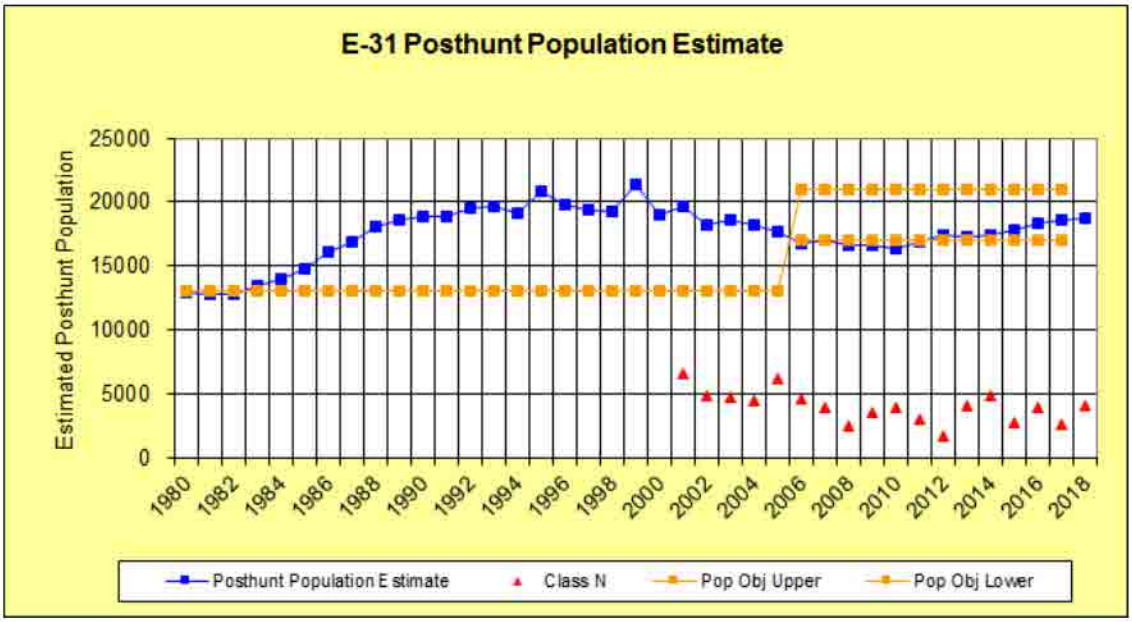
From: Weinmeister - DNR, Brad
Sent: 20 Nov 2019 12:00:09 -0700
To: Garcia, Anthony -FS
Subject: E31 population data

Anthony,

Here are some population data for E31 (GMUs 75, 77, 78, 751, and 771). The population graph shows the population in an increasing trend. This is somewhat deceiving and has to do with the limitations of the population model. A reminder that population models are a tool, not an end all answer. The population at best is remaining stable, and perhaps even decreasing. Each year our estimate is around 19,000 +/-. This year's estimate (18,680) is actually lower than the 2016 (19,030) and 2017 (19,260) estimate. Confused yet? With the winter calf numbers we're seeing, we can't grow a population. The other thing to keep in mind with this model is that difference in the peak of the population in the late 90's early 2000's and the recent low is much greater than what is being shown. I'm trying to get a better working model, but right now it's best to recognize the limitations.



Here's a link to elk statistics on CPW's webpage that has population estimates for DAUs dating back to 2005 .

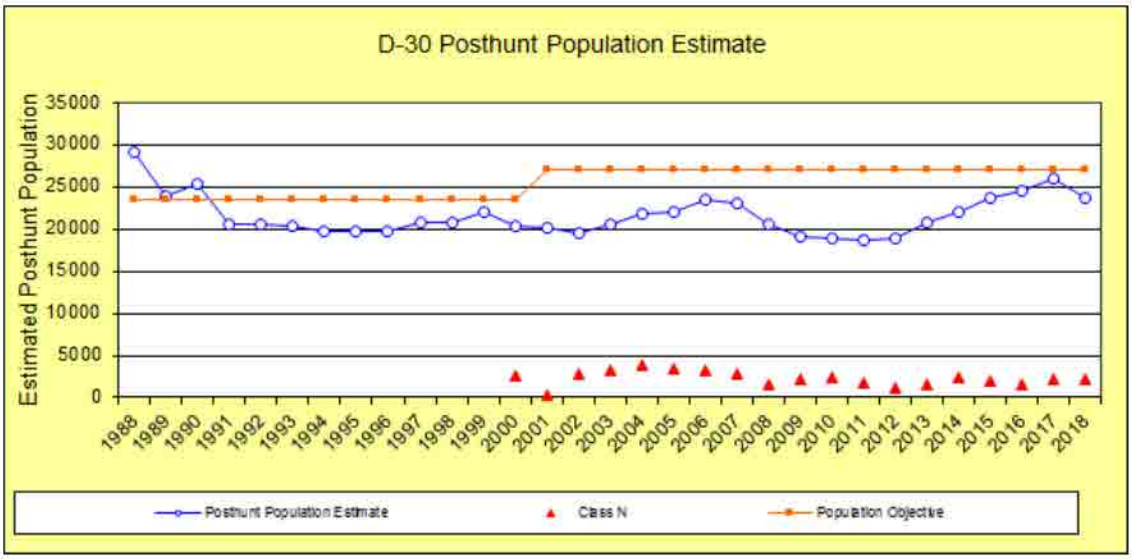
--
Brad Weinmeister
Wildlife Biologist

Colorado Parks and Wildlife
970-375-6714
151 East 16th St, Durango, CO 81301

From: Weinmeister - DNR, Brad
Sent: 21 Nov 2019 14:58:14 -0700
To: Garcia, Anthony -FS
Subject: Re: E31 population data
Attachments: D30 plan DRAFT Nov2019.pdf

Here's the D-30 data. I feel a lot better about this model and its depiction of the population. We've been seeing good recruitment over the past several years that supports the upward population trend. I'm in the process of revising the management plan with the new plan proposing to keep the same management objectives. The draft plan is attached. In the next day or two I'll be asking the FS for review and comments on the plan (I'll be asking HPP for the same).

For what it's worth, we've been trying to manage E-31 towards the upper end of the population objective range of 21,000 for the past nine years.



On Thu, Nov 21, 2019 at 11:49 AM Garcia, Anthony -FS <anthony.garcia3@usda.gov> wrote:

> Thanks Brad! We'll continue to say the E31 elk population is stable to slightly decreasing in our EA reports. And, the current population estimate is approximately 18,680 which is in the population objective range of 17,000 to 21,000 animals. We'll be using this information for the Valle Seco Land Exchange EA and Upper Rio Blanco Vegetation Management EA.
>
> Can you send me the same information for mule deer?

Anthony

Anthony Garcia
Wildlife Program Lead
Forest Service

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p: 970-264-1544
f: 970-264-1538
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180 Pagosa Street
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www.fs.fed.us

Caring for the land and serving people

From: Weinmeister - DNR, Brad <brad.weinmeister@state.co.us>
Sent: Wednesday, November 20, 2019 12:00 PM
To: Garcia, Anthony -FS <anthony.garcia3@usda.gov>
Subject: E31 population data

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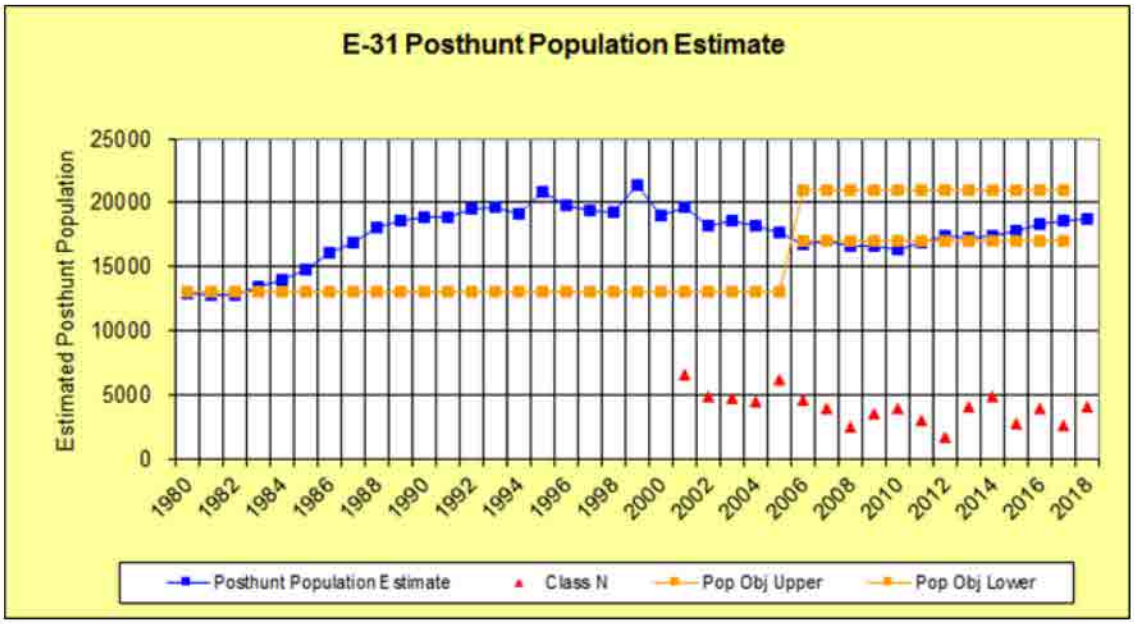

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--

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- DRAFT -

San Juan Basin Mule Deer Herd Management Plan

Data Analysis Unit D-30

Game Management Units 75, 77, 78, 751 and 771

Prepared by:
Brad Weinmeister
Wildlife Biologist
Colorado Parks and Wildlife
Durango, CO

November 2019

San Juan Basin Mule Deer Herd Management Plan (D-30)

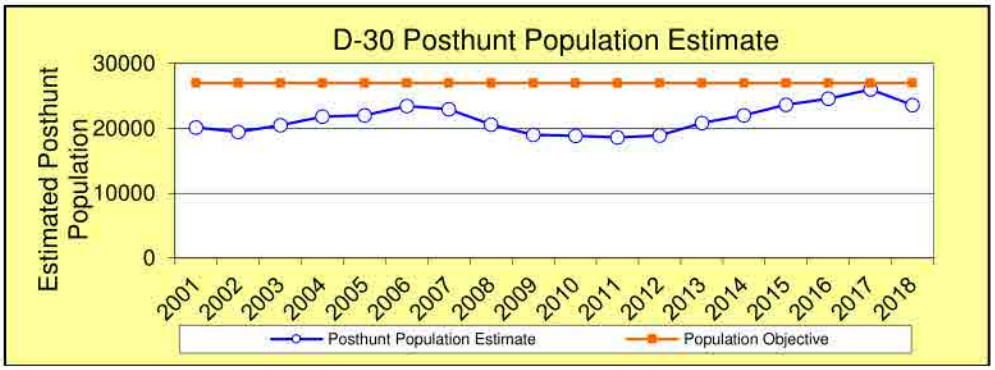
Executive Summary

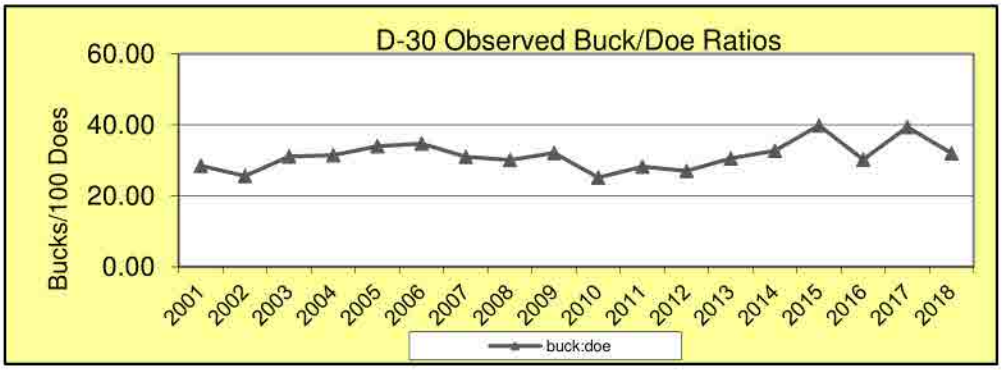
GMUs: 75, 77, 78, 751 and 771
Land Ownership: 55% USFS, 30% private land, 12% Southern Ute Tribal Lands, and 2% BLM
Posthunt Population:

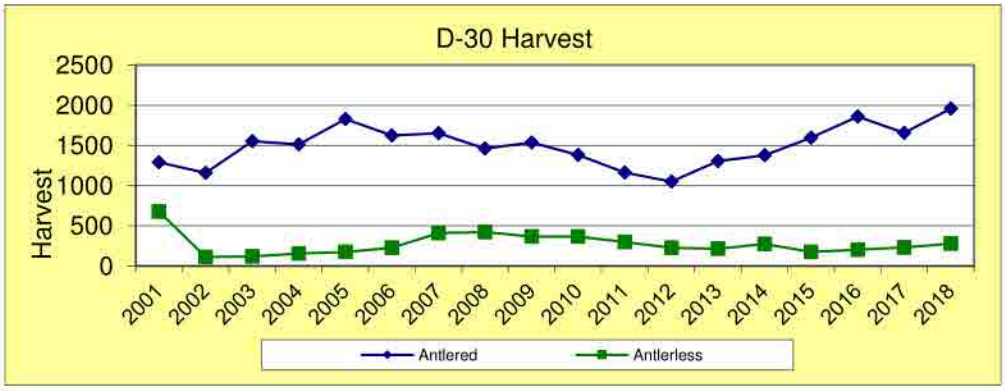
2018 Modeled Estimate: 23,500
Previous Objective: 27,000
Proposed Objective: 23,000 – 27,000

Posthunt Sex Ratio:

2018 Observed: 32 bucks:100 does
Previous Objective: 26-30 bucks:100 does
Proposed Objective: 26-30 bucks:100 does







Background

The San Juan Mule Deer Herd is located in Southwest Colorado and includes GMUs 75, 77, 78, 751, and 771. The DAU is within portions of Archuleta, Hinsdale, La Plata, Mineral, and San Juan counties. The deer population has been gradually increasing over the past six years due to good fawn numbers and reached the population objective of 27,000 in 2017. Severe drought decreased numbers slightly in 2018. The buck ratio has been running above objective, but aggressive hunter harvest over the past two years is bringing it down.

Significant issues

Conflicts between deer and agricultural interests occurs within the DAU, but overall remains low. The degree of conflict varies and is addressed through the availability of private land only hunting licenses and on an individual basis with land managers. The San Juan Basin Habitat Partnership Program is active in working with landowners where conflicts exist.

Loss of critical habitat, specifically winter range and migration corridors, due to human population growth is a concern in the DAU. Exurban development is occurring in Archuleta and La Plata counties and homes are replacing open lands currently supporting wintering deer. Natural gas well development is also increasing in deer habitat on private and public lands. Lastly, outdoor recreation continues to grow, placing more people into areas used by deer. Increased recreational trails and recreation use is decreasing the amount of effective habitat. Wildlife biologists and the public are concerned over cumulative and prolonged impacts disrupting migration and decreasing quality and quantity of winter habitat. Actions to enhance and protect important mule deer habitat will be necessary to meet the population objectives of this HMP.

Chronic wasting disease (CWD) has not been detected in the DAU, but is found in adjacent areas. It is expected that CWD is in the population and hasn't been detected, or it will be in the population by the time this HMP expires. Management practices are identified to decrease the spread of and impacts of CWD.

Management Objectives

There have not been significant concerns about the current management of the D-30 herd. Based on this, it is proposed to continue with the same objectives, course of management actions, and strategies for this DAU. Objectives would remain at:

Posthunt Population: 23,000-27,000
Posthunt Sex Ratio: 26-30:100

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Introduction and Purpose

Colorado Parks and Wildlife (CPW) manages wildlife for the use, benefit and enjoyment of the people of the state in accordance with the CPWs Strategic Plan and mandates from the Parks and Wildlife Commission and the Colorado Legislature. Colorado's wildlife resources require careful and increasingly intensive management to accommodate the many and varied public demands and growing impacts from people. To manage the state's big game populations, CPW uses a "management by objective" approach (Figure 1). Big game populations are managed to achieve population objective ranges and sex ratio ranges established for data analysis units (DAUs).

The purpose of a DAU plan is to provide a system or process which will integrate the plans and intentions of Colorado Parks and Wildlife with the concerns and ideas of land management agencies and interested publics in determining how a big game herd in a specific geographic area, DAU, should be managed. In preparing a Herd Management Plan (HMP), agency personnel attempt to balance the biological capabilities of the herd and its habitat with the public's demand for wildlife recreational opportunities. Our various publics and constituents, including the U.S Forest Service, the Bureau of Land Management, sports persons, guides and outfitters, private landowners, local chambers of commerce and the general public, are involved in the determination of DAU population and herd composition objectives and related issues. Public input is solicited and collected by way of questionnaires, public meetings and comments to the Parks and Wildlife Commission.

A Data Analysis Unit or DAU is the geographic area that represents the year-around range of a big game herd and delineates the seasonal ranges of a specific herd while keeping interchange with adjacent herds to a minimum. A DAU includes the area where the majority of the animals in a herd are born and raised as well as where they die either as a result of hunter harvest or natural causes. Each DAU usually is composed of several game management units (GMUs), but in some cases only one GMU makes up a DAU.

The primary decisions needed for an individual HMP are how many animals should exist in the DAU and what is the desired sex ratio for the population of big game animals e.g., the number of males per 100 females. These numbers are referred to as the DAU population and herd composition objectives, respectively. Secondarily, the strategies and techniques needed to reach the population size and herd composition objectives also need to be selected. The selection of population and sex ratio objectives drive important decisions in the big game license setting process, namely, how many animals need to be harvested to maintain or move toward the objectives, and what types of hunting seasons are required to achieve the harvest objective.

Figure 1. Management by objectives process used by the CPW to manage big game populations on a DAU basis.

Description of DAU

The San Juan Basin Mule Deer Herd (DAU D-30) is located in the southwest part of Colorado and contains GMUs 75, 751, 77, 771, and 78 (Figure 2). The DAU is 2,800 square miles and includes portions of Archuleta, Hinsdale, La Plata, Mineral, and San Juan counties. D-30 is bounded on the north and east by the Continental Divide, on the south by the New Mexico state line, and on the west by the Animas River and contains the towns of Durango, Bayfield, Ignacio, Arboles, and Pagosa Springs.

The climate is a highland or mountain climate, characterized by cool springs and falls, warm summers and moderately cold winters. Average precipitation and snowfall for Durango are 18 and 63 inches per year respectively. Snowfall increases dramatically moving to the east and toward the Continental Divide, approaching 250-300 inches per year. Vegetative types include: alpine over 12,000 feet elevation, spruce/fir stands down to 10,000 feet, oakbrush, serviceberry, and ponderosa pine above 7,000 feet, and pinyon/juniper/sagebrush and agricultural fields below 7,000 feet.

Habitat Resource and Capabilities

Land ownership is composed of 55% U.S. Forest Service (which includes portions of two Wilderness Areas, the Weminuche and South San Juan), 2% Bureau of Land Management, 30% private land, and 12% Southern Ute Tribal (SUIT) lands (Figure 2).

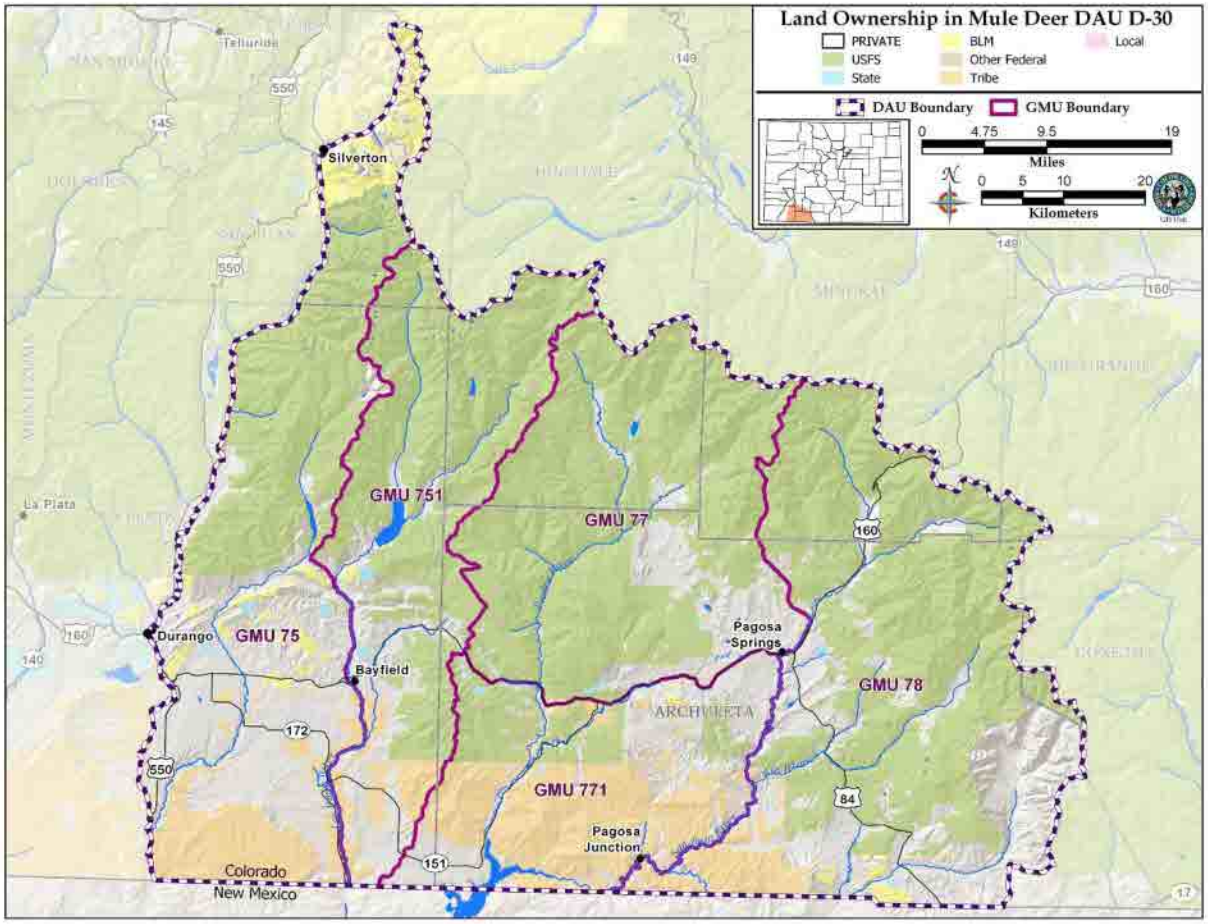

Figure 2. DAU D-30 boundaries, GMUs, and Land Ownership in the San Juan Deer Herd.

Deer generally summer at higher elevations found at the northern and eastern part of the DAU and winter in lower elevations in the southern portion. The timing of deer migration is consistent annually. In the spring it peaks around the second week of May. Fall migration peaks around the third week of October for does. Bucks generally migrate one to two weeks later in the fall.

While the entire DAU is considered summer range, winter range is more limited and comprises approximately 37% of the DAU (1,030 miles^2). The areas along US Highway 160 and south of the highway, as well as the Animas River Valley are classified as winter range (Figure 3). Severe winter range, the area where most of the deer are found in severe winters, covers 390 miles^2 (14% of the DAU) and are located along and south of Hwy 160 between Durango and Bayfield, lower Stollsteimer Creek, and Valle Seco/Trujillo. Winter concentration areas are those areas where deer normally concentrate in a range of winter severities. These areas make up approximately 13% (365 miles^2) of the DAU and occur along the Hwy 160 corridor between Bayfield and Durango, Florida Mesa, Piedra River/Stollsteimer Creek south of Hwy 160, and Valle Seco/Trujillo areas. Winter range of the deer herd extends onto SUIT Lands and into New Mexico.

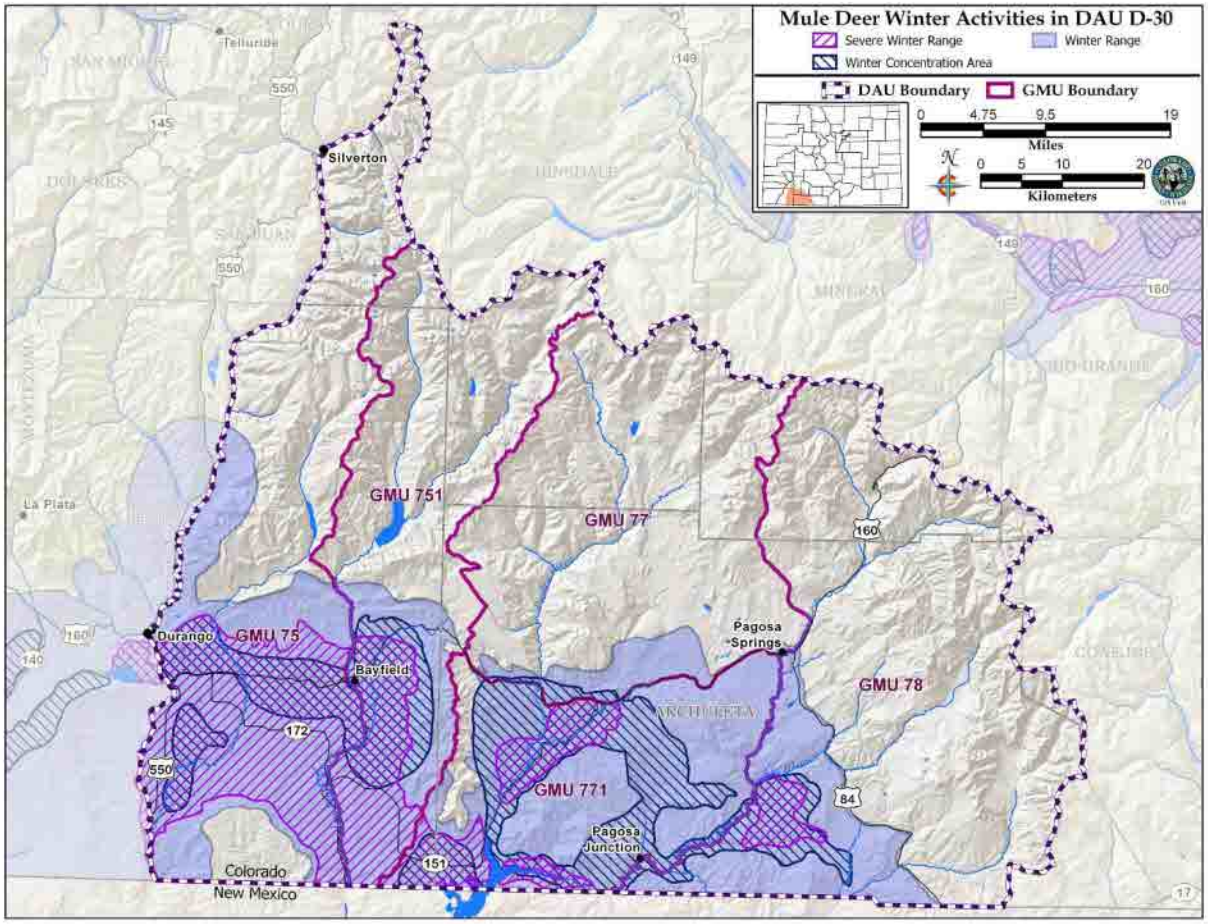

Figure 3. Mule Deer winter activity in D-30.

Winter Habitat Resources

The amount and quality of winter range is a limiting factor for this deer herd. Winter range is primarily privately owned (51%), with the remainder located on the SUIT (28%) and public lands (21%). Ten percent of severe winter range occur on public lands, 21% on SUIT, and 69% on private lands. These lands are becoming more limited with human encroachment. Drought over the past two decades has decreased the quality of habitat, especially winter habitat.

Habitat Loss

Urban development is occurring on much of the winter range and migration corridors in D-30. Managers and the public are increasingly concerned over cumulative and prolonged impacts disrupting migration and decreasing quality and quantity of winter range. Development influences both carrying capacity and harvest management. Development is a DAU wide issue but it is a considerably larger problem near Durango, Bayfield, and Pagosa Springs. Loss of habitat is one of the top causes for species declines that lead to extinction.

Conflicts with Agriculture

Growing crops in the area consist primarily of irrigated grass hay and grass hay/alfalfa mix. There are cattle and domestic sheep operations on private lands as well as on Forest Service and BLM lands.

Wildlife conflict areas are mostly south of US Hwy 160. Specific conflict areas are the Florida Mesa, Allison/Arboles, the Pine River Valley, and the southern San Juan River. Conflicts are addressed in part with Private Land Only (PLO) hunting licenses and Distribution Management hunting licenses. Wildlife Managers and the San Juan Habitat Partnership Program also work with local agriculture producers to minimize conflicts.

US Forest Service employees have not reported conflicts with permittees at current or past deer population sizes.

Herd Management History

Posthunt Population Size

The primary goal of this HMP amendment is to re-evaluate the population objective. The current post-hunt deer population objective of 27,000 was established in 2001. The estimated posthunt deer population since 2001 has been below objective, but has been increasing over the past six years due to good recruitment. The current (2018) posthunt population is estimated to be 23,500 (Figure 4).

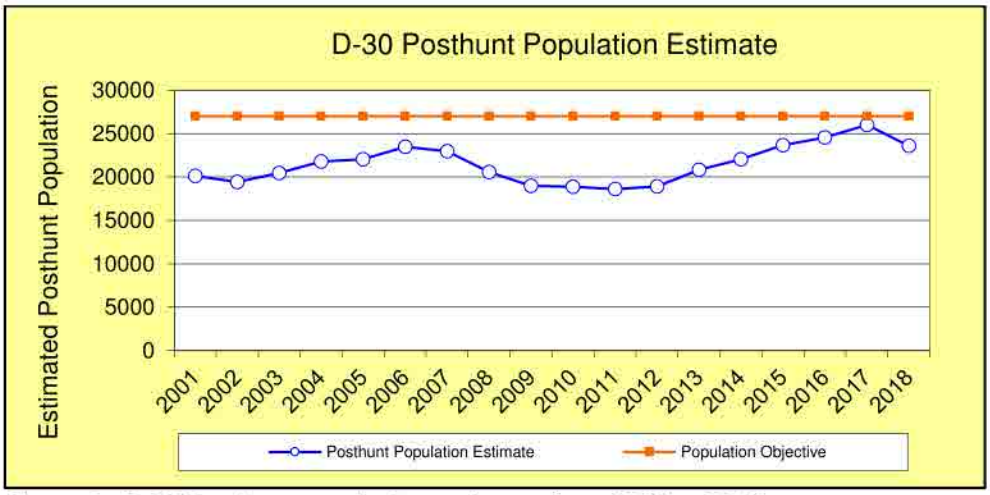

Figure 4. D-30 Posthunt population estimate from 2001 to 2018.

Posthunt Herd Composition

Posthunt fawn ratio estimates, observed from aerial inventory, averaged 53 fawns per 100 does from 2001 (the year the previous management plan was developed) to 2018 (range of 43 to 65) (Figure 5). A mean of 54 fawns per 100 does was observed over the last six years and contributed to the population growth over the same time. Fawn numbers dropped in 2018 due to an extremely dry winter the previous year with poor forage. Drought can be more influential on fawn survival than harsh winters.

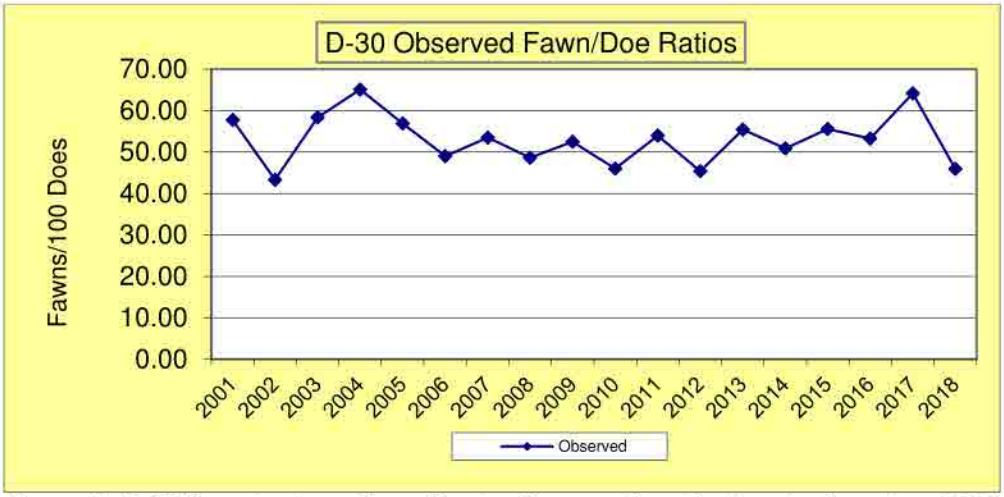

Figure 5. D-30 fawn to doe ratio estimates from posthunt helicopter inventory 2001- 2018.

Buck licenses were limited in the DAU in 1999 when CPW went from over-the-counter buck licenses to limited. Post-hunt buck to doe ratio estimates have fluctuated since limitation and currently are high (Figure 6). This is because of the limited licenses, but more so attributed with the increase of fawn numbers over the past several years. From 2001 to 2018 buck to doe ratios averaged 31 bucks per 100 does (range = 25 in 2010 to 40 in 2015). The 5 and 10 year buck to doe ratio means are 35 and 32 respectively. A fourth season buck hunt is offered in the DAU with limited opportunity.

All antlerless licenses are limited and set annually to meet population objectives. Private Land Only (PLO) doe licenses are available to address deer conflicts on private land.

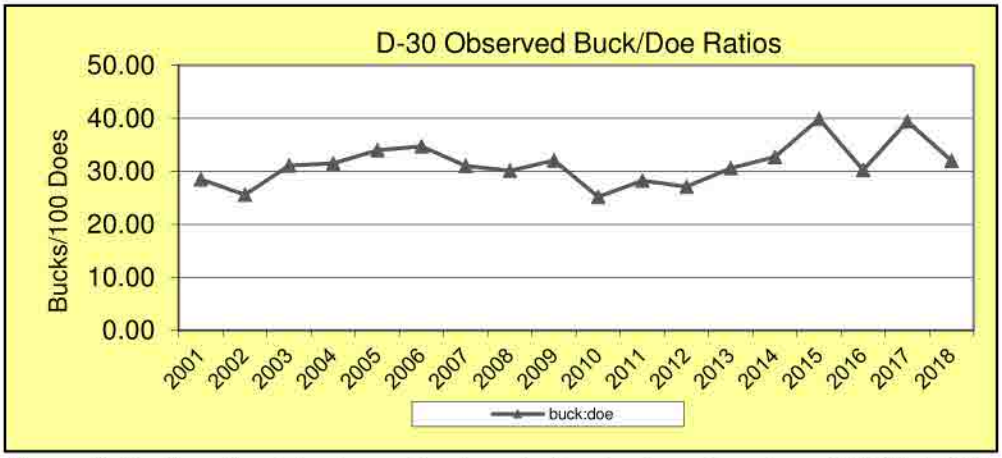

Figure 6. Posthunt buck to doe ratios from helicopter inventory from 2001 to 2018.

Harvest

Doe harvest has been low in an effort to increase the population and achieve the population objective (Figure 7). Doe harvest has ranged from 111 in 2002 to 678 in 2001 (average 273 from 2001 to 2018). Buck harvest has ranged from 1,050 in 2012 to 1,959 in 2018 (average 1,498 from 2001 to 2018). Success rates for bucks are high, generally running above 55% during the rifle seasons. Interestingly,

buck harvest in 2018, under limited licenses, was 1,959. This was equivalent to the buck harvest in 1998, the last year of unlimited buck licenses, when 1,980 bucks were harvested. Today there are more bucks in the population, more mature bucks, and hunter demand approximately equals the number of available licenses in most of the seasons.

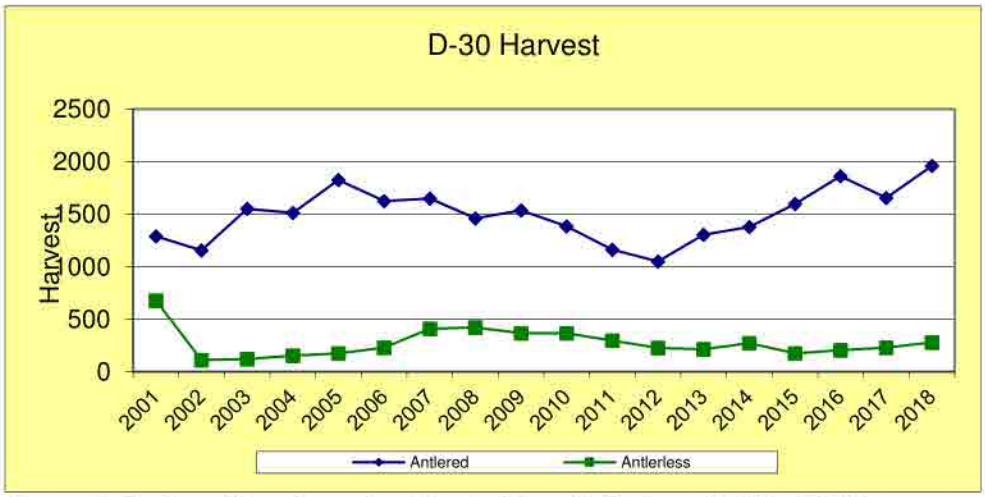

Figure 7. Buck and Doe harvest estimated from D-30 from 2001 to 2018.

Herd Management Issues

Human Encroachment into Critical Habitat

Winter range, a critical component for deer, is already limited and the habitat that is most at risk by development. Deer eat less and lose weight during the winter and, to conserve energy, they limit physical activity. Any type of disturbance will cause a deer to use more energy during this critical time and lead to a higher chance of that animal dying. It can also influence reproduction success and survival of fawns.

Migration corridors are needed for deer to access important summer and winter ranges. The largest and most productive deer populations in the west are migratory. Development and barriers that disrupt migration can have a direct bearing on deer health, survival and reproductive success.

Population Growth and Development

Colorado's population has grown by 1.2 million, or approximately 27% over the past 17 years. La Plata County, which also experienced a 27% growth for the same period, currently has an estimated 55, 600 people (United States Census Bureau at census.gov). This is expected to increase to 94,000, a 70% increase, by 2050 (Colorado Department of Local Affairs) (Figure 8). Archuleta County, the other main population center in the San Juan Basin, had an estimated population of 13,300 in 2017 and grew 35% over the past 17 years. New housing development is necessary to accommodate this growth. Annually there are over 300 building permits issued in La Plata County. With the increased estimated population growth, the number of building permits needed annually is expected to be 790, an increase of 130% (Iverson 2015).

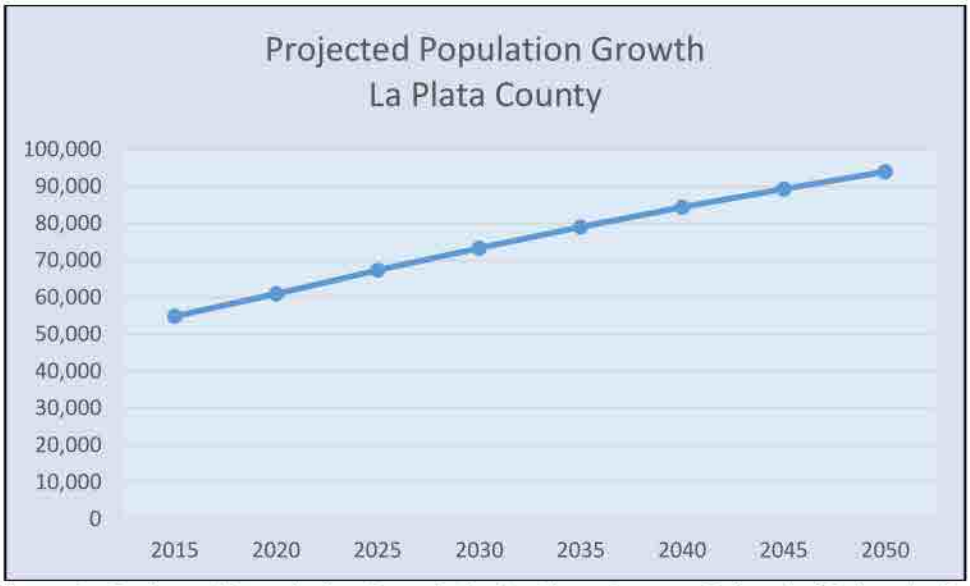

Figure 8. Projected Population Growth for La Plata County, Colorado (Colorado Department of Local Affairs).

Johnson et al. (2016) analyzed a 40-year relational/correlative study, looking at land use changes from 1970 to 2010 and the impacts on deer populations. From this analysis, for the entire D-30 DAU, the proportion of "undeveloped" private land (0 houses) has decreased from 22% to 9%. The majority of this growth occurs in areas that overlap mule deer winter range. Winter range, which is already limited, is continually being lost due to residential development and will be lost at a greater rate with the expected human population growth. Already, from 1970 to 2010, the amount of winter range on private lands that has been undeveloped has decreased by 67%. With a shrinkage of winter habitat, we can expect to see declining recruitment rates and a reduction in the deer population (Johnson et al 2016).

Not only do housing developments increase with the expanding population, but vehicle traffic also increases. US Highway 160, the major east/west transportation route in the area, US Highway 84 south of Pagosa Springs, and US Highway 550 bisect mule deer winter range. Highway 160 five miles east of Durango has an Average Annual Daily Traffic (AADT) count of 13,000 (Colorado Department of Transportation). This is expected to increase to over 18,000 AADT in the next 20 years, a 38% increase. The number of vehicle/wildlife collisions is difficult to track because not all are reported. It is common to drive Hwy 160 east of Durango when mule deer are on winter range and see several fresh deer carcasses along the road. Increased vehicle density logically will intensify deer mortality. It is a concern for both herd welfare and human safety. Also, highways can be a barrier to wildlife movement, short-stopping animals from reaching critical habitats. Where highways and deer overlap there are two goals; 1) keep deer off the roadway and from getting hit by vehicles, and 2) allow deer to access both sides of the highway in their daily and seasonal movements.

Housing development and roads further reduce available habitat through fragmentation. Animals remaining in developed areas have to navigate across roads, and around houses, humans, dogs, fences and other physical and psychological barriers. This requires additional energy and increases stress for each animal, leading to poorer health, lower chance of survival, and decreased reproductive success (Gill et al 1996 and Frid and Dill 2002).

Energy Development

La Plata County has one of the largest coalbed methane reserves in Colorado. These reserves underlie mule deer winter range. The gas is presently extracted through wells and according to the Colorado Oil and Gas Conservation Commission website (cogcc.state.co.us) there were over 3,400 active wells in La Plata County in 2018 (Figure 9). The average well pad is 3.5 acres in size.

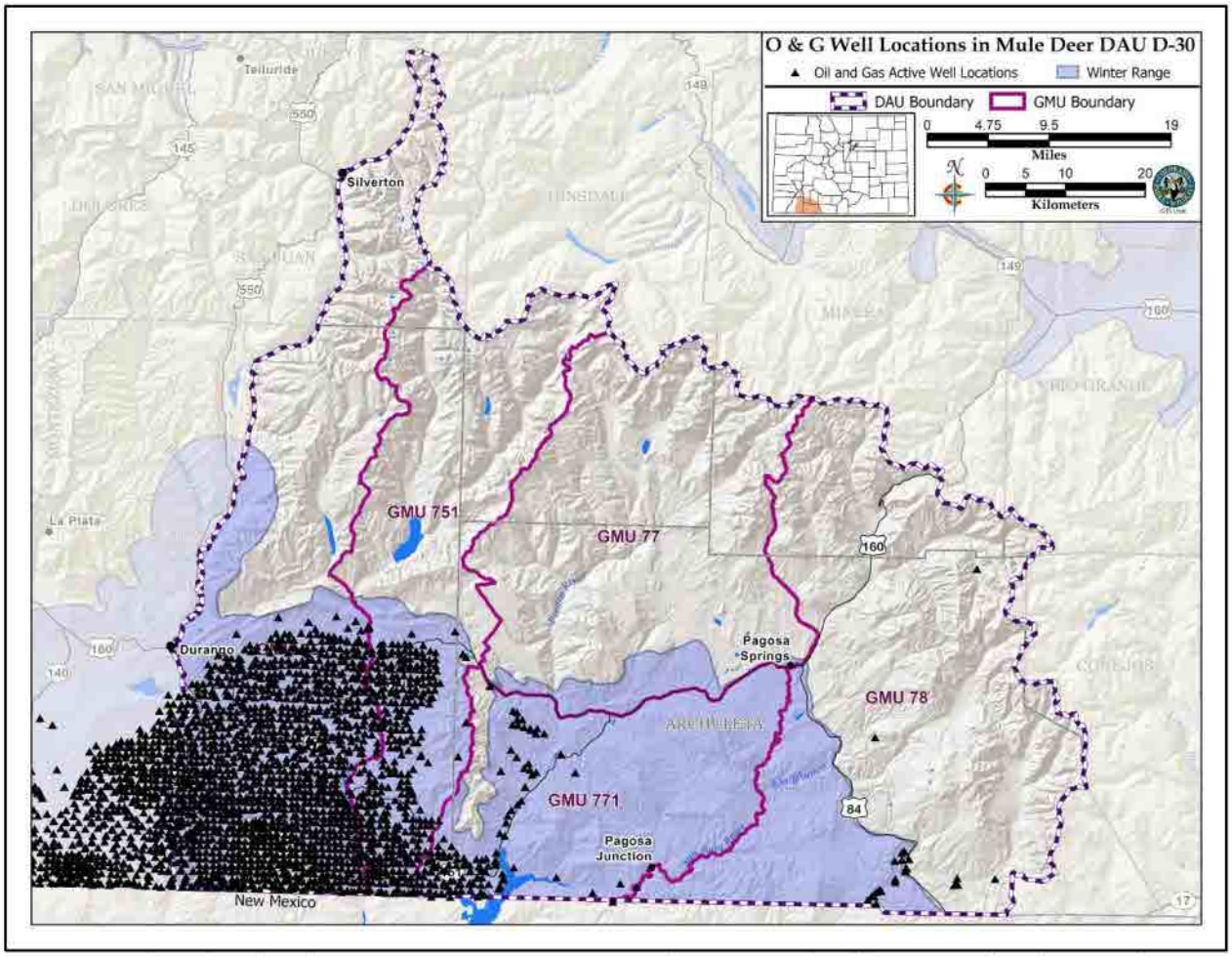

Figure 9. Colorado Oil and Gas Conservation Commission's permitted well locations (as of September 2018) mapped on mule deer winter range in DAU D-30.

Energy development can have an adverse impact to mule deer recruitment rates and population size (Johnson et al 2016). Habitat is lost directly from well pads, roads, gas lines and facilities. Associated activity and disturbance from well development and maintenance can lead to animal avoidance and decrease the overall quantity of effective habitat (Barber et al 2010, Sawyer et al 2006, 2009). Effective habitat is reduced further by fragmentation of habitat (Noss and Cooperrider 1994). Lastly, physiological stress often occurs in animals, which can negate health, survival, and reproductive success (Gill et al 1996 and Frid and Dill 2002).

Recreational Development

Outdoor recreation is highly sought after in the southwest Colorado with hundreds of miles of recreation trails around Durango and Pagosa Springs. These trails are popular with hikers, runners, skiers, snowshoers, equestrians, and mountain bikers. There is a continued and seemingly endless demand for the development of more trails. A high percentage of existing and proposed trails are on mule deer winter range (Figure 10).

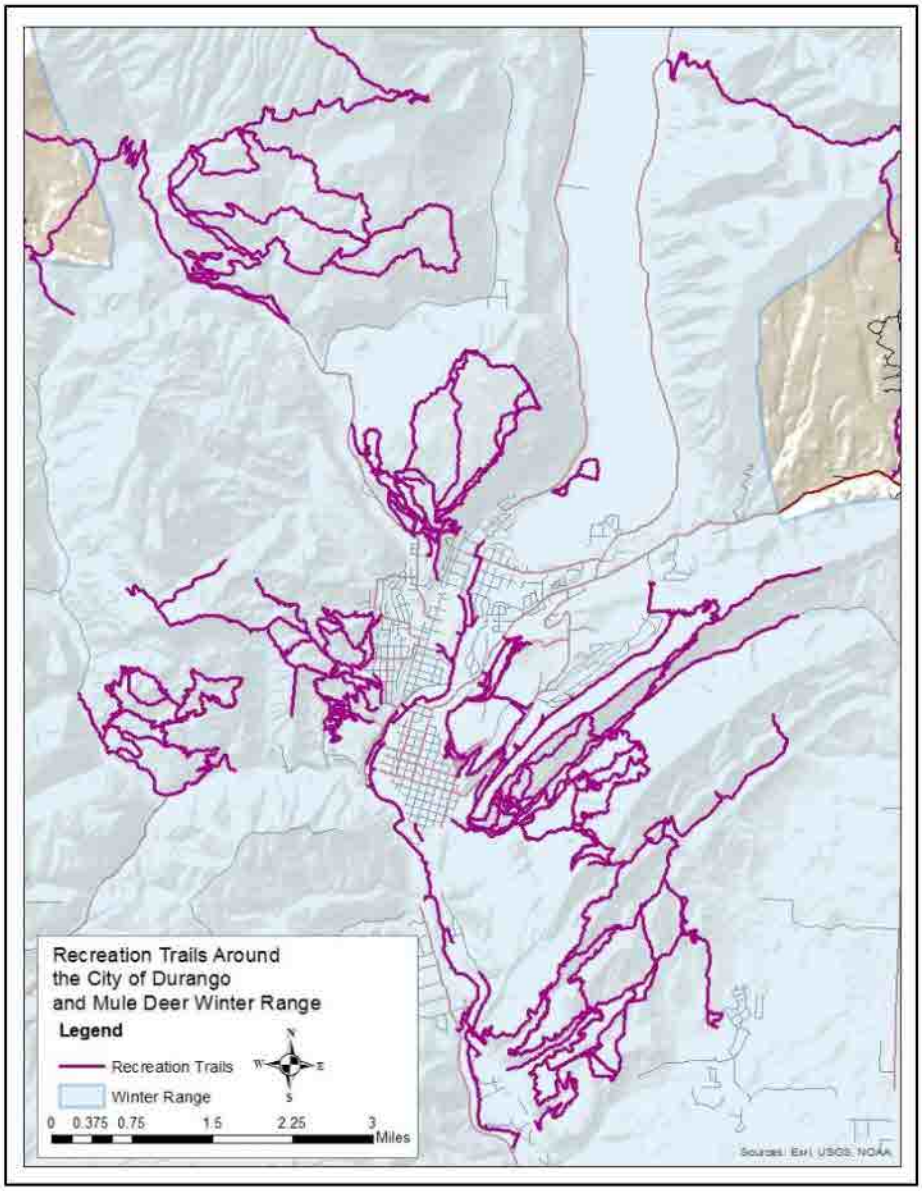

Figure 10. Recreation trails located on mule deer winter range around Durango, CO. Illegal, or "social", trails are not depicted on the map.

Outdoor recreation associated with trails influence a variety of wildlife species in multiple ways. Impacts to wildlife from trail use are often negative and are associated with increased direct disturbance and displacement from optimal habitats due to avoidance of human activities. Mule deer movement rates during the day, especially in the morning, have been demonstrated to be higher in the presence of

mountain biking and hiking (Wisdom et al 2004). Trail recreation disturbance to deer reduces foraging opportunity. Reduced forage and nutrition decreases the individual health, survival, and reproductive potential, which can have a cumulative effect of reducing the overall population (Bergman et al 2015, Bishop et al 2009). Response by deer to hiking and biking is generally similar except there is a greater flight distance (movement to avoid people) caused by people on foot (Taylor and Knight 2003). Biking generally has a larger area of disturbance because of the greater distance travelled per trip. The presence of a dog with a recreationist (dogs are popular in the area) results in a greater area of negative influence from trail use, including amplified avoidance distances moved by mule deer (Miller et al 2001). Mule deer generally do not habituate to hiking or mountain biking (Taylor and Knight 2003).

Cumulative Impacts from Various Forms of Development

As can be seen, the San Juan Basin Mule Deer Herd faces many challenges due to various types of development. Although another stretch of recreation trail or one more well pad might not be detrimental by itself, the effects are cumulative and do have a major impact to available habitat and the mule deer population. Loss of habitat is the primary cause for species declines in the west and around the world.

Disease

Epizootic Hemorrhagic Disease

Epizootic Hemorrhagic Disease, or EHD, is a fatal viral disease in white-tailed deer, and a sometimes fatal, less severe disease in other species including mule deer. The disease is transmitted by biting midges and is more prevalent in exceptionally dry weather when animals congregate at limited water resources. EHD occurs in D-30 and adjacent units. Within the DAU, the disease can cause large die-offs of mule deer in the driest years. More common though are infection of individual animals with minimal impacts to the overall population.

Chronic Wasting Disease

Chronic wasting disease (CWD) is a fatal neurological disease found in deer, elk and moose. It belongs to a family of diseases caused by prions (misfolded proteins). This particular prion disease attacks the brains of infected deer, elk and moose, causing the animals to display abnormal behavior, become uncoordinated and emaciated, and eventually die. No immunity, recovery, or absolute resistance to CWD has been documented in any of the susceptible species. Infection can be detected in carcasses as well as in live animals. Diagnostic tests are becoming increasingly reliable in individual animals as the disease progresses. Chronic wasting disease is infectious. Infected individuals shed prions from several routes during most of the disease course, exposing others either directly or through contamination of shared resources or environments. Shed prions can persist for years in the environment, and their binding to soil elements (e.g., clay) enhances persistence and infectivity.

As of July 2018, at least 31 of Colorado's 54 deer herds (57%) are known to be infected with CWD; at least 16 of 43 elk herds (37%) and 2 of 9 moose herds (22%) also are infected. In general, deer herds tend to be more heavily infected than elk herds living in the same geographic area and CWD is relatively rare in moose. In infected mule deer populations, bucks have a higher prevalence rate than does.

CWD has not been detected in the San Juan Basin herds, but has been found in adjacent populations. Because there is overlap with animals from the San Juan Basin Herd and animals from infected populations, it is expected that CWD is already in the population and has yet to be detected or it will appear in the near future. Testing for CWD in the San Juan Herd has been minimal, coming from voluntary hunter harvest, suspect animals (sick appearing animals euthanized by CPW), and the occasional road kill.

Research has shown that CWD prevalence rates can be reduced through management actions. This includes reduction of the overall population, a decrease in the buck to doe ratio, a decrease in older (4-6 year old) bucks, decrease the congregation of animals, and minimizing prion point source (primarily from transporting infected carcasses).

Management Strategies

Development in Critical Mule Deer Habitats

There are several ways CPW can be involved to minimize and mitigate impacts from development. Although action can be taken to lessen the effects of development, these measures won't stop the continued loss of habitat. Higher quality habitat will be required to maintain the current deer population. Following are actions necessary to achieve the goals of this HMP:

- Large-scale habitat treatments on FS and BLM lands in mule deer critical habitat, which includes transitional range and winter range.
- The treatment and removal of non-desirable, invasive vegetation on public and private lands to maintain quality deer habitat.
- Identification and protection of migration corridors to maintain connection between seasonal habitats.
- Closure of roads and trails on public lands in critical habitat and setting aside areas of critical habitat from recreation use.
- Identification of and support for development of recreation areas outside of winter and other critical habitat for deer that will meet the demand for trail development while minimizing the impacts to deer.
- Mitigation for proposed residential, energy and recreation development. This can come in various forms such as;
    - Timing restrictions and closures to minimize disturbance during critical time periods such as migration or mule deer use on winter range,
    - Habitat improvement projects on nearby or adjacent areas. Treatment areas will need to be larger than the impacted area, with a minimum of 7:1 ratio.
- Education and outreach. The majority of people are unaware of the influence different forms of development have on mule deer. For example, trail users believed other users have a higher effect on wildlife then their user group (Taylor and Knight 2003). Most of these individuals, once they learn about their influence, were willing to change their behavior to lessen their impacts. Through education and outreach people can learn about the impacts of development on wildlife and can make informed decisions.
- The design and construction of fences that don't create a movement barrier and allow for safe crossing by deer, both adults and fawns, while still being effective for livestock.
- Consideration of deer habitat throughout all, but especially early phases, of the developmental planning process at local, state, and federal levels.

- Identification of deer highway crossing areas and involvement with Colorado Department of Transportation in the design and building of wildlife crossing structures, and fences to minimize restriction of deer movements and reduce deer/vehicle collisions.
- Use available radio collar data to identify priority habitat and migration routes.
- Use available radio collar data to identify timing of migrations.
- Establishing conservation easements with willing landowners in important deer habitat.

Chronic Wasting Disease

Steps can be taken to minimize the impact of CWD and are similar to management recommendations for infected populations found in CPW's CWD response plan (December 2018). These include:

- Monitoring for CWD through testing of agency euthanized animals that are sick or show signs of CWD infection, roadkills (when practical), and voluntary testing of hunter harvested animals. Wildlife managers and biologists should submit samples from carcasses for CWD testing when possible.
- Population Management. Although most everyone favors more animals and larger populations, in the case of disease management a smaller, dispersed population is more prudent. A large population is more likely to crash from the introduction of a disease and take longer to recover. By keeping a wildlife population at a smaller number, disease is less likely to spread into and through the population and have a less devastating effect. Once a disease is introduced, recovery time in a smaller population is generally quicker.
- Manage for less bucks in the population. Higher buck numbers in the population are favorable to most people, especially hunters, because there is a higher chance of finding a buck during the hunting season as well as there are more older age class (i.e. bigger) bucks. In terms of CWD, bucks, especially older bucks, are more likely to carry CWD. Therefor it is sensible to manage for fewer and younger bucks in the population. Expecting CWD to come into the population and spread, a lower buck to doe ratio will decrease the spread of the disease and the impact of the disease. In heavily CWD infected areas bucks succumb to the disease prior to reaching maturity and are unavailable to hunters.
- Reduce congregation of animals. Wild ungulate can be attracted to areas by illegal feeding and baiting. Animals can also be attracted to areas through common agriculture practices such as salting, and stacking hay on deer wintering areas. CPW needs to identify where animals congregate and work with producers and landowners to minimize the source of attractant. This might be as simple as providing fencing for a stack yard to keep deer off stacked hay. Illegal feeding and baiting should be handled appropriately through education efforts and enforcement. CPW should not congregate deer or elk by baiting or feeding.
- Minimize prion point source by excluding transportation of carcasses from infected areas. Biologists may also be able to minimize the chance of spread of CWD by identifying areas of overlap between infected herds and clean populations. Hunter harvest can be focused in these areas through license numbers, seasons, and special hunt areas to target removal of individual animals within the overlap. This will minimize the chance of an individual animal contracting the disease and introducing it to a uninfected population.

Public Involvement

A copy of the draft plan will be posted on CPWs webpage for a 30 day comment period. There will also be local outreach.

Management Objectives

The primary goal of this plan is to review and revise current management objectives. Estimating free-ranging ungulate populations in complex landscapes is challenging. This DAU is also particularly problematic because it is a state line unit where animals migrate to, and are harvested in Colorado, again on Southern Ute Tribal Lands and Jicarilla Apache Tribal Lands, and finally in New Mexico. This results in incongruent harvest management and objectives across the herd's range. The San Juan Interstate Wildlife Working Group works to address communication between these entities. This group has representatives from CPW, New Mexico Game and Fish, public land management agencies, and Southern Ute and Jicarilla Indian Nations.

Established population objective range alternatives heavily depend on the population estimate when revising the HMP. Population modeling is an evolving process whereby modeled estimates can change over time based on additional data or improved modeling methodology. As such, when modeled estimates change irrespective of an actual change in the population, it is reasonable to adjust or index population objectives relative to the new modeled estimate. The basis of harvest-based population management is to increase female harvest when a population exceeds objective, decrease female harvest when a population is below objective, and maintain female harvest when a population is at objective. Because population objectives are only meaningful in the relative context of the population estimates available at the time the objective was established, indexing maintains the integrity of the objective based on the fundamental criteria of whether there are too many, too few, or the desired number of animals in the population. Therefore, as we improve modeled population estimates, it is important to adjust or index the population objectives. If HMPs are current and no other elements of the plan have changed, it is only necessary to amend the HMP executive summary through the typical two-step Parks and Wildlife Commission process to update the population objectives. The life of this plan is ten years. However, the plan may be revised prior to the 10 year timeline if conditions change such as large tracts of habitat improvement.

There have not been significant concerns about the current management of the D-30 herd. Therefore, this plan is presented as an extension of the 2001 plan. As such, continuation of the same objectives, course of management actions, and strategies are proposed.

Posthunt Population Objective:

Current: 27,000
Proposed: 23,000 to 27,000

Sex Ratio Objective:

Current: 26-30 bucks:100 does
Proposed: 26-30 bucks:100 does

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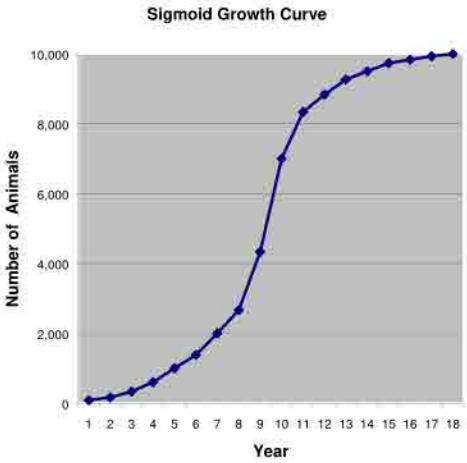
APPENDIX 3

Population Dynamics, Maximum Sustained Yield, and Density Dependence

Numerous studies of animal populations, including such species as bacteria, mice, rabbits, and white-tailed deer have shown that the populations grow in a mathematical relationship referred to as the "sigmoid growth curve" (right). 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 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 population growth.

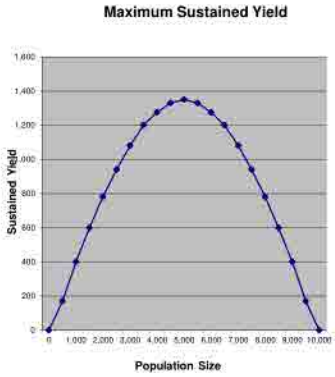


The second phase occurs when the population number is at a moderate level. This phase is characterized by high reproductive and survival rates. During this phase, food, cover, water and space are not a limiting factor. During this phase, for example, animals such as white-tailed deer have been known to successfully breed at six months of age and produce a live fawn on their first birthday and older does have been known to produce 3-4 fawns that are very robust and healthy. Survival rates of all sex and age classes are also at maximum rates during this phase.

The final or third phase occurs when the habitat becomes too crowded or habitat conditions become less favorable. 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. These types of factors that increasingly limit productivity and survival at higher population densities are known as density-dependent effects. During this phase, for example, white-tailed deer fawns can no longer find enough food to grow to achieve a critical minimum weight that allows them to 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 situations are fawns, then bucks, followed by adult does. Severe winters affect the future buck to doe ratios by favoring more does and fewer bucks in the population. Also, because the quality of a buck's antlers is somewhat dependent upon the quantity and quality of his diet, antlers development is diminished. 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 body condition, habitat condition would be degraded from over-use, and when a severe winter or other catastrophic event occurs, a large die-off is inevitable.

What does all this mean to the management of Colorado's big game herds? It means that if we attempt to manage for healthy big game herds that are being limited by density-dependent

effects, we should attempt to hold the populations more towards the middle of the "sigmoid growth curve." Biologists call this point of inflection of the sigmoid growth curve the point of "MSY" or "maximum sustained yield." In the example below, MSY, which is approximately half the maximum population size or "K", would be 5,000 animals. At this level, the population should provide the maximum production, survival, and available surplus animals for hunter harvest. Also, at this level, range habitat condition should be good to excellent and range trend should be stable to improving. Game damage problems should be lower and economic return to the local and state economy should be higher. This population level should produce a "win - win" situation to balance sportsmen and private landowner concerns.



A graph of a hypothetical deer population showing sustained yield (harvest) potential vs. population size is shown (right). 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 in the population. This phenomenon occurs because the population of 3,000 deer has a much higher survival and reproductive rate compared to the population of 7,000 deer. However, at the 3,000 deer level, there will be less game damage and resource degradation but lower watchable wildlife values.

Actually managing deer and elk populations for MSY on a DAU basis is difficult if not impossible due to the amount of detailed biological information about habitat and population size required. Additionally, carrying capacity is not static, the complex and dynamic nature of the environment cause carrying capacity to vary seasonally, annually, and trend over time. In most cases we would not desire true MSY management even if possible because of the potential for overharvest and the number of mature of bulls and bucks is minimized because harvest reduces recruitment to older age classes. However, the concept of MSY is useful for understanding how reducing densities and pushing asymptotic populations towards the inflection point can stimulate productivity and increase harvest yields. Knowing the exact point of MSY is not necessary if the goal is to conservatively reduce population size to increase yield. Long-term harvest data can be used to gauge the effectiveness of reduced population size on harvest yield.

Research in several studies in Colorado has shown that density-dependent winter fawn survival is the mechanism that limits mule deer population size because winter forage is limiting (Bartmann et al. 1992, Bishop et al. 2009). Adult doe survival and reproduction remain high but winter fawn survival is lower at higher population sizes relative to what the winter habitat can support. The intuition to restrict, or even eliminate, female harvest in populations where productivity is low and when populations are below HMP objectives is counterproductive and creates a management paradox. In that, for populations limited by density dependent processes, this “hands-off” type of management simply exacerbates and perpetuates the problem of the

population being resource limited, and countermands the goals and objectives of the HMP. As Bartmann et al. (1992) suggest, because of density-dependent processes, it would be counterproductive to reduce female harvest when juvenile survival is low and increase harvest when survival is high. Instead, a moderate level of female harvest helps to maintain the population below habitat carrying capacity and should result in improved survival and recruitment of fawns. Increased fawn recruitment allows for more buck hunting opportunity and a more resilient population.

Thus, the key for DAU planning and management by objective is to set population objectives in line with what the limiting habitat attributes can support. A population objective range aptly set must be below carrying capacity.

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APPRAISAL STATEMENT OF WORK FOR THE PROPOSED VALLE SECO 2019 LAND EXCHANGE

ONE NON-FEDERAL PARCEL TOTALING 880.00 ACRES +/- IN SIZE WITHIN THE BOUNDARY OF THE SAN JUAN NATIONAL FOREST IN ARCHULETA COUNTY, COLORADO

AND TEN FEDERAL PARCELS TOTALING 452.06 ACRES +/- IN SIZE CURRENTLY PART OF THE SAN JUAN NATIONAL FOREST IN ARCHULETA COUNTY, COLORADO

Real estate appraisals are needed for the proposed exchange of the above-referenced lands. An Agreement to Initiate was executed on May 17, 2019. Modification #1 of Agreement to Initiate was executed on May 5, 2020. Modification #2 of the Agreement to Initiate was executed on July 24, 2020.

Property Name	Size (acres)	County	Forest	District	Ownership
Non-Federal Parcel A – Valle Seco *	880.00	Archuleta	San Juan	Pagosa	Bootjack Ranch, LLC
Non-Federal Property: maximum of 880.00 acres					
Federal Parcel 1 – Bootjack Ranch Johnny Creek	175.48	Archuleta	San Juan	Pagosa	U.S.A.
Federal Parcel 2 – Bootjack Ranch Road	0.66	Archuleta	San Juan	Pagosa	U.S.A.
Federal Parcel 3 – Bootjack Ranch River Bench	16.40	Archuleta	San Juan	Pagosa	U.S.A.
Federal Parcel 4 – Rancho del Sol Middle	80.00	Archuleta	San Juan	Pagosa	U.S.A.
Federal Parcel 5 – Rancho del Sol Bench Pasture	33.00	Archuleta	San Juan	Pagosa	U.S.A.
Federal Parcel 6 – Rancho del Sol Inholding	20.00	Archuleta	San Juan	Pagosa	U.S.A.
Federal Parcel 7 – El Rancho Pinoso J. T. Tiernan	55.00	Archuleta	San Juan	Pagosa	U.S.A.
Federal Parcel 8 – El Rancho Pinoso Bench	3.486	Archuleta	San Juan	Pagosa	U.S.A.
Federal Parcel 9 – El Rancho Pinoso Corner	0.02	Archuleta	San Juan	Pagosa	U.S.A.
Federal Parcel 11 – Corral Mountain	68.00	Archuleta	San Juan	Pagosa	U.S.A.
Federal Property: maximum of 452.06 acres					

* The non-Federal parcel A includes two water rights as identified in the RFVS to be conveyed in the exchange. Some of the Federal parcels will include power line, access easements, conservation easements, and unauthorized improvements as identified in the ATI as modified and are to be conveyed "as-is".

The purpose of these appraisals is to derive a single market value conclusion of a fee simple interest in the package of Federal lands, and a single market value conclusion of a fee simple interest in the non-Federal land. Therefore, the market analyses should consider whether or not there is a single-transaction value impact in the Federal lands.

In addition to a value of the total Federal property, the appraisal should provide unit values (per acre) of the above Federal Parcel 5 (33.00 acres) and Federal Parcel 11 (68.00 acres) as each contributes to the whole 452.06-acre Federal property. The appraisal should also provide a unit value (per acre) for the non-Federal property as a whole, and a unit value (per acre) for the Federal property as a whole, and acreage ranges in which those unit values remain valid for use.

The appraisals must comply with the *General Exchange Act of March 20, 1922*, the *Federal Land Policy and Management Act of October 21, 1976* as amended by the *Federal Land Exchange Facilitation Act of August 20, 1988*, 36 CFR 254 (Subpart A), the current edition of the *Uniform Appraisal Standards for Federal Land Acquisitions*, and the current edition of the *Uniform Standards of Professional Appraisal Practice*.