Rifle Creek Mule Deer Data Analysis Unit Plan
Game Management Unit 33

Prepared for:
Colorado Division of Wildlife

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DATA ANALYSIS UNIT PLAN
Executive Summary

DAU: D-42 Rifle Creek Mule Deer

GMUs: 33

Current Populations Estimate: 9,200	Current Sex Ratio: 20.6/100/64.7
Old Population Objective: 10,500	Old Sex Ratio Objective: 20/100/70
New Population Objective: 8,400	New Sex ratio Objective: 20/100/70
Percent Change: 20% decrease.	No Change.

Summary of Management Decisions

The Rifle Creek DAU has, in the past, been an area of intense hunter interest and good harvests. Historically, the DAU provided superb hunting opportunity and supported excellent deer populations. In recent years, deer populations have been sustaining high archery and muzzleloading hunter pressure as well as high regular season hunter interest.

During the past, deer populations have been higher than the established post-hunt population objective of 10,500. This has resulted in poor winter range forage, high winter fawn mortality, and excessive problems with deer on private lands. The CDOW has been aggressively harvesting does since 1988 in an effort to reduce the population and bring it into a better balance with habitat conditions. The new objective is recommended to maintain a smaller, but more productive herd for this DAU.

The preferred alternative for the composition objective (sex ratio) is to maintain the current objective. Buck ratios are acceptable at the present objective, to substantially increase this ratio would likely require limited buck licenses in the DAU. Current buck ratios are considered good, relative to many populations in western Colorado. Increased fawn winter survival may help to achieve the desired fawn ratio of 70/100 does.

Significant Issues

The current mule deer population (1993 levels) was considered by most respondents as being appropriate. Game damage problems were not considered to be significant at current population levels. There was some concern that the population was too low, but not excessively so. Over use of vegetation on winter ranges is a major concern with the BLM and CDOW. The lack of mature bucks in the population was a significant issue among hunters, as well as land use agencies and CDOW. Maintaining a healthy, highly productive herd that can sustain antlered and antlerless harvests similar in size to average historic levels is a desirable goal for this for this population.

Introduction and Purpose

Historically, big game seasons were set either as a result of tradition or political pressures. Often the seasons that resulted did not adequately address big game population dynamics and the condition of habitats. To a lesser degree, the setting of big game hunting seasons are still traditional and political, however, in Colorado the season setting process has changed. Numerous individuals, organizations, and groups such as U.S. Forest Service, Bureau of Land Management, sportsmen, guide and outfitters, ranchers, hikers, fishermen, the viewing public, and chambers of commerce all have a vital interest in the size and composition of big game herds.

The Colorado Division of Wildlife (CDOW) is responsible for maintaining the state's big game herds at population levels that have been examined through a public review process and approved by the Colorado Wildlife Commission.

Each individual herd of deer, elk, and antelope is referred to as a Data Analysis Unit (DAU). DAU boundaries are drawn so that they approximate a herd unit where most of the animals are born, raised, and die with as little ingress or egress from other herds as possible. Normally, each DAU is composed of several game management units (GMU), but in some cases a DAU is composed of only one GMU.

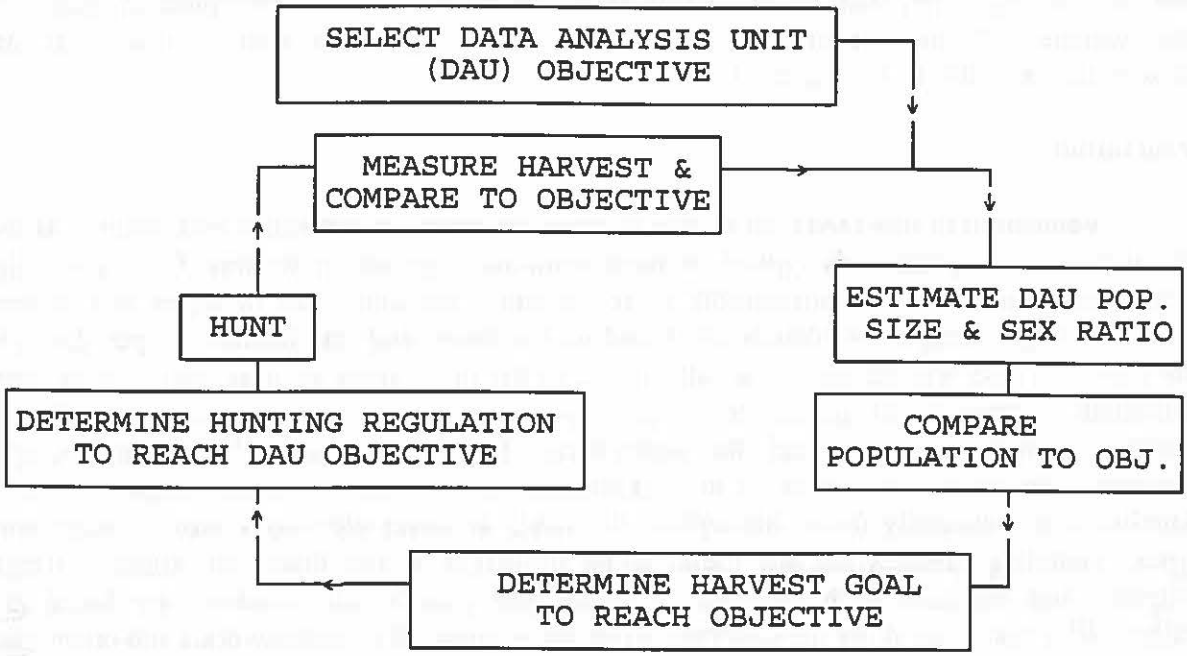
The DAU plan analyzes and generates two primary decisions; 1) how many animals should the DAU contain, and 2) to a lesser extent, what should be the desired sex ratio (number of males per 100 females). These numbers are then referred to as the DAU population and composition objective, respectively. Secondarily, the DAU plan collects and organizes most of the important management data for a particular herd into one planning document; determines DAU issues through a public scoping process; identifies alternative solutions to the issues and problems determined in this process; and selects the preferred alternative.

The DAU plan process is designed to examine the public desires and biological herd capabilities and determine what is an appropriate balance of each. The public is involved in the determination of these goals by way of public meetings and comments to the Colorado Wildlife Commission. The herd objectives are usually set for a five year period.

The herd population objective drives the most important decisions in the annual big game season setting process - how many animals needed to be harvested to maintain or work toward the population objective. The management by objective approach is an annual long term cycle of information collection, information analysis, and decision making that culminates each year in a hunting season (see diagram on page 5). The cyclic objective setting approach is designed to key the decision making process to the collection and analysis of information. It also focuses the decision makers, the Wildlife Commission, on "What it is we want."

This DAU plan analyzes data and supports decisions for population and composition objectives for the Rifle Creek mule deer herd.

CYCLE OF MANAGEMENT BY OBJECTIVE



RIFLE CREEK MULE DEER DAU PLAN

Description of Data Analysis Unit

Location

The Data Analysis Unit is located in the west-central portion of Colorado and is commonly called the Rifle Creek DAU. It's Colorado Division of Wildlife alpha-numeric designation is D-42. It is bounded on the north by the drainage divide between the Colorado and White Rivers, on the east by Canyon Creek, on the south by the Colorado River, and on the west by Colorado Highway 13 (Figure 1).

Physical Geography

Elevations vary from the high flat top mountains in the White River National Forest at approximately 9,600 feet in the north portion of the DAU, south to the flood plain of the Colorado River at approximately 5,400 feet. One of the main topographic feature of this DAU is the Grand Hogback, which runs northwest to southeast near the southern border of the DAU. The hogback rises sharply from 6,900 feet to as high as 7,300 feet in a half to one mile horizontal distance, creating a major topographic division of the DAU. The Grand Hogback creates a funnel effect which pushes mule deer down into the Rifle Creek drainage. The northern half of D-42 is characterized by big deep drainages continuing down from the Flat Tops

into central areas of the DAU. These canyons create a large number of east and west facing slopes, which are of an unfavorable aspect to be suitable winter range. The south half of D-42 has more south facing slopes than the north half, but it too is cut by drainages and has many east and west facing slopes that are unsuitable as winter range. Annual precipitation ranges from approximately 20 inches near Rifle to 40 inches in the higher elevations. The mean annual temperature at Rifle is 43 degrees F.

Vegetation

Vegetation in this DAU varies due to the wide range of elevations that occur. At lower elevations, the vegetation is typical of most semi-arid regions in western Colorado. Higher elevations, which receive considerably more moisture, are composed of aspen and spruce-fir forests. Pinyon-juniper woodlands are found on the lower and intermediate slopes throughout the DAU. These woodlands are usually found in the drier areas such as south facing slopes. Oakbrush is often found just above the pinyon-juniper woodlands and is often the dominant vegetation until elevations reach the aspen/spruce/fir zone. Sagebrush and snowberry are commonly found in open areas in the oakbrush zone at intermediate and higher elevations. Sagebrush is commonly found throughout the DAU at lower elevations also. Desert shrubs types, including greasewood are found along drainages at the lower elevations. Irrigated cropland and grassland with half-shrub mixtures and grass/alfalfa meadows are found in the valley. River bottoms along the Colorado River are dominated by cottonwoods and other species including willows and cattails. Irrigated crops include corn, grains such as wheat, barley, and oats, and alfalfa and grass grown for pasture and hay.

Land Status

The Rifle Creek deer DAU contain a mixture of public and private lands. Approximately 75% of the land within this DAU is public property, of which 60% is managed by the White River National Forest (FS) and about 40% by the Bureau of Land Management (BLM). Lands under private control are primarily utilized for farming and ranching. Metropolitan areas are found along the southern border, and include the towns of Rifle, Silt, and New Castle. Like many areas in western Colorado, public lands are found at higher elevations and private lands are found at lower elevations where the land is more suitable for farming, ranching, and communities. D-42 is 418 square miles in size. The U. S. Forest Service manages approximately 188.2 square miles and the Bureau of Land Management manages about 121.8 square miles. The Colorado Division of Parks and Outdoor Recreation and CDOW manage about 2.7 square miles of land at Rifle Gap and Harvey Gap State Parks, CDOW lands along

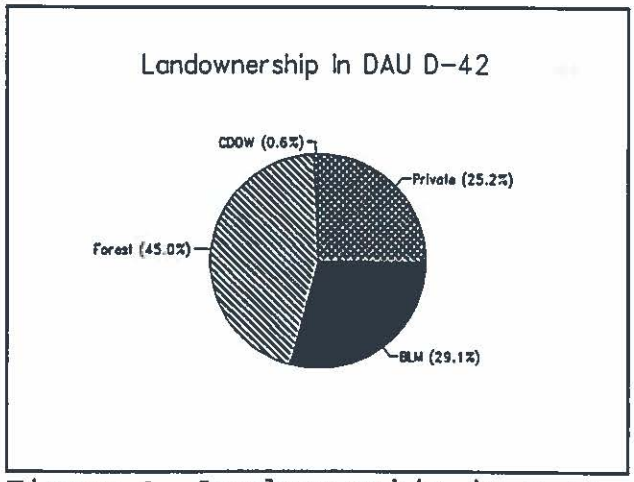


Figure 1. Landownership in D-42

West Rifle Creek, and the Rifle Fall fish hatchery along east Rifle Creek. The Division property along west Rifle Creek is managed primarily for hunting access and mule deer winter range. There are 105.3 square miles of private land in the DAU.

Land Use

Because of the DAU's wide range in elevations, there are a variety of uses occurring on the lands. These range from livestock production to some of the best big game hunting in Western Colorado.

In the southern portion of the DAU, on both sides of the Grand Hogback, agriculture is the dominant land use. Crops such as corn, various grains, and the production of hay are the most common uses of the land. In many cases cattle and sheep ranchers graze livestock on Forest Service allotments during the summer and then during the fall they move the livestock to home ranches for the winter.

Some of the lands in this area have been subdivided into small parcels of land where single family homes have been built. Often these parcels are large enough to keep horses and other small livestock.

In the middle to lower portions of the DAU, BLM is the dominant landowner. These lands are used to graze both cattle and sheep. Some firewood is harvested, both commercially and privately. Recreation is also an important use of these lands. Hunting, camping, hiking, and sightseeing are all important activities.

These lands comprise important winter ranges for both deer and elk. Areas such as Horse Mountain, Cedar Mountain, the Grand Hogback, and the lower portions of the Elk Creeks support the DAU's mule deer populations during the winter. Due to heavy accumulations of snow on the White River National Forest, both deer and elk are forced to winter at lower elevations. Favorable snow depths, slope and aspect, and moderate winter temperature make this area suitable for wintering big game.

The northern portion of the DAU is where the highest elevations are found and the land is managed by the U.S. Forest Service. On the east side, the terrain is quite rugged with large canyons and some cliff-type terrain. Vehicular access to the area is limited, but it provides forage for livestock and excellent backcounty hunting, fishing, and hiking. The middle and western portions of the FS lands are less extreme in relief. This area is excellent for hunting, camping, hiking, fishing, and observing wildlife. Some timber is harvested, including spruce/fir and aspen. Livestock, mostly cattle, are grazed on these lands too.

The DAU contains approximately 188 square miles of winter range, 69 square miles of winter concentration areas, and 39 square miles of severe winter range. Severe winter range is defined as the area of winter range where 90% of the deer will be confined during the worst two winters out of ten when the snowpack is at the maximum. The majority of the winter ranges are found on BLM and private lands. Only about 1% of the mule deer winter range is found on FS lands. The BLM has about 65% of the winter range and the remaining portion, about 34% is on private lands.

Habitat Condition and Capability

Public Lands-Forest Service

The US Forest Service has 11 allotments in D-42 (Table 1). For mule deer, these are considered summer ranges. Mule deer utilize these allotments from May through most of October. Summer mule deer ranges are in good condition. Mule deer usually spread out over summer ranges and usually do not negatively impact a specific area such as riparian zones. Very few mule deer winter on FS lands.

The Forest Service has not indicated that there are any known conflict areas where mule deer are negatively affecting vegetation condition or livestock use and management.

Table 1. Wildlife and livestock grazing summary for DAU D-42

Agency	Number of Allotments	No. Vacant Allotments	Total Acres	Allocated AUM's	Actual Use AUM's	Wildlife AUM's
BLM	48	9	59,512	5243		7789
USFS	11					

Public Lands-BLM

The BLM has 48 allotments in D-42 (Table 1). In these allotments, 5243 AUMs are designated for livestock use and 7789 AUMs are allotted for wildlife use.

Mule deer make extensive use of BLM lands for winter ranges. The largest portion of the D-42 deer herd migrates from BLM lands during the late spring and summer. However, some mule deer occupy BLM lands on a year-round basis. This year-round use occurs on the BLM lands at higher elevations. During late spring, summer, and early fall mule deer spend a large portion of their time on summer ranges in the White River National Forest.

The Glenwood Springs Resource Area manages lands in which D-42 lies. Currently, winter browse conditions are rated as poor by the BLM in much of the DAU. The BLM has been concerned for a number of years about the condition of vegetation, particularly browse species, and the heavy use by wintering deer herds. The BLM also indictes that the grass/forb understory in pinyon-juniper woodlands is often in poor condition and at some P-J sites almost nonexistant. The forb understory is also lacking in many of the sagebrush stands in Critical Winter Ranges.

Wintering deer concentrate in areas such as West Rifle Creek, along the Hogback and in other areas both on private and pubic lands. Much of the sagebrush, serviceberry, bitterbrush, mountain mahogany, and other browse species are in poor condition due to overuse. In the recent past (late 1980s), shrub, grass, and forb growth was severely impacted due to poor moisture conditions caused by an extende drought.

The BLM indicates that there is a concern about conflicts between mule deer and domestic sheep use in the Estes Gulch area. Vegetation in this area is under heavy winter use pressure by both domestic livestock and mule deer resulting in poor browse conditions.

Private Lands

Habitat condition and capability on private land was not assessed in this plan. However, generally native habitats are in similar condition to those on BLM lands. Sagebrush and other browse species are overused and in poor condition.

Past Management History

Post-hunt Population Size

The number of animals in a big game population fluctuate throughout the year. Normally, the population peaks in the spring just after the birth of the young. Populations then decline throughout the year as natural mortality and hunting season take animals from the population. Traditionally, the CDOW uses post-hunt (immediately after conclusion of the last hunting season, usually in late November) populations as a frame of reference when we refer to the size of a population of mule deer. In this manner we can eliminate confusion when we refer to populations.

The CDOW is unable to conduct intensive censuses in every DAU every year due to budgetary constraints. We base much of our management on computer simulations of populations, and in some DAU's, on more refined data such as quadrat and line-transect population censuses. Quadrats censuses are currently the most accurate method of determining populations followed by line-transect methodology. The former is very time consuming and expensive in both personnel costs and helicopter flight time. The latter method is less expensive, but has not yet proven to provide an acceptable estimate of populations.

The CDOW has conducted line-transect censuses in DAU D-42 in past years as part of an experiment that is being conducted in this DAU. This information in addition to harvest data and other biological information is entered into a computer program and a simulation is generated which is intended to mimic the natural population in this DAU. This is where the post-hunt population data in the plan is generated.

Post-hunt populations that are referred to in this plan (Table 2 and Figure 2) have been generated by computer simulation. They have been compared to the results of line-transect censuses that were conducted in only two years - 1990 and 1991.

Mule deer population in D-42 have fluctuated over the years. Populations were high in the early 1960's and again in the early 1980's. Since the severe winter of 1983-84, the population has been in a declining phase. This decline has resulted from a combination of events both natural and in response to CDOW management. The main natural factor that has impacted the herd has been a decline in recruitment of young deer into the population. This has tended to decrease the rate of growth of the herd. The CDOW has substantially increased the antlerless harvest in an effort to reduce the size of the population in the DAU. The management philosophy behind this reduction is that the population was likely too high for the amount of available winter range. The result was that fawn mortality was probably greater than 50% during most winters. The objective of the reduction was to increase fawn survival each year by reducing the losses resulting from winter starvation. This would result in a smaller but more productive herd, allowing for about the same annual harvest from a smaller population. (See Appendix A for a discussion on sustained yield and carrying capacity).

Table 2. Mule deer harvest, hunters and post-hunt population for DAU D-42 from 1952-1992.

YEAR	TOTAL HARVEST	TOTAL HUNTERS	POPULATION	ANTLERLESS HARVEST	ANTLERED HARVEST
1953	737	UNK	11189	305	432
1954	860	1503	12467	300	560
1955	925	1510	14563	324	601
1956	2745	2637	14879	1424	1321
1957	1849	1839	15997	927	922
1958	2001	2733	17345	1117	884
1959	2717	3312	17963	1462	1255
1960	1584	1478	19846	852	732
1961	3465	2476	20123	1887	1578
1962	6341	3666	16936	3911	2430
1963	2850	2884	16320	1595	1255
1964	1993	2455	17263	1103	890
1965	1608	1982	18875	887	621
1966	1994	2201	20309	1132	862
1967	2889	2617	20902	1506	1383
1968	1613	1866	18163	866	747
1969	874	1571	18520	475	399
1970	976	2277	16240	394	582
1971	420	832	16966	0	420
1972	1165	2056	17503	306	859
1973	1116	2387	14279	461	655
1974	695	1706	10850	0	695
1975	427	1634	9830	0	427
1976	617	1510	10802	0	617
1977	1575	2828	11764	192	1363
1978	1545	3227	13222	306	1239
1979	1421	4231	12054	547	846
1980	1152	3168	13230	145	1007
1981	1378	3211	14406	88	1290
1982	1021	2443	16645	55	966
1983	1088	2822	18687	119	969
1984	977	2310	14986	35	942
1985	654	1911	16100	39	615
1986	878	3030	16962	142	736
1987	893	3216	18745	166	727
1988	1515	4217	17216	593	922
1989	2094	5735	15633	1115	978
1990	2143	5994	13231	1079	1061
1991	1920	5423	11392	891	1029
1992	1795	4467	10920	1060	735

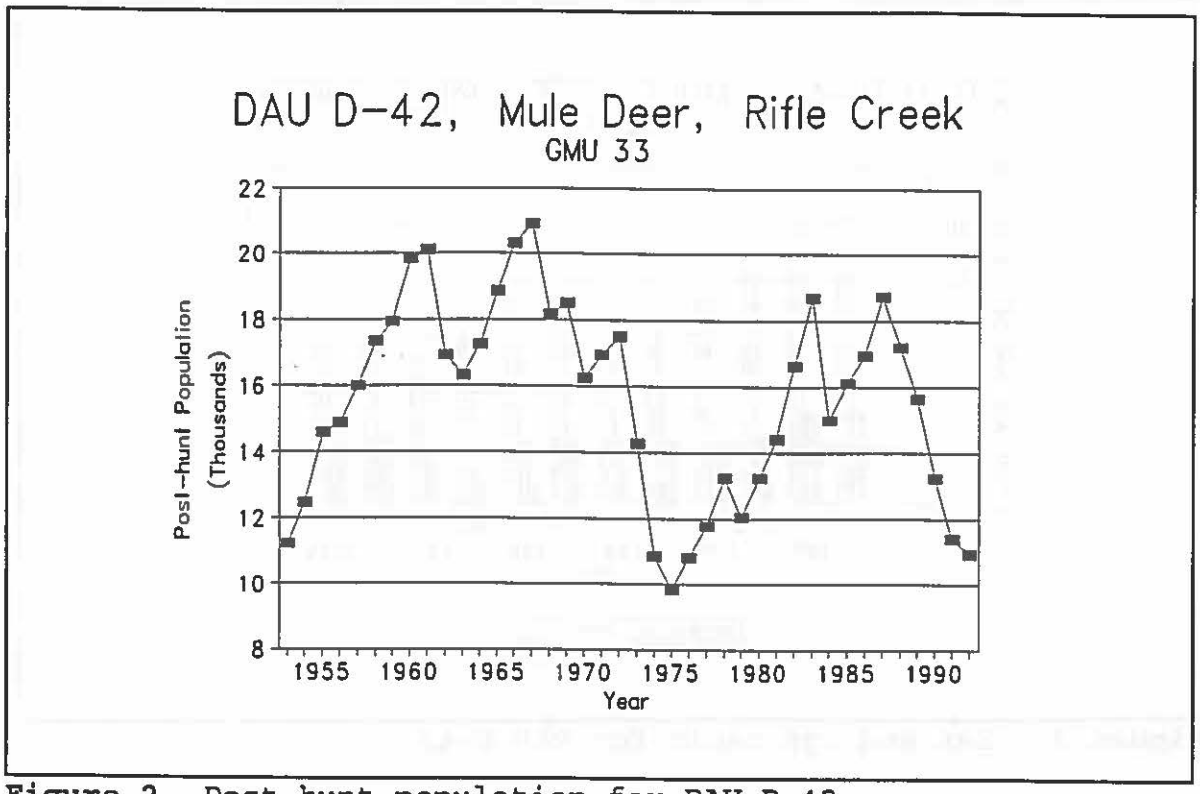


Figure 2. Post-hunt population for DAU D-42

There has been considerable concern for the number of mule deer using private lands during the winter for the last 5-7 years. Both the private landowners and CDOW felt that the number of deer using these lands had increased over historic levels. The CDOW responded to these concerns by increasing the overall antlerless harvest in this DAU since 1989. This was accomplished by increasing regular season licenses and by initiating both private land and late season antlerless deer hunts. While no population data are available to substantiate results, both the CDOW (Don Crane) and landowners feel that mule deer populations in the conflict areas have decreased over the past few years.

Post-hunt Herd Composition

Each year, since 1986, the CDOW has conducted aerial sex/age composition counts in D-42. Prior to that time these "classification counts" were conducted every other year starting in 1974. These counts are designed to sample the existing post-hunt population and determine the ratios of bucks to does and fawns to does. They are often mistaken by the public as total counts of the population. The results are presented as the number of bucks/100 does and the number of fawn/100 does.

Both the buck and fawn ratios have declined in this DAU from those that were observed during the initial counts in 1974 (Figure 3). The declines are the most evident in the fawn segment of the population. Declines in the fawn ratios are indicative of either poor reproduction or poor survival of young deer prior to the counts, which are usually flown in December. Both of these conditions could result from overpopulation of deer, poor winter range, or a

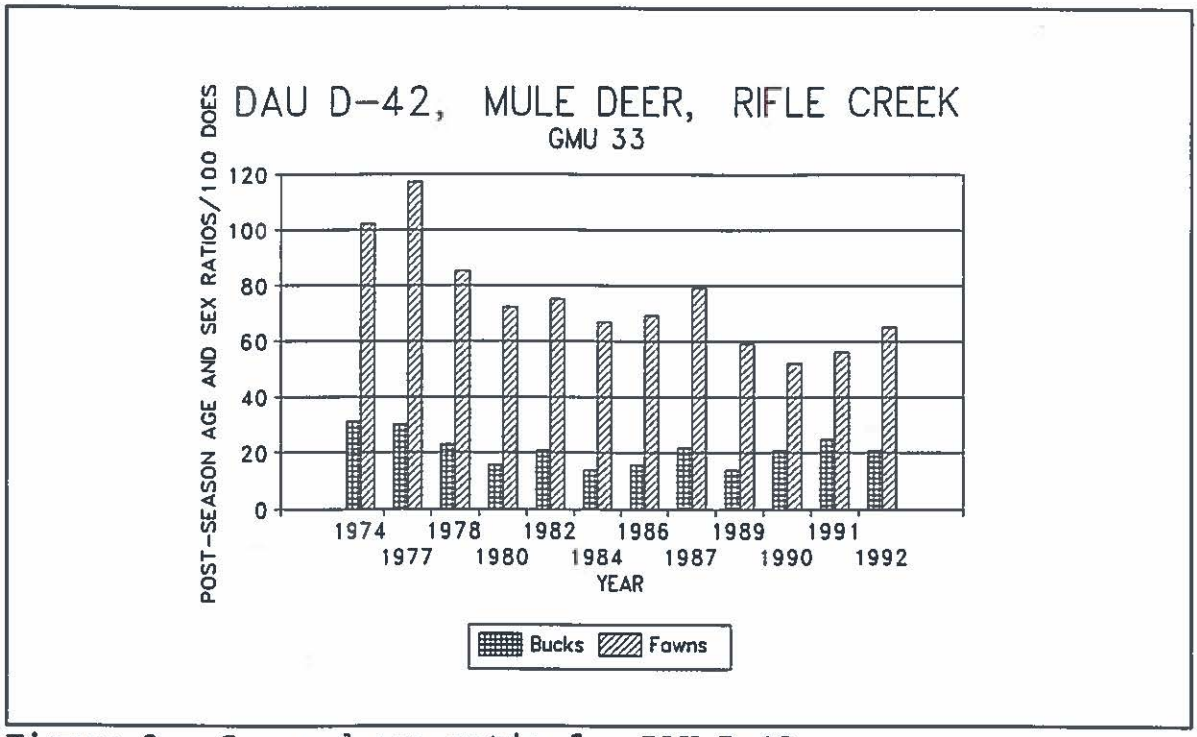


Figure 3. Sex and age ratio for DAU D-42.

combination of these factors. Declining recruitment can dramatically impact the population as well as the number of animals that can be harvested from a population.

Buck ratios have declined slightly in relation to the initial data gathered in 1974. The reason for this, if indeed there has been a decline, may be attributed to several factors. Hunters numbers have increased during the 1980s and 1990s. Additional hunters in the field may have increased the hunting pressure to a point that it reduced the total number of antlered deer in the population. Additionally, hunters are better equipped with the tools of the hunt including vehicles and rifles. Access has improved allowing for increased harvest potential of antlered deer. Season structure has changed which may also have put added pressure on buck deer.

Antler point restrictions were begun in this DAU in 1986 and continued through the 1991 season. The regular rifle season was broken into 3 seasons. During the first two seasons, only deer with three antler points or more on a side could be harvested. During the last season, any antlered deer could be harvested. Antler point restrictions were instituted in an effort to increase the availability of larger antlered deer for harvest. This "experimental" management plan was discontinued after 1991 when it was determined that it was not meeting its objective.

Disclaimer

Estimating populations of wild animals over large geographic areas is an extremely difficult and inexact science. Numerous attempts have been made to accurately count all the known number of animals in large fenced areas. All of these efforts have failed to consistently count 100% of the animals. In some cases less than 50% of the animals can be observed and counted. Highly sophisticated methods using infrared sensing have also met with very limited

success. The Colorado Division of Wildlife recognizes this is a serious problem to our management. The CDOW attempts to minimize this problem using the latest technology and inventory methodology that is available today. Most population estimates are derived using computer model simulations that involve estimations of mortality rates, hunter harvest, wounding loss and annual production. These simulations are then adjusted to align on measured post-hunting season age and sex ratio classification counts and in some cases density estimates derived from quadrat surveys and line transect. If better information becomes available, such as new estimates of survival rates, wounding loss, sex ratio at birth, density estimates, or new modeling techniques and programs, the CDOW reserves the right to use this new information and the new techniques. Making these changes may result in significant changes in the population estimate. It is recommended that the population estimates presented in this document be used only as an index or as trend data. They represent CDOW's best estimate of populations at the time they are presented.

Harvest History

Mule deer harvest has changed substantially over time in this DAU (Table 2 and Figure 4). In 1953 the harvest was 737 deer. By 1962 the harvest had increased to a record 6341 deer by 3666 hunters. This high harvest occurred during the halcyon days of mule deer management in western Colorado. Hunters were allowed to harvest more than one deer at this time. Harvests stayed high during the 60's. The average harvest for the 1960's was 2521 deer/year. Then a decline in harvest occurred in the 1970's. Only 420 deer were harvested in 1971; this harvest included no does, only bucks were legal animals. During the rest of the 70's harvests increased somewhat with the high harvest being 1575 deer in 1977. The average harvest during the 1970's was 986 deer. During the 1980's harvests increased somewhat and the 10 year average was 1165 deer. The severe winter of 1983-84 reduced the population, virtually eliminating the fawn age class that winter.

The CDOW initiated several mule deer research projects in the Piceance Basin during the early 1980's. These projects focused on the apparent declining mule deer populations in the area. The preliminary results indicated that mule deer populations were characterized by an overabundance of older age class does and a very high winter mortality on fawns. Their hypothesis was that the herds were at or above carrying capacity and that at lower population levels fawn survival would increase. The result would be similar harvests, but the herd and habitat would be in a healthier condition. DAU D-42 was selected in 1988 as a DAU that would participate in these research projects and act as extensive experiment of the hypothesis. Since that time CDOW has harvested antlerless deer in an aggressive manner in this DAU. The results on fawn survival are unknown at this time.

Hunting Pressure

Hunting pressure has fluctuated greatly over the years in this DAU (Table 2 and Figure 4). The lowest number of hunters was 832 in 1971. The highest hunting pressure occurred in 1989 when there were 5735 hunters afield. In 1962 when the two-deer licenses were issued 3666 hunters harvested 6341 deer!

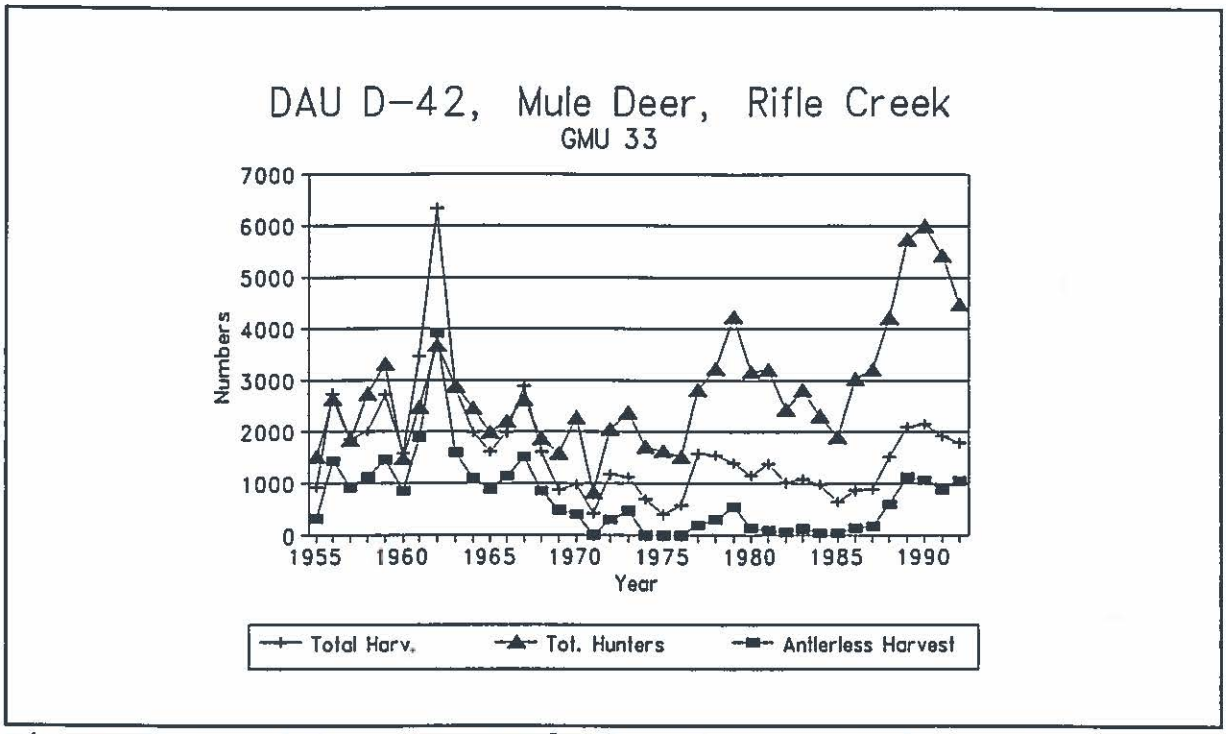


Figure 4. Total harvest, antlerless harvest and hunters for DAU D-42.

This DAU has some of the highest hunting pressure in the State. The abundance of both deer and elk and the system of roads in the National Forest allows good access to excellent hunting areas. Both archery and muzzleloading hunters find this area very attractive and hunting pressure is intense during these seasons.

Current Management Status

Current Objective

The current population objective for DAU D-42 is 10,500 deer. The sex/age ratio objective is 20 bucks/100 does and 70 fawns/100 does. The population estimate, post-hunt 1992, was 10,900 mule deer.

Recent Management Program

Since 1988, the CDOW has been aggressively reducing the population of deer in this DAU. This management was brought about for several reasons. Research at CDOW's Little Hill experiment Station in the Piceance Basin (SW of Meeker) revealed that fawn mortality was averaging about 65-70% each year. Losses of fawns in this research experiment were generally attributed to starvation and predators. Preliminary, intensive experiments, with fawns placed in fenced pastures (typical winter range) revealed that survival was directly related to density of fawns. Currently the hypothesis is being tested on a much larger scale on a free ranging

population of migratory deer. Both the CDOW and BLM were seeing the same type of overpopulation in the D-42 deer herd. Fawn mortality appeared to be high, based on field observations and reports from both the public and land management agencies. The condition of vegetation on the winter range was rated very poor by the BLM. Landowners were seeing a significant increase in deer numbers on private lands.

These factors, combined with the relatively low antlerless harvest from 1981 through 1987 indicated that perhaps the population was near carrying capacity.

Issues and Strategies

The CDOW held two public meetings and one meeting with the Forest Service and BLM in order to obtain issues and concerns. The public meeting in Rifle was held on August 18, 1993 and another public meeting was held in Glenwood Springs on August 19, 1993. At these public meeting information was presented which highlighted past management in D-42. The objective of the DAU plan was presented and questionnaires were made available for interested parties to indicate their management preferences and also present their concerns and justification for these concerns. The meeting with land use agencies was held in Glenwood Springs on August 11, 1993. Representatives from the Glenwood Resource Area (BLM) and the Rifle Ranger District (White River National Forest) were present. At this meeting DAU plans were explained and objectives were presented. Each agency discussed their preferences for DAU population and composition objectives. Issues and concerns regarding management of mule deer populations were discussed.

Eleven questionnaires were received from sportsmen, landowners, environmental concerns, outfitters, and interested individuals.

Issues and concerns - CDOW

1. Limited winter range - Mule deer populations throughout Colorado are closely tied to the amount of available winter range. Mule deer populations in D-42 are similarly restricted to a maximum size due to limitations on the amount of available winter range. After migrating from the relative lush and expansive summer ranges on the White River National Forest, the deer are forced by snow and their own traditional habits into the valleys north of Rifle, Silt, and New Castle. These mountain valleys are the last stop - the deer can't get any lower in elevation. Interstate 70 and development along the Colorado River corridor has eliminated much of the deer's historic winter range. The winter range in this DAU is of lower vegetative quality than summer ranges. This is due to the lack of moisture and the poor soil conditions.

2. High fawn mortality - The CDOW does not have empirical data which show that fawn mortality is high in this herd. But information from the local District Wildlife Manager, poor vegetation on the winter range, and environmental conditions similar to those in the Piceance Basin, all indicate that fawn mortality has been high for some time. As discussed earlier, high fawn mortality is usually a characteristic of overpopulation of deer. CDOW has conducted continuous studies in the Piceance Basin for about 12 years and fawn winter mortality has consistently stayed in the 60-70% range. Winter range

conditions in D-42 are somewhat similar to those found in Piceance Basin. In both areas, mule deer winter in similar habitat, with pinon-juniper woodlands making up the bulk of the range.

3. Housing development - The Rifle area has in the last decade seen a rapid development of housing in areas that once were deer winter ranges. Ranches have been subdivided and natural habitats have been changed or eliminated. This development has combined to reduce the amount of useable winter range for deer.

4. Game damage - Mule deer populations on private lands became a concern during the late 1980's. During that time local landowners were experiencing a noticeable increase in mule deer on their ranches during the winter and spring. The number increased to levels where there was a concern for the amount of forage that was being lost and therefore unavailable for livestock. The CDOW addressed this issue through the development of private land deer license which directed pressure and harvest onto those lands that were experiencing problems.

5. Lack of mature bucks - Like most of western Colorado the number of large, mature, trophy bucks has dropped to a very low level. The high hunting pressure and excellent harvest by hunters has limited this herd's ability to support large numbers of mature mule deer bucks. It is difficult for a buck to evade harvest and reach 5 or 6 years of age under heavy hunting pressure, which is occurring in this DAU. However, under current hunting regulations the buck ratio has maintained itself in the vicinity of the current objective of 20 bucks per 100 does (Figure 3).

6. Premature migration from National Forest - The CDOW is concerned that mule deer are moving off summer ranges sooner than has been historically observed. This premature movement results in deer becoming less available to hunters, reducing hunting success. GMU 33 historically had some of the highest hunting pressure from archery and muzzleloading hunters in the state. In 1985 there were 518 archery and muzzleloading hunters in GMU 33. This has increased to 1300 early season hunters during the 1992 season. Hunting success appears to be dropping in areas on the National Forest, particularly during the regular rifle season. The reason for this early movement is uncertain, but there is some concern that it is due to activities associated with high hunting pressure from both archery and muzzleloading hunters. This pressure combined with easy access and the increased use of all terrain vehicles, may induce deer to seek surroundings that offer added security. This problem also appears to be occurring in elk populations. The CDOW is currently addressing this concern in GMUs 23 and 24 through a elk research project. The results of this research project are not available yet.

7. Maintenance of a stable population - CDOW's objective is to maintain D-42 as a highly productive deer population, that can annually support a harvest similar to those it has supported in the past. There is a concern that deer populations are declining throughout the West and that D-42 may be impacted in a negative manner.

Issues and Concerns - Comments by Land Use Agencies

1. The FS feels the CDOW needs to provide more areas for quality buck hunting statewide. The FS as well as the CDOW is experiencing a demand for higher quality bucks. While many hunters are satisfied with harvesting any buck, a large and vociferous segment of the deer hunting community is demanding a deer population which supports a larger segment of mature bucks.

2. Both land management agencies felt that the current population objective in D-42 is probably appropriate. There is the general feeling that elk populations are a confounding factor, since they have been expanding into new areas. Elk use on deer winter ranges makes it difficult to assess mule deer use (FS & BLM).

3. The Glenwood Resource Area of the BLM expressed a concern with the lack of older age class bucks. There is a demand for large antler deer by both the hunters and perhaps with the general non-hunting public as well. There is a concern that the age structure that has evolved under current hunting regulations is not necessarily one that is biologically sound. The lack of older age class buck may have a long-term negative impact on mule deer populations (genetics).

4. The BLM is particularly concerned with mule deer winter ranges. Including general winter range, critical winter ranges, and winter concentration areas. These ranges have been and currently are in poor condition across the DAU. Over use of vegetation by mule deer and elk has occurred in the past. There are some conflicts with domestic livestock, mostly domestic sheep grazing during the winter. Drought conditions for several years in the late 80's and early 90's increased the problems.

5. The FS is concerned with mule deer distribution during the hunting seasons. The Coulter Mesa road system may possibly affect the distribution of mule deer during the hunting season. The impact would be movements of deer prematurely off their natural ranges due to excessive pressure during hunting season. This would impact harvest as well as opportunity for recreation on the forest.

Summary of Comments - Public Questionnaire

The eleven public responses to the questionnaire were summarized in Table 3. All 11 individuals indicated responses to the question concerning desired population levels, however, only 9 of the respondants selected a preference for the sex ratios (i.e., the second line does not add up to 11).

There does not appear to be significant outstanding concern for deer populations among the public sector in this DAU. Some of the concern voiced by landowners in the past 5 years may have been reduced due to the high number of limited antlerless licenses issued by CDOW since 1988.

Table 3. Summary of public response to questionaaire for DAU D-42

D-42 Rifle Creek	HOLD	INCREASE	DECREASE	% CHANGE +	% CHANGE -
Population size	6	4	1		-10
Sex ratio	1	8	0	+20*	

*Of the 3 responses to this questions the average was 20% increase.

Written Comments Included on Public Questionnaire

1. There is a demand for more quality areas for hunting deer. Several individual expressed this concern. The CDOW has several new (1992 season) GMU that have been set aside for this type of hunting; they are GMU 44 and 61. It is not likely that GMU 33 would be developed into this type of quality hunt unit. This is due to its popularity and ability to sustain a deer herd under present regulations.

2. One hunter indicated that antler point restrictions should be placed on mature bucks with no restrictions on young bucks. Limited licenses could then be used to harvest a limited number of mature bucks. This regulation has not been tried by the CDOW in the past. While it may have merits, there are potential problems. Illegal and unintentional harvest of mature bucks by unlicensed hunters would likely be a problem. This would put all the hunting pressure on young bucks. It is likely that not many young bucks would survive in the population so that they could grow into mature deer.

3. Considerable concern was voiced about elk being driven off of the public lands onto private lands due to archery and muzzleloading seasons. No comments were received concerning similar occurrences with mule deer.

4. Concern was expressed about the "health" of the mule deer herd and habitat. CDOW, FS, and BLM should be managing both so that they are in balance. CDOW, FS, and BLM are concerned with maintaining both deer herds and their ranges in good condition. The DAU plan process hopefully will result in deer populations that are more in balance with natural vegetative environment.

Alternative Development

Below are a few of the many possible alternatives that could be considered to accomplish the main purpose of the DAU plan - to determine the population and herd composition objectives. Additional alternatives can and will be considered based on the desires and input of the public and the land management agencies. Each alternative is discussed in an effort to clarify possible impacts on various biological, social, and economic elements that may be associated with mule deer in this DAU.

Population Size

Introduction - The current long-term objective is 10,500 deer. The estimated population was 10,920 deer, post-hunt 1992. The recommendation for the 1993 hunting season will likely take the population down to approximately 9,000 deer, post-hunt. As discussed earlier, CDOW has intentionally reduced this herd below the current objective as part of an extensive research project focused on increasing fawn survival and evaluating the benefits of private land deer hunts.

1. **Increase Population Objective to 12,600 (20 % increase)**

General Discussion - This would increase the population to the level of about what it was in 1989 or 1990.

Game Damage - Game damage problems, such as damage to growing hay, would likely increase. Local ranchers and farmers have indicated that at the most recent population levels (1992) damage has been reduced noticeably.

Habitat Improvement - Intensive range improvements such as burning , fertilization, and reduction in competition with elk and livestock would be necessary to maintain and hold the population at this level. The CDOW's Habitat Partnership Program (HPP) would become vitally important to improving range conditions.

Season Structure - Initially, the populations would be increased in size from present levels by drastically reducing the number of limited antlerless hunting licenses. At this level more antlerless licenses would be necessary in private land and late season hunts. This type of season would be necessary to reduce damage to stored and growing crops.

Fiscal Impacts - Income to the DOW might vary depending on numerous factors. If, at this population level, fawn mortality and range conditions remained poor, harvest may not be increased much over what could be achieved at lower population levels. After a severe winter, if ranges are in poor condition, harvest and license sales may be severely decreased. Initially license sales would drop fairly dramatically since the population would need to be built to the new level from the present level of about 8,500 deer post-hunt 1993. Game damage at these higher levels would likely be higher as would time spent in hazing and damage prevention.

2. **Maintain Population at 10,500 (current objective)**

General Discussion - Our current models indicate that CDOW has not achieved this population objective until only recently. The post-hunt population has not been this low since 1975, when the estimate was 9830 deer. Mule deer numbers have been as high as almost 18,700 deer in this GMU.

Game Damage - Game damage problems would be moderate under this alternative.

Habitat Improvement - Habitat improvement projects and reduction in competition would still be required to consistently hold the population at this level, especially during severe winters. We may not see any improvement in condition of the vegetation on winter ranges.

Season Framework - The present season framework of three combined seasons could be maintained during the regular season. The potential would remain for late seasons which would be necessary to mitigate game damage problems on private lands and in areas of the winter range where high deer numbers are affecting overused winter ranges.

Fiscal Impacts - License sales would decrease initially as the population is increased to the objective. Once the new objective is met, the antler harvest could be increased dependent on the rate of recruitment of fawns into the adult population. Fawn mortality would be a key factor. If fawn survival increased then additional deer would be available for harvest.

3. **Decrease Population Objective to 8,400 (decrease of 20%)**

General Discussion - This alternative would represent the lowest mule deer population in this D-42 ever recorded. In 1975 the post-hunt population was thought to be about 9,800 deer. This objective would be about 600 animals less than the predicted 1993 post-hunt population.

Game Damage - Game damage would remain at or below present levels. Indications from landowners are that problems have been reduced and may be at levels that they can live with.

Habitat Improvement - At this level winter populations would likely be closer to what the winter range might carry. Habitat improvement projects might not be as necessary or could be delayed or reduced in size and number. Competition with elk would be reduced. Vegetation may recover from the current poor rating. Benefits from the new Habitat Partnership Program would potentially be more significant.

Season Framework - The regular season could be maintain in its present form. Late season may be eliminated. Private land hunts would be reduced in duration or possibly not be necessary at all or authorized on some other yearly rotation.

Fiscal Impacts - Income to the CDOW and local businesses would be the most stable with this alternative. License sales may approach those levels which occurred prior to 1988. It is not likely that harvest could be sustained at the harvest level that have occurred from 1988 thorough 1993. Populations were decreased during this time and this necessitated high antlerless harvests. Game damage could be reduced, except during

extremely bad winters. If fawn survival increases, harvests may be similar to those at higher population levels.

Herd Composition (Buck:Doe Ratio)

General Discussion - The buck/doe ratio is a result of hunting seasons that have not limited the number of hunters hunting buck deer. There has been some restrictions on antler points and season length, but no limit on the number of buck hunters. The average buck/doe of the last 12 censuses is 21.1.

1. **Increase post-hunt Buck Ratio - 30 bucks/100 does.**

Habitat Improvement and Game Damage - This alternative would not have any effect on the habitat, the need for habitat improvement projects or game damage.

Season Framework - In order to obtain this ratio it would most likely be necessary to change the season structure to protect antlered deer in some manner. This could be accomplished by shortening the season length; closing the season earlier in November when the bucks are most susceptible to hunters; using limited either-sex licenses; or going to totally limited licenses. Antler point regulations have not appeared to work since there apparently is a high illegal kill resulting from this regulation. We are currently evaluation the shorten season alterative, but have no information to date which shows that this alternative may increase the number of bucks in the population. The most likely method of increasing the number of bucks in the population would be to totally limit the number of licenses for both buck and doe.

Survival Rates, Quantity and Quality of Harvest - Fewer bucks will be available for harvest under this alternative. To increase the buck ratio, the harvest of bucks will necessarily decrease during hunting seasons. Increasing the number of bucks in the population will require reducing the number of doe deer in the herd to maintain the population at the desired objective. This would lower the number of fawns that are produced and lower the overall harvest potential for the herd. The quality (trophy bucks) of the buck harvest would be expected to improve due to higher numbers of older age class bucks in the population. Survival rates would not change greatly, however, since there would be fewer fawns in the population, overall rates would decrease slightly.

Fiscal Impacts - The number of licenses that could be sold would most likely decrease in any of the scenarios used to increase buck ratios. If totally limited licenses were used the successful hunters would increase but total hunter numbers and recreation days would decrease. If shorter antlered seasons were used, the percent success, recreation days, and antlered harvest would decrease. Both of the above alternatives would result in a drop in DOW and local income and economic benefits that are derived for this herd. Totally limited licenses would result in the largest drop. However, if the number of mature bucks increased, wildlife photography and persons watching wildlife might increase. This would benefit local businesses, motel, restaurants, etc.

2. **Maintain Sex Ratio at the Present Objective** - 20 bucks/100 does

Habitat Improvement and Game Damage - This alternative would not have any effect on the habitat, the need for habitat improvement projects or game damage.

Season Framework - The season structure would not likely have to be changed. Due to various factors, the buck/doe ratio has stabilized at about 20:100. Since 1974 when post-season counts were started the ratio has averaged 21:100. During this time there have been various seasons structures and methods of conducting the hunting seasons. The factor that has remained somewhat unchanged is the number of total days available for harvesting deer.

Survival Rates, Quantity and Quality of Harvest - These would not change from the level that the public has become accustomed to finding.

Fiscal Impact - This would not change from what we are experiencing under present regulations.

3. **Decrease Post-hunt Sex Ratio** - 10 bucks per 100 does.

Habitat Improvement and Game Damage - Habitat improvement projects may be necessary to increase the carrying capacity of the summer and winter ranges. This alternative would produced the maximum number of deer available for harvest each year. Habitat conditions should be optimal so that does and fawns are getting the best nutrition possible. It should not impact damage claims because post-hunt populations should remain at or near objectives.

Season Framework - This alternative would require a change in seasons to achieve the objective. The CDOW would direct hunting pressure to the male segment of the population. This could be accomplished by lengthening the seasons, especially to allow a post-season when the bucks would be more vulnerable and available for harvest. Antler point regulations should not be used so that the buck harvest would be maximize.

Survival Rates, Quantity and Quality of Harvest - This alternative would produce the largest pre-hunt population because more does would be necessary to maintain the herd at the population objective. Carrying more does in the herd would increase the number of fawns produced each year. This then would increase the overall harvest potential for the herd. Survival rates may not change, but the total number of deer lost to winter mortality may increase because more fawns are being carried into winter and their mortality is higher than adults during the winter. The quality of the harvest based on the production of trophy bucks would decrease in response to the hunting pressure placed on the buck population. It would be more difficult for bucks to survive successive hunting seasons so that they might reach the older age classes.

Fiscal Impact - This alternative would increase hunter success, total harvest and recreation days. The would produce the maximum harvest potential for the herd. This would increase license sales and the number of hunters.

ALTERNATIVE SELECTION

Preferred Alternative

Population Objective: Decrease current objective 20%: 8,400.

Sex Ratio Objective: Maintain at current objective: 20:100.

Justification

Population Objective - The D-42 mule deer population has been either at or above carrying capacity for some time. This has been reflected in poor winter fawn survival, poor condition of winter range vegetation, and excessive damage to domestic forage and stored hay. Growth in human populations and land that has been subdivided has reduced the amount of winter range. Increases in elk numbers and competition for scarce winter resources have also put added pressure on deer herds. This accumulation of data indicates poor herd conditions and a prudent alternative would be to decrease population in an effort to produce a more "healthy" mule deer herd. By reducing the population winter survival may be increased for all age classes and sexes. Additionally, reproduction may increase due to a better body fitness of adult does after winter.

Sex Ratio objective - Currently, the CDOW is studying the impact of the 3 day buck hunting season on the production of more mature bucks in the population. It would be wise to assess this management scheme prior to adding additional regulation that would target a higher buck ratio.

Game management unit 33 is one of the most popular hunting areas in the Colorado. Increasing the buck ratio would likely require a modification in the hunting season that would significantly impact hunter opportunity. It would take some major change rather than a minor change to increase buck ratios even 20%. This DAU appears to be maintaining acceptable buck ratios under current regulations.

The demand for producing more older age class buck is high, however, there is also a substantial demand for harvesting any age class bucks too.

Management Implementation - The D-42 1993 post-hunt population is expected to be about 8000-9000 deer. The herd has been decreased below the present objective as discussed earlier. This would have the greatest impact on the number of antlerless licenses issued for the 1994 big game season. Populations will already be at or near the new objective. Substantially fewer antlerless licenses would be issued for this DAU. The number issued would be dependent on winter conditions during 1993-94, which would directly affect fawn survival. Private land, post and

early season may not be necessary. Habitat Partnership Program projects would help maintain a stable population.

Appendix A.

Comments on Deer Population Dynamics and Objectives

Numerous studies of biological populations of such species as bacteria, mice, rabbits and white-tailed deer have shown that animal populations grow in a mathematical relationship that biologists refer to as the "sigmoid growth curve" or "S" curve (Fig. 5). There are three distinct phases to this cycle. The first phase occurs while the population level is still very low and is characterized by a slow growth rate and a high mortality or death rate. This occurs because the populations may have too few animals and the loss of even a few of them to predation or accidents can significantly affect the population. In other words, there appears to be something to be said for the old saying, "there's strength in numbers."

The second phase occurs when the population number or density is at a moderate level. This phase is characterized by a very high reproductive and survival rate. During this phase, food, cover, water and space (habitat) is abundant and optimal. Also, during this phase, animals such as white-tailed deer have been known to successfully breed at six months of age and produce a live fawn on their first birthday, older does have been known to produce 3-4 fawns that are very robust and healthy. Survival rates of all the deer (bucks, does and fawns) are at maximum rates during this phase.

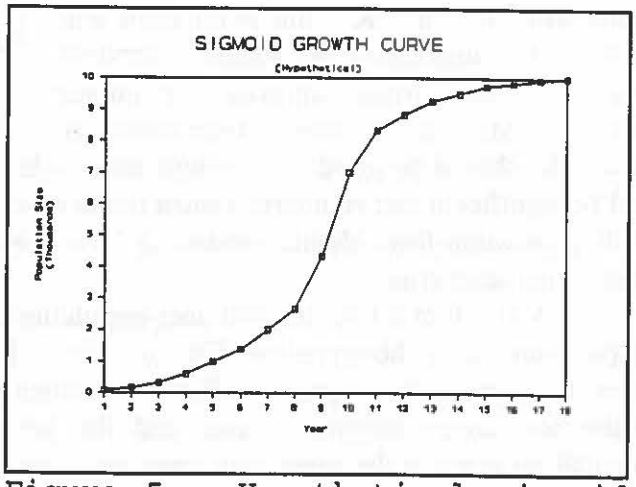


Figure 5. Hypothetical sigmoid growth or "S" curve.

The final or third phase occurs when the habitat becomes too crowded. During this phase the quantity and quality of food, water, cover and space become scare due to the competition with other members of the population. This phase is characterized by a decrease in reproduction and survival. Also, during this phase white-tailed deer fawns can no longer find enough food to grow to achieve a critical minimum weight so that they can reproduce; adult does will usually only produce 1-3 fawns; and survival of all deer (bucks, does and fawns) will decrease. During severe winters, large die offs can occur due to the crowding and lack of food. The first to die during these situation are fawns, then bucks followed by the adult does. The severe winters thus affects the future buck to doe ratios by favoring more does and fewer bucks in the population. Also, since the quality of a buck's antlers is dependant upon the quantity and quality of his diet, the antlers are stunted during this phase. If the population continues to grow it will eventually reach a point called "K" or the maximum carrying capacity. At this point, the population reaches an "equilibrium" with the habitat. The number of births each year equal the number of deaths, therefore, to maintain the population at this level would not allow for any "huntable surplus." The animals in the population would be in relatively poor condition and when a severe winter or other catastrophic event occurs, a large die-off is inevitable. Thus, another old expression, "the bigger they are the harder they fall" may be appropriate here. A recent example of such a population die-off occurred in the relatively unhunted Northern

Yellowstone elk herd during the severe winter of 1988-89. This winter followed the forest fires of 1988 that raged in the National Park.

What does all this mean to the management of Colorado's big game herds such as deer and elk? It means that if we attempt to manage for healthy big game herds, we should attempt to hold the populations at about the middle of the "sigmoid growth curve." Biologist call this "MSY" or "maximum sustained yield." At this level, which is exactly half the maximum population size or "K", the population will display the maximum production, survival and available surplus animals for hunter harvest. Also, at this level, range condition and trend should be good to excellent and stable, respectively. Game damage problems should not be significant and economic return to the local and state economy should be at the maximum. This population level should produce a "win - win" situation to balance sportsmen and private landowner concerns.

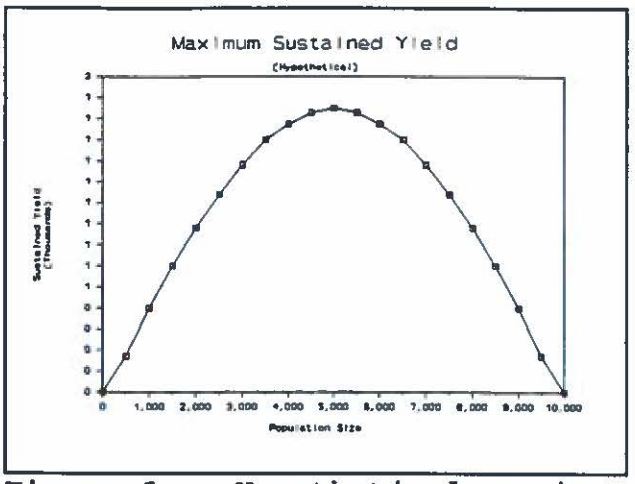


Figure 6. Hypothetical maximum sustained yield curve (MSY).

A graph of a hypothetical deer population showing sustained yield (harvest) potential vs. population size is shown below (Fig. 6). Notice that as the population increases from 0 to 5,000 deer, the harvest also increases. However, when the population reaches 5,000 or "MSY", food, water and cover becomes scarce and the harvest potential decreases. Finally, when the population reaches the maximum carrying capacity or "K" (10,000 deer in this example), the harvest potential will be reduced to zero. Also, notice that it is possible to harvest exactly the same number of deer each year with 3,000 or 7,000 deer. This phenomenon occurs since the population of 3,000 deer has a much higher survival and reproductive rate compared to the population of 7,000 deer.