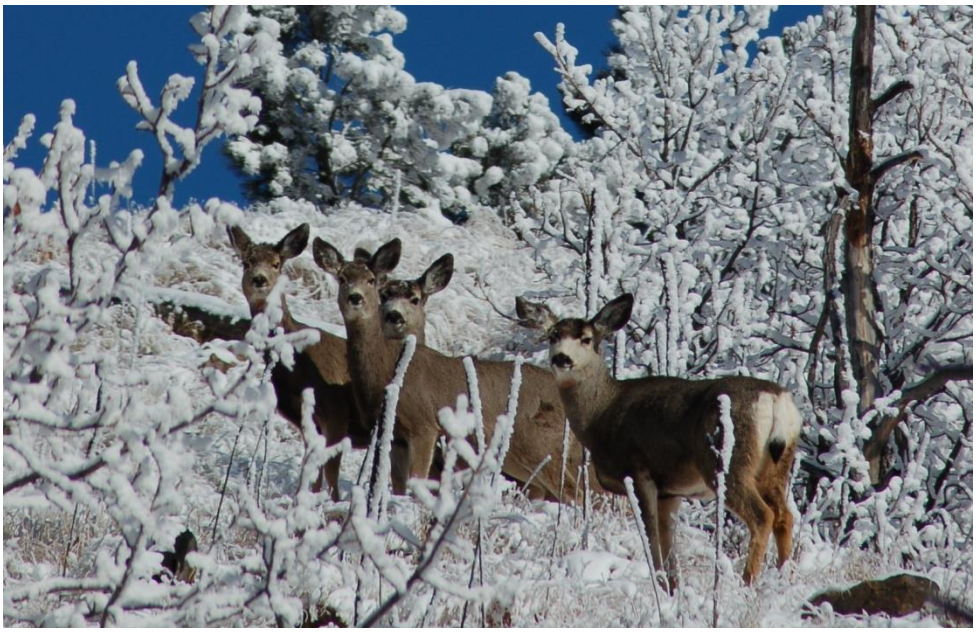
D-20 Herd Management Plan
North Fork Gunnison River Deer Herd
Game Management Units 53 and 63



Approved February 8th 2018

Revised By:
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2300 S. Townsend Ave.
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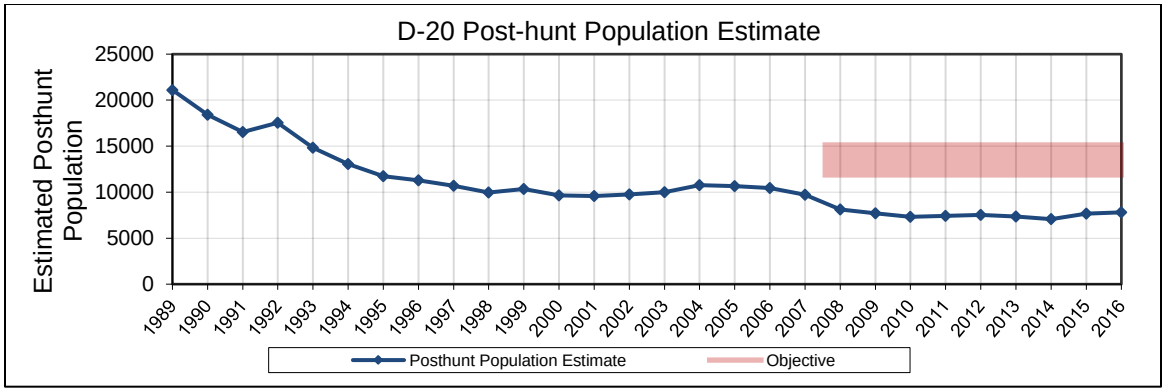
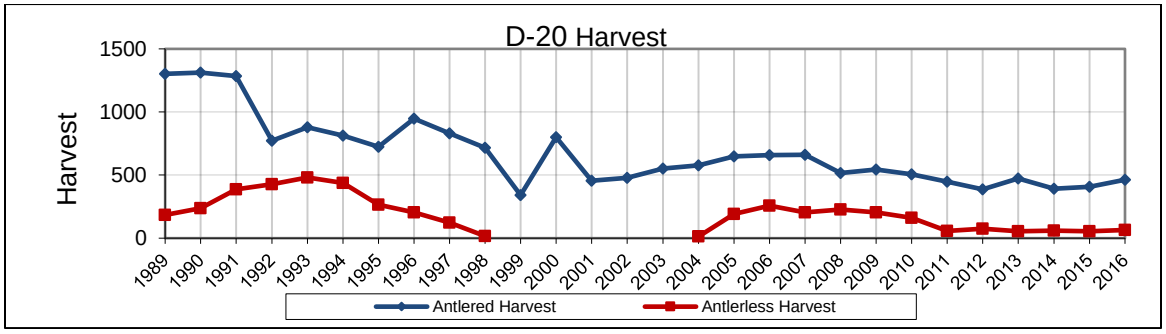
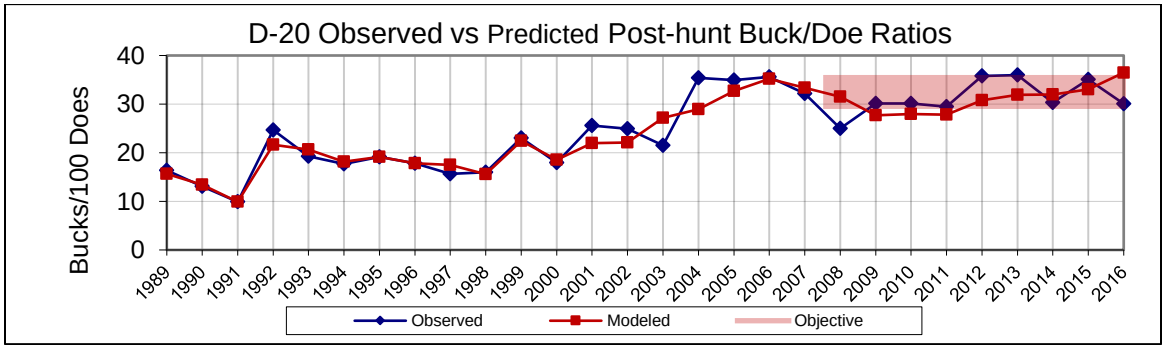
D-20 HMP Executive Summary

GMU: 53 and 63
Land Ownership: 47% USFS, 32% private, 15% BLM, 5% National Park, less than 1% State
Post-hunt Population:
- 2016 Modeled Estimate: 7,800* new model
- Previous 2008-2017 Objective: 12,500-14,500* old model
- **Approved 2018-2028 Population Objective: 7,500-9,500**

Post-hunt Sex Ratio:
- 2016 Observed Sex Ratio: 30:100
- Previous 2008-2017 Objective: 30-35:100
- **Approved 2018-2028 Sex Ratio Objective: 33-38 bucks:100 does**







Background

The North Fork Gunnison River deer herd is located in west-central Colorado in Delta, Gunnison, and Montrose Counties and is comprised of Game Management Units (GMU) 53 and 63. Prior to this 2018 plan, GMUs 53 and 63 were managed as separate deer herds. However, due to geographic proximity, geographic scale, deer movements, and parallel management history, GMU 53 and 63 deer herds will be managed with guidance from this plan as one herd.

The overall model estimated population trend has been declining since the 1980s but relatively stable from 2007 to present. At 7,800 deer, is well below the 2008-2017 population objective range, even when the population objective is indexed to reflect recent data and improvements in population modeling. Buck:doe ratios during 2007-2016 average 31.4:100 which is within the 2008-2017 buck:doe objective range of 30-35:100.

Significant Issues

As indicated by the overall population trend, the North Fork Gunnison River Valley cannot currently support the numbers of deer it did several decades ago. However, the majority of public meeting attendees, randomly-selected survey respondents, and general public survey respondents would like to see this deer herd increase in size. In the context of harvest-based population management, where antlerless licenses are manipulated to effect change in population growth, options to increase this population are non-existent until other limiting factors are addressed. Antlerless licenses in the last decade have been made available at a very limited basis only for private lands and at a time of year to focus on non-migratory resident deer that are causing damage to private agricultural lands. Habitat, especially in deer winter range, has been reduced in amount and quality due to human development and associated infrastructure. Diseases like Epizootic Hemorrhagic Disease Virus, which has been documented in the North Fork Gunnison River deer herd, may also play a role in suppressing this population's growth. Chronic Wasting Disease, although not documented in GMU 53 or 63 to date, may become an issue as its prevalence increased in adjacent GMUs in recent years.

Management Alternatives

Population Objective Alternatives

1) Population Alternative 1: 5,500-7,500
2) Population Alternative 2: 6,500-8,500
3) Population Alternative 3: 7,500-9,500

Sex Ratio Objective Alternatives

1) Sex Ratio Alternative 1: 25-30 bucks:100 does
2) Sex Ratio Alternative 2: 30-35 bucks:100 does
3) Sex Ratio Alternative 3: 35-40 bucks:100 does
4) Sex Ratio Alternative 4: 33-38 bucks:100 does

Approved Selected Alternative:

Population

Responses received during the public involvement process indicate that the majority of interested publics support increasing the deer population in GMUs 53 and 63. The approved selected alternative is a **population objective of 7,500 to 9,500** deer which allows for increase in the population but also maintains realistic expectations by encompassing the current population estimate.

Sex Ratio

Responses received during the public involvement process indicate that the majority of interested publics would like to see the buck:doe ratios stay the same, with those that would like to see an increase in buck doe ratio the second most popular interest. The approved selected alternative is a **sex ratio objective of 33-38 bucks per 100 does**.

Strategies to achieve approved selected alternative objectives

- Population- When the population is below or at the low end of the objective range, antlerless licenses may be allocated as Private Land Only at the lowest levels needed to satisfy needs of private landowners to proactively address private land game damage issues. If the population grows toward the upper end of the population objective range or exceeds it, public land antlerless licenses may be allocated at that time.
- Sex Ratio- Antlered licenses may be increased if the observed sex ratio is above the objective and decreased if the observed sex ratio is below objective.

This Herd Management Plan and selected alternative was approved by the Colorado Parks and Wildlife Commission February 8th, 2018.

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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 and its visitors in accordance with CPW's Strategic Plan and mandates from the Parks and Wildlife Commission and the Colorado Legislature. CPW uses a "management by objective" approach for big game where herds are managed to achieve population and sex ratio objectives established for each herd. A big game herd is a population that resides in a distinct geographic area, called a data analysis unit (DAU), the boundaries of which are delineated to minimize interchange of animals between adjacent herds. A herd management DAU, includes the year-round range of that big game herd, where the majority of the animals in the herd are born, live, and die. A herd management DAU may be comprised of several game management units (GMUs) which are utilized to distribute hunters and harvest across a herd or geographic area. The North Fork Gunnison River deer herd was managed as two distinct deer herds in the past as D-20, the Coal Creek deer herd, and D-39, the Fruitland Mesa deer herd. Due to geographic proximity and deer movement, CPW will manage this area as one herd moving forward designated as D-20 beginning with this North Fork Gunnison River herd management plan.

The herd management planning process incorporates public input, habitat capabilities, and herd considerations into management objectives for population size and population composition for each of Colorado's big game herds. The general public, sportspersons, federal land management agencies, landowners and agricultural interests were involved in determining Herd Management plan objectives through questionnaires , public meetings, comments on draft plans, and input to the Colorado Parks and Wildlife Commission. This herd management plan will serve as the basis for guidance in the annual herd management cycle where the size and composition of the herd is assessed and compared to the objectives defined in this plan. Licenses are then allocated each year to maintain or move towards those objectives.

Description of Herd Management Area

Location

The North Fork Gunnison River deer herd is located in west central Colorado in Delta, Gunnison and Montrose counties in the North Fork of the Gunnison River Valley and the western West Elk Mountains. The North Fork Gunnison Deer Herd DAU is comprised of GMUs 53 and 63 and contains 766 square miles (Figure 1). The North Fork Gunnison River deer herd is bounded on the north by State Highway 92, North Fork Gunnison River, and Gunnison County Road 12; on the east by the North Fork Gunnison River and Gunnison River divide and Curecanti Creek; and on the south and west by the Gunnison River. Communities in or adjacent to the D-20 deer herd are Crawford, Hotchkiss, and Paonia.

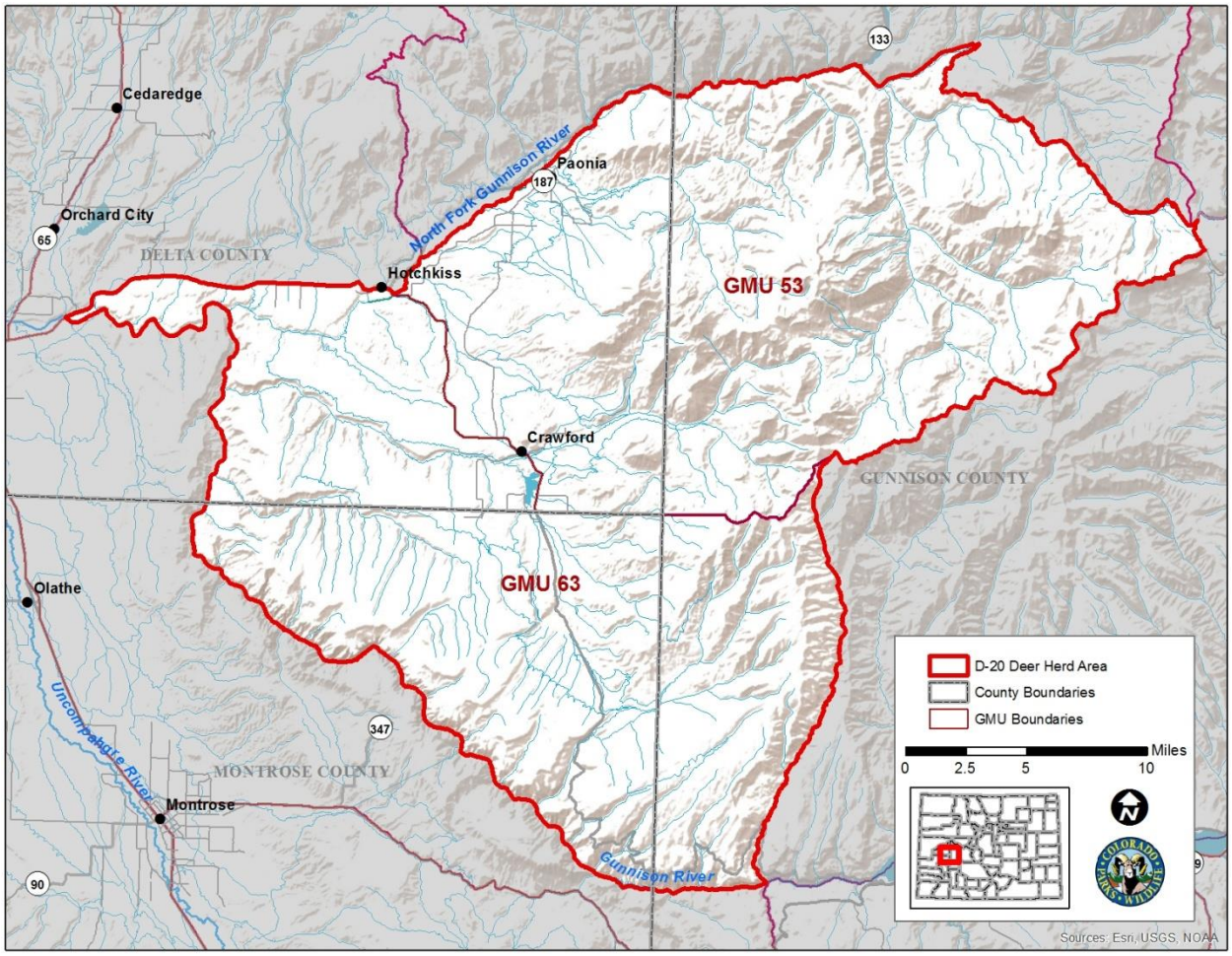

Figure 1. Geographic location of the North Fork Gunnison River Deer Herd Management Area.

Topography and Climate

Elevations within GMUs 53 and 63 range from a low of 5,000 feet near the community of Austin below the confluence of the North Fork Gunnison River and Gunnison River to almost 13,000 feet at the summit of Mount Gunnison. Prominent geographic features within GMUs 53 and 63 include the West Elk Wilderness area with multiple peaks over 12,000 feet and a number of rivers and perennial creeks that flow through and adjacent to the herd management area that include the North Fork Gunnison River, Gunnison River, Coal, Minnesota, Smith Fork, and Curecanti Creeks.

Climate in the DAU varies greatly with elevation. Lower-elevation valleys experience warmer temperatures, milder winters and lower annual precipitation, while the higher elevations are characterized by colder temperatures and higher annual precipitation. Most annual precipitation across all elevations is in the form of snowfall. Near the town of Hotchkiss at the lower elevations annual mean precipitation is 16 inches per year while elevations above 11,000 feet receive more than 40 inches of annual precipitation.

Vegetation

Vegetation within the DAU is diverse and depends on many factors including elevation, aspect, and soils. Lower-elevations are characteristic of high desert with shrub species consisting of four wing-saltbrush, greasewood, and rabbit brush. Lower elevation private lands also contain lands converted to irrigated agriculture with hay fields, corn, artificially-seeded and irrigated rangelands and orchards. Moving up in elevation are habitats characterized by big sagebrush and mixed grasslands. Pinion/juniper woodlands and mountain shrub consisting of Gambel oak, serviceberry, and mountain mahogany shrubs occupy the mid elevations. Above the mountain shrub zone are extensive stands of aspen and mixed spruce/fir forests, and at the highest elevations are alpine habitats.

Land Use

The North Fork Gunnison River deer herd DAU is comprised of lands of which 47% is managed as National Forest by the US Forest Service, 32% is privately owned, 15% is managed by the BLM, 5% is National Park, and less than 1% is managed by Colorado Parks and Wildlife (Figure 2). The majority of the private lands are located in the west side of GMU 53 and the north central portion of GMU 63 at the lower and mid elevations which overlaps extensively with mule deer winter range, winter concentration area, and severe winter range (Figure 3).

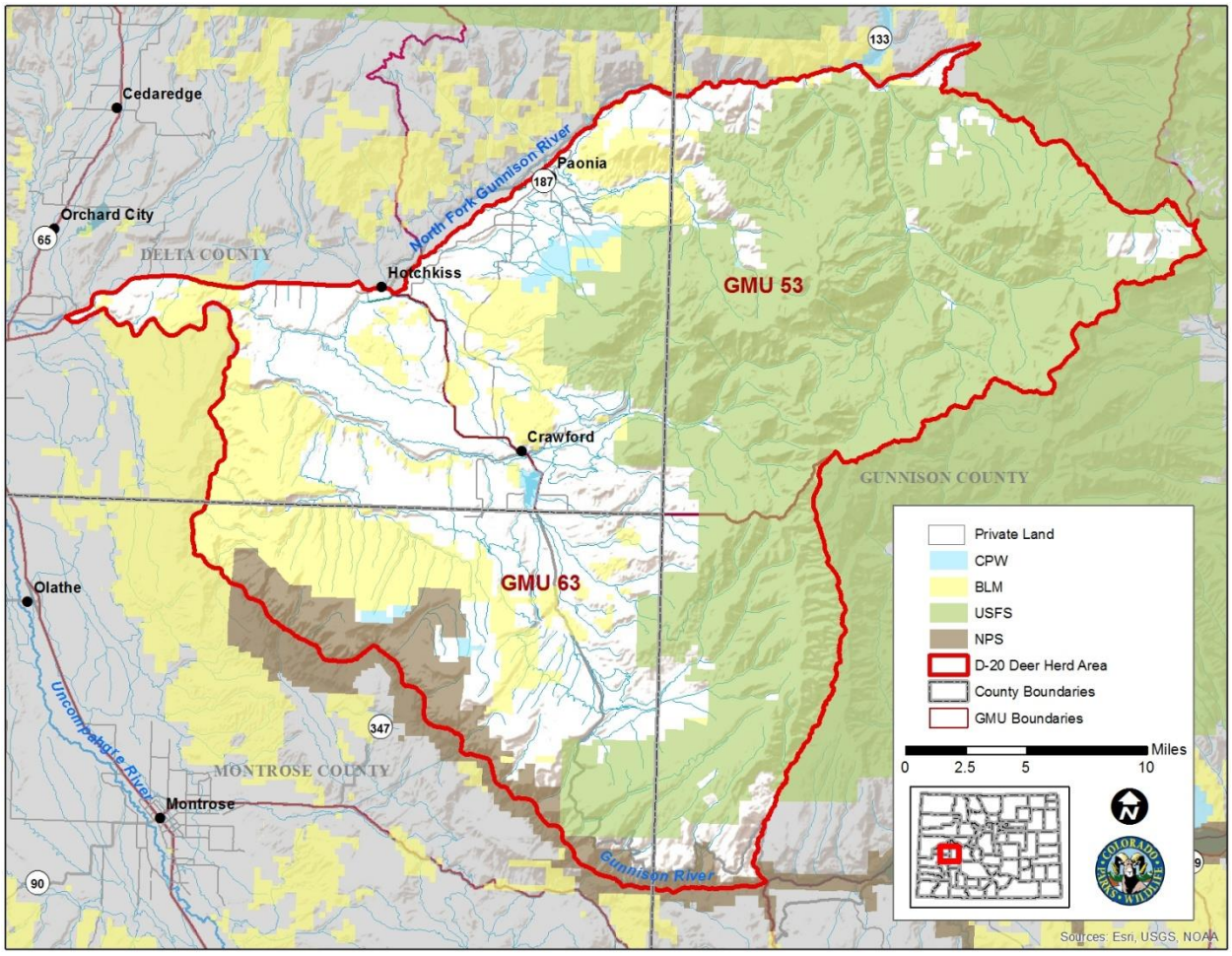

Figure 2. Land management in the North Fork Gunnison River deer herd (D-20), Game management Units 53 and 63.

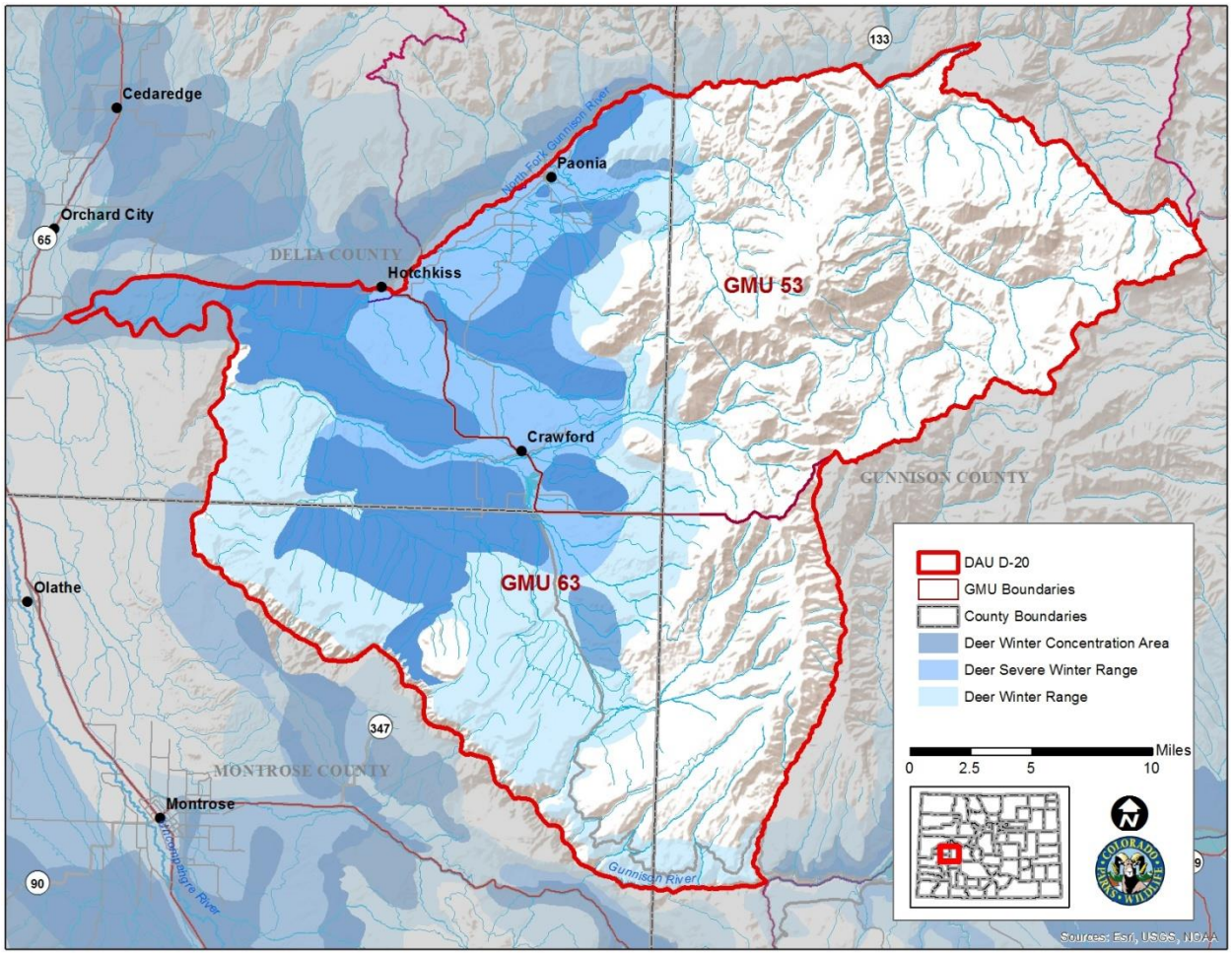

Figure 3. Winter Range, severe winter range, winter concentration areas of deer in GMUs 53 and 63.

Herd Management History

Previously, GMU 53 and 63 were managed as separate herds of D-20, the Coal Creek deer herd, and D-39, the Fruitland Mesa deer herd, respectively. Due to geographic proximity, geographic scale, deer movements, and parallel management history, GMU 53 and 63 deer herds will be managed with guidance from this plan as one herd. Henceforth the North Fork Gunnison River deer herd (D-20) will refer to deer in both GMUs 53 and 63. Additional background information on herd and management history can be found in Diamond 2008a and Diamond 2008b.

Post-hunt herd composition

Post-hunt herd composition is obtained using ad-hoc helicopter flights conducted in December to January after the big game hunting seasons when deer and elk are concentrating on winter range and prior to antler shedding. In GMU 53 and 63 deer and elk are inventoried simultaneously to make more efficient use of helicopter flight time. Aerial surveys are subject to variability due to weather conditions, snow cover, sample size, and observers. The average observed buck:doe ratio during 2008-2016 was 31.4 with a high of 36 in 2013 and a low of 25 in 2008 (Figure 4). Fawn:doe ratios have shown an increasing trend from 2007-2016, from its lowest ratio of 30 fawns:100 does measured in 2008 to one of the highest ratios, 56 fawns:100 does measured in 2015 (Figure 5). The average fawn:doe ratio from 2008-2016 was 44 fawns:100 does. The low fawn:doe ratio in 2008 is likely a result of the severe winter of 2007-2008 affecting doe body condition.

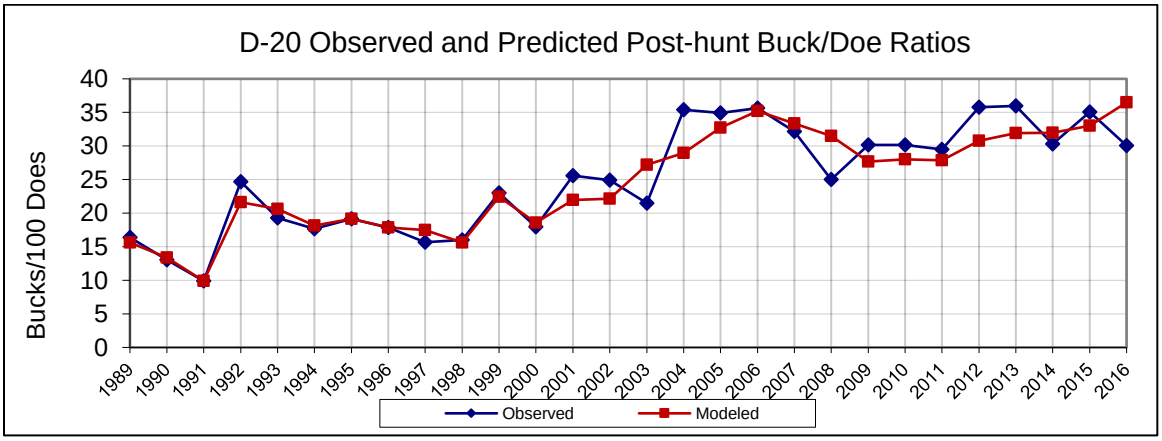

Figure 4. Observed (blue line) and predicted (red line) post-hunt buck:doe ratios in GMU 53 and 63, 1989-2016.

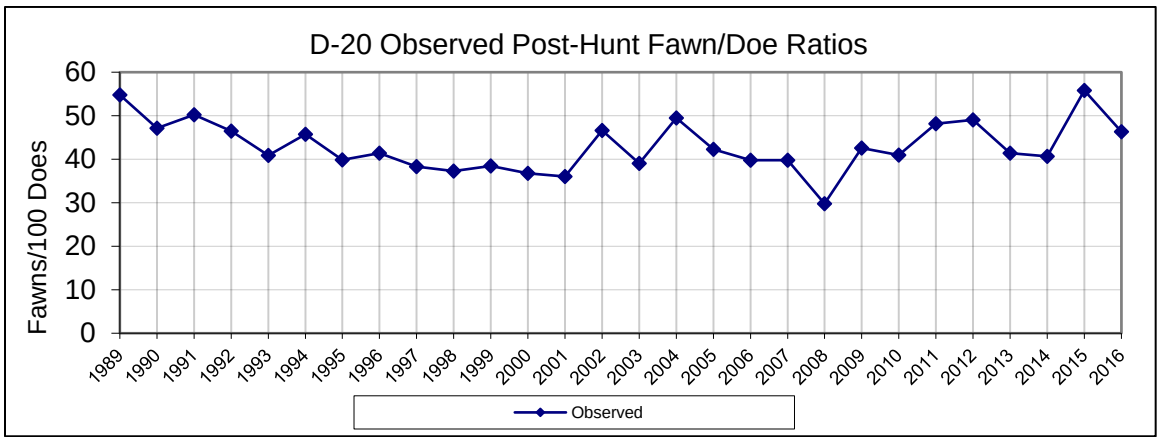

Figure 5. Observed Fawn Doe Ratios in GMU 53 and 63, 1989 to 2016.

Post-hunt population size

Post-hunt population size is estimated using a computer spreadsheet population model. The model uses age and sex ratios collected during ad-hoc winter helicopter classification flights, hunter harvest data collected through annual harvest surveys, and survival data of does and

fawns collected on the Uncompahgre Plateau deer monitoring area, which is the closest in proximity and climate to GMUs 53 and 63 of the five mule deer survival monitoring areas across the state. Population modeling is an evolving process whereby modeled estimates can change over time based on additional data and improved modeling methodology.

It is well documented that overall, the population of mule deer in the North Fork Gunnison River Valley, as well as most of Colorado have seen major declines since the 1980s (Gill et al. 2001). From 2007 to 2016 the North Fork Gunnison River deer population has held fairly stable with a slight decline from 2007 to 2014 with a change in trend to a slight increase in population in 2015 and 2016. During 2007 to 2016, the deer population in the North Fork Gunnison River Valley varied from 7,000 to 9,700 with a 2016 post-hunt population estimate of about 7,800 (Figure 6). These annual population estimates are on average around 2000 less than what has been published each year 2007 to 2016 using modeling data and methods used for the 2008 plan (Figure 7). New estimates derived from newer data and updated modeling methods represent a more accurate estimate, not an actual change in on the ground population size. Even after indexing the population objectives to align with updated population models and data, this population has continued to be below objective.

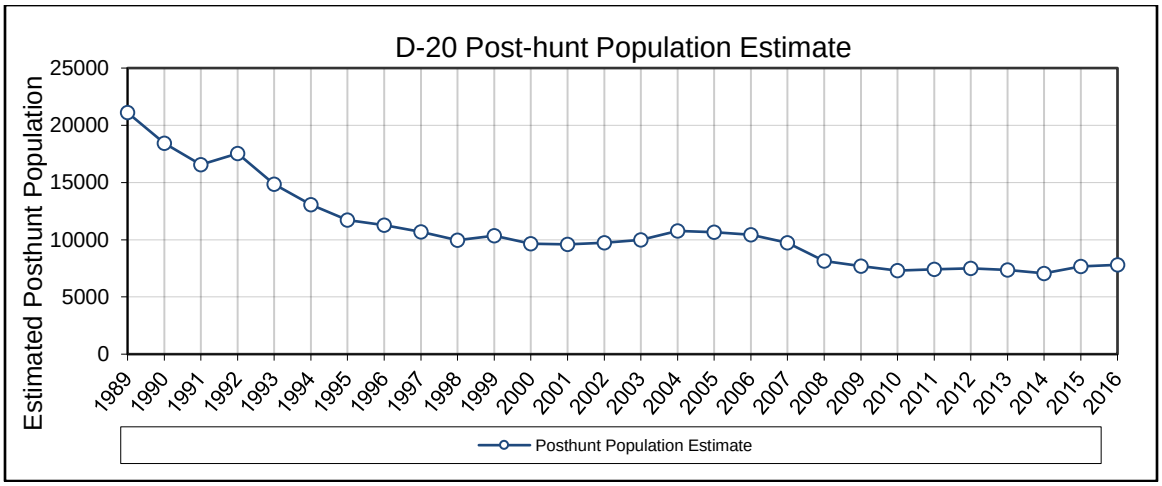

Figure 6. Modeled population estimates of deer in GMUs 53 and 63, 1989 to 2016.

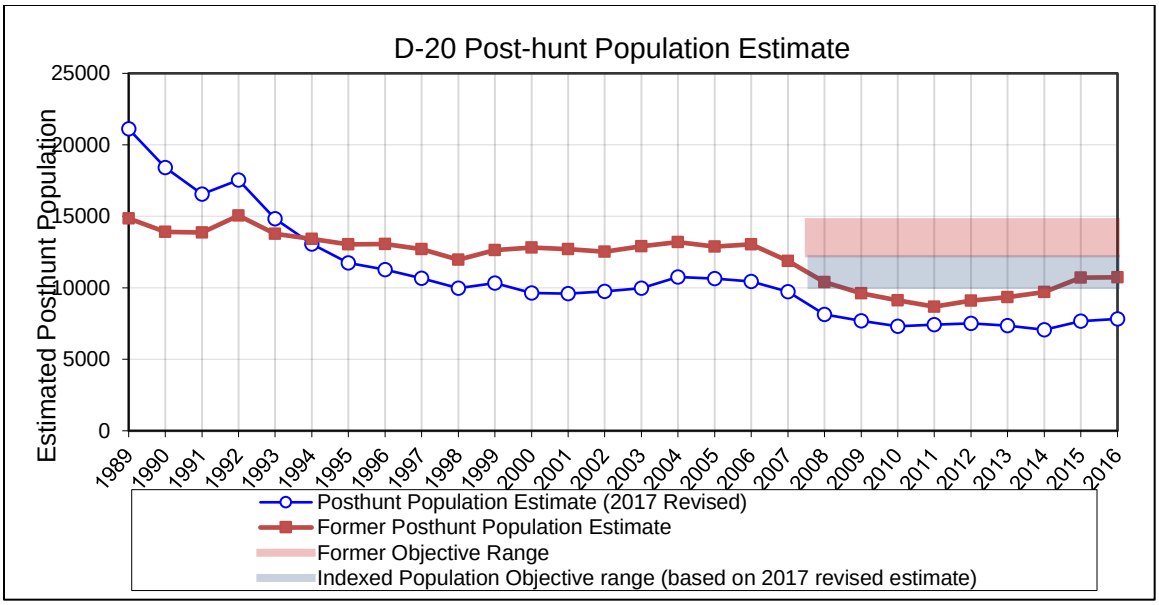

Figure 7. Modeled post-hunt population estimates using updated model (blue line) and old model (red line), the 2008-2017 population objective range (red shaded area), and 2008-2017 objective indexed to the population estimates of the updated model (blue shaded area) for deer in GMUs 53 and 63.

Population Objective Indexing

Established population objective range alternatives heavily depend on the population estimate when revising the herd management plan. 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 the 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 population is at objective. Because population objectives are only meaningful in the context of the population estimates 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 herd management plans are current and no other elements of the plan have changed, it is only necessary to amend the herd management plan executive summary through the typical two-step Parks and Wildlife Commission process to update the population objectives.

License and Harvest History

Deer harvest since 1999, when deer licenses in GMUs 53 and 63 were changed from unlimited to limited, is a function primarily of license allocation and season structure. Weather also plays a role in harvest by affecting success rates. The number of antlered licenses allocated during 2008 to 2017 decreased from 950 to a low of 680 where licenses remained static for the 2012-2015 hunting seasons (Figure 8). License allocation between GMU 53 and 63 was very similar during 2007-2016 (Figure 9). A slight increase in antlered licenses in GMU 53 occurred in 2016. 2008 was the first year a fourth regular rifle season antlered license was implemented, with 10 available in GMU53 and 10 available in GMU 63 every year since its implementation. Shifts in the number of antlered licenses over the course of the last ten years has taken place in the second and third regular rifle seasons. Antlerless licenses were not issued from 1998 to 2005 in an attempt to address deer population declines from the 1980s through 1990s. In 2005 antlerless deer licenses were issued with private land only restrictions to help private landowners alleviate agricultural and private land damage due to deer. The season for the antlerless license runs from September 1st to October 31st with the intent to target deer that are non-migratory resident deer on private lands. Harvest trend is depicted in figure 10 for the herd and by GMU in figure 11. Success rates have averaged 61% for buck hunters during 2008 to 2016 (Figure 12). Those with private land antlerless licenses had similar success, averaging 60% during the same time period.

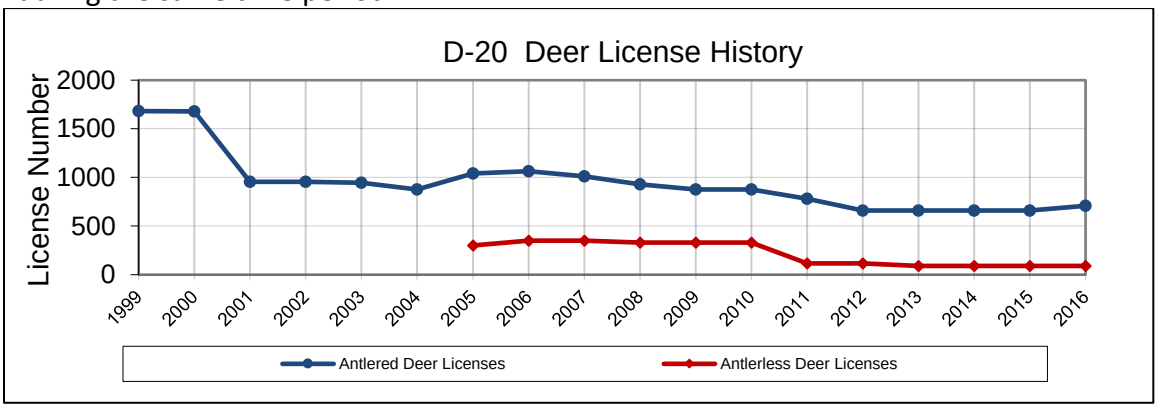

Figure 8. License history for GMUs 53 and 63, 1999 to 2016.

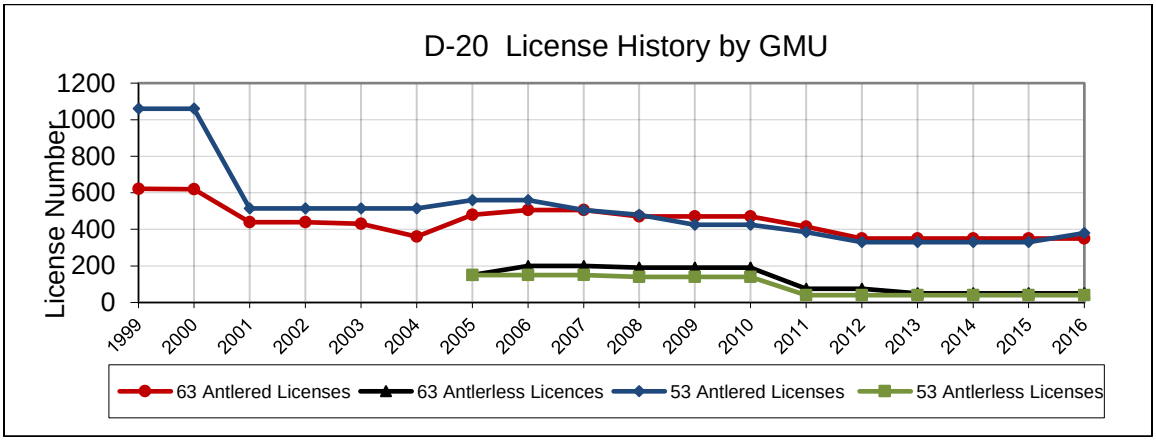

Figure 9. License History by GMU for GMU 53 and 63, 1999 to 2016.

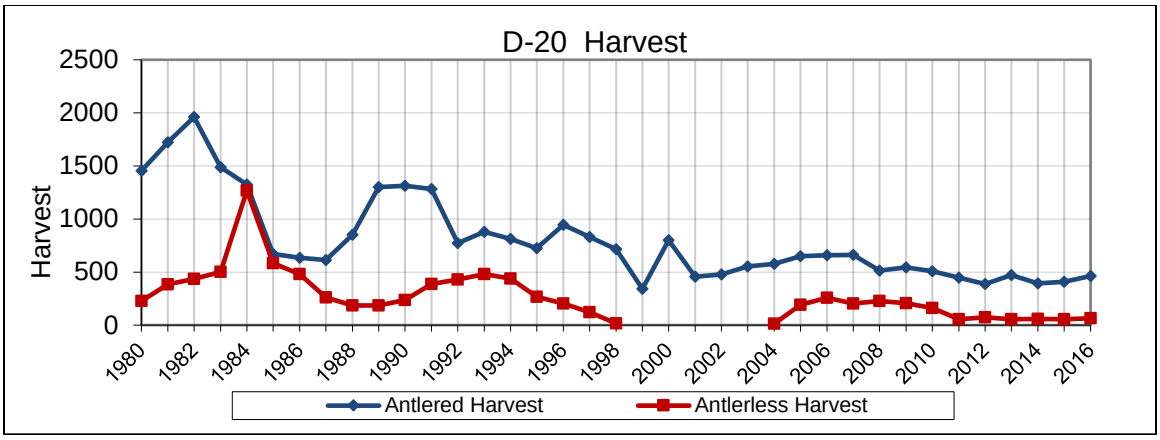

Figure 10. Antlered and antlerless harvest in GMUs 53 and 63, 1980 to 2016.

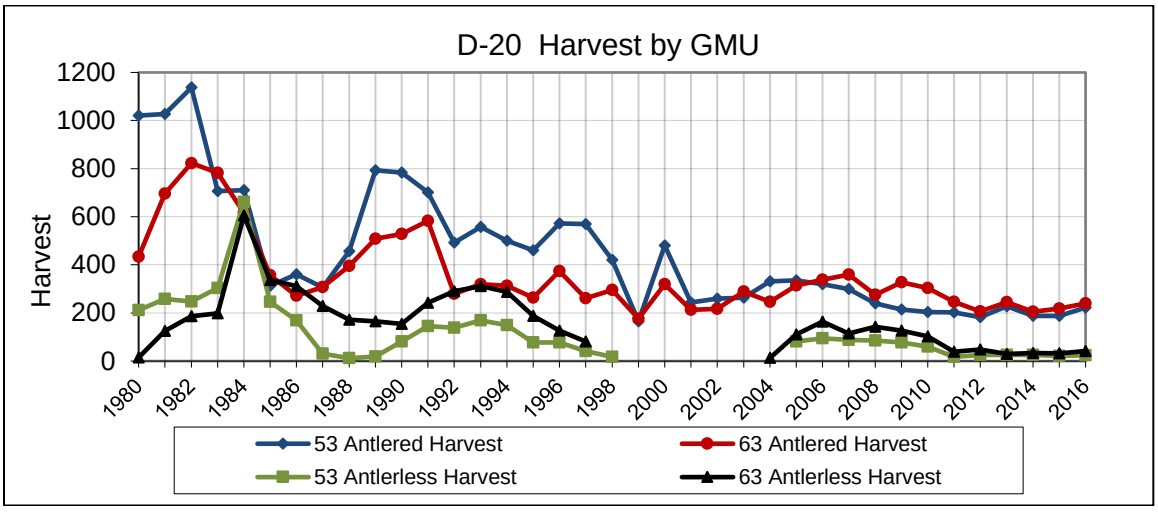

Figure 11. Antlered and antlerless harvest by GMU for GMUS 53 and 63, 1980 to 2016.

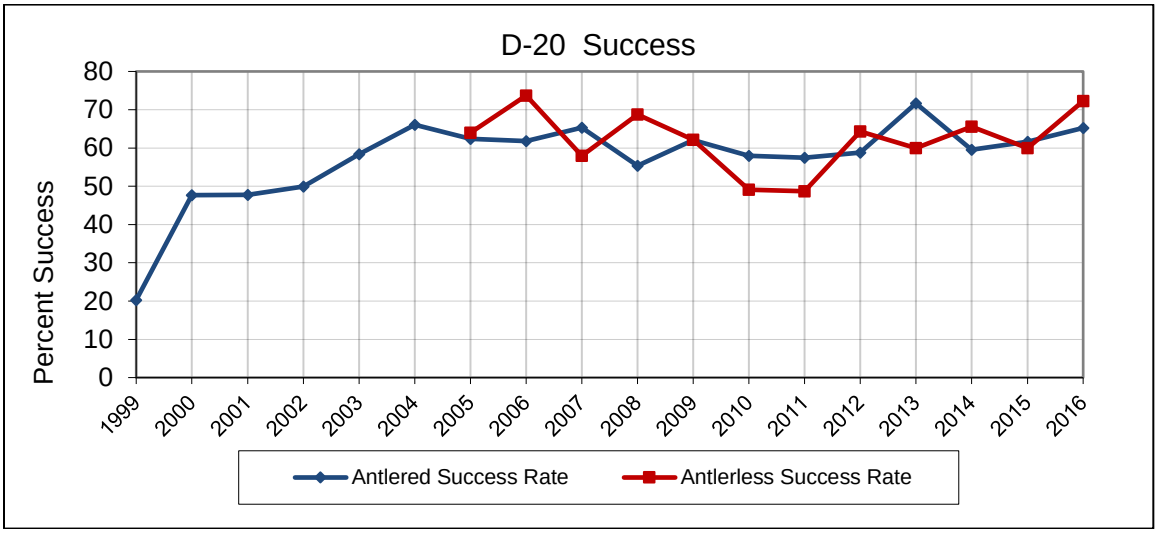

Figure 12. Hunter success rates for antlered and antlerless deer in GMUs 53 and 63, 1999 to 2016.

Current Herd Management Issues

Habitat Change

Of the many hypothesized causes for the decline and suppression of mule deer populations across Colorado, the majority of evidence suggests that habitat loss and degradation have played the greatest role (Gill et al. 2001, Bishop et al. 2009). Johnson et al. (2016) examined the influence of residential and energy development on mule deer populations across Colorado using long-term datasets and their correlation with fawn recruitment. While residential development and energy development were associated with declining fawn recruitment, the specific mechanisms responsible for these correlations are unknown. Land-use change causes direct habitat loss and fragmentation through the construction of infrastructure, and indirect habitat loss through deer avoidance of infrastructure and related activities (Vogel 1989; Sawyer et al. 2009, Northrup et al. 2015); these consequences likely reduce the carrying capacity of the landscape. It has also been documented that deer migrating through areas with high densities of energy development detour from established routes, increase rates of movement and decrease stopover use (Sawyer et al. 2013), impacts that may increase energetic costs while decreasing access to high-quality forage. Additionally , mule deer may suffer higher mortality rates in developed landscapes compared to natural areas (but see Hebblewhite and Merrill 2011). Deer in close proximity to residential housing can experience increased vehicle collisions, harvest, poaching, accidents (e.g. entrapment in fences), and predation from domestic pets (Porter et al. 2004; Krauseman et al. 2011). We suspect that several of these factors contribute to the negative association between land-use change and deer recruitment, but experimental research is needed to identify the specific mechanisms responsible. From 1970 to 2010 in GMUs 53 and 63, Exurban (0.012 to 0.23 structures per acre), Suburban (0.24-2.02 structures per acre), Urban (greater than 2.02 structures per acre), and Rural (fewer than 0.012 structures per acre) development increased by 250%, 102%, 200%, and 20% respectively while undeveloped private lands decreased by 44% (Johnson et al. 2016). As of 2010, the total amount of private lands with housing densities defined as exurban, suburban, urban, and rural were 12,834, 385, 7, and 95,184 acres respectively. The majority of human development occurs on lower and mid elevation deer winter range in the North Fork Valley.

Disease

Chronic Wasting Disease (CWD) is a fatal neurological disease that occurs in 5 species of cervids, including mule deer. CWD is characterized by deterioration of the brain and nervous system resulting in behavioral changes and progressive loss of body condition leading to death with no known treatments (Williams and Young 1992). Evidence suggests that deer herds infected with CWD will not thrive in the long term (Miller et al. 2008). CWD was detected in GMU 521 (directly adjacent to GMU 53) in 2003 in two cases, one deer and one elk. CWD was more recently detected in GMUs 62, 64, and 65 (directly adjacent to GMU 63) in 2016 with over 10 cases in those GMUs over 2016-2017. If CWD is not already present in the North Fork Valley, it will likely spread there at some point given past trends throughout Colorado and North America. Eradication of CWD once present is unlikely, but strategies such as population reduction through hunting harvest and maintaining low buck:doe ratios appear promising to

reduce prevalence (Miller and Fischer 2016). Despite the vast amount of research that has been conducted on this disease there are still many unknowns and new information is made available periodically. For more information about CWD and current maps of CWD prevalence in Colorado please visit http://cpw.state.co.us/learn/Pages/ResearchCWD.aspx.

Epizootic Hemorrhagic Disease Virus (EHDV) has been documented in the North Fork Valley deer herd as well as other herds throughout Colorado. Transmitted by biting midges that can proliferate during periods of dry weather in late summer, EHDV can affect all age classes of deer. One phenomenon attributed to EHD outbreaks is buck deer that retain antler velvet (also known as "cactus bucks") after EHDV damages testicular growth and subsequent testosterone production (Fox et al. 2015). Mule deer are relatively more resistant to population effects from EHDV outbreaks than white-tailed deer, however, EHDV is attributed to a 10-25% decline in the mule deer population in the Mesa Verde deer population in southwest Colorado during the mid-1990s (Weinmeister 2014).

In 2016 a new hemorrhagic disease known as Adenovirus Hemorrhagic Disease was discovered in Colorado in both the White River mule deer herd and the Gunnison Basin mule deer herd. Adenovirus is different than other hemorrhagic diseases, such as Epizootic Hemorrhagic Disease (EHD) and Blue Tongue, in that it doesn't require an intermediate insect host. Since Adenovirus is spread animal to animal, it can be spread in the winter. Little is known about impacts to deer populations from adenovirus.

Recreation

Public lands in GMU 53 and 63 receive a significant amount of recreation throughout the year. Outdoor recreation can take the form of many different activities including but not limited to hiking, mountain biking, operating OHVs, and shed antler collecting among many others. Outdoor recreation has increased in recent years and is likely to keep increasing. Activities such as these have the potential to disrupt deer especially during winter months which negatively affects deer by increasing activity due to the disturbance and thus using up energy needed to survive colder winter temperatures and reduce forage quality. Deer may also be displaced to suboptimal habitats where limited resources are lower in quality or onto private lands.

Public Involvement

CPW solicited public input regarding deer in GMUs 53 and 63 using 4 methods: a public meeting, an online survey of randomly selected license applicants and landowners, a general online survey and comment form open to anyone, and a 30-day public comment period on the draft plan. Detailed information regarding public input is in Appendix A.

1. All interested people were invited to attend a public meeting held on the evening of July 6th 2017 at the Paonia Public Library at which CPW personnel presented information regarding the North Fork Gunnison River deer herd and collected audience opinion

through the use of anonymous live audience polling. Twenty-five individuals attended for the deer discussion and live audience polling results indicated that a majority of the audience (62%) would like to see the deer population increase and the highest proportion of the audience (41%) would like to see a slight increase in buck:doe ratio.

2. A randomly-selected group of hunting license applicants that applied for a deer license during 2013-2016 and a randomly-selected group of private landowners who owned more than 10 acres within GMUs 53 and 63 were invited to participate in an online survey regarding deer and deer management in GMUs 53 and 63. 1,951 license applicants, 684 landowners, and 291 landowner/applicants were invited to participate in the survey and 13.8% responded. The majority would like to see the deer population increase (53%) and no change in buck:doe ratio received the highest response (31%)
3. An online survey and comment form was posted online from August 28th to September 18th for any interested person to fill out. Fifty-three people interested in deer management responded, the majority would like to see the deer population increase (58%) and no change to buck:doe ratios received the highest response (27%)
4. The draft plan was released to the public for a 30-day public comment period from the end of October to the end of November. Two comments were received generally supporting the proposed preferred alternatives for population and sex ratio objective. Local USFS, BLM, and NPS offices that manage public lands within GMU 53 and 63 were notified of the public comment period on the draft plan with alternatives. Federal agencies declined to comment citing the similarity in deer management to the previous 2008 plan and did not have issues with the proposed management alternatives. The North Fork of the Gunnison Habitat Partnership Program (HPP) Committee consisting of three livestock growers, local USFS, BLM, CPW, and sportsmen representatives held a meeting on November 13th 2017 to discuss this plan and provided a letter of support of the preferred alternatives for population and sex ratio (Appendix C).

Management Alternatives

Population Objective Alternatives

Population objective alternatives are based on the current modeled post-hunt 2016 population estimate of 7,800 deer. Licenses are issued annually to manage for a target population. Antlerless licenses are the primary means to affect population growth by increasing female harvest to decrease, or slow the growth, of a population and decreasing female harvest to increase the growth of a population. During 2008 to 2017, GMUs 53 and 63 were managed and licenses were allocated to attempt to achieve population objectives that were higher than the modeled population during those years. Currently, antlerless licenses in GMU 53 and 63 are only available on a very limited basis as Private Land Only licenses with a season that runs from September 1st to October 31st with the intent to target those deer that are resident to lower-elevation private property that are more likely to cause agricultural and private property damage. Antlerless licenses are currently set at the lowest amount possible with the intent to

increase the deer herd while still addressing local private property damage issues. The following three population objective alternatives were considered.

Population Alternative 1: 5,500-7,500 (decrease population)
Population Alternative 2: 6,500-8,500 (stable population)
Population Alternative 3: 7,500-9,500 (increase population)

Sex Ratio Objective Alternatives
Sex Ratio Objectives address the ratio of bucks to does in the population and relate to varying degrees of hunting opportunity and hunt quality. If a deer herd is managed for increased hunting opportunity, more buck licenses are made available and buck hunters are generally able to hunt more frequently. However, this can result in fewer total bucks in the herd (*lower buck-to-doe ratio*) and fewer mature bucks. If a herd is managed for increased hunt quality, fewer buck licenses are issued in order to increase the number of bucks in the population (*higher buck-to-doe ratio*). This generally results in less-frequent hunting opportunity, fewer hunters in the field, but a greater chance of encountering a mature buck. The ability to draw a license and frequency one can hunt are also affected by demand and the number of people applying to hunt in each particular unit in addition to the number of licenses available. During 2008-2017, the deer herd in GMU 53 and 63 was managed with a sex ratio objective of 30-35 bucks per 100 does, which is a balanced approach but trending towards the quality end of the spectrum. The following three sex ratio objective ranges were considered:

Sex Ratio Alternative 1: 25-30 bucks:100 does
(decrease buck:doe ratio, increase buck hunting opportunity)
Sex Ratio Alternative 2: 30-35 bucks:100 does
(maintain current buck:doe ratio, maintain current buck hunting opportunity and quality)
Sex Ratio Alternative 3: 35-40 bucks:100 does
(increase buck:doe ratio, increase buck hunting quality, decrease opportunity)
Sex Ratio Alternative 4: 33-38 bucks:100 does
(slight increase in buck:doe ratio)

Approved Selected Alternative

Population
Responses received during the public involvement process indicate that the majority of interested publics support increasing the deer population in GMUs 53 and 63. The selected alternative is a **population objective of 7,500 to 9,500** deer, which allows for increase in the population but also maintains realistic expectations by encompassing the current population estimate.

Sex Ratio

Responses received during the public involvement process indicate that the majority of interested publics would like to see buck:doe ratios stay the same, with those that would like to see an increase in buck doe ratio the second most popular interest. Based on this the selected alternative is a **sex ratio objective of 33-38 bucks per 100 does**.

Strategies to achieve approved selected alternative objectives

- Population- When the population is below or at the low end of the objective range, antlerless licenses may be allocated as Private Land Only at the lowest levels needed to satisfy needs of private landowners to proactively address private land game damage issues. If the population grows toward the upper end of the population objective range or exceeds it, public land antlerless licenses may be allocated at that time.
- Sex Ratio- Antlered licenses may be increased if the observed sex ratio is above the objective and decreased if the observed sex ratio is below the objective.

The selected alternative was approved by the Colorado Parks and Wildlife Commission February 8th,2018.

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Appendices

Appendix A. Public involvement surveys

Randomly selected applicant and landowner survey

We invited a randomly-selected group of landowners and hunting license applicants to participate in an online survey during August 2017 regarding their opinions about deer and elk in GMUs 53 and 63. Landowners who own at least 10 acres in GMUs 53 and 63 were randomly selected from county parcel data. Applicants who applied for a deer or elk hunting license in GMU 53 or 63 during the years 2013, 2014, 2015 and 2016 were randomly selected. This survey targeted both deer and elk hunters because information was being sought regarding public opinion of elk in GMU 53 and 63 for a concurrent management plan for elk in these GMUs. Care was taken to not contact any one individual twice to avoid any bias in survey response rate. Some individuals selected were both an elk and deer license applicant or a landowner and license applicant but only one invitation to participate in the survey was sent per individual. Two-thousand individual deer and elk license applicants, 704 landowners and 296 applicant/landowners were randomly selected to participate. Notification was sent by mail, however, some post cards were returned due to undeliverable addresses for an end result of 1,951 license applicants, 684 landowners, and 291 landowner/applicants invited to participate in the survey. Of the 1,951 license applicant, and 291 applicant/landowner postcards delivered, 1,468 individuals applied for at least one deer hunting license in either GMU 53 or 63. For the purposes of this plan we focus our analysis on deer specific survey respondents. Of the 1,468 invited deer license holders, 222 responded to the survey for a response rate of 15.2%. Landowners that have applied for a deer hunting license during 2013-2016 responded at a rate of 15.7% and landowners responded at a rate of 10.5%.

Survey Response rate by respondent type		
Respondent type	**Response**	
	Percent	**Count**
Deer License Applicant (total)	15.20%	222
Resident	14.70%	85
Nonresident	16.60%	111
Applicant/Landowner	15.70%	35
Landowner	10.50%	72

Each survey respondent was asked the following questions regarding deer and deer management in GMUs 53 and 63. Survey logic was used to guide respondents to the appropriate questions and separate deer survey and elk survey respondents. For example, only those that answered they were a landowner in question 3 were able to view questions regarding their land management and those that responded that they hunted deer and elk viewed questions regarding hunting. Only the deer license applicants, landowners, and

landowners that have also applied to for a deer license in 2013-2016 for GMU 53 or 63 are summarized here.

To start the survey, please enter your unique 4-digit pin that was provided to you on the post-card notice:	
Answered	**303**
Skipped	**0**

Which of the following best describes you (choose up to three choices):		
Answer Choices	Response	
	Percent	Count
Have hunted deer or elk in GMU 53 or 63	80.2%	243
Have applied for deer or elk licenses, but not yet had the opportunity to hunt in GMU 53 or 63	12.9%	39
Involved in the hunting service industry (hunting guide/outfitter) in GMU 53 or 63	3.3%	10
Own or manage private land in GMU 53 or 63	33.3%	101
Agricultural producer (farm or ranch operator) in GMU 53 or 63	14.5%	44
Wildlife watcher	17.5%	53
Other business owner	2.6%	8
Non-hunting outdoor recreationist (e.g., ATV/OHV rider, hiker, skier, mountain biker, antler collector)	11.2%	34

Which unit(s) are you most interested in?		
Answer Choices	Response	
	Percent	Count
Game Management Unit 53	36.31%	106
Game Management Unit 63	34.46%	95
Both 53 & 63	29.23%	94
	Answered	301
	Skipped	2

Have you experienced any significant loss (i.e., fence damage, forage loss, hay loss, orchard loss, etc) from deer or elk in the past 10 years?		
Answer Choices	Responses	
	Percent	Count
YES, from deer	8.65%	9
YES, from elk	10.58%	11
YES, from both deer and elk	9.62%	10
NO	71.15%	74
	Answered	104
	Skipped	199

If you answered YES to previous question, what has been the solution for solving these agricultural damage issues? (Choose all that apply)		
Answer Choices	Responses	
	Percent	Count
I generally tolerate the damage	85.29%	29
Submitted claims to CPW Game Damage Program	5.88%	2
Applied for special hunts	14.71%	5
Sought help from the CPW Habitat Partnership Program	2.94%	1
Developed my own agricultural protection measures	17.65%	6
Increased hunting pressure during hunting seasons	8.82%	3
Other (please specify)	17.65%	6
	Answered	34
	Skipped	268

Which of the following best describes hunting activities on your owned or managed property in GMU 53 and 63? (Choose all that apply)		
Answer Choices	Responses	
	Percent	Count
No hunting is allowed	20.0%	21
Only myself, family, and/or friends are allowed to hunt	63.8%	67
Land is leased to an outfitter/guide or we outfit/guide on property	6.7%	7
Public is allowed to hunt with permission, trespass fee is required	1.9%	2
Public is allowed to hunt with permission, no trespass fee is required	10.5%	11
Other (please specify)	10.5%	11
	Answered	105
	Skipped	198

How important to you is each of the following reasons to hunt deer/elk in GMU 53 or 63?										Weighted Average
	Not important		Slightly important		Moderately important		Very Important		Total	
	Percent	Count	Percent	Count	Percent	Count	Percent	Count		
To spend time in nature and/or enjoy the time with family and friends	1.0%	3	7.9%	23	18.2%	53	72.9%	212	291	3.63
To obtain wild game meat	4.4%	13	13.2%	39	31.5%	93	50.9%	150	295	3.29
To contribute to wildlife management and conservation	2.7%	8	14.4%	42	36.3%	106	46.6%	136	292	3.27
To contribute to the local community (e.g., financial benefits from hunters)	14.9%	43	28.5%	82	33.7%	97	22.9%	66	288	2.65
To obtain a trophy	28.3%	82	23.5%	68	26.2%	76	22.1%	64	290	2.42

How would you rate the level of crowding you experienced while hunting deer and/or elk in GMU 53 or 63?												
Answer Choices	Responses											
	All Combined		All Applicants		Resident Applicants		Non-Resident Applicants		Applicant/ Landowner		Landowner	
	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count
Very crowded	10.0%	24	9.4%	16	10.1%	8	8.8%	8	14.7%	5	8.6%	3
Somewhat crowded	25.1%	60	24.1%	41	22.8%	18	25.3%	23	23.5%	8	31.4%	11
Slightly crowded	36.0%	86	37.6%	64	38.0%	30	37.4%	34	26.5%	9	37.1%	13
Not at all crowded	25.9%	62	26.5%	45	25.3%	20	27.5%	25	35.3%	12	14.3%	5
No opinion	2.9%	7	2.4%	4	3.8%	3	1.1%	1	0.0%	0	8.6%	3
Answered		239		170		79		91		34		35
Skipped		64		26		5		20		1		37

Overall, how satisfied were you with your experience while hunting deer in GMU 53 or 63?												
Answer Choices	Responses											
	All Combined		All Applicants		Resident Applicants		Non-Resident Applicants		Applicant/ Landowner		Landowner	
	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count
Very unsatisfied	17.60%	34	17.30%	28	19.70%	15	15.30%	13	18.70%	6	N/A	N/A
Somewhat unsatisfied	20.20%	39	19.80%	32	23.70%	18	16.50%	14	21.90%	7	N/A	N/A
Neither unsatisfied nor satisfied	13.00%	25	11.80%	19	14.40%	11	9.40%	8	18.70%	6	N/A	N/A
Somewhat satisfied	23.80%	46	24.80%	40	23.70%	18	25.80%	22	18.70%	6	N/A	N/A
Very satisfied	25.30%	49	26.00%	42	18.40%	14	32.90%	8	21.90%	7	N/A	N/A
Answered		193		161		76		85		32		N/A
Skipped		38		35		9		26		3		N/A

Which method of take have you preferred to hunt deer with in GMU 53 and/or 63?		
Answer Choices	Responses	
	Percent	Count
Archery	13.80%	35
Muzzleloader	6.75%	17
Rifle	73.41%	185
No preference	5.95%	15
	Answered	**252**
	Skipped	**51**

Would you like the number of deer in GMUs 53 and 63 to:												
Answer Choices	Responses											
	All Combined		All Applicants		Resident Applicants		Non-Resident Applicants		Applicant/ Landowner		Landowner	
	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count
Decrease from the current level	3.6%	10	1.1%	2	2.5%	2	0.0%	0	9.00%	3	8.3%	5
Stay the same as now	36.5%	101	36.4%	67	43.2%	35	31.1%	32	36.40%	12	36.7%	22
Increase from the current level	53.4%	148	56.0%	103	48.1%	39	62.1%	64	42.40%	14	51.7%	31
No preference	6.5%	18	6.5%	12	6.2%	5	6.8%	7	12.10%	4	3.3%	2
Answered		277		184		81		103		33		60
Skipped		26		12		4		8		2		12

The following question was preceded by this brief description defining the terms “Hunting Opportunity” and “Hunt Quality”

If a deer herd is managed for **increased hunting opportunity**, more buck hunting licenses are made available and buck hunters are generally able to hunt more frequently. This generally results in fewer total bucks in the herd (*lower buck-to-doe ratio*) and fewer mature bucks.

If a herd is managed for **increased hunt quality**, fewer buck licenses are issued in order to increase the number of bucks in the population (*higher buck-to-doe ratio*). This generally results in less frequent hunting opportunity, less hunters in the field, but a higher chance of potentially encountering a mature buck.

The ability to draw a license and frequency one can hunt is also affected by demand and the number of people applying to hunt in each particular unit in addition to the number of licenses available.

Currently, the deer herd in GMU 53 and 63 is managed with a balanced approach but towards the quality end of the spectrum.

How should the deer herd in GMUs 53 and 63 be managed in terms of buck hunting opportunity and quality?												
Answer Choices	Responses											
	All Combined		All Applicants		Resident Applicants		Non-Resident Applicants		Applicant/ Landowner		Landowner	
	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count
Greatly increase the hunting opportunity	7.2%	18	4.9%	9	1.3%	1	7.6%	8	15.2%	5	12.1%	4
Slightly increase the hunting opportunity	20.8%	52	20.7%	38	26.6%	21	16.2%	17	21.2%	7	21.2%	7
No change (maintain current management objectives)	31.2%	78	32.6%	60	32.9%	26	32.4%	34	24.2%	8	30.3%	10
Slightly increase the hunt quality	24.8%	62	26.1%	48	21.5%	17	29.5%	31	21.2%	7	21.2%	7
Greatly increase the hunt quality	11.2%	28	10.9%	20	11.4%	9	10.5%	11	12.1%	4	12.1%	4
No preference	4.8%	12	4.9%	9	6.3%	5	3.8%	4	6.1%	2	3.0%	1
Answered		250		184		79		105		33		33
Skipped		53		13		6		6		2		39

How concerned are you about the following items:										
	Not at all concerned		Slightly concerned		Moderately concerned		Very concerned		Total	Weighted Average
	Percent	Count	Percent	Count	Percent	Count	Percent	Count		
Habitat quantity or quality (not having enough habitat for elk/deer, other wild species, and/or domestic livestock)	12.7%	40	15.2%	48	32.6%	103	39.6%	125	316	2.99
Potential for deer and/or elk to starve during the winter	10.8%	34	18.1%	57	30.8%	97	40.3%	127	315	3.01
Economic losses due to deer and/or elk (i.e., ag-production, gardens, fences)	32.1%	101	36.2%	114	22.2%	70	9.5%	30	315	2.09
Land not being accessible for hunting (i.e. places where deer and/or elk hunting is not allowed)	15.9%	50	17.5%	55	23.2%	73	43.5%	137	315	2.94
Impacts of hunting recreation pressure on the distribution of deer and/or elk	8.6%	27	29.6%	93	42.0%	132	19.8%	62	314	2.73
Impacts of non-hunting recreation (i.e., ATVs, hikers, camping, antler collecting) on the distribution of deer and/or elk)	18.4%	58	28.3%	89	31.4%	99	21.9%	69	315	2.57
Disease (i.e., Chronic Wasting Disease) negatively affecting deer and/or elk populations	8.0%	25	21.3%	67	32.2%	101	38.5%	121	314	3.01
Disease (i.e., Chronic Wasting Disease) transmission potential from wildlife to humans, pets, or livestock	18.5%	58	31.9%	100	24.2%	76	25.5%	80	314	2.57
Predators affecting deer and/or elk populations	16.5%	52	20.9%	66	25.6%	81	37.0%	117	316	2.83
Vehicle collisions with deer and/or elk	22.2%	70	35.8%	113	27.9%	88	14.2%	45	316	2.34
									Answered	**316**
									Skipped	**12**

General Public Survey and Comment Form

An online survey and comment form was posted online from August 28th to September 18th for any interested person to fill out. Advertisements were published in local newspapers and notifications were sent out through CPW insider and the comment form was advertised on CPWs herd management web page. Seventy-one people responded, of which, 53 indicated that they were interested in deer management in GMUs 53 and 63.. Questions were identical to those asked in the randomly selected survey and are summarized here. These results show only responses of those 53 individuals that answered they were interested in only deer or deer and elk in question 4.

How did you hear about this survey?		
Answer Choices	Responses	
	percent	number
Newspaper	8%	4
CPW insider	49%	26
From a friend	15%	8
Received a postcard in the mail	8%	4
Other	21%	11
	Answered	**53**
	Skipped	**0**

Which of the following best describes you (choose up to three choices):		
Answer Choices	Responses	
	Percent	Count
Have hunted deer or elk in GMU 53 or 63	40%	21
Have applied for deer or elk licenses, but not yet had the opportunity to hunt in GMU 53 or 63	30%	16
Involved in the hunting service industry (hunting guide/outfitter) in GMU 53 or 63	4%	2
Own or manage private land in GMU 53 or 63	17%	9
Agricultural producer (farm or ranch operator) in GMU 53 or 63	6%	3
Wildlife watcher	45%	24
Other business owner	9%	5
Non-hunting outdoor recreationist (e.g., ATV/OHV rider, hiker, skier, mountain biker, antler collector)	23%	12
	Answered	**53**
	Skipped	**0**

Which unit(s) are you most interested in?		
Answer Choices	Responses	
	Percent	Count
Game Management Unit 53	28%	15
Game Management Unit 63	9%	5
Both 53 & 63	62%	33
	Answered	**53**
	Skipped	**0**

Have you experienced any significant loss (i.e., fence damage, forage loss, hay loss, orchard loss, etc) from deer or elk in the past 10 years?		
Answer Choices	Responses	
	Percent	Count
YES, from deer	0%	0
YES, from elk	11%	1
YES, from both deer and elk	22%	2
NO	67%	6
	Answered	**9**
	Skipped	**44**

If you answered YES to previous question, what has been the solution for solving these agricultural damage issues? (Choose all that apply)		
Answer Choices	Responses	
	Percent	Count
I generally tolerate the damage	33%	1
Submitted claims to CPW Game Damage Program	33%	1
Applied for special hunts	33%	1
Sought help from the CPW Habitat Partnership Program	33%	1
Developed my own agricultural protection measures	0%	0
Increased hunting pressure during hunting seasons	0%	0
Other (please specify)	33%	1
	Answered	**3**
	Skipped	**50**

Which of the following best describes hunting activities on your owned or managed property in GMU 53 and 63? (Choose all that apply)		
Answer Choices	Responses	
	Percent	Count
No hunting is allowed	11%	1
Only myself, family, and/or friends are allowed to hunt	78%	7
Land is leased to an outfitter/guide or we outfit/guide on property	0%	0
Public is allowed to hunt with permission, trespass fee is required	0%	0
Public is allowed to hunt with permission, no trespass fee is required	0%	0
Other (please specify)	22%	2
	Answered	**9**
	Skipped	**44**

How important to you is each of the following reasons to hunt deer/elk in GMU 53 or 63?										
	Not important		Slightly important		Moderately important		Very Important		Total	Weighted Average
	Percent	Count	Percent	Count	Percent	Count	Percent	Count		
To spend time in nature and/or enjoy the time with family and friends	0%	0	6%	2	19%	7	75%	27	36	3.69
To obtain wild game meat	0%	0	3%	1	36%	13	61%	22	36	3.58
To contribute to wildlife management and conservation	0%	0	6%	2	37%	13	57%	20	35	3.51
To contribute to the local community (e.g., financial benefits from hunters)	12%	4	21%	7	41%	14	26%	9	34	2.82
To obtain a trophy	37%	13	43%	15	11%	4	9%	3	35	1.91
									Answered	**36**
									Skipped	**17**

Which method of take have you preferred to hunt deer with in GMU 53 and/or 63?		
Answer Choices	Responses	
	Percent	Count
Archery	22%	8
Muzzleloader	8%	3
Rifle	56%	20
No preference	14%	5
	Answered	**36**
	Skipped	**17**

Would you like the number of deer in GMUs 53 and 63 to:		
Answer Choices	Responses	
	Percent	Count
Decrease from the current level	0%	0
Stay the same as now	22%	11
Increase from the current level	59%	30
No preference	20%	10
	Answered	**51**
	Skipped	**2**

The following question was preceded by this brief description defining the terms “Hunting Opportunity” and “Hunt Quality”

If a deer herd is managed for **increased hunting opportunity**, more buck hunting licenses are made available and buck hunters are generally able to hunt more frequently. This generally results in fewer total bucks in the herd (*lower buck-to-doe ratio*) and fewer mature bucks.

If a herd is managed for **increased hunt quality**, fewer buck licenses are issued in order to increase the number of bucks in the population (*higher buck-to-doe ratio*). This generally results in less frequent hunting opportunity, less hunters in the field, but a higher chance of potentially encountering a mature buck.

The ability to draw a license and frequency one can hunt is also affected by demand and the number of people applying to hunt in each particular unit in addition to the number of licenses available.

Currently, the deer herd in GMU 53 and 63 is managed with a balanced approach but towards the quality end of the spectrum.

How should the deer herd in GMUs 53 and 63 be managed in terms of buck hunting opportunity and quality?		
Answer Choices	Responses	
	Percent	Count
Greatly increase the hunting opportunity	6%	2
Slightly increase the hunting opportunity	24%	8
No change (maintain current management objectives)	27%	9
Slightly increase the hunt quality	21%	7
Greatly increase the hunt quality	18%	6
No preference	3%	1
	Answered	**33**
	Skipped	**20**

How concerned are you about the following items:										
	Not at all concerned		Slightly concerned		Moderately concerned		Very concerned		Total	Weighted Average
	Percent	Count	Percent	Count	Percent	Count	Percent	Count		
Habitat quantity or quality (not having enough habitat for elk/deer, other wild species, and/or domestic livestock)	2%	1	18%	8	20%	9	60%	27	45	3.38
Potential for deer and/or elk to starve during the winter	2%	1	20%	9	23%	10	55%	24	44	3.3
Economic losses due to deer and/or elk (i.e., ag-production, gardens, fences)	31%	14	44%	20	18%	8	7%	3	45	2
Land not being accessible for hunting (i.e. places where deer and/or elk hunting is not allowed)	15%	7	17%	8	20%	9	48%	22	46	3
Impacts of hunting recreation pressure on the distribution of deer and/or elk	9%	4	20%	9	41%	19	30%	14	46	2.93
Impacts of non-hunting recreation (i.e., ATVs, hikers, camping, antler collecting) on the distribution of deer and/or elk)	15%	7	30%	14	33%	15	22%	10	46	2.61
Disease (i.e., Chronic Wasting Disease) negatively affecting deer and/or elk populations	11%	5	24%	11	33%	15	33%	15	46	2.87
Disease (i.e., Chronic Wasting Disease) transmission potential from wildlife to humans, pets, or livestock	28%	13	28%	13	24%	11	20%	9	46	2.35
Predators affecting deer and/or elk populations	28%	13	26%	12	15%	7	30%	14	46	2.48
Vehicle collisions with deer and/or elk	15%	7	28%	13	46%	21	11%	5	46	2.52
									Answered	**46**
									Skipped	**7**

Public Meeting

All interested people were invited to attend a public meeting held on the evening of July 6th 2017 at the Paonia Public Library at which CPW personnel presented information regarding the North Fork Gunnison River deer herd and collected audience opinion through the use of anonymous live audience polling. Advertising for the meeting included advertisements in local newspapers, on local radio stations and fliers that were hung in local businesses. Twenty-five individuals attended for the deer discussion and live audience polling results indicated that a

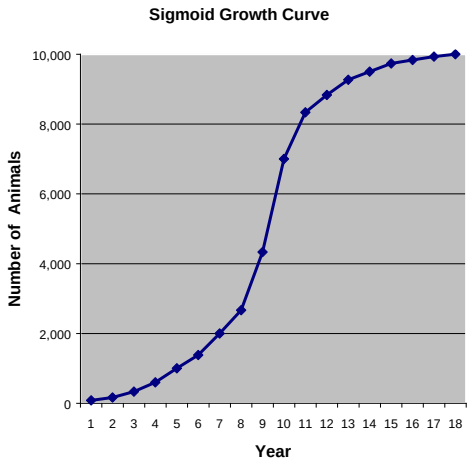
majority of the audience would like to see the deer population increase (62%) and a slight increase in buck:doe ratio had the highest response rate (41%).

Which of the following best describes you (choose up to three choices):		
Answer Choices	Responses	
	Percent	Count
Hunter	65%	17
Involved in the hunting service industry (hunting guide/outfitter) in GMU 53 or 63	13%	3
Own or manage private land in GMU 53 or 63	9%	2
Agricultural producer (farm or ranch operator) in GMU 53 or 63	4%	1
Wildlife watcher	4%	1
Other business owner	4%	1
Non-hunting outdoor recreationist (e.g., ATV/OHV rider, hiker, skier, mountain biker, antler collector)	0%	0

Would you like the number of deer in GMUs 53 and 63 to:		
Answer Choices	Responses	
	Percent	Count
Decrease from the current level	5%	1
Stay the same as now	29%	7
Increase from the current level	62%	16
No preference	5%	1

How should the deer herd in GMUs 53 and 63 be managed in terms of buck hunting opportunity and quality?		
Answer Choices	Responses	
	Percent	Count
Greatly increase the hunting opportunity	0%	0
Slightly increase the hunting opportunity	18%	5
No change (maintain current management objectives)	18%	5
Slightly increase the hunt quality	41%	9
Greatly increase the hunt quality	23%	6

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.

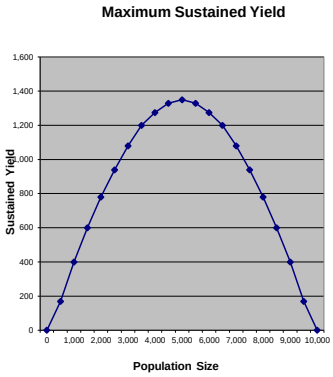


The second phase occurs when the population number is at a moderate level. This phase is characterized by high reproductive and survival rates. During this phase, food, cover, water and space are not limiting factors. During this phase, for example, animals such as white-tailed deer have been known to 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 DAU plan 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 DAU plan. 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.

Bartmann, R.M., G.C. White, L.H. Carpenter. 1992. Compensatory mortality in a Colorado mule deer population. Wildlife Monographs No. 121. 39 pp.

Bishop, C.J., G.C. White, D.J. Freddy, B.E. Watkins, and T.R. Stephenson. 2009. Effect of enhanced nutrition on mule deer population rate of change. Wildlife Monographs No. 172. 28 pp.

NORTH FORK OF THE GUNNISON HABITAT PARTNERSHIP PROGRAM COMMITTEE

Evan Phillips, Wildlife Biologist
Colorado Parks & Wildlife
2300 S. Townsend Ave.
Montrose, CO 81401

RE: North Fork of the Gunnison HPP Committee comments on Deer DAU 20 plan

Dear Mr. Phillips,

This letter is in response to your request for formal comment regarding the Colorado Parks & Wildlife D20 herd management draft plan. The Habitat Partnership Program (HPP) was created to help resolve wildlife conflicts, particularly those associated with fence and forage issues; and to assist CPW in achieving game management objectives. The diverse makeup of local HPP committees (3 livestock growers, Forest Service, BLM, CPW and sportsmen representatives) provides a good cross section of local interests to review DAU proposals and respond accordingly for CPW consideration. The North Fork of the Gunnison HPP Committee held a special meeting on November 13th to discuss deer population objectives for D20, and review the herd management plan alternatives. After careful consideration, the committee will offer the following recommendations:

- The committee agrees that the current deer population objective should be slightly increased according to the preferred alternative (Alternative #3). This represents a post hunt population of 7,500 – 9,500 deer. The committee recognizes that increasing the deer population is highly supported by landowners and sportsmen; however limited habitat and winter range reduces the ability of the landscape to support a large increase in deer numbers. The proposed objective increase is in line with current population estimates, but also allows for an increase in deer numbers if/when conditions are conducive to population growth. The increase is modest enough that it will be sustainable and well-received by the public with little change to the current levels of hunting opportunity, hunter crowing, license demand, and agricultural conflict issues.

- The committee supports managing the D20 buck ratio according to the preferred alternative (Alternative #4). This represents an increased objective of 33-38 bucks per 100 does. This is in line with the current observed buck ratio, and is supported by landowners and

sportsmen. Additionally, the proposed objective allows current levels of hunter opportunity and crowding to remain relatively stable.

The committee feels that these alternatives are reasonable and sustainable based on current range conditions, appropriate deer distribution throughout the area, high landowner tolerance for deer, and the extensive public input gathered during this planning process. Game damage potential is limited, as the proposed objective increase is modest and little game damage situations exist currently. Because the proposed population increase above current numbers is very modest, the committee does not foresee that the proposed objectives will increase agricultural conflicts or other issues. The committee did not identify any other areas of concern with the preferred alternatives.

On behalf of the North Fork of the Gunnison HPP committee, we thank you for allowing us to participate in this process and for the opportunity to comment.

Sincerely,

Cody Puncell