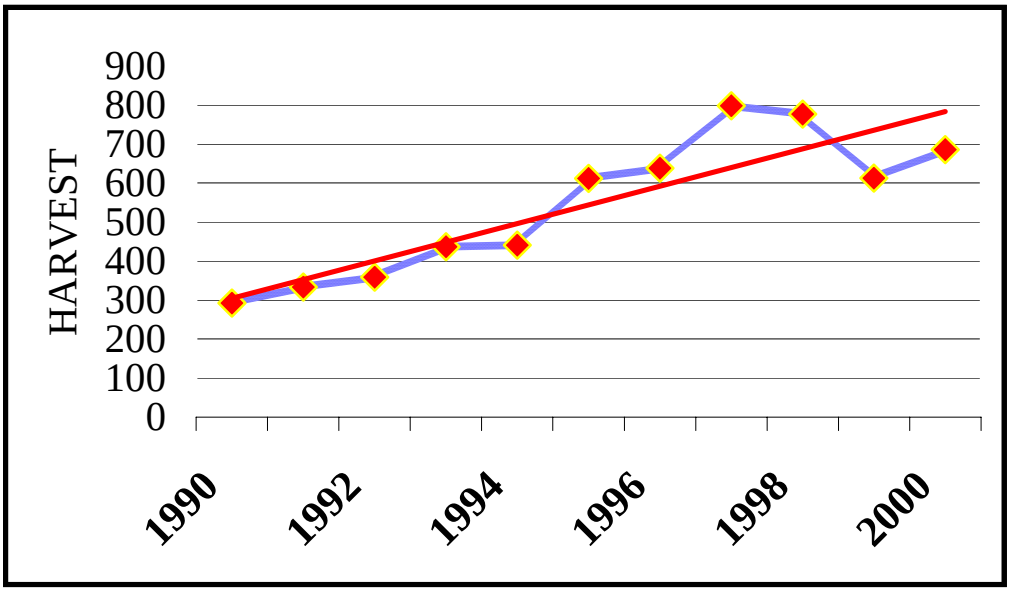


Figure 2. Annual Mountain Lion harvest in Idaho, 1990 – 2000.

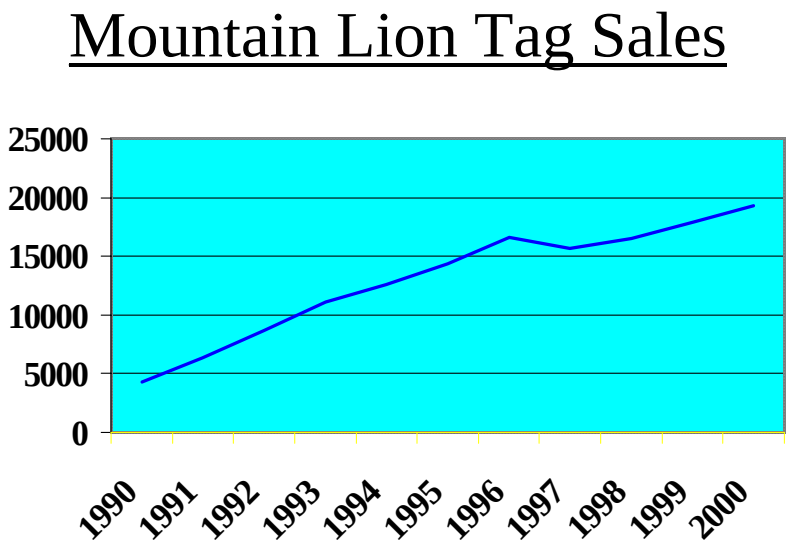


Figure 3. Total number of mountain lion tags issued annually in Idaho, 1990 – 2000.

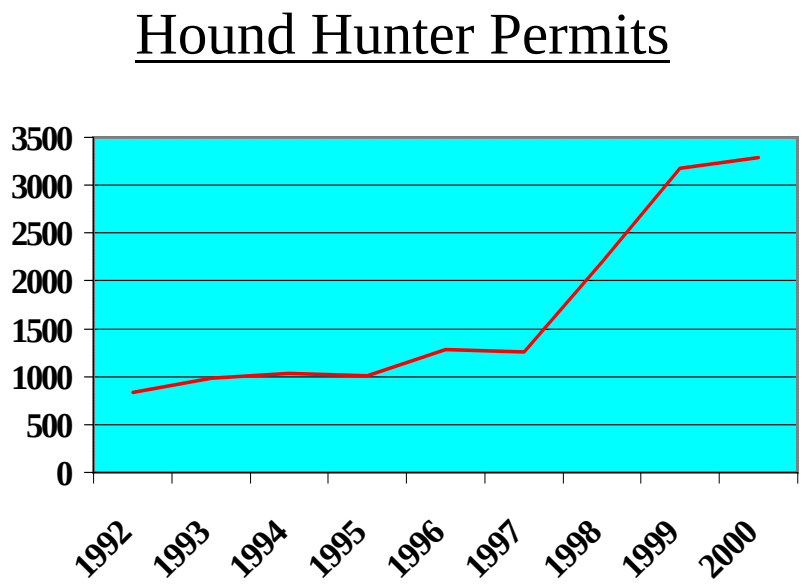


Figure 4. Hound Hunter Permits issued by year, 1992 – 2000.

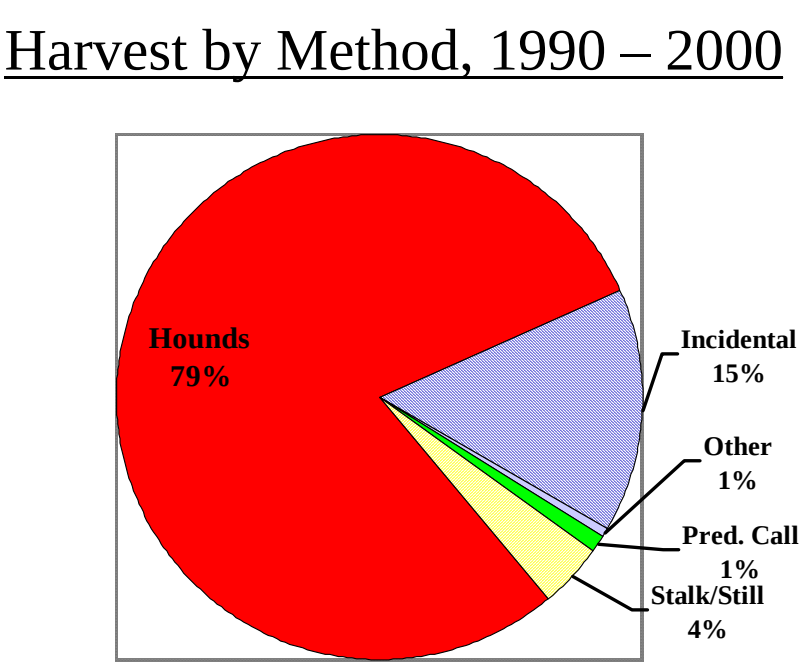
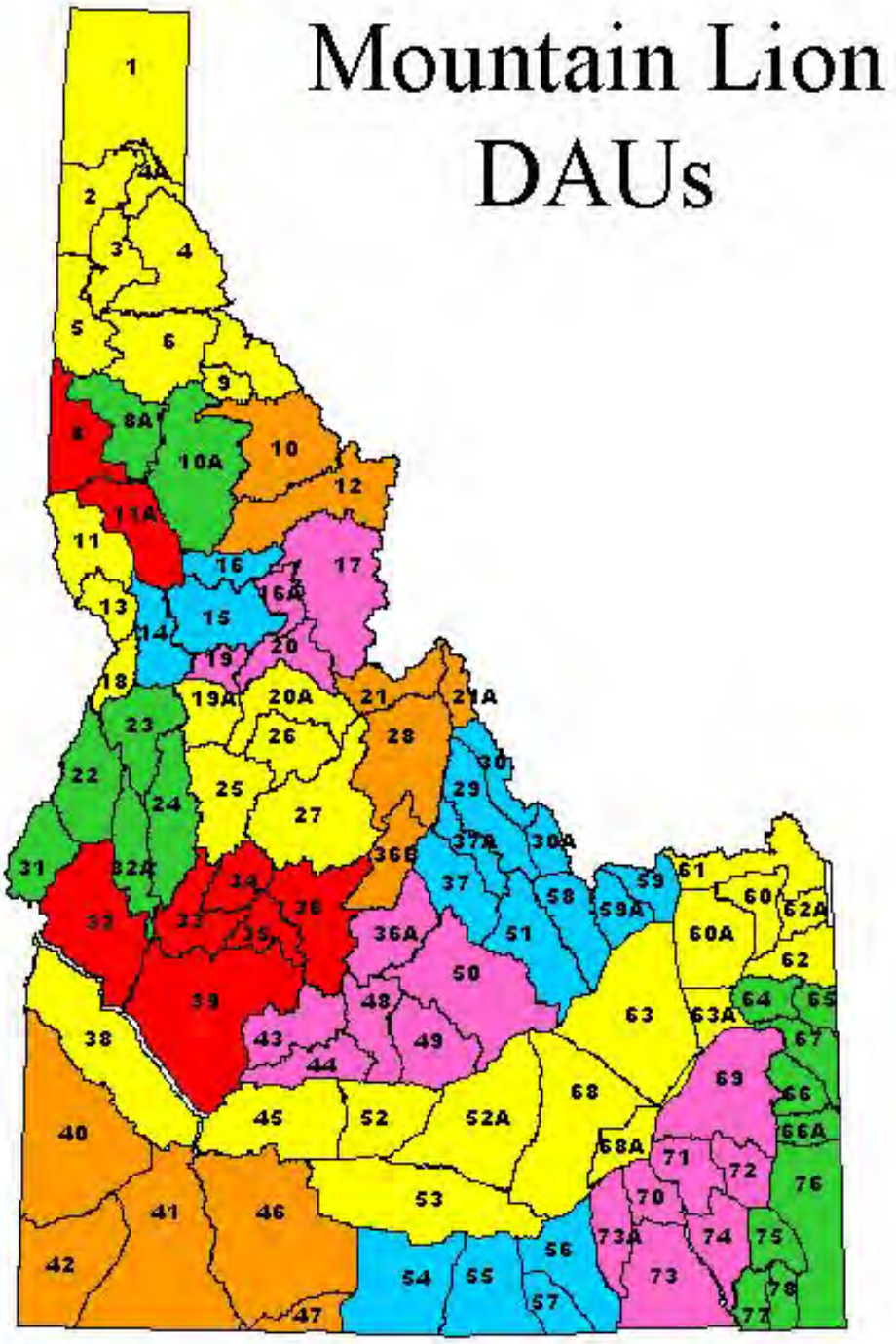
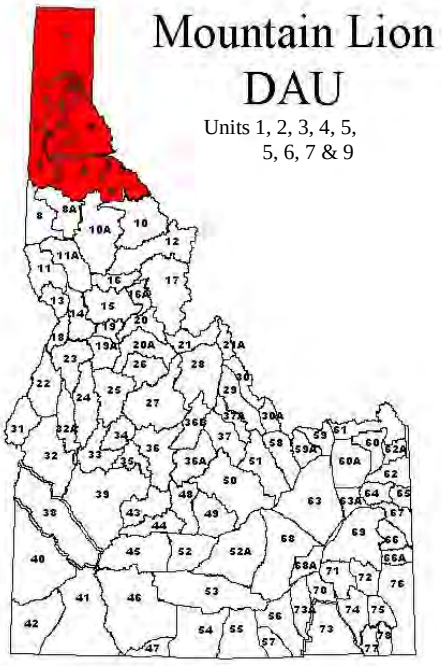
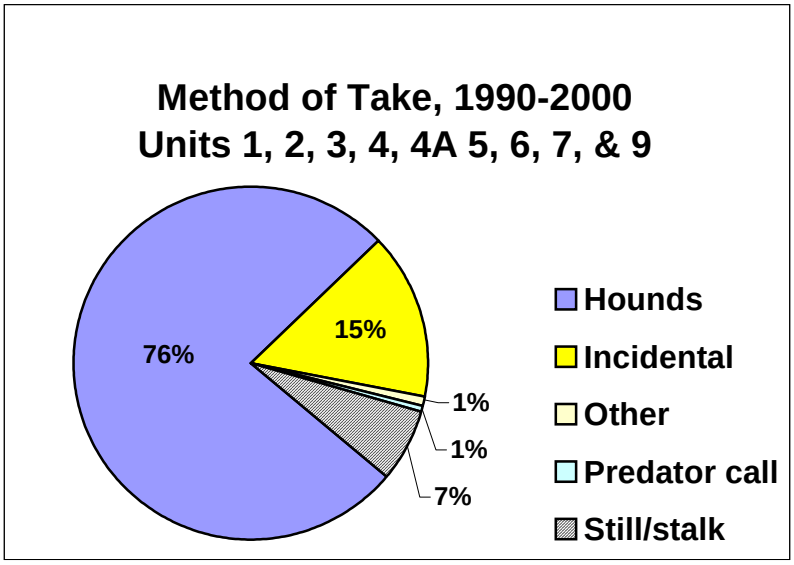


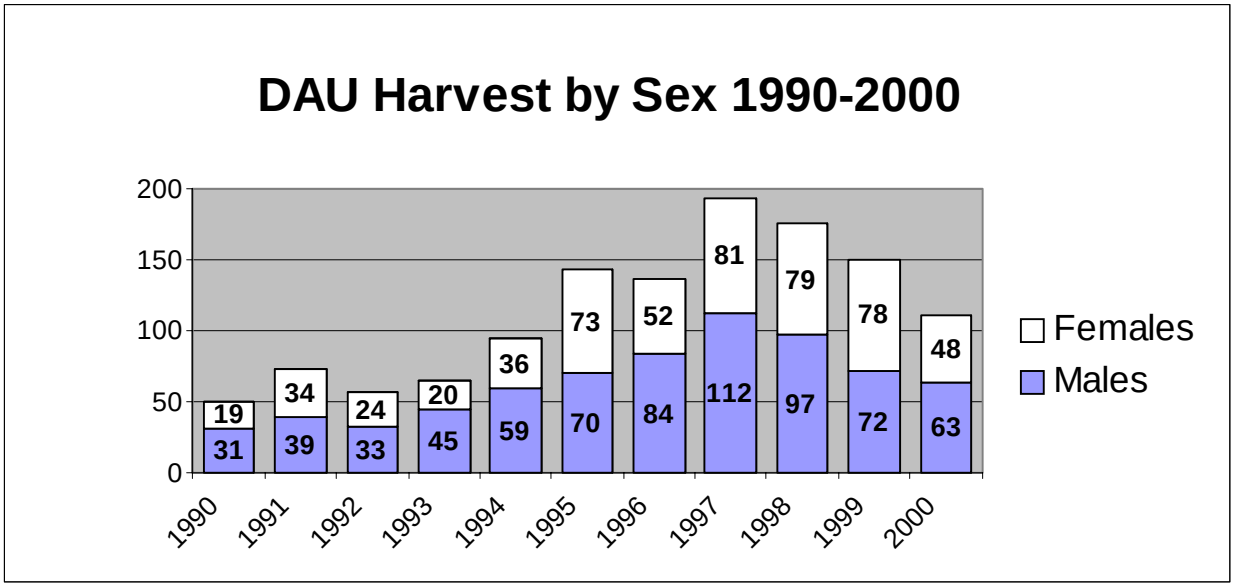
Figure 5 Distribution of mountain lions harvested by method, 1990 – 2000.

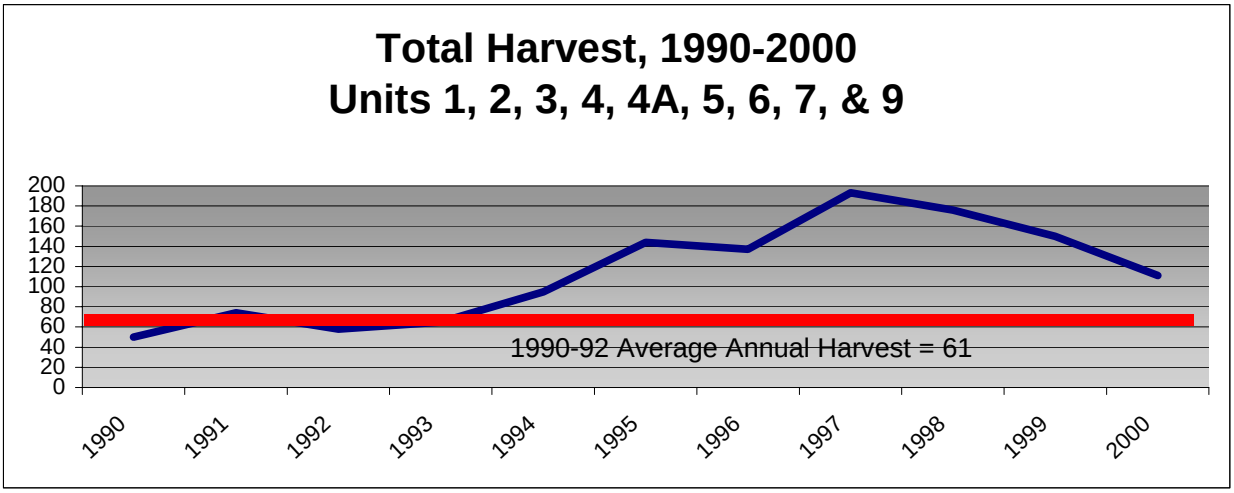

Mountain Lion
DAUs
1
2
3
4
4A
5
6
7
8
8A
9
10
10A
11
11A
12
13
14
15
16
16A
17
18
19
19A
20
20A
21
21A
22
23
24
25
26
27
28
29
30
30A
31
32
32A
33
34
35
36
36A
36B
37
37A
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
52A
53
54
55
56
57
58
59
59A
60
60A
61
62
62A
63
63A
64
65
66
66A
67
68
68A
69
70
71
72
73
73A
74
75
76
77
78

PANHANDLE


Mountain Lion
DAU
Units 1, 2, 3, 4, 5,
5, 6, 7 & 9

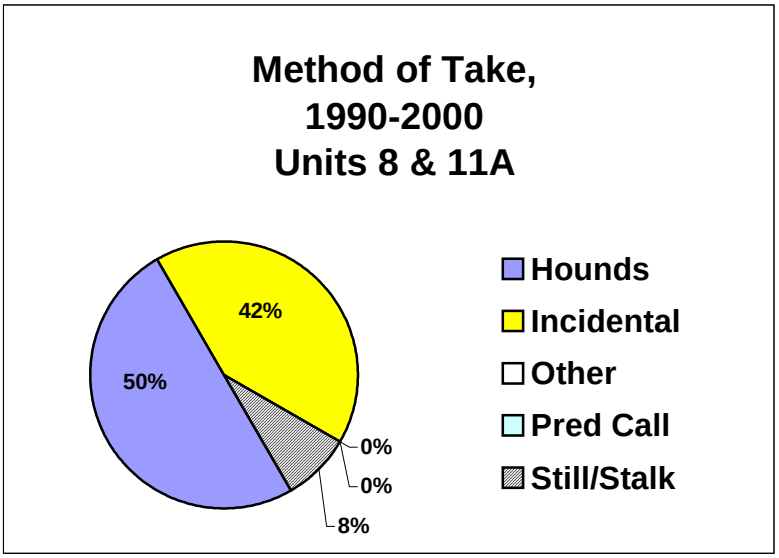

Method of Take, 1990-2000
Units 1, 2, 3, 4, 4A 5, 6, 7, & 9
76%
15%
1%
1%
7%
Hounds
Incidental
Other
Predator call
Still/stalk

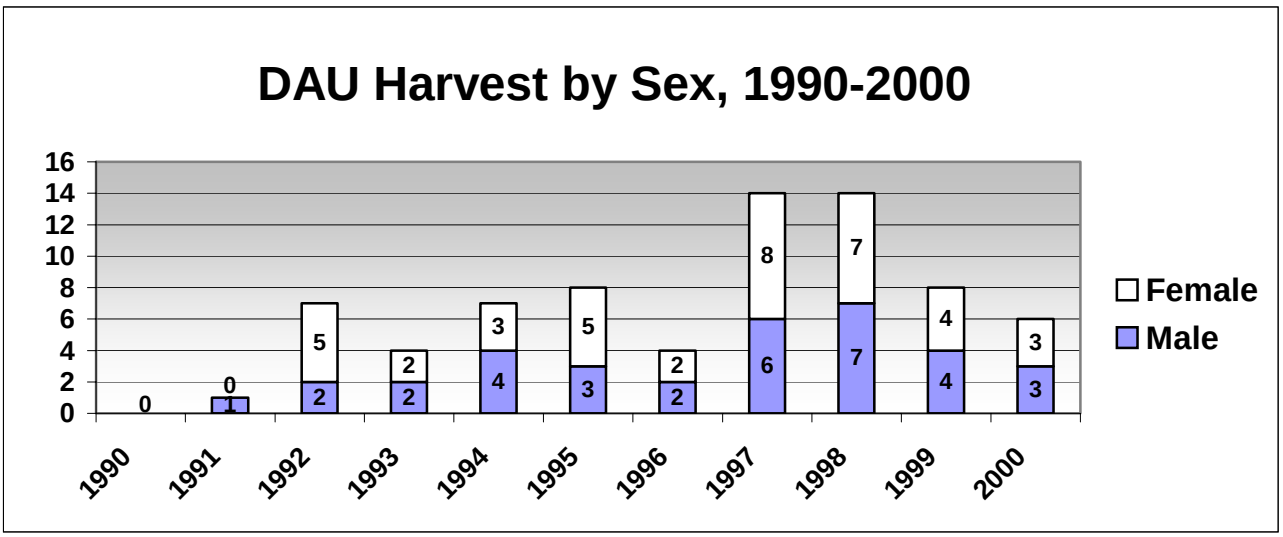

DAU Harvest by Sex 1990-2000
200
150
100
50
0
19
31
34
39
24
33
20
45
36
59
73
70
52
84
81
112
79
97
78
72
48
63
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Females
Males

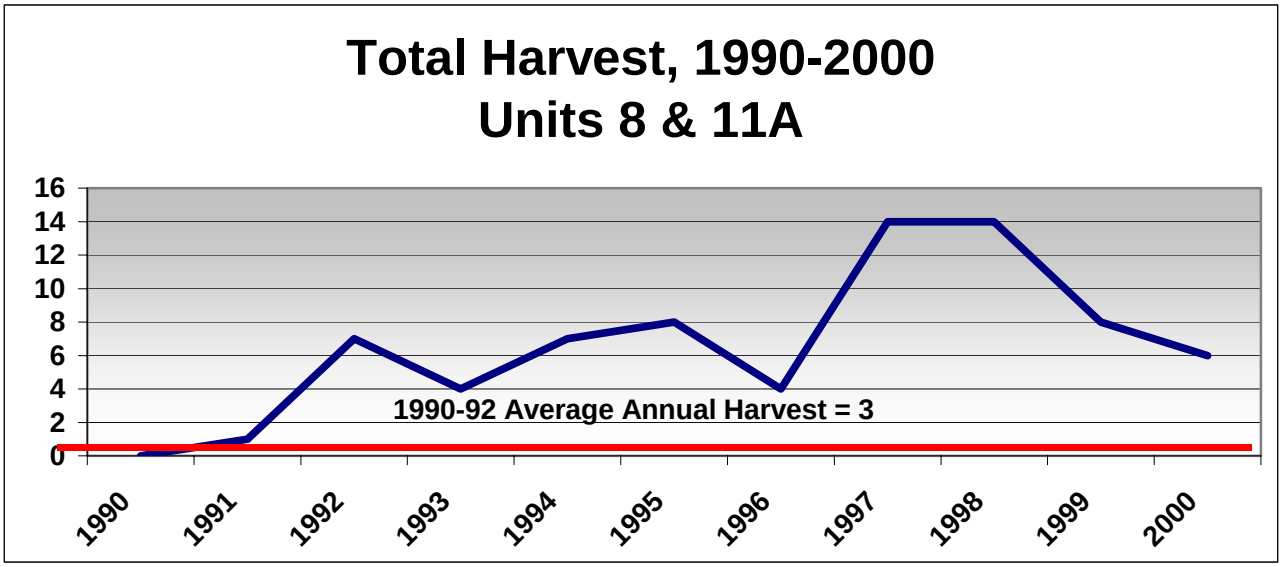

Total Harvest, 1990-2000
Units 1, 2, 3, 4, 4A, 5, 6, 7, & 9
200
180
160
140
120
100
80
60
40
20
0
1990-92 Average Annual Harvest = 61
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000

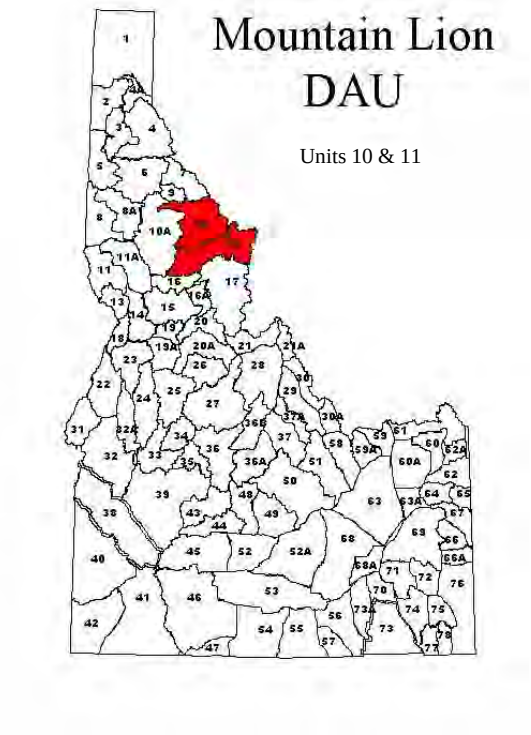

Mountain Lion
DAU
Units 8 & 11A

LATAH

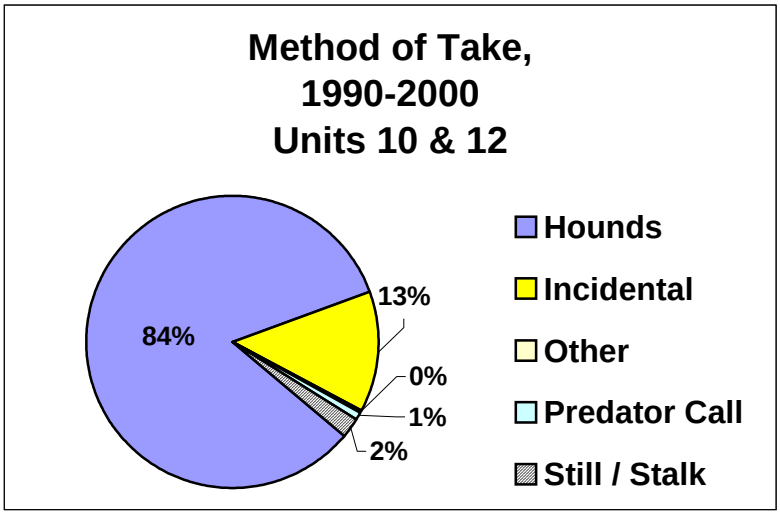

Method of Take,
1990-2000
Units 8 & 11A
42%
50%
0%
0%
8%
Hounds
Incidental
Other
Pred Call
Still/Stalk

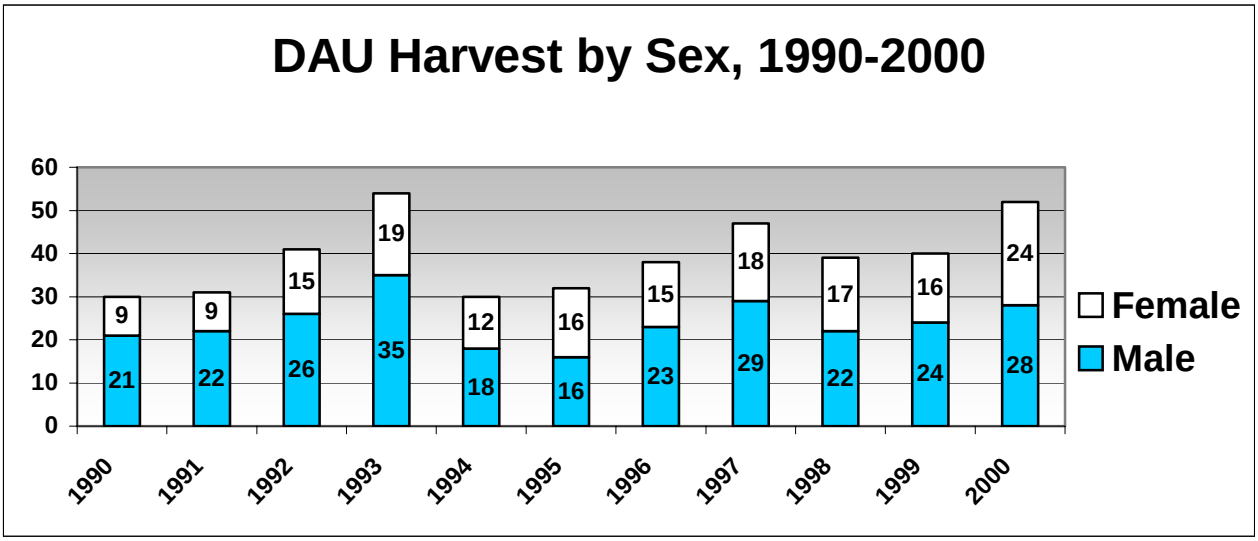

DAU Harvest by Sex, 1990-2000
16
14
12
10
8
6
4
2
0
0
0
1
5
2
2
2
3
4
5
3
2
2
8
6
7
7
4
4
3
3
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Female
Male

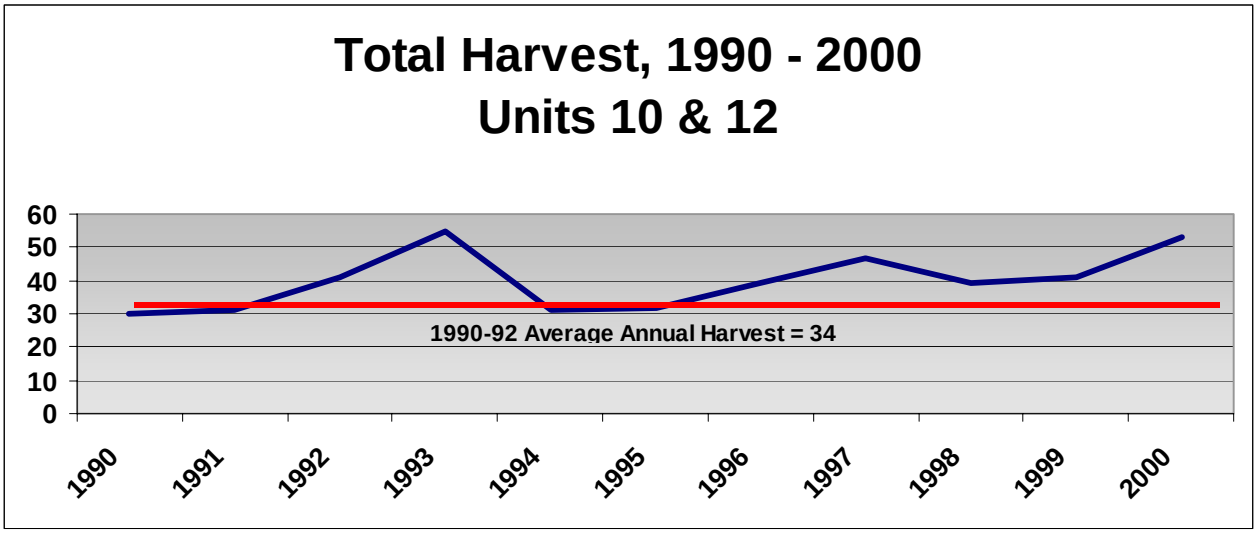

Total Harvest, 1990-2000
Units 8 & 11A
16
14
12
10
8
6
4
2
0
1990-92 Average Annual Harvest = 3
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000


Mountain Lion
DAU
Units 10 & 11

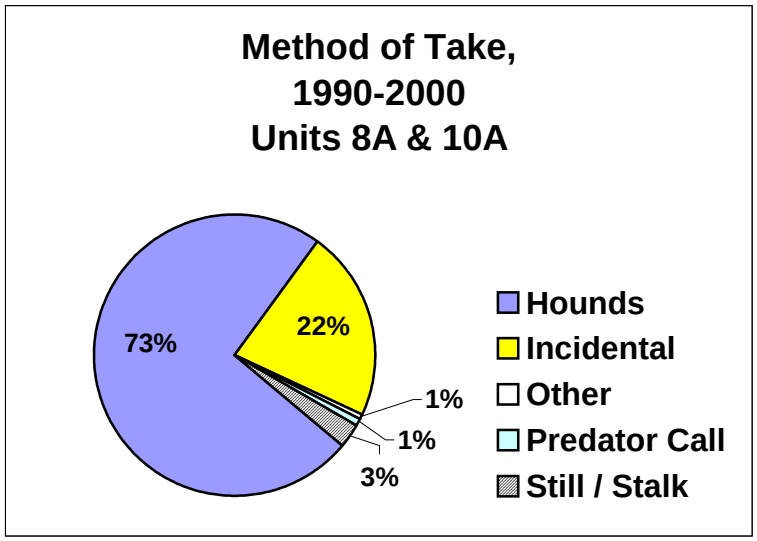
LOLO

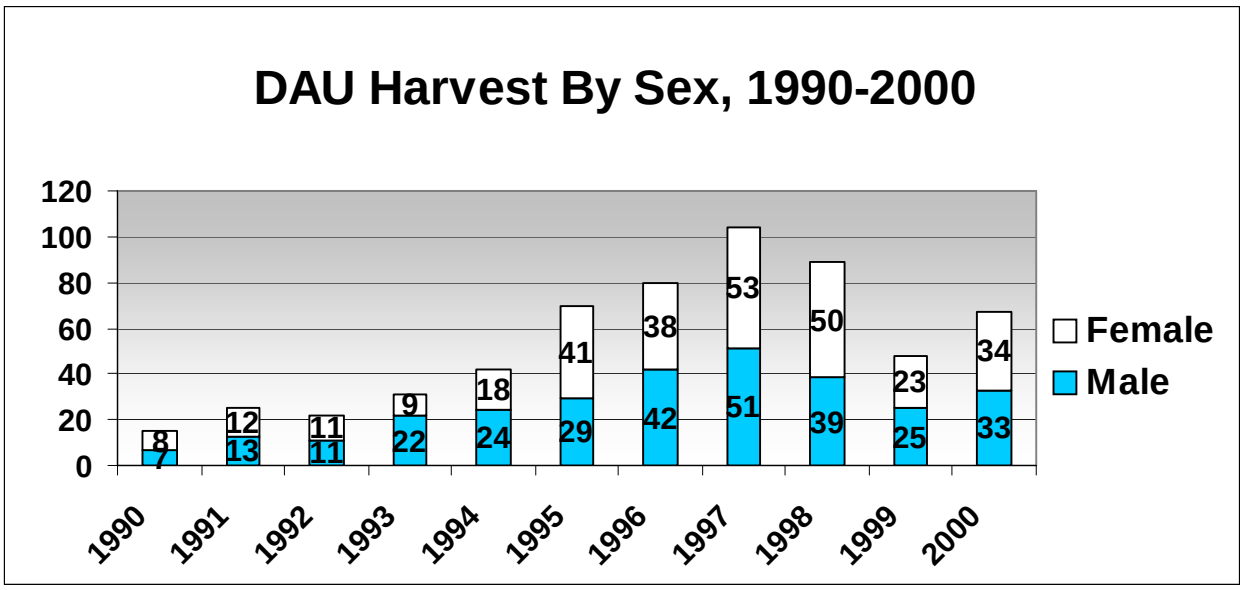

Method of Take,
1990-2000
Units 10 & 12
84%
13%
0%
1%
2%
Hounds
Incidental
Other
Predator Call
Still / Stalk

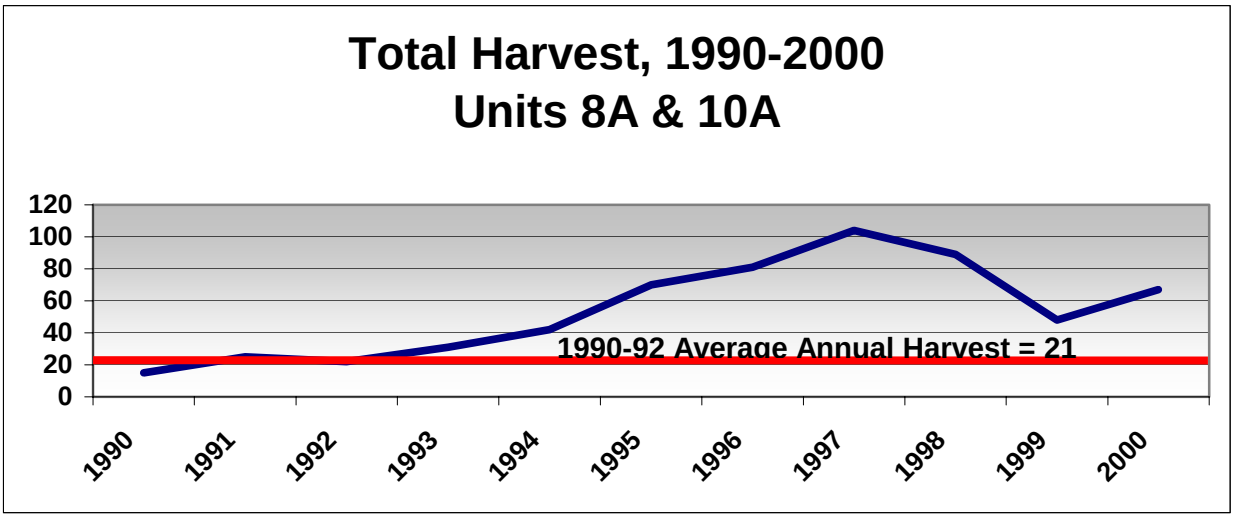

DAU Harvest by Sex, 1990-2000
60
50
40
30
20
10
0
9
21
9
22
15
26
19
35
12
18
16
16
15
23
18
29
17
22
16
24
24
28
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Female
Male

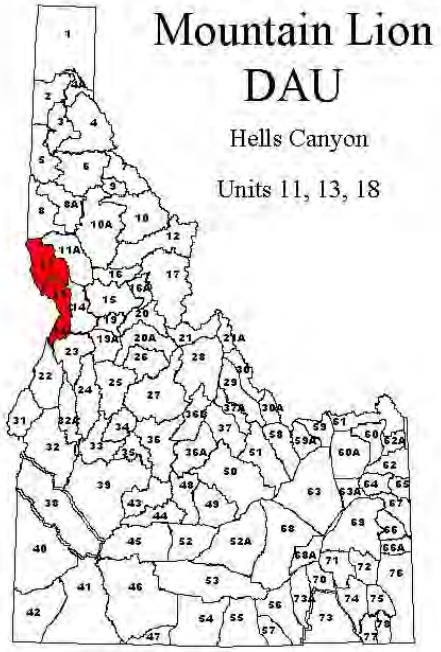

Total Harvest, 1990 - 2000
Units 10 & 12
60
50
40
30
20
10
0
1990-92 Average Annual Harvest = 34
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000

PALOUSE-DWORSHAK

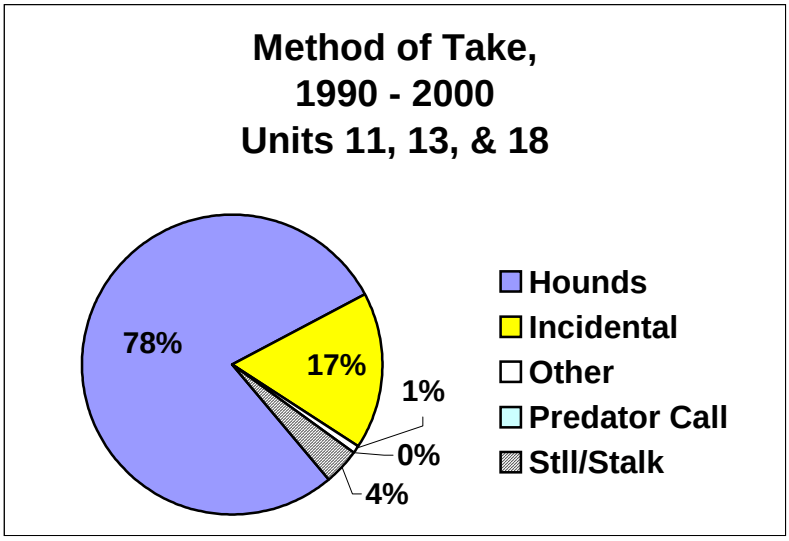


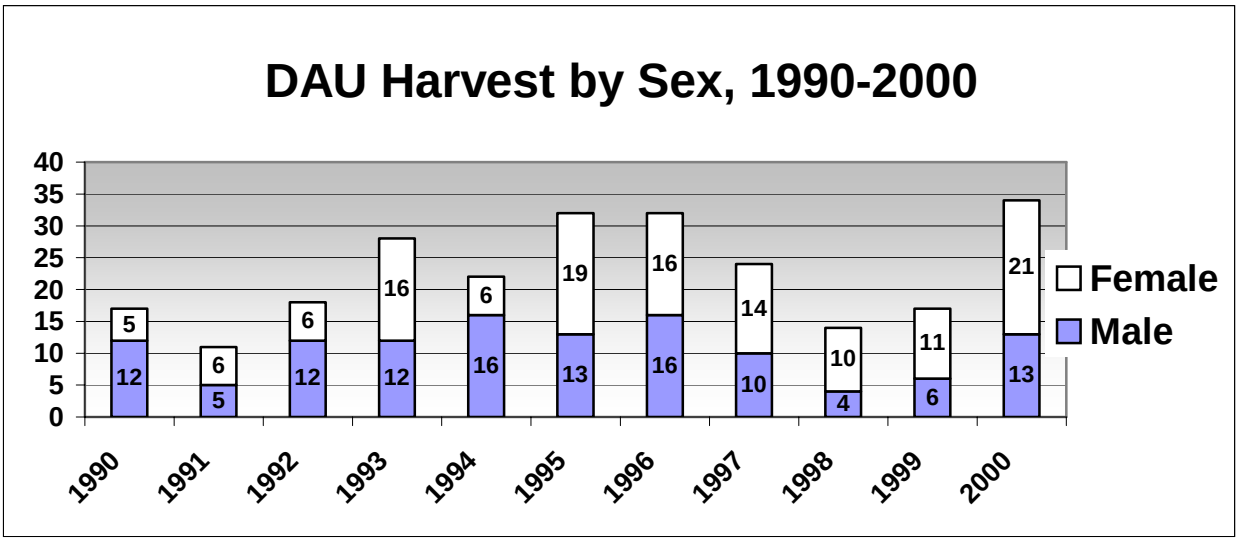


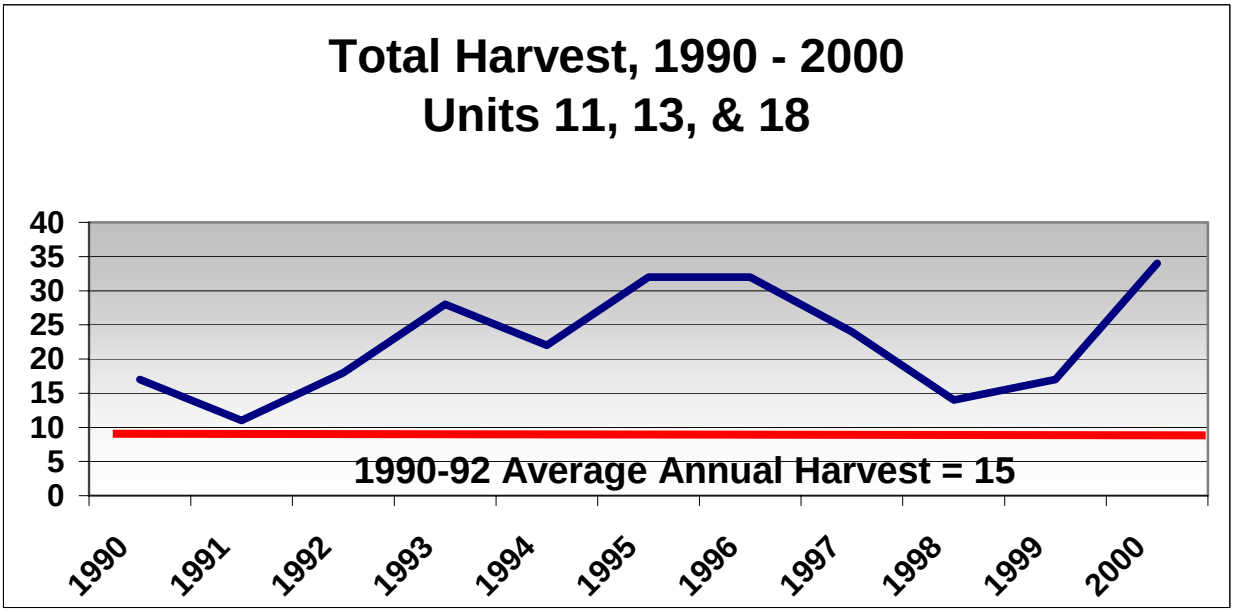


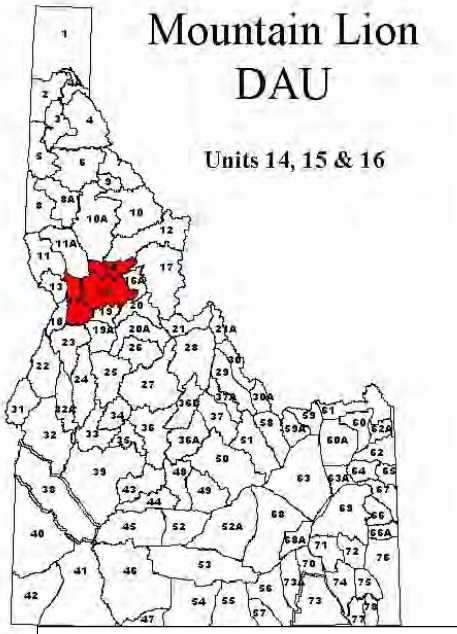


HELLS CANYON

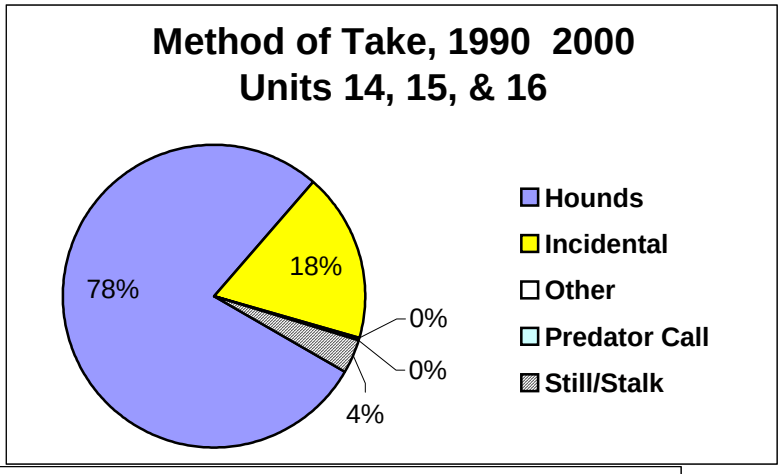


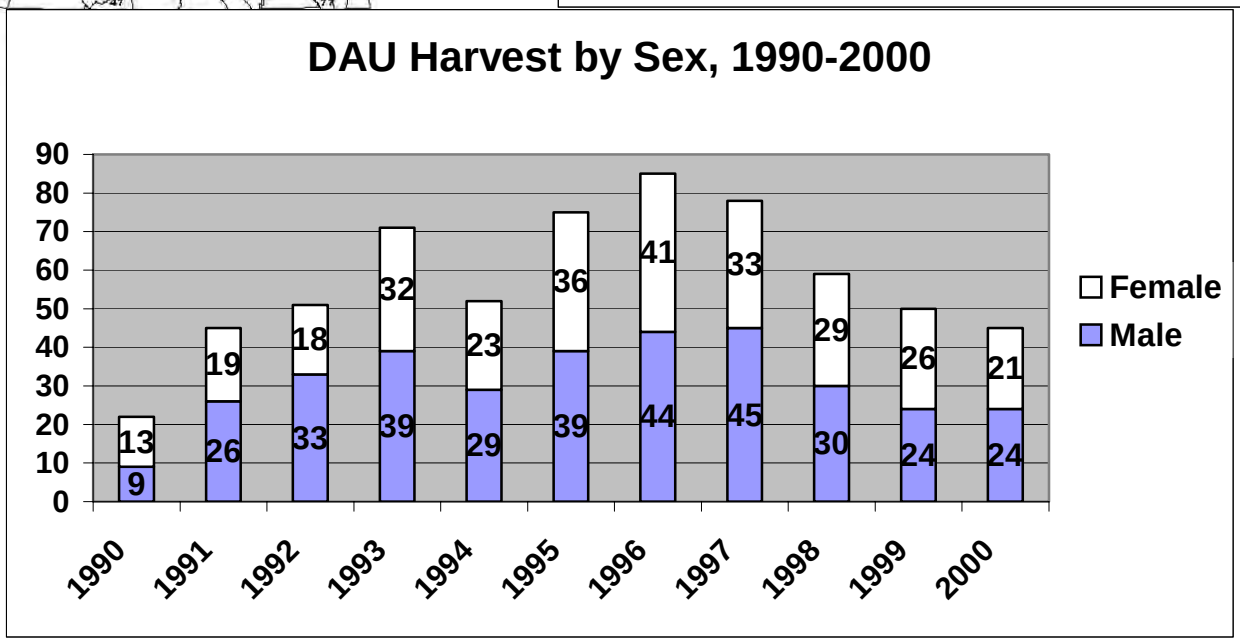


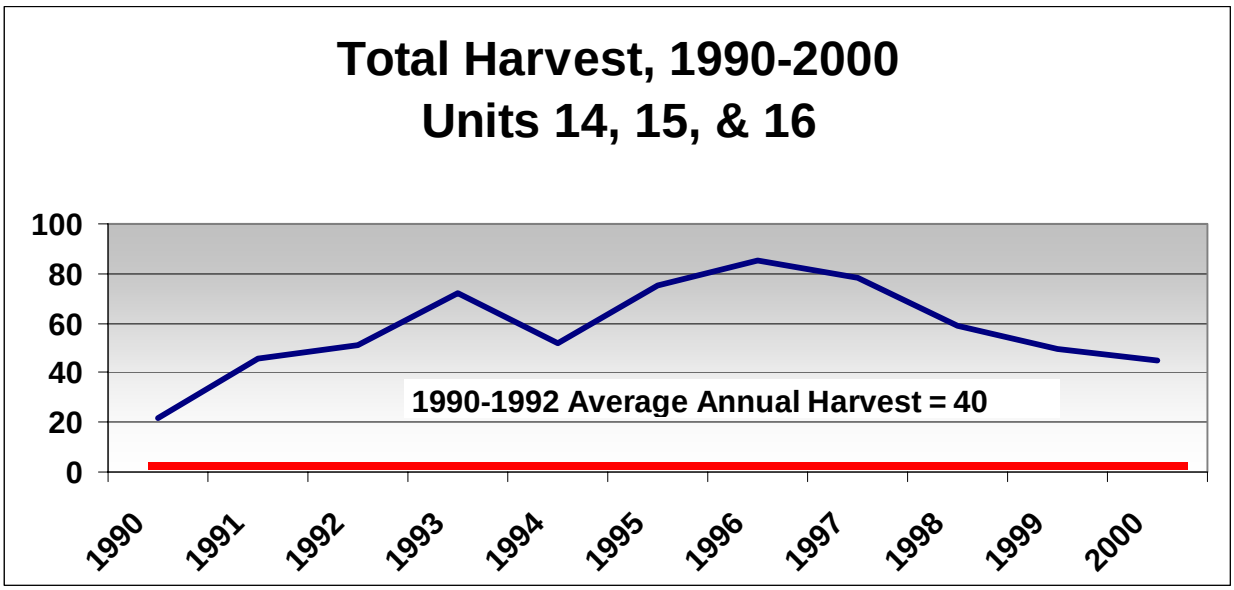


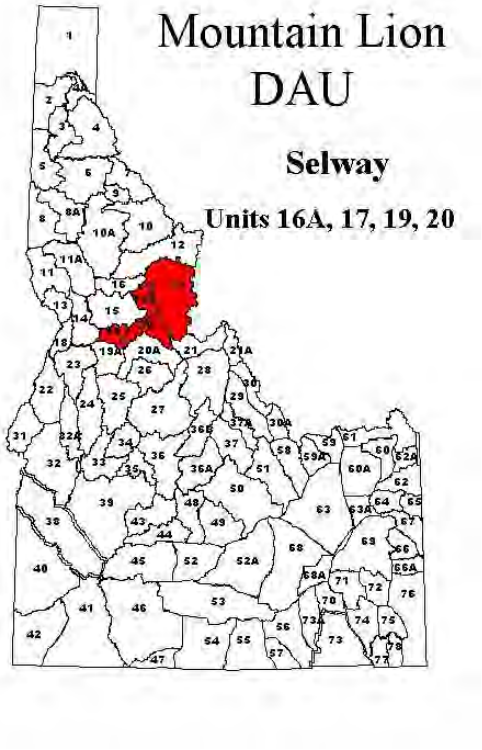

Mountain Lion
DAU
Units 14, 15 & 16

ELK CITY

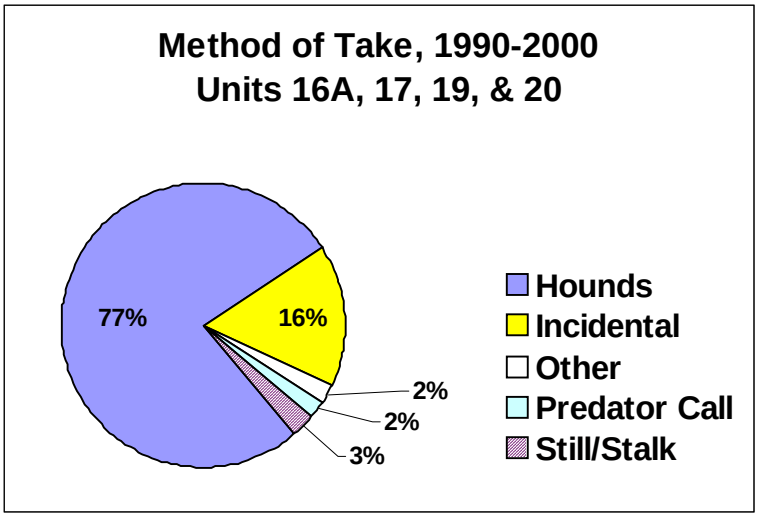

Method of Take, 1990 2000
Units 14, 15, & 16
78%
18%
0%
0%
4%
Hounds
Incidental
Other
Predator Call
Still/Stalk

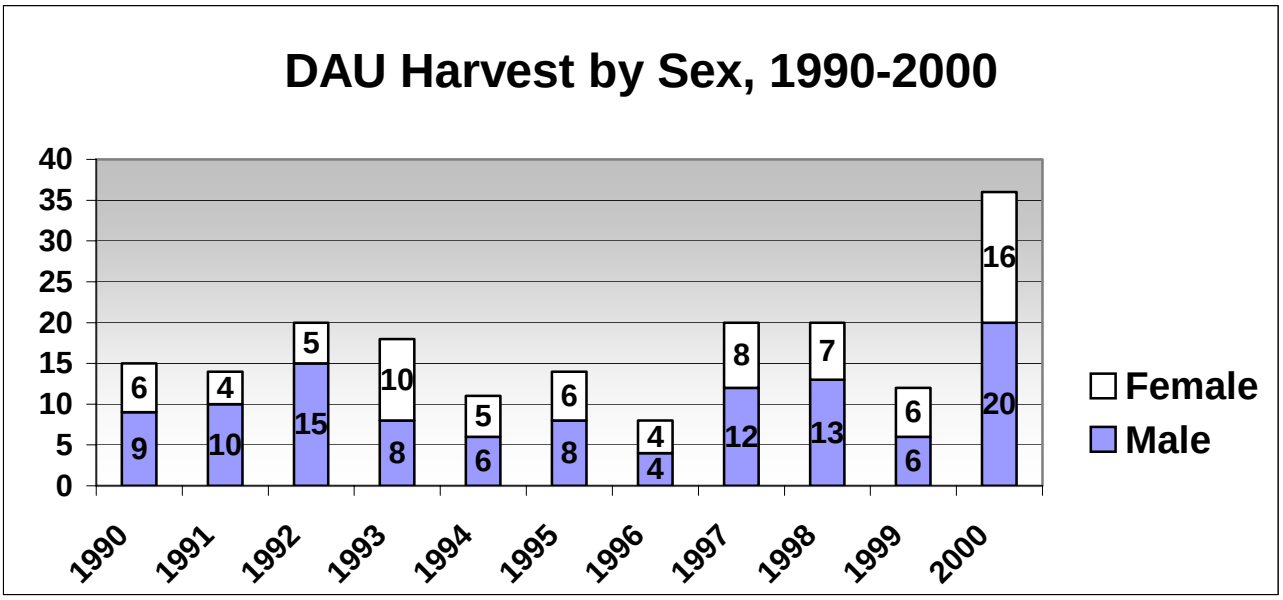

DAU Harvest by Sex, 1990-2000
90
80
70
60
50
40
30
20
10
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000
13 9
19 26
18 33
32 39
23 29
36 39
41 44
33 45
29 30
26 24
21 24
Female
Male

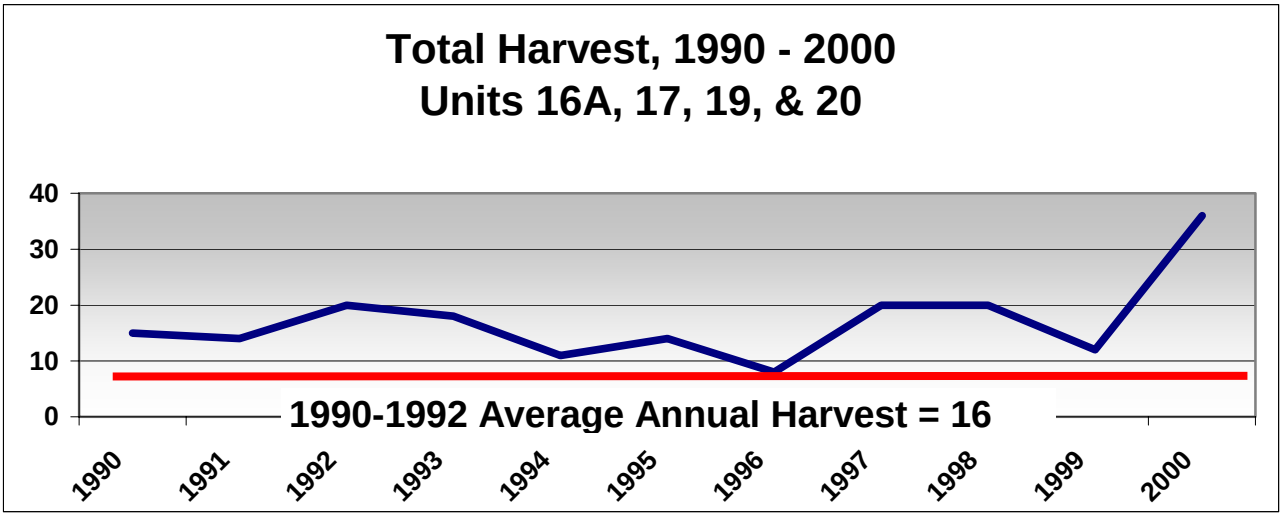

Total Harvest, 1990-2000
Units 14, 15, & 16
100
80
60
40
20
0
1990-1992 Average Annual Harvest = 40
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000

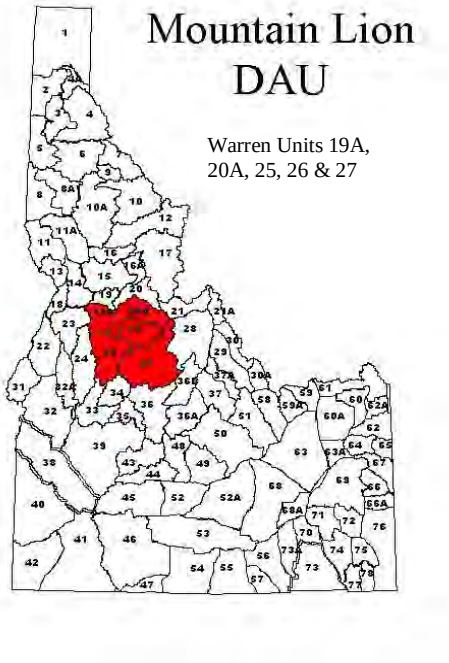

Mountain Lion
DAU
Selway
Units 16A, 17, 19, 20

SELWAY

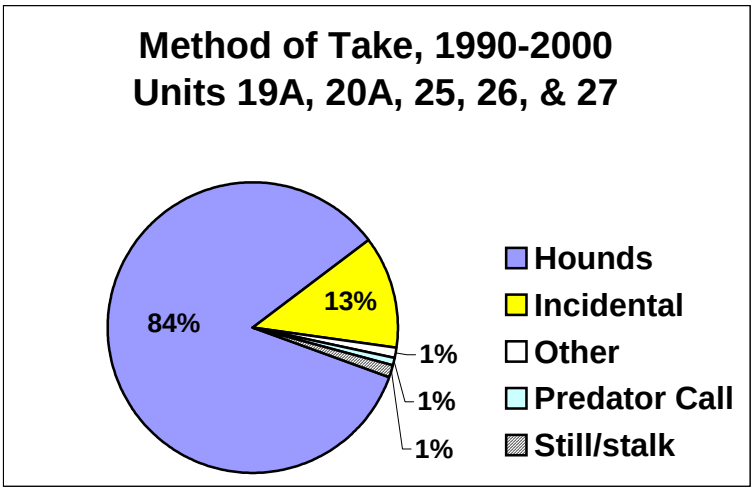

Method of Take, 1990-2000
Units 16A, 17, 19, & 20
77%
16%
2%
2%
3%
Hounds
Incidental
Other
Predator Call
Still/Stalk

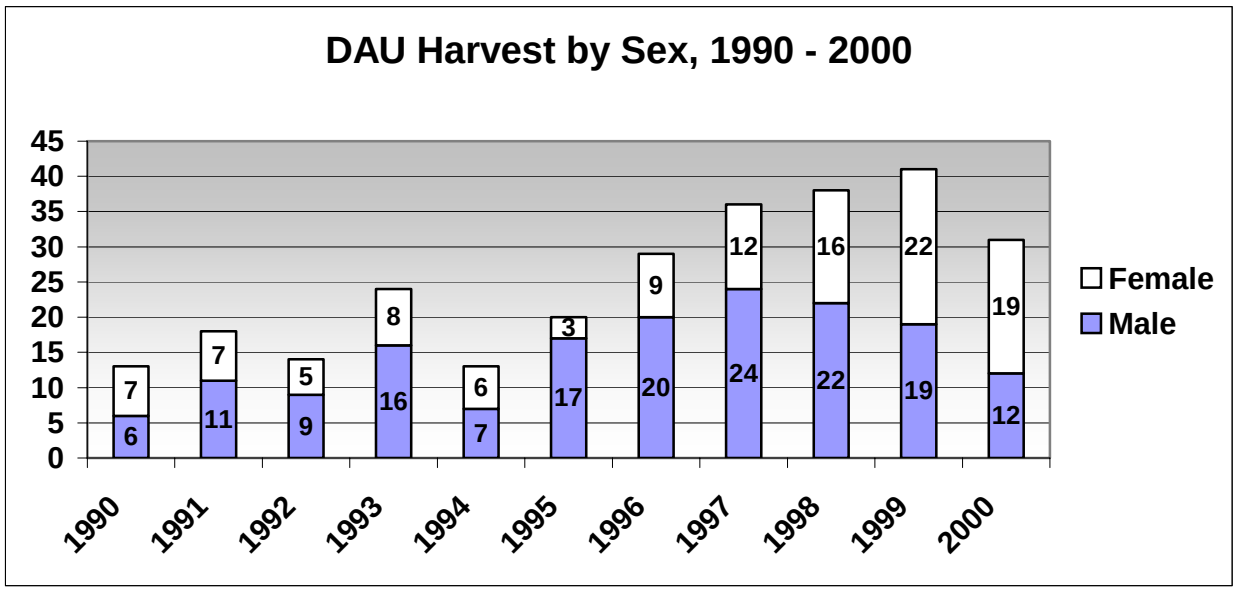

DAU Harvest by Sex, 1990-2000
40
35
30
25
20
15
10
5
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000
6 9
4 10
5 15
10 8
5 6
6 8
4 4
8 12
7 13
6 6
16 20
Female
Male

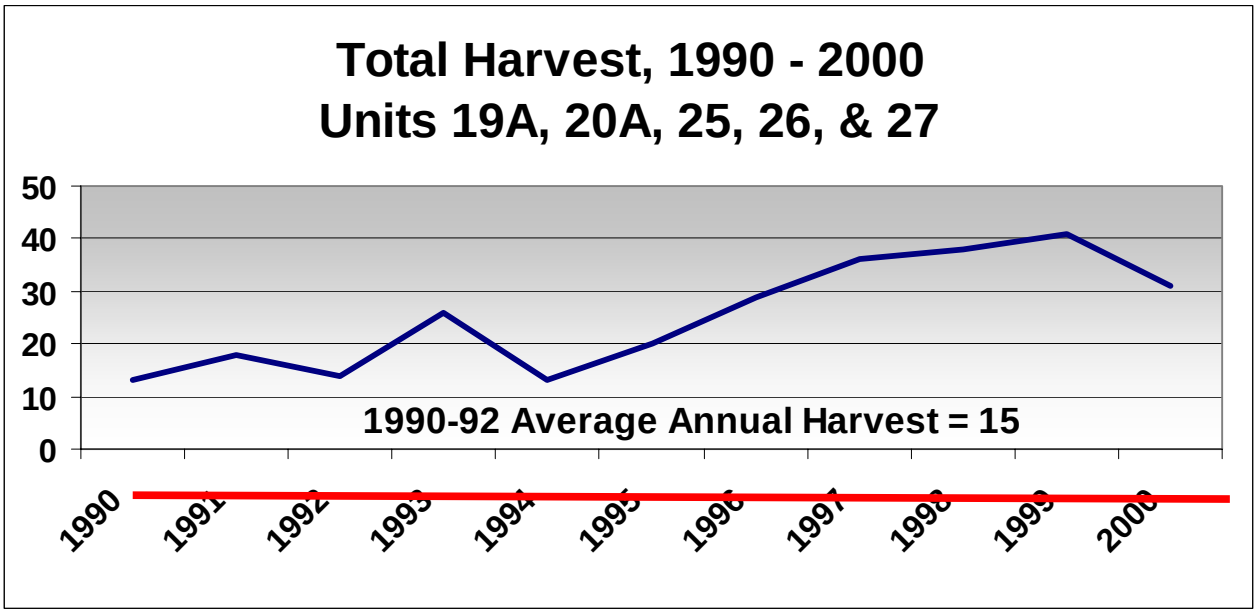

Total Harvest, 1990 - 2000
Units 16A, 17, 19, & 20
40
30
20
10
0
1990-1992 Average Annual Harvest = 16
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000

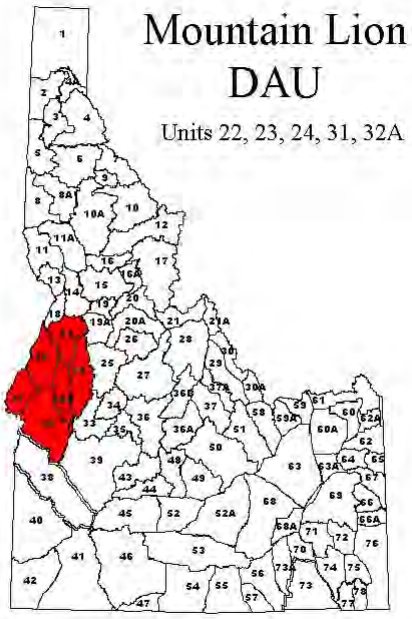

Mountain Lion
DAU
Warren Units 19A,
20A, 25, 26 & 27

WARREN

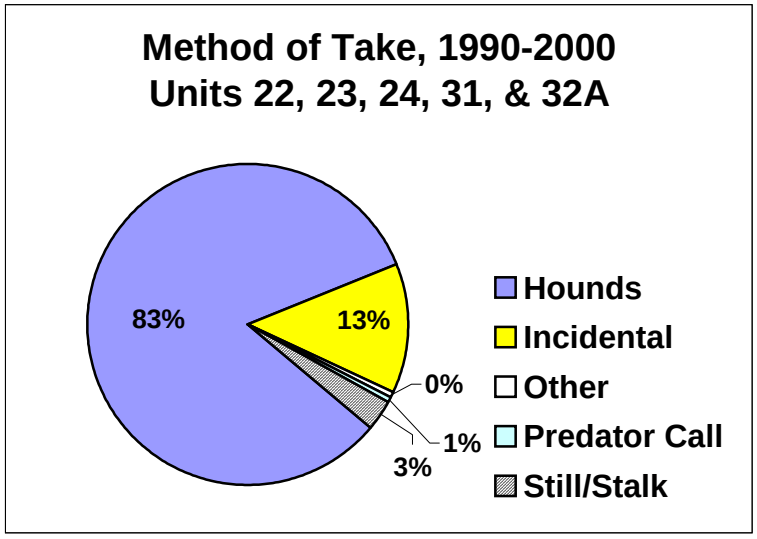

Method of Take, 1990-2000
Units 19A, 20A, 25, 26, & 27
84%
13%
1%
1%
1%
Hounds
Incidental
Other
Predator Call
Still/stalk

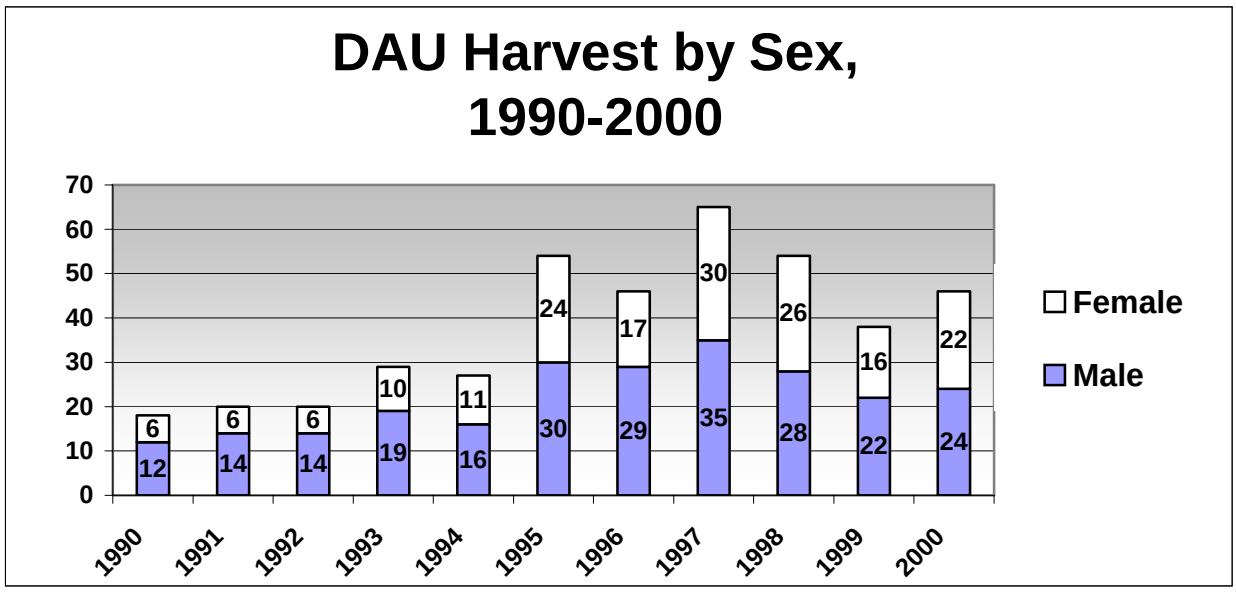

DAU Harvest by Sex, 1990 - 2000
45
40
35
30
25
20
15
10
5
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000
7 6
7 11
5 9
8 16
6 7
3 17
9 20
12 24
16 22
22 19
19 12
Female
Male

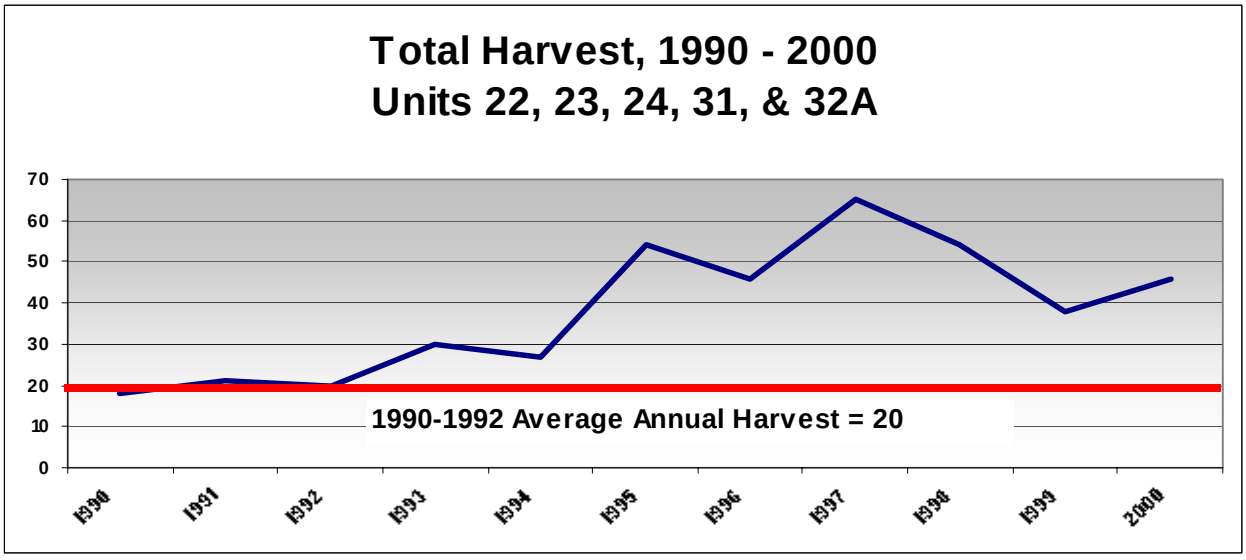

Total Harvest, 1990 - 2000
Units 19A, 20A, 25, 26, & 27
50
40
30
20
10
0
1990-92 Average Annual Harvest = 15
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000

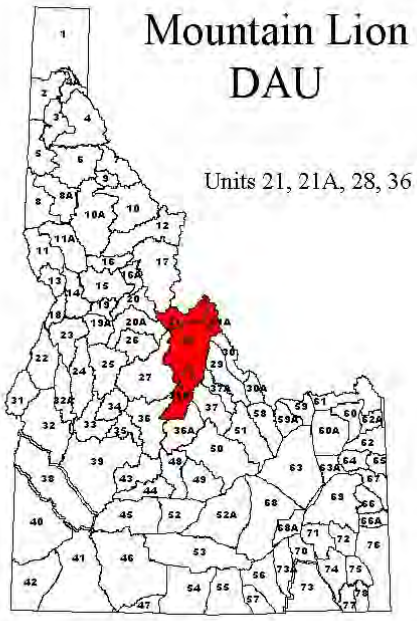

Mountain Lion
DAU
Units 22, 23, 24, 31, 32A

MC CALL

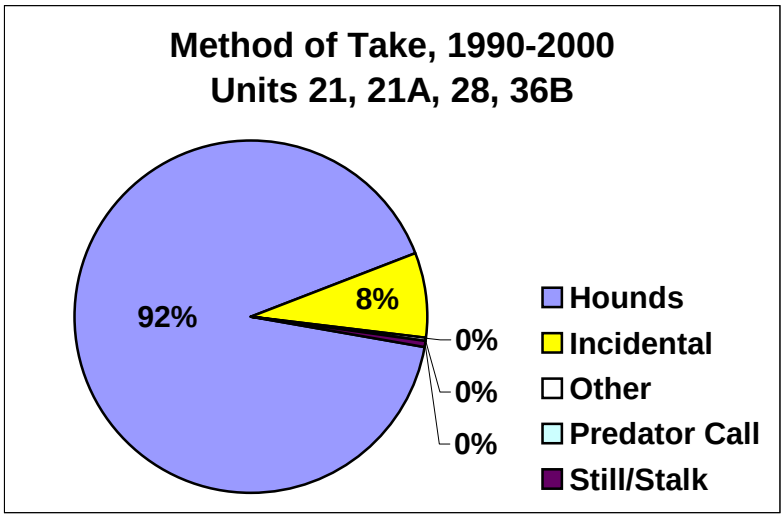

Method of Take, 1990-2000
Units 22, 23, 24, 31, & 32A
83%
13%
0%
1%
3%
Hounds
Incidental
Other
Predator Call
Still/Stalk

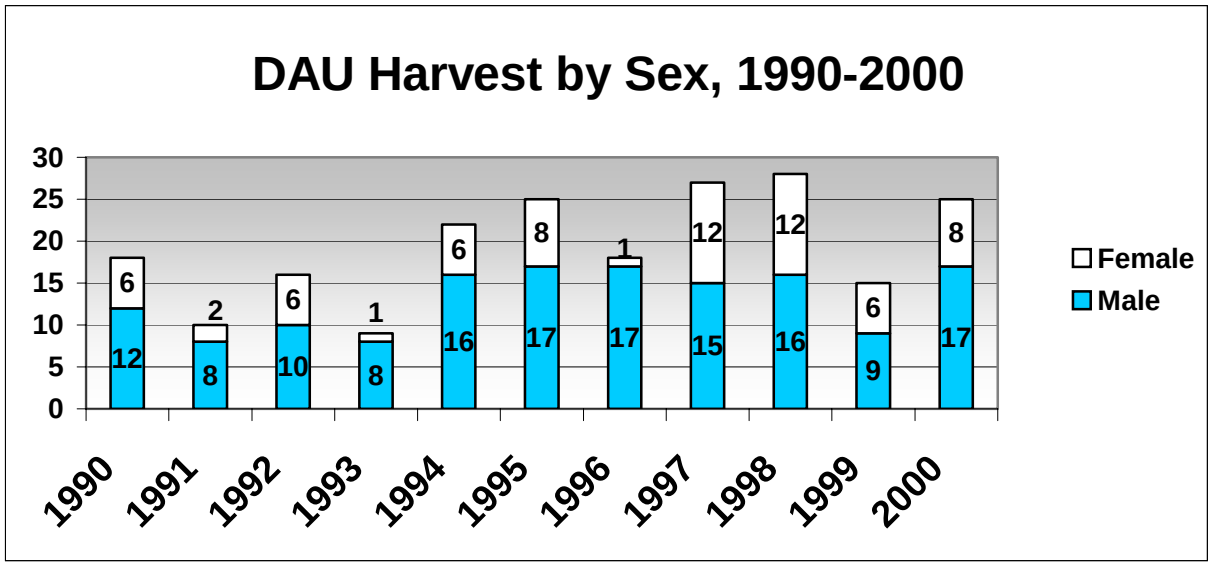

DAU Harvest by Sex,
1990-2000
70
60
50
40
30
20
10
0
6
12
6
14
6
14
10
19
11
16
24
30
17
29
30
35
26
28
16
22
22
24
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Female
Male

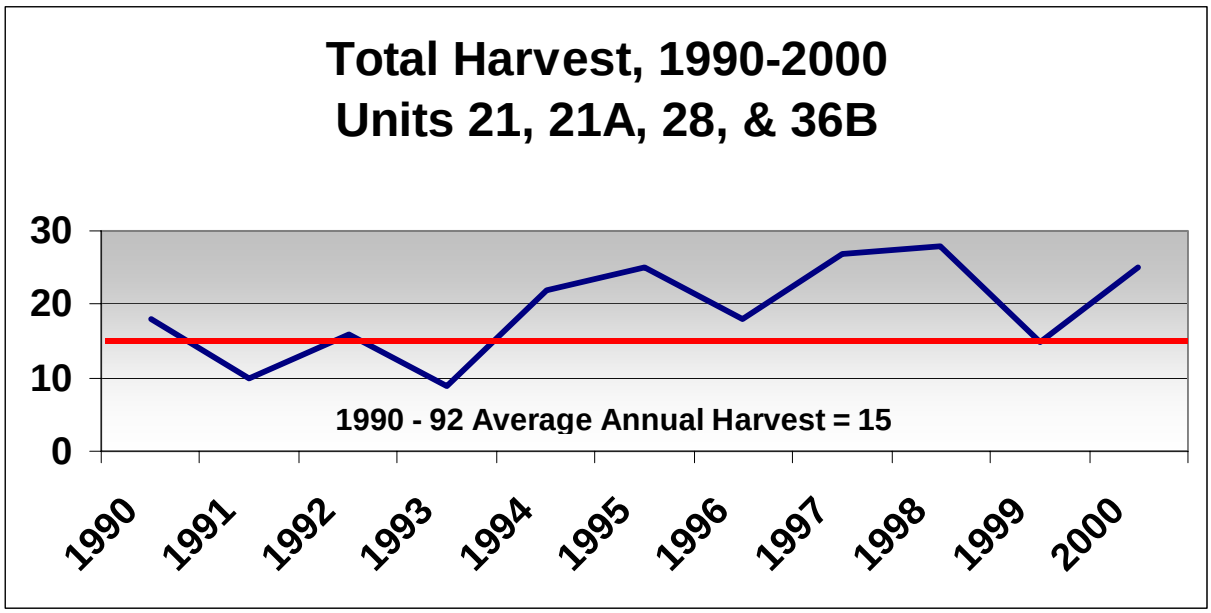

Total Harvest, 1990 - 2000
Units 22, 23, 24, 31, & 32A
70
60
50
40
30
20
10
0
1990-1992 Average Annual Harvest = 20
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000

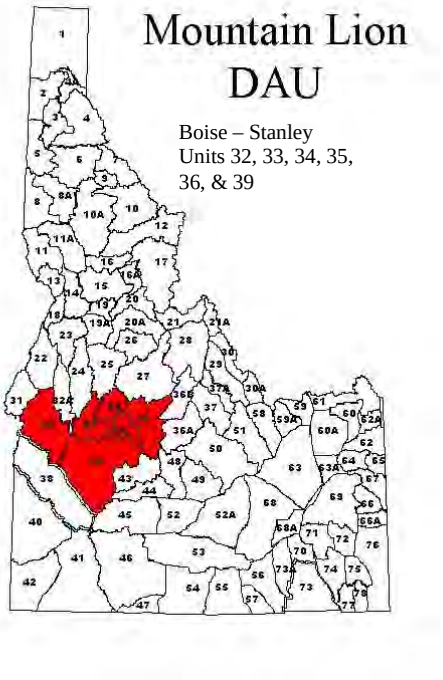

Mountain Lion
DAU
Units 21, 21A, 28, 36

SALMON

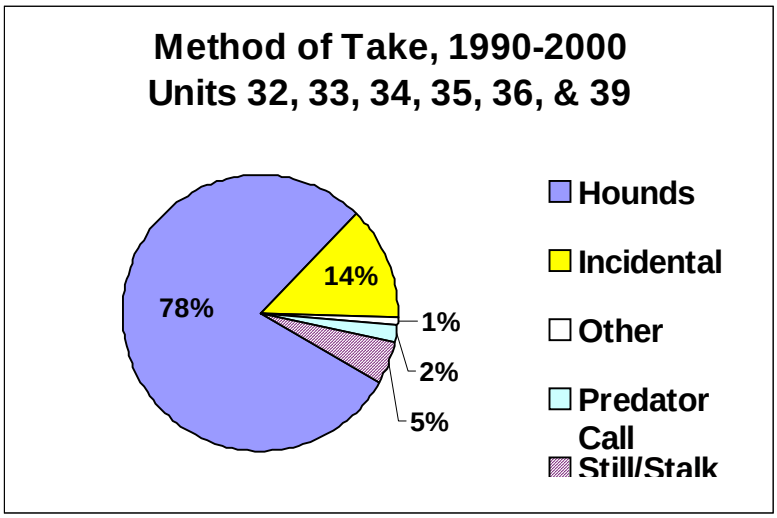

Method of Take, 1990-2000
Units 21, 21A, 28, 36B
92%
8%
0%
0%
0%
Hounds
Incidental
Other
Predator Call
Still/Stalk

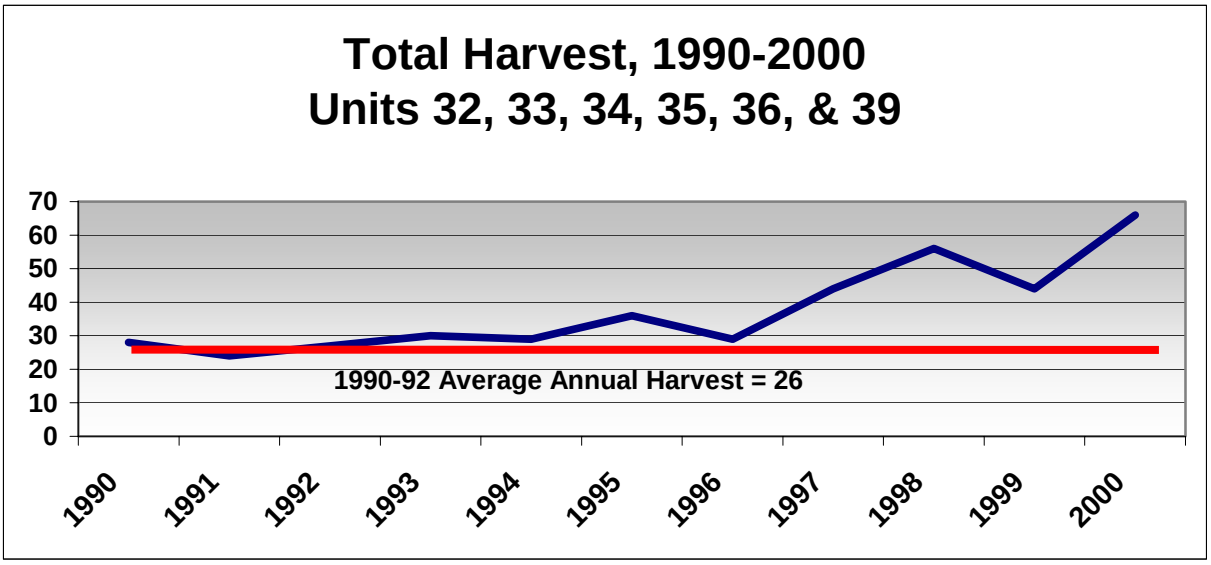

DAU Harvest by Sex, 1990-2000
30
25
20
15
10
5
0
6
12
2
8
6
10
1
8
6
16
8
17
1
17
12
15
12
16
6
9
8
17
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Female
Male

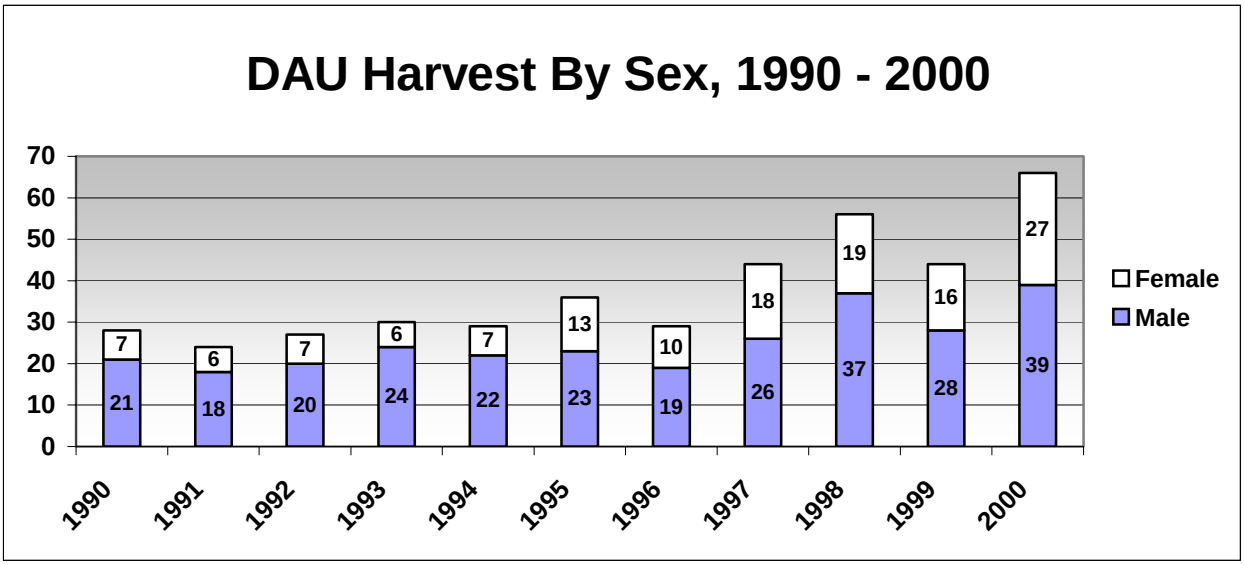

Total Harvest, 1990-2000
Units 21, 21A, 28, & 36B
30
20
10
0
1990 - 92 Average Annual Harvest = 15
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000

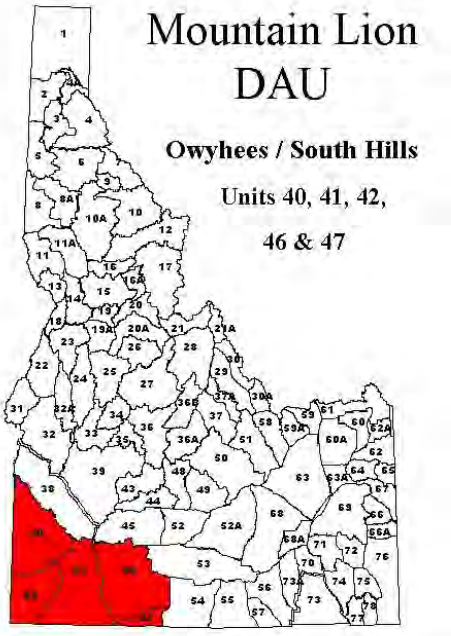


BOISE-STANLEY

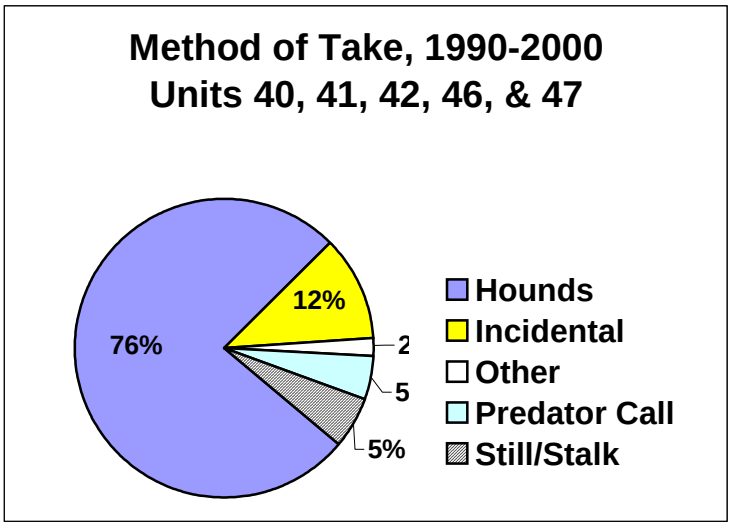


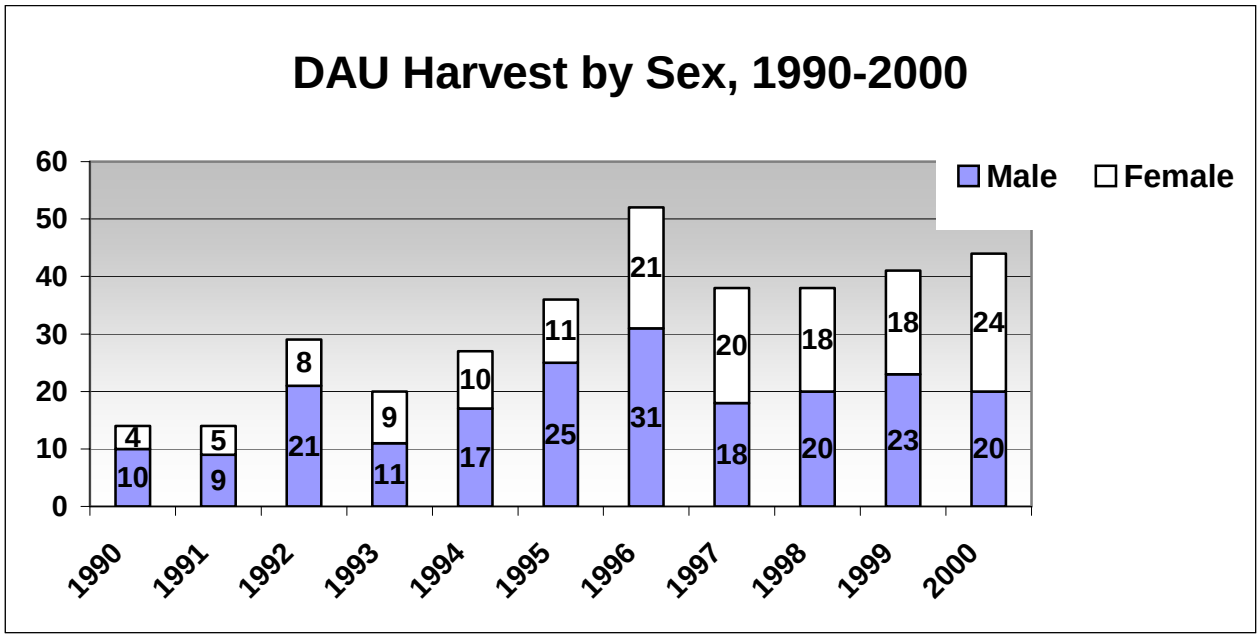


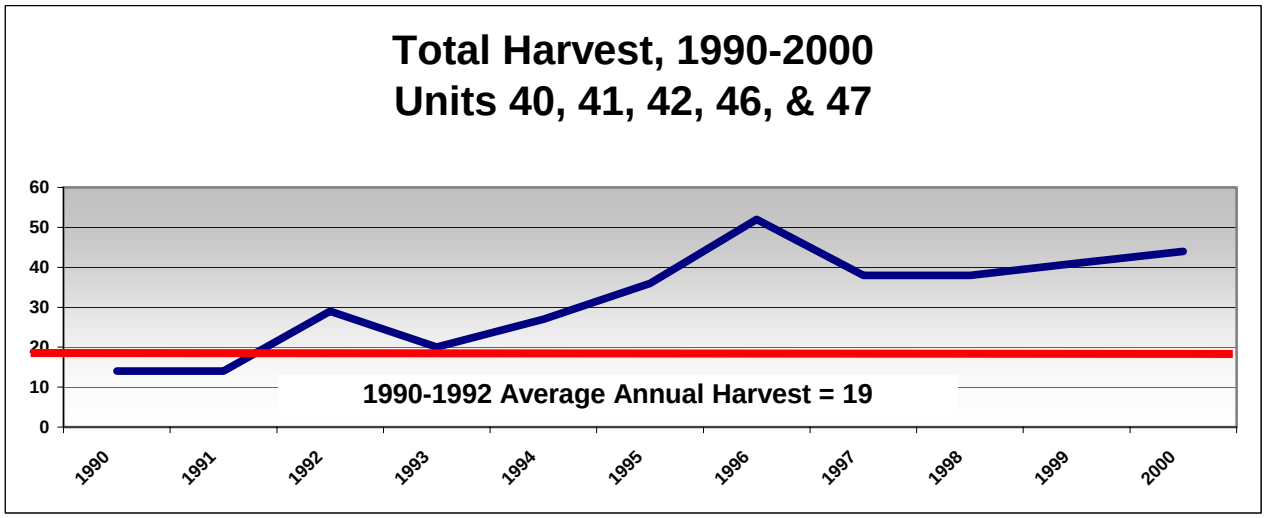


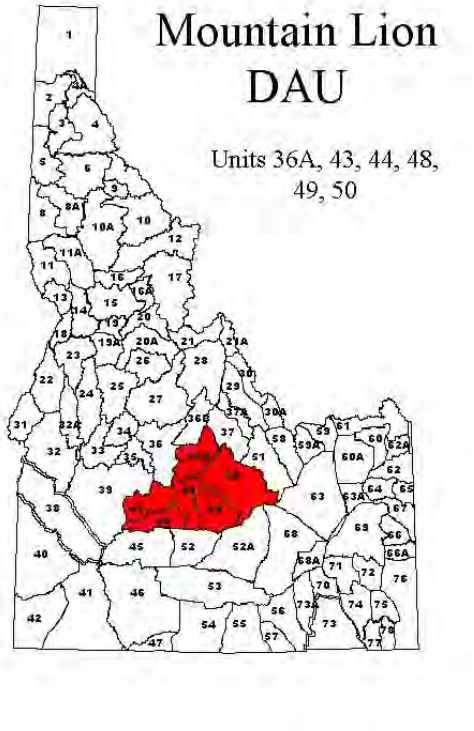

Mountain Lion
DAU
Owyhees / South Hills
Units 40, 41, 42,
46 & 47

OWYHEES

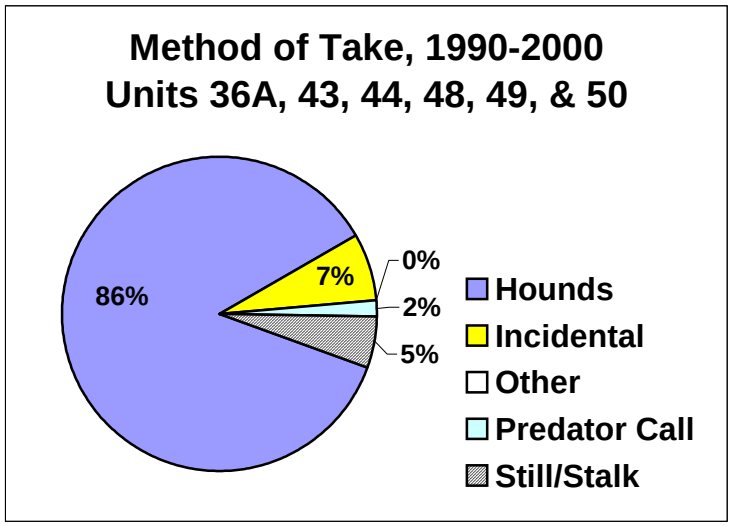

Method of Take, 1990-2000
Units 40, 41, 42, 46, & 47
76%
12%
2
5
5%
Hounds
Incidental
Other
Predator Call
Still/Stalk

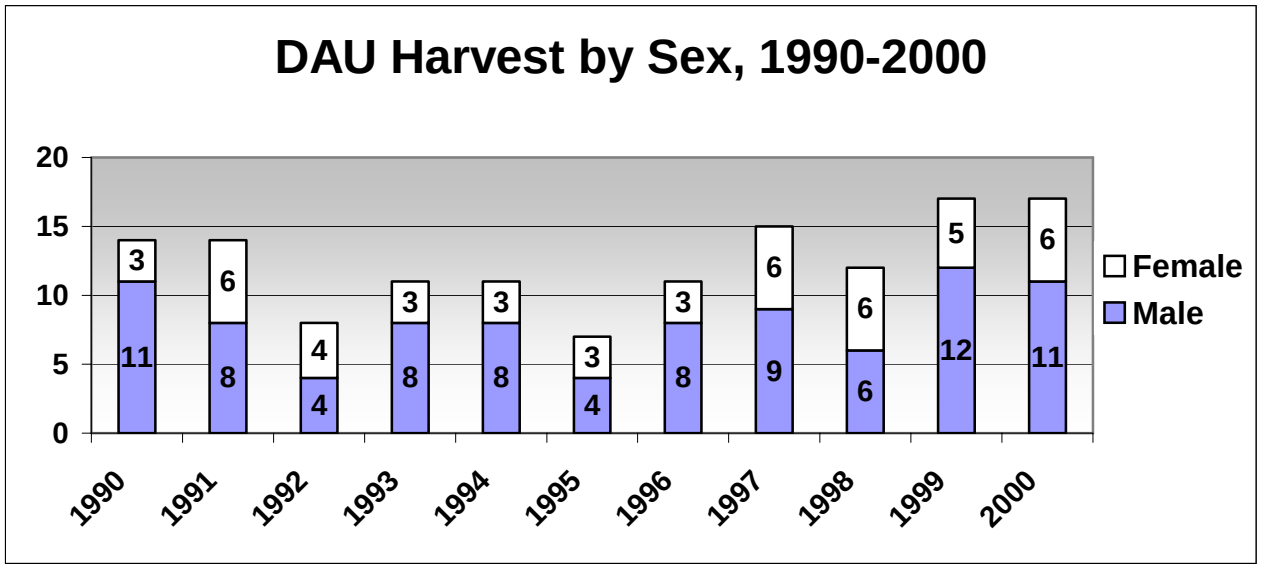

DAU Harvest by Sex, 1990-2000
Male
Female
60
50
40
30
20
10
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000
4 5 8 9 10 11 21 20 18 18 24
10 9 21 11 17 25 31 18 20 23 20

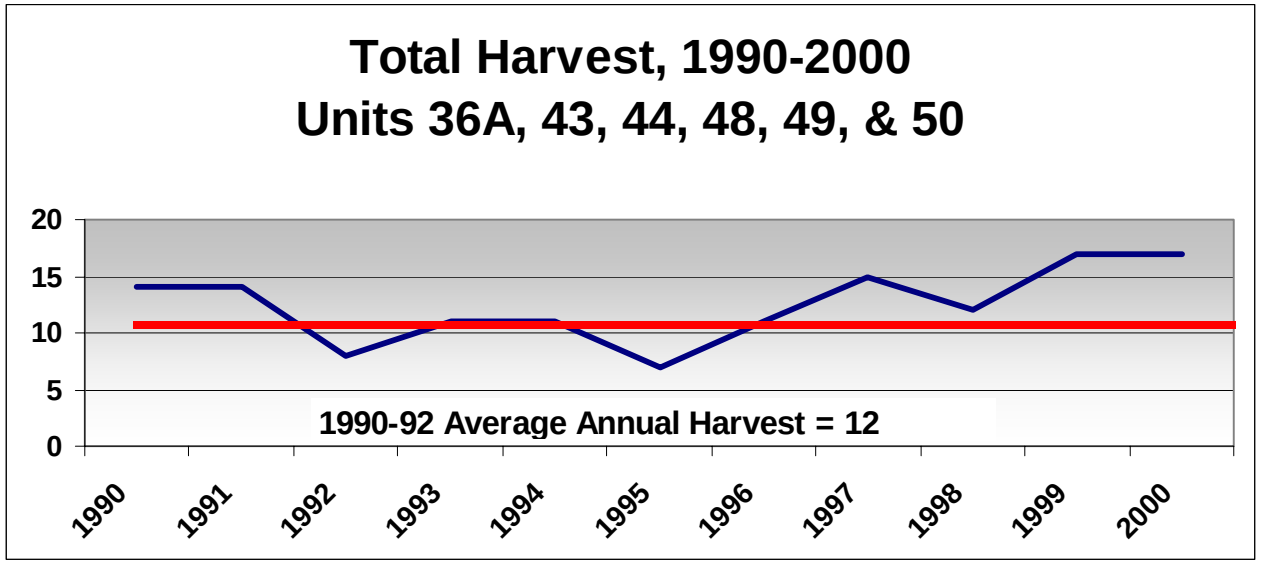

Total Harvest, 1990-2000
Units 40, 41, 42, 46, & 47
60
50
40
30
20
10
0
1990-1992 Average Annual Harvest = 19
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000

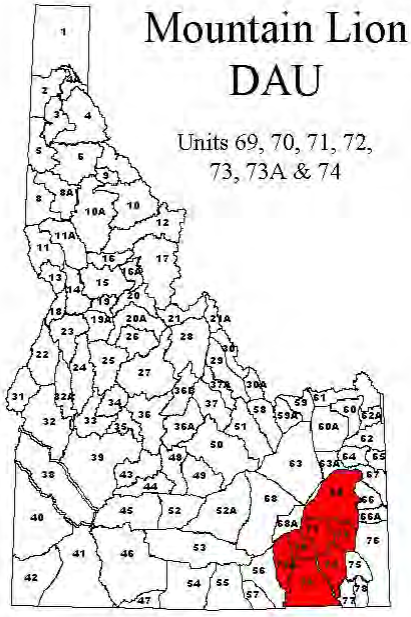

Mountain Lion
DAU
Units 36A, 43, 44, 48,
49, 50

SUN VALLEY

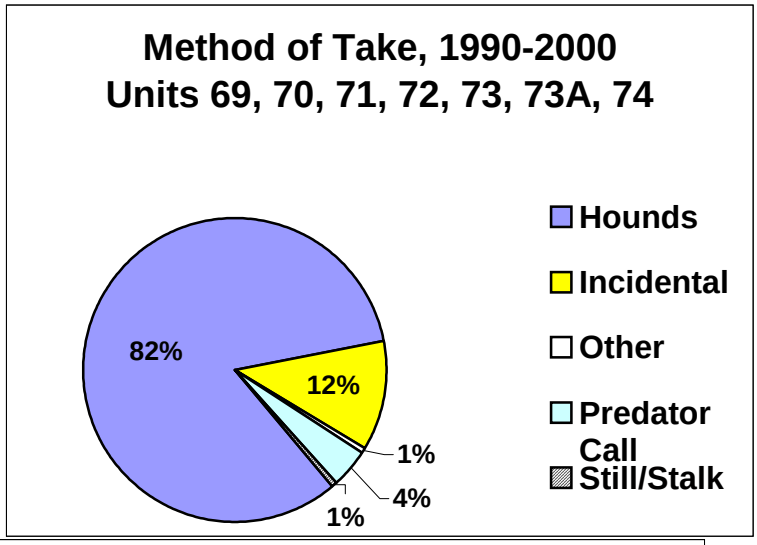

Method of Take, 1990-2000
Units 36A, 43, 44, 48, 49, & 50
86%
7%
0%
2%
5%
Hounds
Incidental
Other
Predator Call
Still/Stalk

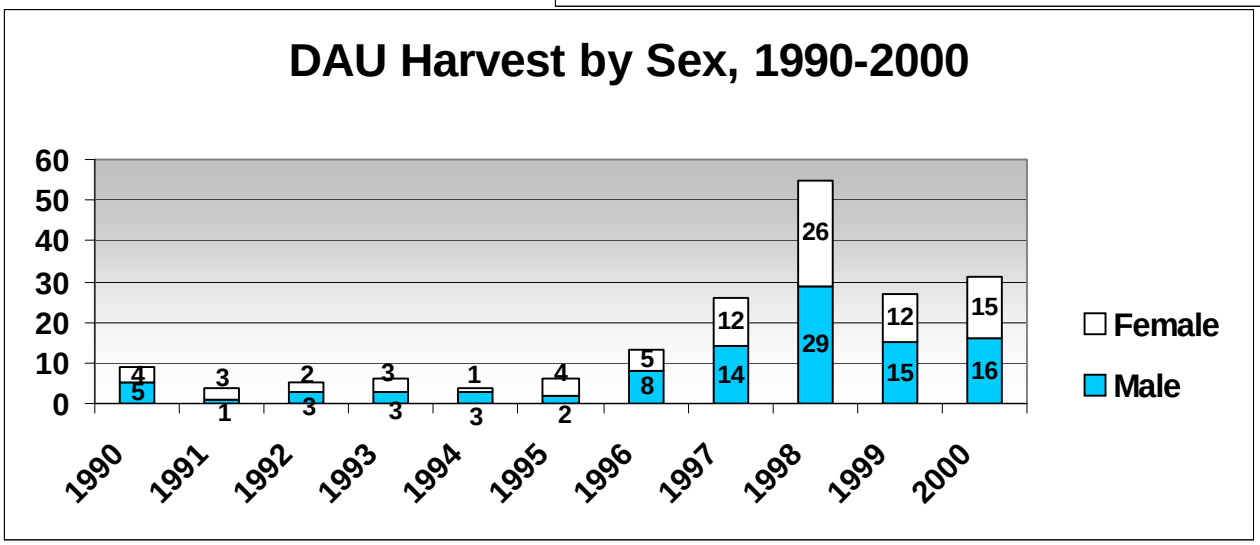

DAU Harvest by Sex, 1990-2000
20
15
10
5
0
1990 3 11
1991 6 8
1992 4 4
1993 3 8
1994 3 8
1995 3 4
1996 3 8
1997 6 9
1998 6 6
1999 5 12
2000 6 11
Female
Male

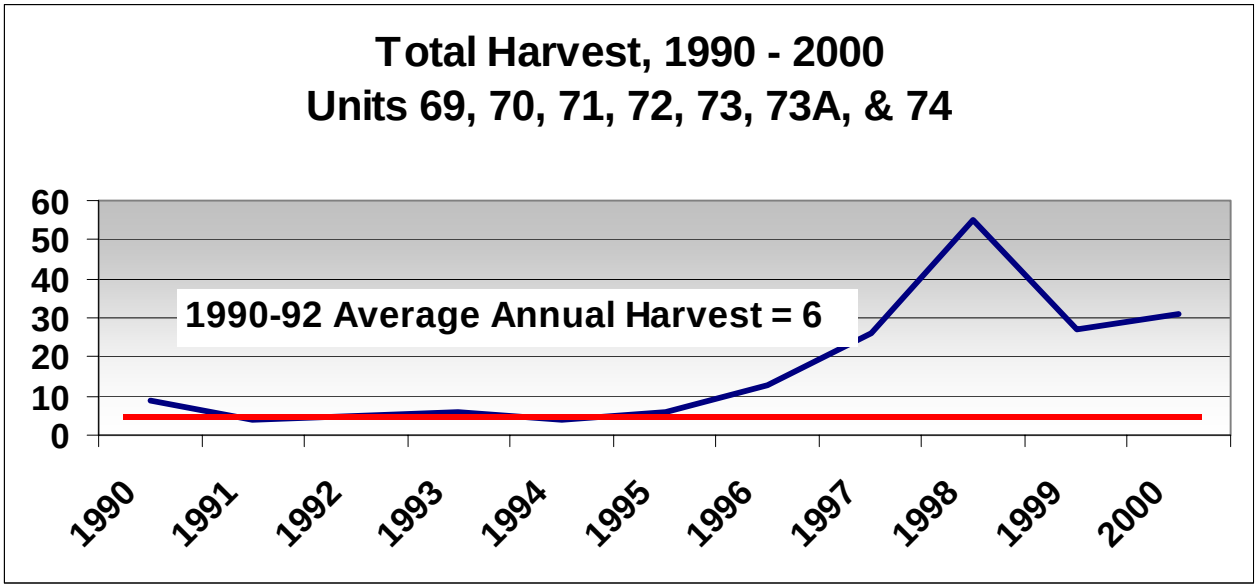

Total Harvest, 1990-2000
Units 36A, 43, 44, 48, 49, & 50
20
15
10
5
0
1990-92 Average Annual Harvest = 12
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000

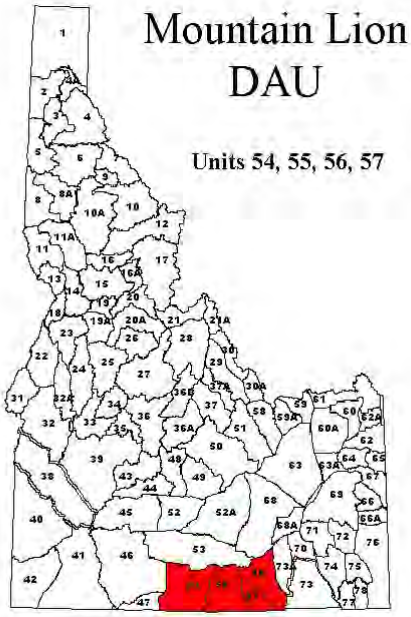

Mountain Lion
DAU
Units 69, 70, 71, 72,
73, 73A & 74

POCATELLO

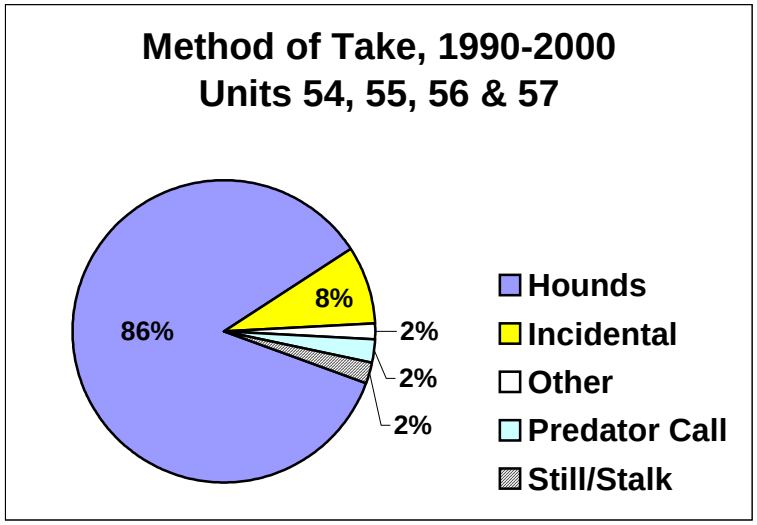

Method of Take, 1990-2000
Units 69, 70, 71, 72, 73, 73A, 74
82%
12%
1%
4%
1%
Hounds
Incidental
Other
Predator Call
Still/Stalk

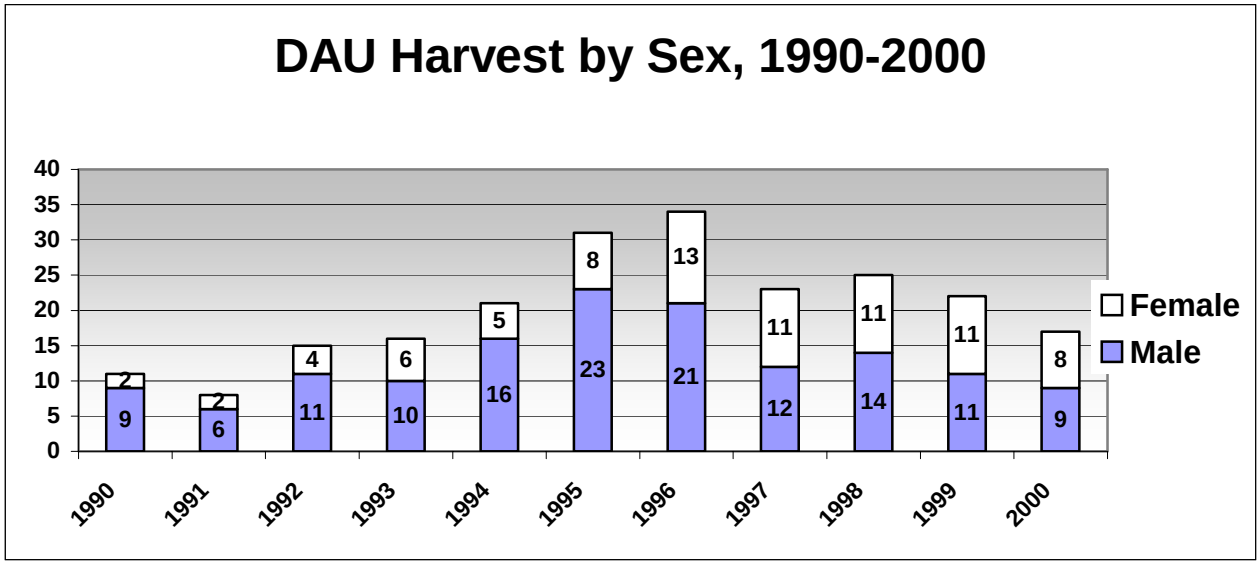

DAU Harvest by Sex, 1990-2000
60
50
40
30
20
10
0
1990 4 5
1991 3 1
1992 2 3
1993 3 3
1994 1 3
1995 4 2
1996 5 8
1997 12 14
1998 26 29
1999 12 15
2000 15 16
Female
Male

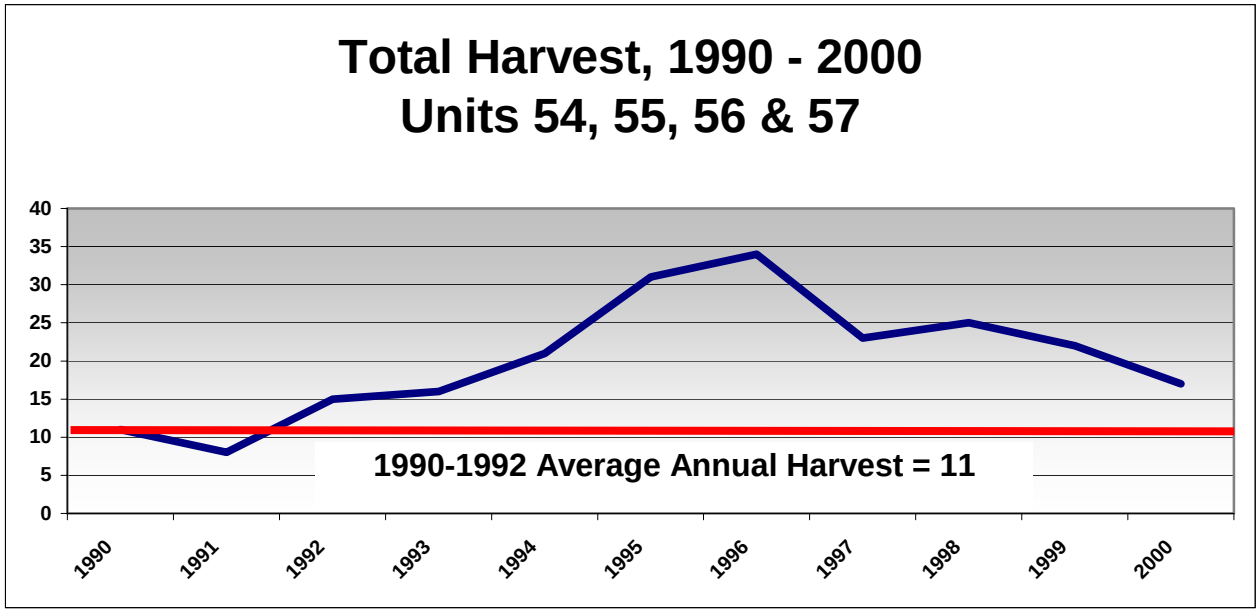

Total Harvest, 1990 - 2000
Units 69, 70, 71, 72, 73, 73A, & 74
60
50
40
30
20
10
0
1990-92 Average Annual Harvest = 6
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000

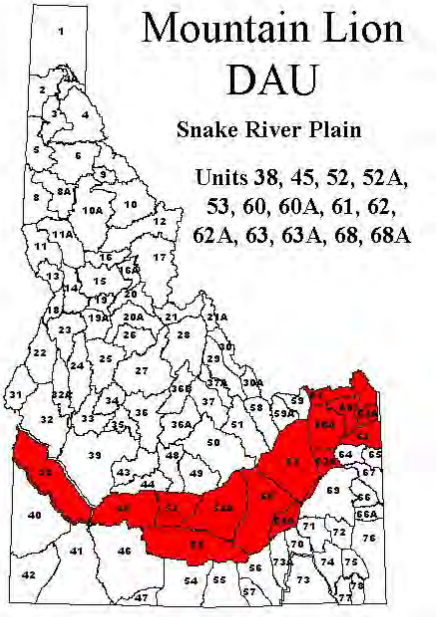

Mountain Lion
DAU
Units 54, 55, 56, 57

OAKELY

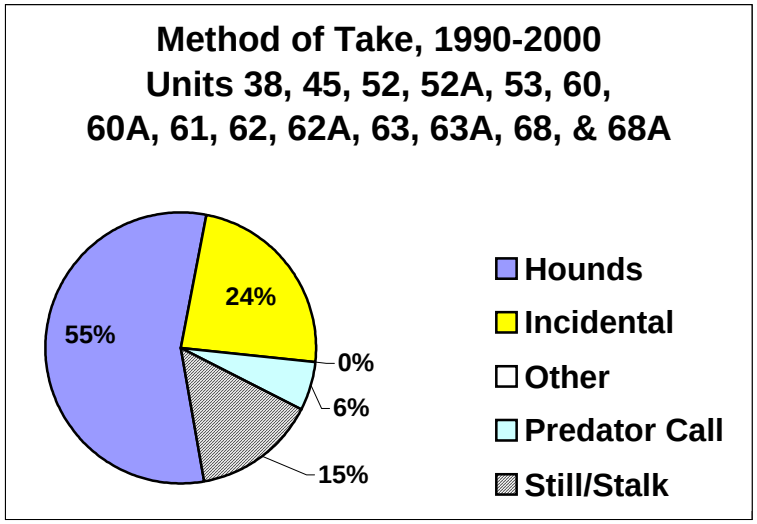

Method of Take, 1990-2000
Units 54, 55, 56 & 57
86%
8%
2%
2%
2%
Hounds
Incidental
Other
Predator Call
Still/Stalk

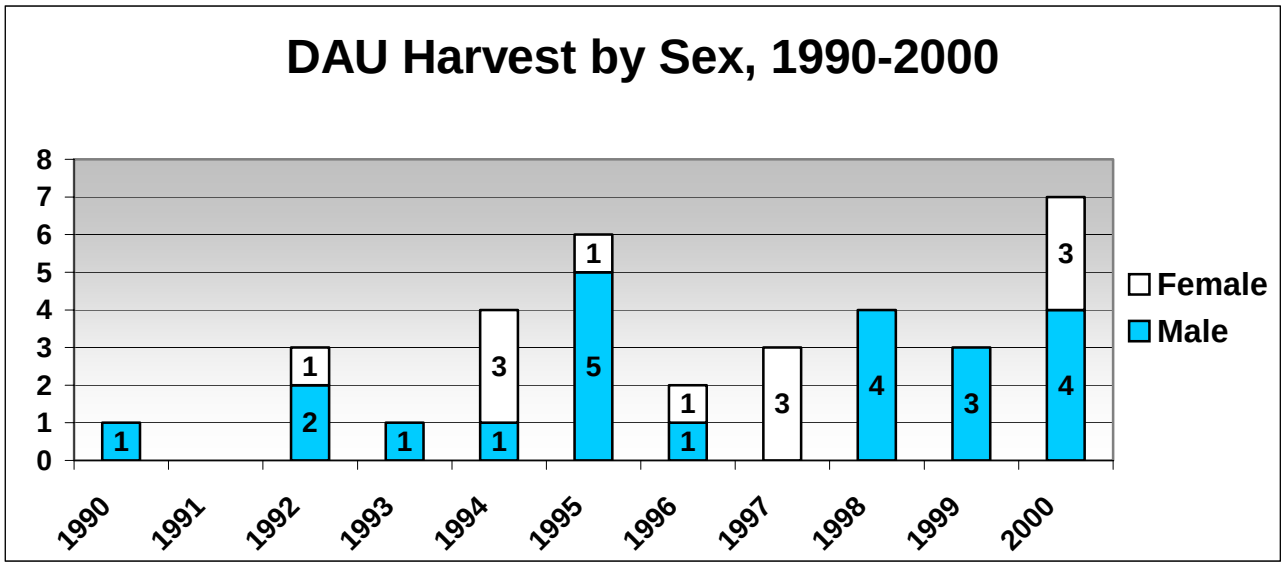

DAU Harvest by Sex, 1990-2000
40
35
30
25
20
15
10
5
0
1990 2 9
1991 2 6
1992 4 11
1993 6 10
1994 5 16
1995 8 23
1996 13 21
1997 11 12
1998 11 14
1999 11 11
2000 8 9
Female
Male

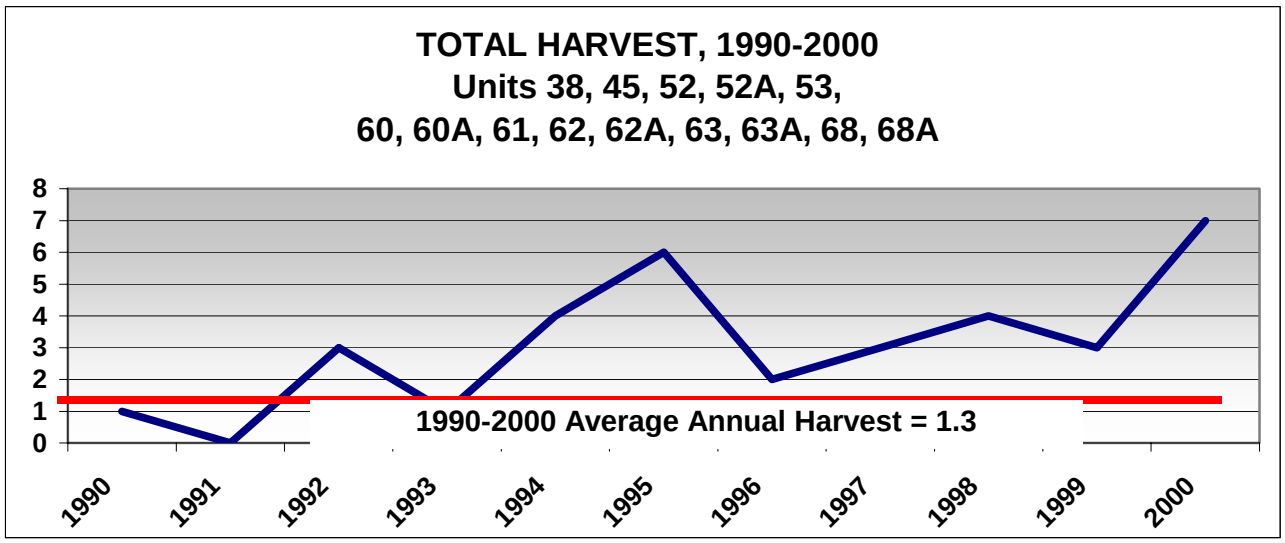

Total Harvest, 1990 - 2000
Units 54, 55, 56 & 57
40
35
30
25
20
15
10
5
0
1990-1992 Average Annual Harvest = 11
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000

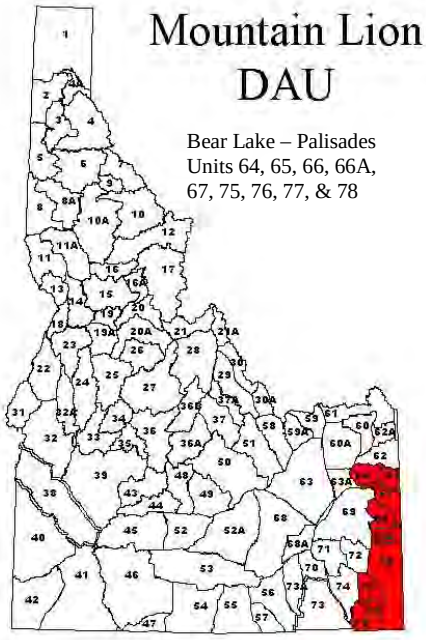


SNAKE RIVER PLAIN

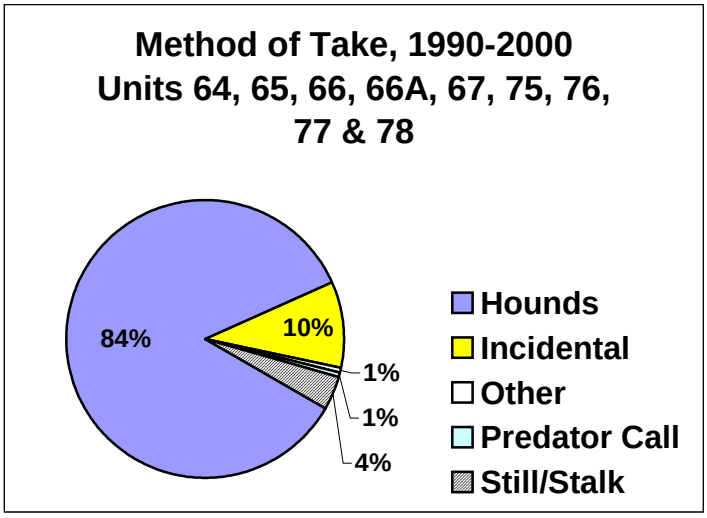


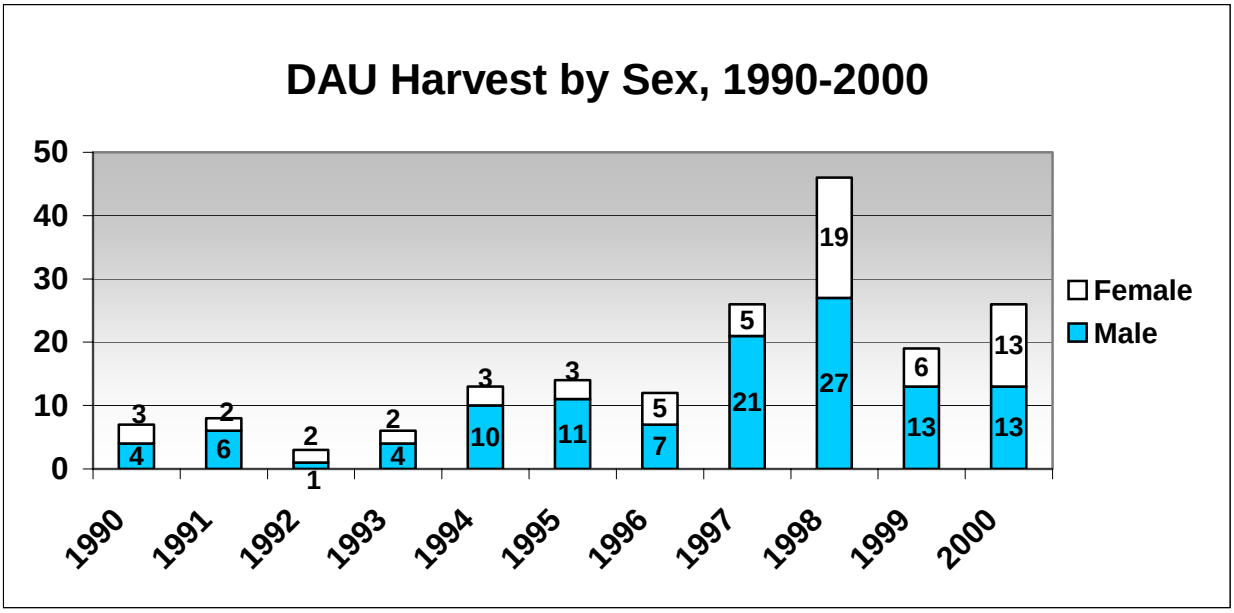


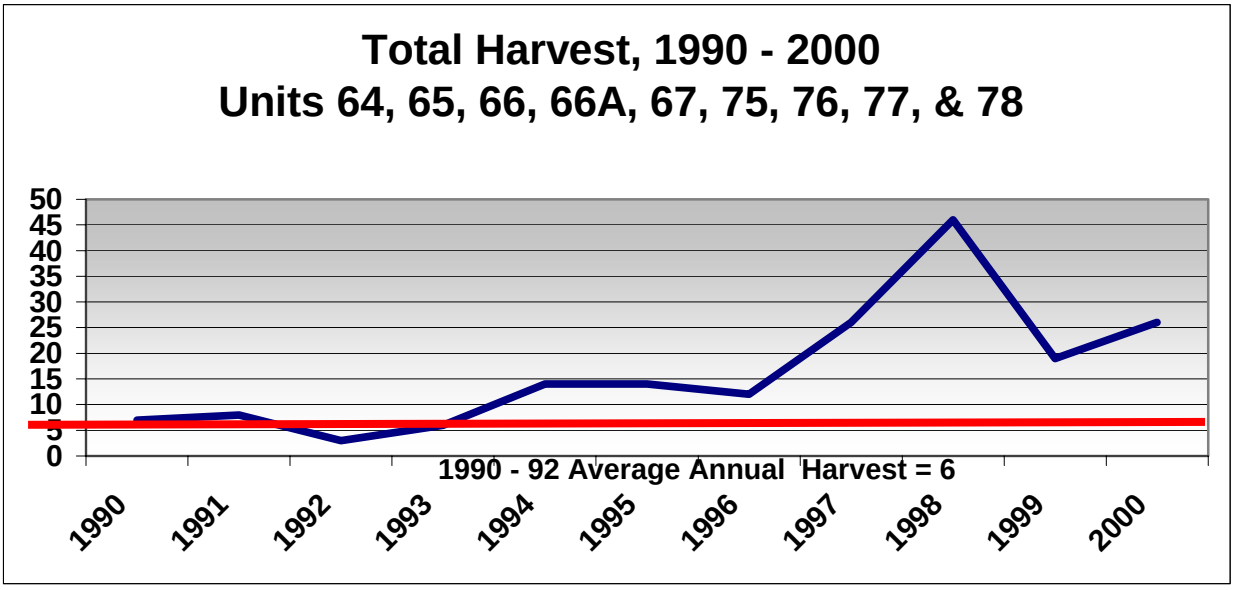


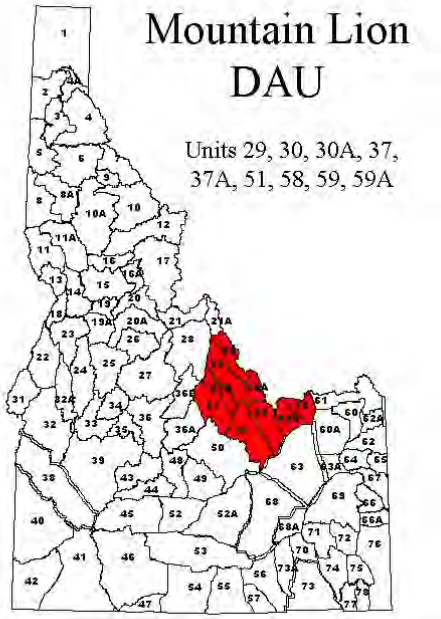


BEAR LAKE - PALISADES

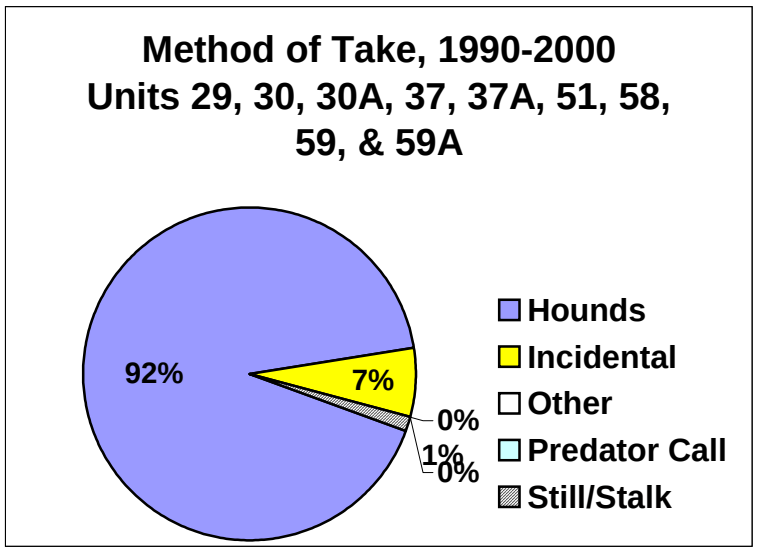


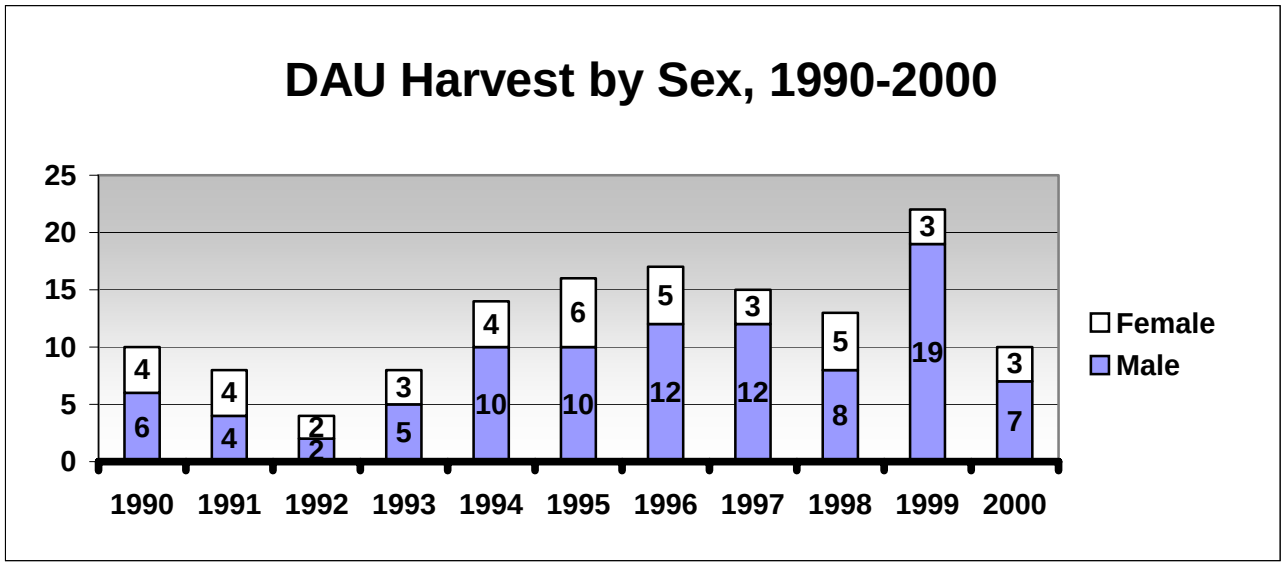


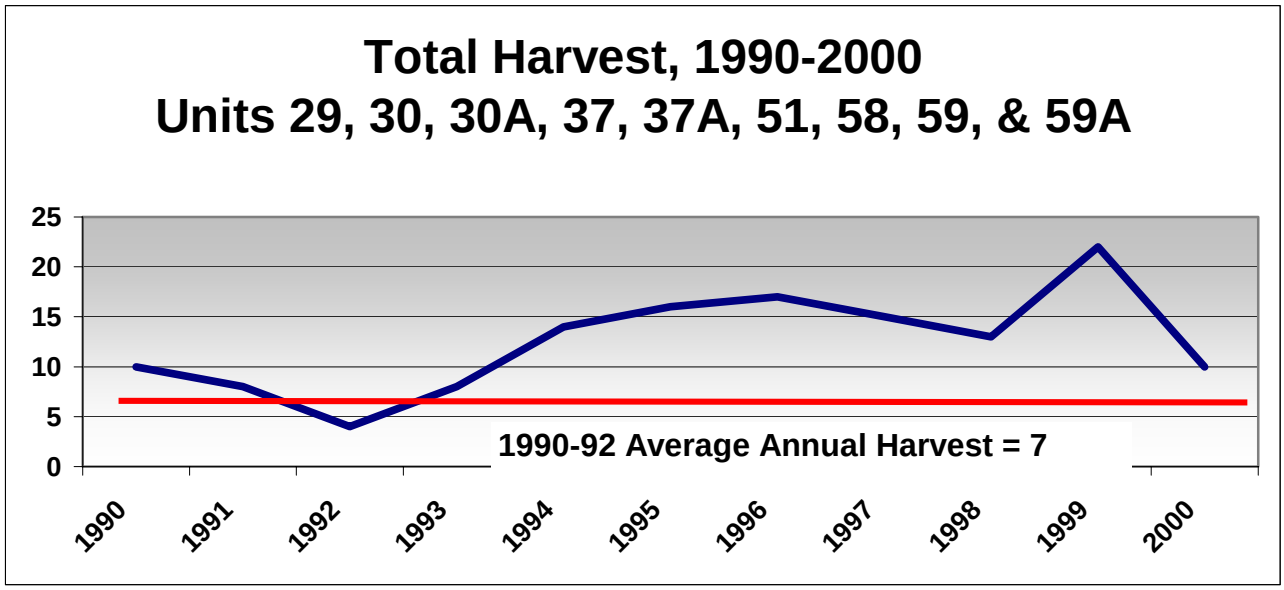



Mountain Lion
DAU
Units 29, 30, 30A, 37,
37A, 51, 58, 59, 59A

BORAH


Method of Take, 1990-2000
Units 29, 30, 30A, 37, 37A, 51, 58, 59, & 59A
92%
7%
0%
1%
0%
Hounds
Incidental
Other
Predator Call
Still/Stalk


DAU Harvest by Sex, 1990-2000
25
20
15
10
5
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000
6 4 4 4 2 2 5 3 10 4 10 6 12 5 12 3 8 5 19 3 7 3
Female
Male


Total Harvest, 1990-2000
Units 29, 30, 30A, 37, 37A, 51, 58, 59, & 59A
25
20
15
10
5
0
1990-92 Average Annual Harvest = 7
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000