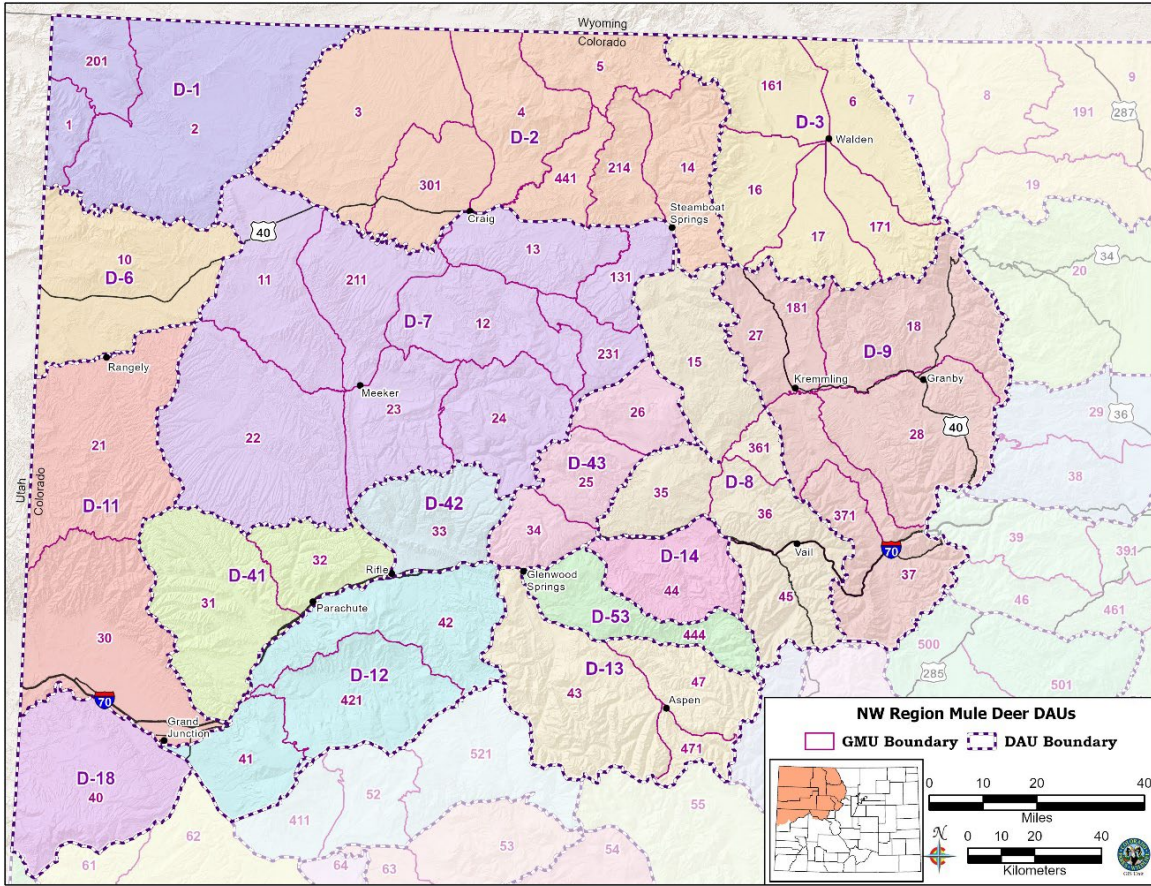


Draft
Northwest Colorado Mule
Deer Herd Management Plans

Data Analysis Units:
D-01, D-02, D-03, D-06, D-07, D-08, D-09, D-11, D-12,
D-13, D-14, D-18, D-41, D-42, D-43, D-53



PREPARED FOR
COLORADO PARKS AND WILDLIFE



BY

NW Terrestrial Staff
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NW Land use Staff

This plan was approved by the Colorado Parks and Wildlife Commission on

Executive Summary

The 2021 post-hunt population estimate for mule deer in the Northwest Region of Colorado totaled 165,510, which represents almost 40% of the mule deer in all of Colorado. There are 16 mule deer data analysis units (DAUs) across northwest Colorado, with 7 herd management plans (HMPs) that are up-to-date with approved population and sex ratio objectives in the last 3 years. The other nine HMPs are either out-of-date or have never had official plans approved. Traditionally, Colorado Parks and Wildlife (CPW) staff have presented one HMP at a time for approval to the Parks and Wildlife Commission (PWC). In order to address the large numbers of HMPs that need to be updated, staff have taken a new approach to develop a Regional roll-up of all HMPs in a CPW region for a single big game species to update or establish new population and sex ratio objectives. This document presents the proposed objectives for all 16 northwest deer DAUs, including the new proposed and recently approved objectives. The table above lists the 9 DAUs with objectives to be updated followed by the 7 DAUs that have been approved in the last 3 years that we want to extend. The plan also describes the significant management issues for mule deer herds in the northwest part of the state as well as what public input was used to develop proposed objectives and the individual HMPs for each of the deer herds.

While deer populations are down from historic high numbers in the 1960's to 1980's, populations in northwest Colorado are still some of the largest in the state and North America. Based on declining deer populations since the 1990's, CPW (then Colorado Division of Wildlife) has taken numerous measures over the years to attempt to slow down and understand population declines. Mule deer have been one of the most studied species in wildlife conservation, but there still is no single factor that has been identified to fix the decline and grow populations. We have implemented mule deer monitoring studies in 5 herds across the state including 2 in northwest Colorado (the White River, D-7, and Middle Park, D-9, herds) to monitor annual adult doe survival and over-winter fawn survival annually since the year 1998. The state has conducted numerous studies to understand the relationship of habitat and predators on mule deer populations. We have completed thousands of acres of conservation easements to protect private lands from development. The state also developed a West Slope Mule Deer Strategy in 2014, which incorporated public input, to guide the stabilization and recovery of deer populations that would in turn increase hunting and other wildlife-related recreation opportunities in the state. Following the guidance of the mule deer strategy, funds have also been made available and matched, to improve habitat across large parts of western Colorado. All of the efforts have contributed greatly to mule deer conservation and management and also to the benefit of other species using similar habitat types.

Through all of the monitoring efforts, research, and public input, we have identified a list of issues that impact deer populations and herd health in northwest Colorado. Chronic Wasting Disease has become one of the greatest issues affecting deer survival and has become a significant driver in establishing population and sex ratio objectives. Habitat quality and quantity are the other biggest factors affecting the potential for deer population size and growth based on carrying capacity, nutritional value, competition for forage with other grazers, and protection from disturbance, weather, and predators. Oil and gas development, renewable energy development, recreation, and residential development can impact deer populations through direct loss of habitat and indirectly by affecting behavior and use of quality habitat. There's also competition with free-roaming horses, elk, and livestock. Highway fencing and crossing structures have become a greater focus on deer management as

well, as fencing is being used to minimize vehicle collisions, but those fences also create barriers to migration and suitable habitat. Finally, predation is always a factor for deer management with coyotes, lions, and bears on the landscape, and following Proposition 114 wolves will be a factor as well in the future.

Public outreach and associated input have been conducted and evaluated to help establish proposed population objectives. Evaluation of newly available optional hunter satisfaction data from our annual hunter harvest surveys as well as public meetings held around the state have been invaluable to understanding hunter perspectives. The optional hunter satisfaction data will also be valuable information to gauge hunter satisfaction in the different deer DAUs from year to year since these questions will be asked every year. In addition, the draft plan will be posted for 30 days for another public comment period to evaluate the proposed objectives. Ultimately, most hunters in public meetings and in the harvest data would like to see more deer across the landscape, but also recognize the challenges of habitat conditions, predators, competition for forage, and game damage conflict.

Based on chronic wasting disease prevalence, habitat conditions with persistent drought conditions, public input, competition for forage, disturbance on important seasonal habitats, and changes to population models, most proposed population objectives are going to be lower than historic objectives. Additionally, some sex ratio objectives have increased in range breadth and lowered values to provide hunting opportunity and to manage CWD prevalence, which is highest in older age class bucks.

Table 1. Population and management status of 16 deer herds occurring in NW Colorado. The first nine plans in the table are being updated with new proposed population and sex ratio objectives. Objectives from the plans completed since 2020 will be extended (shaded rows).

DAU	Mule Deer Herd	Current DAU Plan Approved	Current Population Objective	2021 Post-hunt Population Estimate	Current Sex Ratio Objective	3-Yr Avg Observed Sex Ratio	Male CWD Prevalence (Female 2021)	Proposed Population Objective	Proposed Sex Ratio Objective
D-01	Little Snake	No plan	13,500	2,419	15	28.4	5%	1,500-3,500	15-25
D-02	Bear's Ears	1994	37,800	38,859	22	25.5	18% (10%)	25,000-35,000	15-25
D-03	North Park	2002	5,400-6,600	5,747	30-40	47.4	9%	4,400 - 6,400	Status Quo
D-06	Rangely	No plan	7,000	957	20	44.5	4%	1,500-3,500	15-25
D-12	North Grand Mesa	2010	17,000-23,000	16,550	25-30	21.3	1%	Status Quo	Status Quo
D-13	Maroon Bells	2011	7,500-8,500	5,931	30-35	31.5	0%	7,000-9,000	27-32
D-18	Glade Park	2010	6,500-8,500	3,904	30-35	29.9	0%	4,300-6,500	30-40
D-41	Logan Mountain	2012	6,500-8,500	4,478	25-30	26.8	6%	Status Quo	Status Quo
D-43	Sweetwater Creek	2011	5,000-6,000	5,464	28-32	24.2	14%	4,000-6,000	18-25
D-07	White River	2020*	25,000-35,000	32,279	18-25	25.8	15.3% (9%)	Extension	Extension
D-08	State Bridge	2020*	10,000-14,000	14,463	26-30	23.1	4%	Extension	Extension
D-09	Middle Park	2020*	10,500-14,000	13,994	30-35	36.8	3% (2%)	Extension	Extension
D-11	Bookcliffs	2022*	5,000-8,000	8,662	27-32	31.2	3%	Extension	Extension
D-14	Brush Creek	2020*	1,500-3,500	2,190	35-45	40.2	0%	Extension	Extension
D-42	Rifle Creek	2022*	6,200-8,200	6,390	25-32	24.5	10%	Extension	Extension
D-53	Basalt	2020*	4,000-6,000	4,262	32-40	30.5	1%	Extension	Extension

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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 CPW's 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 changes occurring across Colorado's landscapes from natural events like drought, wildfire, and severe winters to increasing public demands and growing impacts from people.

The purpose of this document and the Herd Management Planning (HMP) process is to provide CPW with long-term objectives that support and accomplish the broader objectives of CPW's Strategic Plan. The HMP planning process incorporates public input, habitat capabilities, CWD prevalence, and herd considerations into management objectives for each of Colorado's big game herds. Specifically, the HMP identifies desired population and sex ratio objectives that guide CPW's deer management practices. CPW is required by statute to manage all wildlife species for the benefit of all Colorado residents and visitors to the state. To ensure public needs are met, the general public, sportspeople, livestock producers, guides and outfitters, federal land management agencies, landowners, wildlife viewers, recreationists, and local businesses are involved in determining HMP plan objectives through surveys, public meetings, comments on draft plans, and input to the Colorado Parks and Wildlife Commission. Secondly, the HMP collects and organizes most of the important management data for the herd into one utilitarian planning document; determines deer herd issues through a public scoping process; identifies alternative solutions to the issues and problems identified in the scoping process; and selects the preferred alternative. HMP objectives are set for 10 years.

In Colorado, each big game population is managed as a herd, which is called a Data Analysis Unit (DAU). Generally each DAU is composed of multiple game management units (GMUs); however, in some cases a DAU is composed of just a single GMU. DAU boundaries are drawn in an effort to approximate the year-round range of that herd to include the areas where the majority of the animals in that population are born and raised and where they die, with minimal interchange between other herds.

CPW uses a "management by objective" approach to manage the state's big game populations (Figure 1). The objectives set forth in the HMP drive the most important decision in the annual big game license setting process: How many animals need to be harvested to maintain or move the population toward those objectives? The management by objective approach is an annual cycle of information collection, information analysis, and decision making that culminates each year in a hunting season. Data used in this process are collected through hunter harvest survey estimates, aerial herd composition surveys, radio telemetry studies to determine survival, wounding loss, and illegal kill estimates. These data are then used to estimate population size through a computer modeling analysis. The population modeling analysis generates harvest recommendations that align population estimates and herd composition with long-term HMP objectives. The cyclical objective-setting approach is designed to guide the decision-making process to data collection and analysis. It also focuses the Parks and Wildlife Commission on goals and objectives.

The purpose of this document is to set management objectives for all deer herds (DAUs) in the Northwest Region of Colorado. There are 16 individual deer DAUs in the Northwest Region, seven of which have HMP objectives that have been approved by the CO Parks and Wildlife Commission within the last three years, while the remaining DAUs have HMP's that

are expired or have never been written. The goal of this regional planning process is to establish current population and sex ratio objectives for all of the deer DAUs in the Northwest Region with the intent of having these objectives set for the next 10 years. The seven HMPs approved within the last three years will be extended for another 10 years. Management objectives can always be updated sooner, if the need arises.

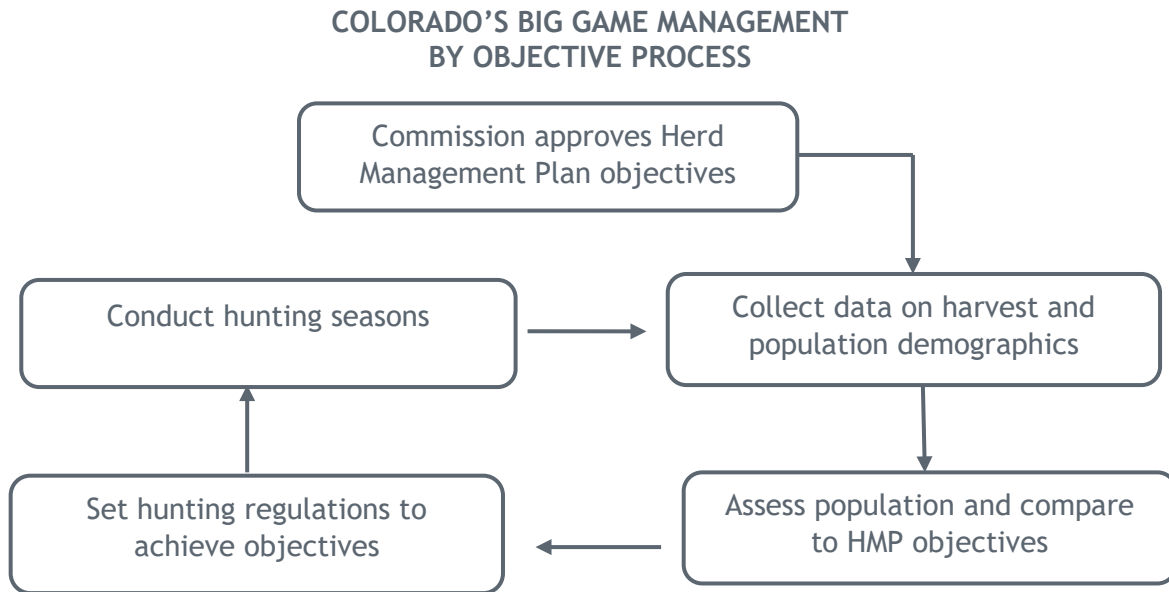


Figure 1. Management by objectives process used by the CPW to manage big game populations on a DAU scale.

Description of the Northwest Region Deer Data Analysis Units

There are 16 deer DAUs in the Northwest Region of Colorado. The herds are spread across the counties of Eagle, Garfield, Grand, Jackson, Mesa, Moffat, Pitkin, Rio Blanco, Routt, and Summit, and a small portion of Gunnison County. The counties span 14,556,058 acres with a total human population of 385,487. The major cities, towns, and communities in NW Colorado include Grand Junction, Rifle, Glenwood Springs, Meeker, Craig, Steamboat, Walden, Kremmling, Hot Sulphur Springs, Silverthorne, Frisco, Breckenridge, Vail, and Aspen. The NW Region of Colorado has large expanses of public lands (Figure 2) managed by the Bureau of Land Management (BLM, 32.6%), United States Forest Service (USFS, 28.9%), National Park Service (1.9%), State-managed lands (CO Parks and Wildlife-managed State Parks and State Wildlife Areas, 0.75%), as well as State Trust Lands, 2.8%). Private lands make up 32.4% of the land ownership.

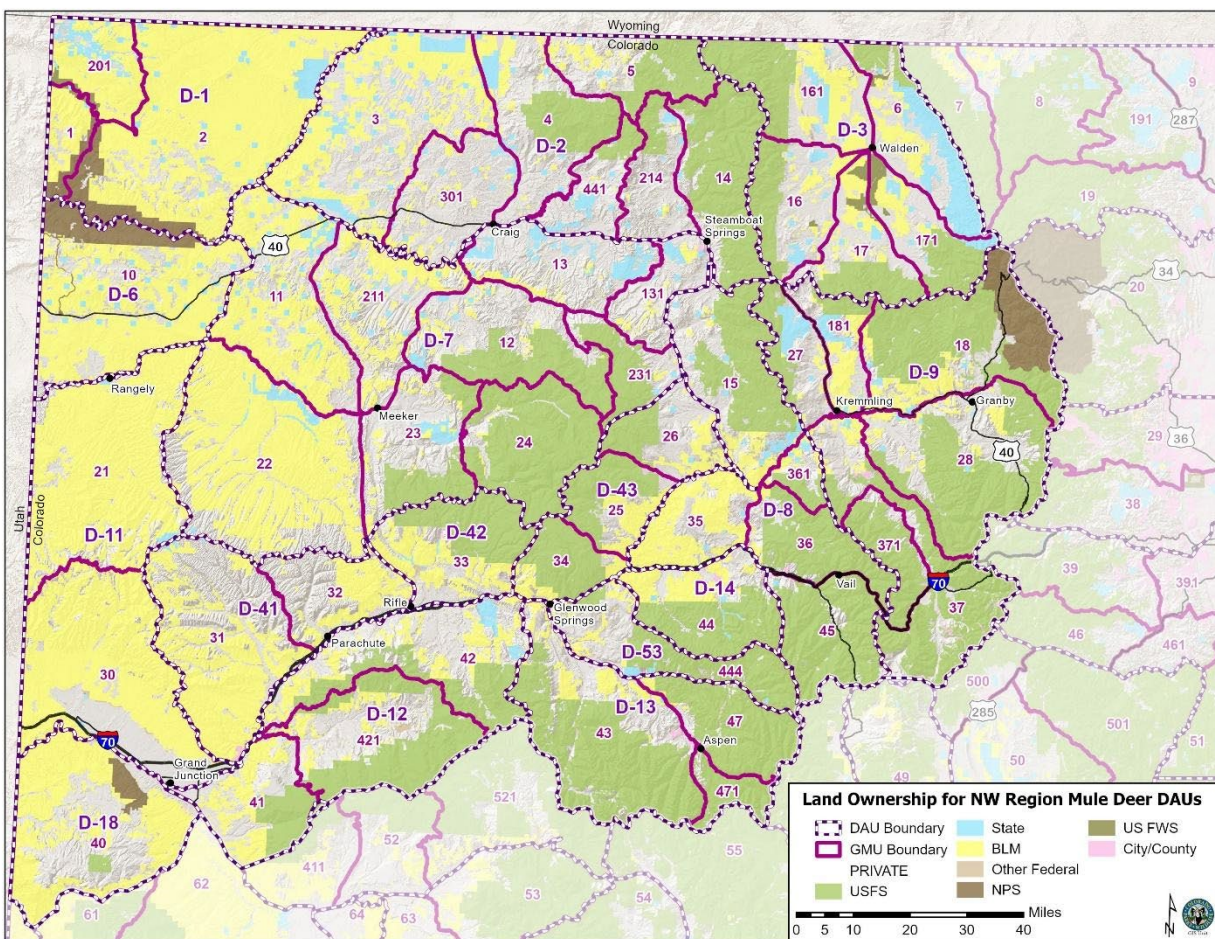


Figure 2. Land ownership across CPW’s Northwest Region in relation to deer herds.

Common Management Issues and Strategies

Mule deer and their habitat can be impacted by a variety of issues including predation, disease, disturbance and quality and quantity. The following section will provide information outlining the primary issues affecting mule deer populations in northwest Colorado. There may be other issues or concerns that are more minor or that may be of greater interest in the future. Keep in mind, most mule deer herds are affected by a variety of issues or concerns that make it difficult to find a single solution to manage mule deer populations. Table 2 provides a matrix depicting the primary and secondary management issues affecting the growth or productivity of the 16 different mule deer populations in the Northwest Region.

Table 2. Issues affecting mule deer populations in northwest Colorado, rated as either primary (dark blue) or secondary (light blue) concerns for each deer herd (DAU).

Mule Deer Management Issues	Data Analysis Units (DAU)															
	Little Snake D-1	Bears Ears D-2	North Park D-3	Rangely D-6	White River D-7	State Bridge D-8	Middle Park D-9	Book-cliffs D-11	North Grand Mesa D-12	Maroon Bells D-13	Red Table Mountain D-14	Glade Park D-18	Logan Mountain D-41	Rifle Creek D-42	Sweet-water Creek D-43	Basalt D-53
Chronic Wasting Disease																
Habitat quality/quantity																
Drought/Severe Winter/Climate																
Oil and Gas Development																
Renewable Energy Development																
Residential Development																
Elk competition																
Free-roaming horses																
Recreation																
Predation																
Fencing																

Chronic Wasting Disease

Chronic wasting disease (CWD) is a fatal neurological disease of deer, elk, and moose. CWD has likely been in Colorado since the 1960's; however, it was not confirmed in Northwest Colorado in 2002. Prevalence was low in the early 2000's, and at that time was not found

throughout many areas of the NW Region. Since 2017, CPW has been conducting mandatory CWD testing across different deer herds to determine prevalence (Figure 3). CWD has been found in more herds and at higher levels than first found in the early 2000’s.

CPW developed the Colorado Chronic Wasting Disease Response Plan in 2018 to provide direction for CWD surveillance and management of mule deer herds in response to the growing detection and prevalence of CWD across the state (CPW 2018). The plan established a schedule to monitor deer herds every 5 years for prevalence rates. In addition, if prevalence is determined to be at 5% or great in the male segment of the population, then management actions should be taken to reduce that prevalence to below the 5% benchmark. The primary recommendations to manage CWD prevalence in deer herds are: 1) Reduce population and density, 2) Reduce male/female ratios, 3) Change age structure, 4) Maximize ability to remove diseased animals at the smallest scale possible (hot spot management), 5) Remove motivations that cause animals to congregate, 6) Minimize prion point sources, and 7) Incorporate CWD management actions and prevalence threshold into herd management plans.

The Northwest deer management plan objectives have been developed to reflect the recommendations from the CWD response plan and attempt to reduce prevalence rates to or below the 5% benchmark. The primary tool for CWD management at the herd level is to manage for lower buck:doe ratios as bucks carry CWD at approximately 2 times the rate of females. Furthermore, managing for lower population densities can also help reduce the prevalence of CWD. When possible, license allocation will be directed to later seasons and locations to best address hot spots of higher CWD prevalence.

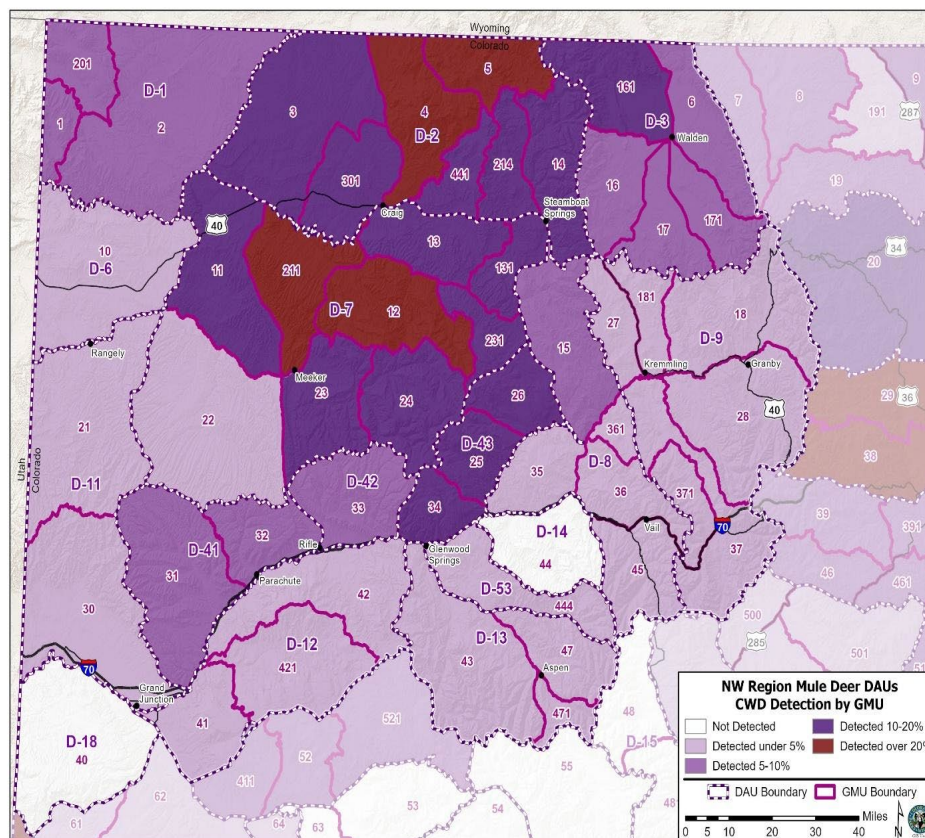


Figure 3. Chronic wasting disease detection rates in Northwest Region mule deer herds from mandatory testing efforts between 2017 and 2021.

Habitat Quality

Mule deer abundance is ultimately limited by the quality and availability of habitat. Factors that influence habitat quality include extreme weather conditions, invasive noxious weeds, fire, shrub eradication, overgrazing, and fragmentation. Quality habitat allows an animal to physically access the biological components for survival, including nutritious vegetation for growth and sustenance and security cover for thermal protection and predator avoidance. Mule deer are selective feeders with a diverse diet. Functionally, a mule deer's digestive system is dependent upon relatively high quality forage and low consumption rates when compared to more generalist grazers, such as cattle and elk. Nutritional requirements for mule deer require a variety of plant types including shrubs, forbs, and grasses, which vary across seasonal ranges.

Influence of Weather on Habitat Quality

Many of the factors affecting habitat quality for mule deer are driven by natural climatic events. Annual variations in seasonal precipitation affect habitat conditions, which drives distribution, reproduction, survival and ultimately abundance of mule deer. Furthermore, weather influences plant abundance, digestibility, and distribution. Perhaps the most critical weather-related periods affecting herd performance are from April to June and December to March. Seasonal precipitation from April through June affects woody plant growth on lower elevation winter ranges that deer rely on for winter forage in December-March. Snow depths and minimum temperatures affect winter survival. Summer drought cycles can have lasting effects on plant characteristics and the health of vegetative communities. During periods of prolonged drought, native plant communities become less productive and more vulnerable to invasive weeds, fire, shrub mortality, disease, and overutilization. This loss in diversity and productivity affects mule deer distribution, reproduction, survival, and relative abundance across seasonal ranges.

The effects of weather on habitat quality can be amplified by the timing of management actions. Management actions aimed at growing mule deer populations during periods of prolonged drought and the cumulative effect these actions can have on habitat quality often do not receive adequate consideration. The combination of summer drought, severe winter, and trying to maintain deer populations at too high of a level results in a lower nutritional carrying capacity on winter ranges.

Habitat Quality and Mule Deer Nutrition

Nutrition influences every life process of mule deer including ovulation, conception, gestation, lactation, and survival. Habitat quality is directly related to the nutritional carrying capacity of mule deer seasonal ranges. Poor habitat quality impacts the nutritional status of individuals in a population subsequently increasing an animal's susceptibility to additional factors such as predation, competition for food, disease, and survival during severe weather conditions.

To obtain sufficient nutrients mule deer require a high quality diet. Growth-promoting, high protein diets are needed in the spring from newly emerging grasses and forbs. Summer through fall deer select for leaves, new leader growth from shrubs, grasses, and flowering forbs high in carbohydrates as they attempt to put on fat to sustain the winter. Deer try to minimize energy expenditures and burn fat reserves to get through winter months. Winter diets are composed of low protein forage including leader growth from shrubs, dried forbs and

grasses. Nutritional deficiencies realized from poor quality seasonal habitats can negatively affect productivity within a herd.

Seasonal Ranges and Habitat Quality

Many mule deer populations in Colorado migrate from higher elevation summer ranges to lower elevation winter ranges. The plant communities vary dramatically across these seasonal ranges, as do the dietary requirements for mule deer across these landscapes. Mule deer will preferentially select for areas with seasonally important forage resources within close proximity to cover and water. Seasonal availability of various plants and seasonal metabolic requirements of deer influence the selection of forages throughout their range.

Spring Transition

Migrations through transitional ranges are traditional, learned behaviors passed on generationally within family groups of deer. The seasonal transition from winter to spring can be extremely challenging for mule deer as a dietary shift occurs from a low nutrition winter diet of woody shrubs to a high nutrition spring diet of emergent green grasses and forbs. Energy reserves are lowest and animals are generally in their poorest nutritional condition at the end of winter. The transition from a low quality diet to consuming highly palatable, succulent herbaceous plants rich in protein is important for recovering body condition this time of year. Migratory deer are able to capitalize on these emerging highly nutritious plants by following spring green-up back to higher elevation summer ranges. However, delays in snowmelt and cold, wet spring storms can be devastating to deer at this critical stage. Energy costs are highest for female mule deer through the spring and early summer. Does are trying to recover their body condition when nutritional forage resources are marginal all while migrating to summer range, preparing for parturition, and experiencing an exponential increase in energy required for lactation and the successful rearing of one or more fawns. Thus, a doe's over-winter body condition and the timing of spring green-up are both critical to increasing the success of a doe's pregnancy.

As landscape fragmentation increases because of human development and land-use changes, conserving the integrity of these transitional habitats is critical to the continuity of migratory movement throughout these ranges.

Summer Range

Mule deer summer ranges are generally expansive and can vary widely across the landscape. Most deer summer at higher elevations; however, some deer are resident and occupy lower elevations year-round. Habitat types at lower elevations include Wyoming big sagebrush and pinyon-juniper, mid-elevations contain mountain big sagebrush, mixed mountain shrub, and aspen, and higher elevation summer ranges are predominately aspen and mixed conifer forest. Plant diversity and production is higher at mid to high elevation summer ranges. Nutrition on summer ranges is generally not a limiting factor for mule deer. Historically naturally occurring wildfire played a major role in the ecology of these habitats. Suppression of fire on summer ranges has resulted in older and more decadent mixed mountain shrub, aspen, and mixed conifer forests more susceptible to disease, insect infestations, and catastrophic wildfires. Drought has had a significant impact on mid-elevation serviceberry and aspen habitats. Many aspen clones at mid-elevations are dead or dying with varying degrees of regeneration. Drought-stressed serviceberry plants have been top-killed from a leaf blight. The effects of the blight are widespread; however, many of the shrubs affected appear to show signs of basal sprouting.

The optimal combination of cover types on summer ranges includes 40% of the area that is a mosaic of hiding, thermal, or fawning cover and 60% foraging area (Olson 1992). Dietary shifts occur over the course of the summer. As grasses dry and cure mid-summer, mule deer transition to forbs and shrubs. By mid to late summer, forbs and leaves can comprise up to two-thirds of the diet. As forbs senesce, deer replace forbs with shrubs in their diet.

Although riparian areas comprise a small portion of the landscape, they are of high importance for mule deer. The optimal combination of cover types occur in these small areas and provide year-round forage for deer. Higher water tables within riparian zones support more diverse plant communities with extended green periods when surrounding uplands dry out, providing deer with access to nutritious grasses, forbs and shrubs.

Fall Transition

The path taken during fall transition along migratory routes often mirrors the path of spring migration. Fall transition occurs from higher elevation summer ranges to lower elevation winter ranges. As mule deer descend in elevation in fall, their diets shift and contain a higher percentage of browse and mast (acorns/berries) from mixed mountain shrub species. Depending on the distance between seasonal ranges and weather, the amount of time spent and intensity of use on transitional ranges can vary. During winters with lighter snow cover, mule deer may remain within transitional ranges longer, where forage quality and plant diversity is often higher than lower elevation winter habitats.

Energy requirements differ for bucks, does, and fawns during the fall. Bucks spend less time foraging this time of year during the rut, so quality of summer and fall transition forage resources are important for maintaining body condition considering the energy requirements during breeding. Increased activity levels result in faster depletion of fat reserves going into the winter. In contrast, doe body condition improves as fawns are weaned in the fall and the demands of lactation decrease. Body condition of does affects timing of ovulation, conception, and fecundity (Tollefson et al. 2010). Odds of winter fawn survival increases for fawns with access to high quality forage. Fawns on a higher nutritional plane have larger body mass, which translates into higher survival rates and subsequent recruitment into the population.

In addition to weather, human activity can also influence time spent in transitional ranges. Deer tend to spend less time in highly developed areas, increasing the rate of movement through or altering the use of habitats within these areas (Sawyer et al. 2013, Lendrum et al. 2013). Where disturbances occur and at what level can potentially have a significant impact on deer population dynamics. Therefore, knowing how deer use transitional ranges is important to making informed land-use decisions in order to avoid or minimize impacts to these critical transition ranges.

Winter Range

The quality of winter range habitat is extremely important to mule deer survival because these ranges are most limited in forage quality and quantity. Forage quality and abundance are at the lowest levels while energy demands are highest during winter months. Browse from the leader growth of shrubs comprise the bulk of the deer diet. Important winter browse species across winter ranges often include Wyoming big sagebrush, black sagebrush, antelope bitterbrush, serviceberry, rabbitbrush, true mountain mahogany, Gambel oak, snowberry, four-winged saltbush, shadscale saltbush, and winterfat. Dietary quantity and

quality are highly variable, with significant declines in digestible nutrients during the winter. Regardless of habitat type, nutritional gains from consuming winter browse is often less than the energy expenditures resulting in depletion of fat reserves as winter progresses. Body protein is often catabolized in order to survive the winter resulting in significant losses in body weight. However, the rate of weight loss can be reduced by improving winter range forage conditions. Enhanced nutritional forage conditions can buffer the effects of the high energy demands needed to survive the winter.

Winter weather conditions influence mule deer distribution on winter ranges. Increased snow depths force deer to concentrate onto smaller landscapes with open southern and western aspects where snow depths are minimal and access to forage resources are greater, although forage is limited. Many winter ranges consist of open sagebrush, mixed mountain shrub, or pinyon-juniper woodlands. Often deer will seek out pinyon-juniper woodlands for thermal cover and lighter snow conditions, allowing for increased mobility and lower energy expenditure.

In addition, lower elevation winter ranges are more susceptible to drought than mesic, higher elevation summer ranges. Overutilization of drought-stressed winter ranges reduces plant vigor and diversity resulting in monocultures, which negatively influence selective foragers such as mule deer. In contrast, some habitat disturbances may be beneficial by reverting succession and increasing plant diversity and forage quality. Fire in pinyon-juniper and mature mountain shrub communities, beetle kill, and agricultural development can all improve habitat quality. However, large-scale fires on mule deer winter ranges can have an adverse effect by converting shrub-dominated landscapes to grasslands rendering them unusable by wintering deer. In effect, the loss of browse from the fires results in a significant increase in deer densities and browsing pressure on the often-small patches of brush that remain. The increased browsing pressure leads to increased stress on the remnant brush, resulting in decreased nutritive value, decreased vigor, less productivity, and lower palatability. Ultimately, these situations lead to winter ranges capable of supporting fewer deer until the browse component within these landscapes are re-established to levels usable by deer.

Drought/Winter Weather Impacts

Weather and climate conditions also affect mule deer populations. Severe weather can manifest in the form of severe winter conditions or extreme drought, and these conditions can have both direct and indirect impacts on mule deer populations.

Severe winter weather in the form of snow depth and/or prolonged extreme cold temperatures can affect mule deer survival rates directly. Deep and/or crusted snow can limit access to forage and cause malnutrition and starvation and malnutrition in mule deer. When snow conditions are severe and snow is deep, mule deer tend to concentrate in larger groups, leading to the depletion of available forage. When mule deer are exposed to extremely cold temperatures for long periods, they may remain in sheltered areas where forage is less abundant. Winter weather can also have indirect impacts on mule deer survival. Because deep snow and extreme cold tend to concentrate mule deer and reduce the amount of available forage, mule deer are more vulnerable to predation and physically in poorer condition.

The impacts of extreme drought in summer are less immediate. During periods of prolonged drought, the nutritional characteristics of forage are compromised and successional stages of

the habitats change. These factors can lead to lower nutritional carrying capacity of the range. Figure 4, below illustrates the percent of the Upper Colorado Watershed that falls in the different drought index categories from the year 2000 to present. This watershed includes all of the Upper Colorado which covers the western slope of Colorado, southwest Wyoming, Utah, and small parts of New Mexico and Arizona. The graph is similar to graphs for higher level watersheds in Colorado.

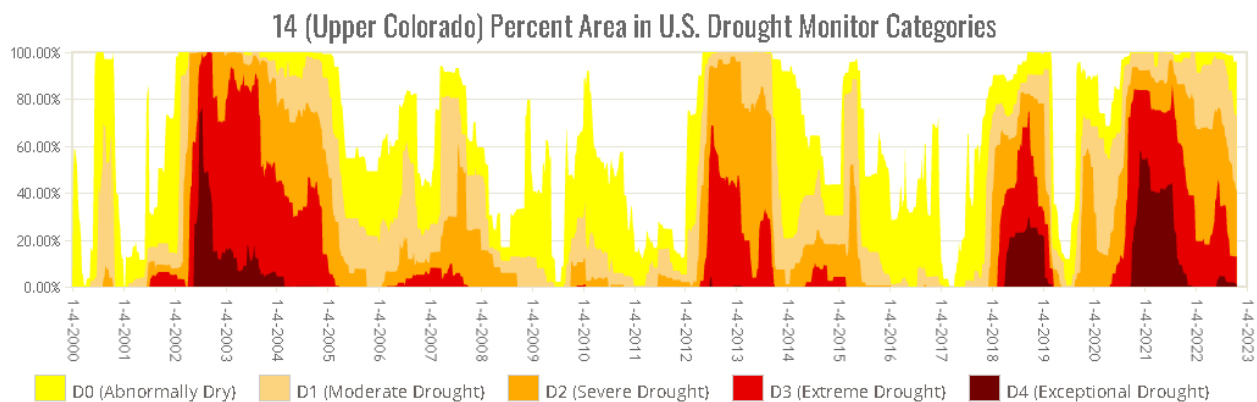


Figure 4. Times series drought monitoring graphing depicting the percentage of the watershed in different drought categories from the year 2000 to present. (www.droughtmonitor.unl.edu)

Human Impacts to Habitat Quality

Humans have both direct and indirect impacts to mule deer habitat. Energy exploration, solar and wind development, urban growth, recreation, highways, railroads, and fence lines all have direct impacts on habitat quality and functionality. These activities and structures fragment habitats and diminish habitat function by limiting access to foraging and resting areas. The quality of vegetative communities can also be degraded by land management practices. Fire suppression, livestock grazing, shrub eradication, and disturbances that promote invasion of cheatgrass and other noxious weeds all have impacts on habitat quality.

Habitat quality is a dynamic and complex issue affecting performance of mule deer herds in Colorado. Climatic changes and human disturbance have the greatest impacts on habitat quality. Drought cycles predispose plant communities to characteristic changes resulting in habitats that are less productive and functional for mule deer. Human growth and development not only affect habitat quantity but also render the remaining habitat less functional due the fragmentation that occurs from these disturbances.

Habitat Quantity

The amount of habitat available to mule deer in Colorado has changed significantly over the last century. However, the rate at which habitat loss has occurred within the last 50 years has accelerated considerably compared to the homesteading days of the late 1800's - early 1900's. Settlement of the West resulted in intensive livestock grazing through the 1930's that actually increased the size, density, and vigor of shrub communities in Colorado and increased the amount of habitat available to mule deer. These increases in habitat contrast greatly with the losses of mule deer habitat within the last 50 years. Changes in climate and

weather patterns and the direct and indirect losses of mule deer habitat due to the growth of Colorado's human population have been driving factors in trends in mule deer populations.

Colorado's population has had recent exponential growth to 5.7 million people. In the last 50 years, the amount of people per square mile has tripled from 17 people per square mile in 1960 to over 50 today. With increasing human population comes an increase in homes with a current estimate of 2.4 million housing units. Subdivisions, condominiums, ranchettes, grocery stores, airports, golf courses, roads, power lines and all other infrastructure that comes hand in hand with homes contribute to a direct loss of mule deer habitat.

One of Colorado's main economic giants is recreation. Recreational activities such as rafting, skiing, camping, hunting, mountain biking, and off-road vehicle use all have indirect impacts to mule deer populations. For example, Colorado's ski industry consists of 23 resorts totaling 44,676 acres that has both direct and indirect impacts to mule deer summer ranges.

Mule deer habitat quantity has also been reduced from energy exploitation in Colorado. There are currently over 37,000 producing natural gas wells compared to 5,125 in 1989. There are also three surface coal mines in Colorado. Oil shale exploration and oil wells are also expected to increase in the future. These activities reduce the amount of available habitat through pads, roads, pipelines, and open mine pits.

Colorado has a network of roads that total 85,400 miles. Road construction directly impacts deer through removal of available habitat and population loss from road kills. Indirect impacts result from fragmentation, which alters deer migration patterns, daily movements and behavior. Roads are continually expanding into mule deer range from housing, energy development, and recreation.

Drought cycles over the past 20 plus years have also had an effect on usable mule deer habitat and mule deer production. Expansive wildfires on critical winter ranges have significantly reduced the amount of winter range available to mule deer. While fire can be beneficial and improve habitat quality for mule deer in most situations, it can be detrimental and result in significant losses of mule deer winter range. This is especially true when fire occurs in the presence of cheatgrass and in plant communities intolerant of fire. In these instances, the loss of winter range to fire significantly reduces the number of mule deer those ranges can support resulting in lower population levels.

The above impacts have resulted in both direct and indirect losses to the amount of habitat available to mule deer. The direct losses of mule deer habitat due to the footprint left by these activities are often amplified through the indirect losses that occur due to fragmentation of the available habitat that is left. The connectivity between the available habitat that is left is fractured, impacting the quality of habitat mule deer use through their life cycle from summer to winter ranges. Ultimately, these losses in available habitat limit mule deer populations.

Oil and Gas Development

Extraction of oil and gas has the potential to affect mule deer populations directly through habitat loss from pad, road, and pipeline development and associated spread of noxious weeds, or indirectly from the increased human presence at pads and use of roads. Oil and gas

development activity in NW Colorado has remained at relatively low levels over the past decade compared to the high volume of activity experienced between 2006 and 2010. Recent market conditions and commodity price increases have resulted in slight upticks in the number of permits being submitted; however, active drilling rig counts have not increased significantly. The figure below (Figure 5) depicts the number of wells drilled annually in the Northwest Region from the year 2000 to present.

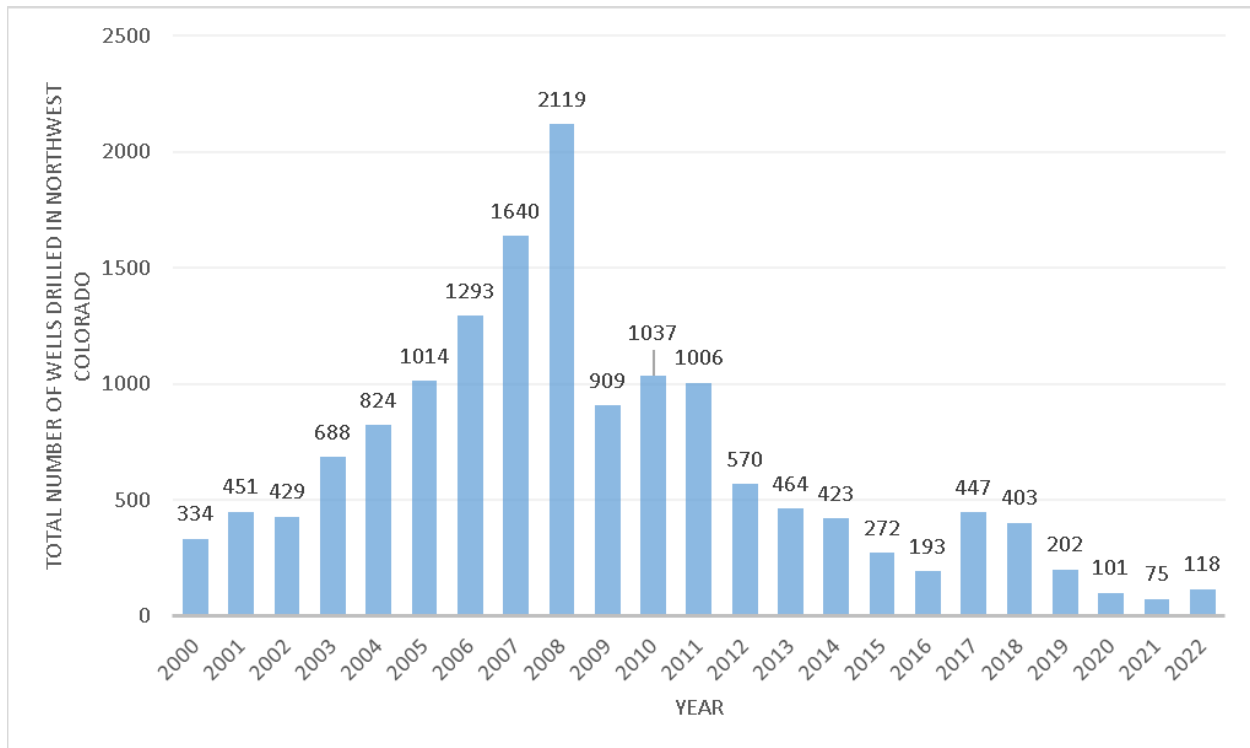


Figure 5. Wells drilled annual in northwest Colorado counties from 2000-September 2022.

Colorado’s recently enacted (January 2021) Senate Bill 19-181 (SB-181) oil and gas regulations contain new provisions and requirements for the protection of wildlife resources during oil and gas development. In particular, the new regulations contain measures to: reduce noise and light impacts, require compensatory mitigation to offset direct and indirect impacts to big game high priority habitats (HPH), limit the density of oil and gas development within big game seasonal ranges, and analyze alternative development locations to minimize adverse impacts. Figure 6, illustrates where active wells overlap with mule deer HPH layers. These new regulations result in significantly greater wildlife protections compared to the State’s previous House Bill 1298 oil and gas regulations, and expand CPW’s involvement and consultative role during the Colorado Oil and Gas Conservation Commission (COGCC) permitting process.

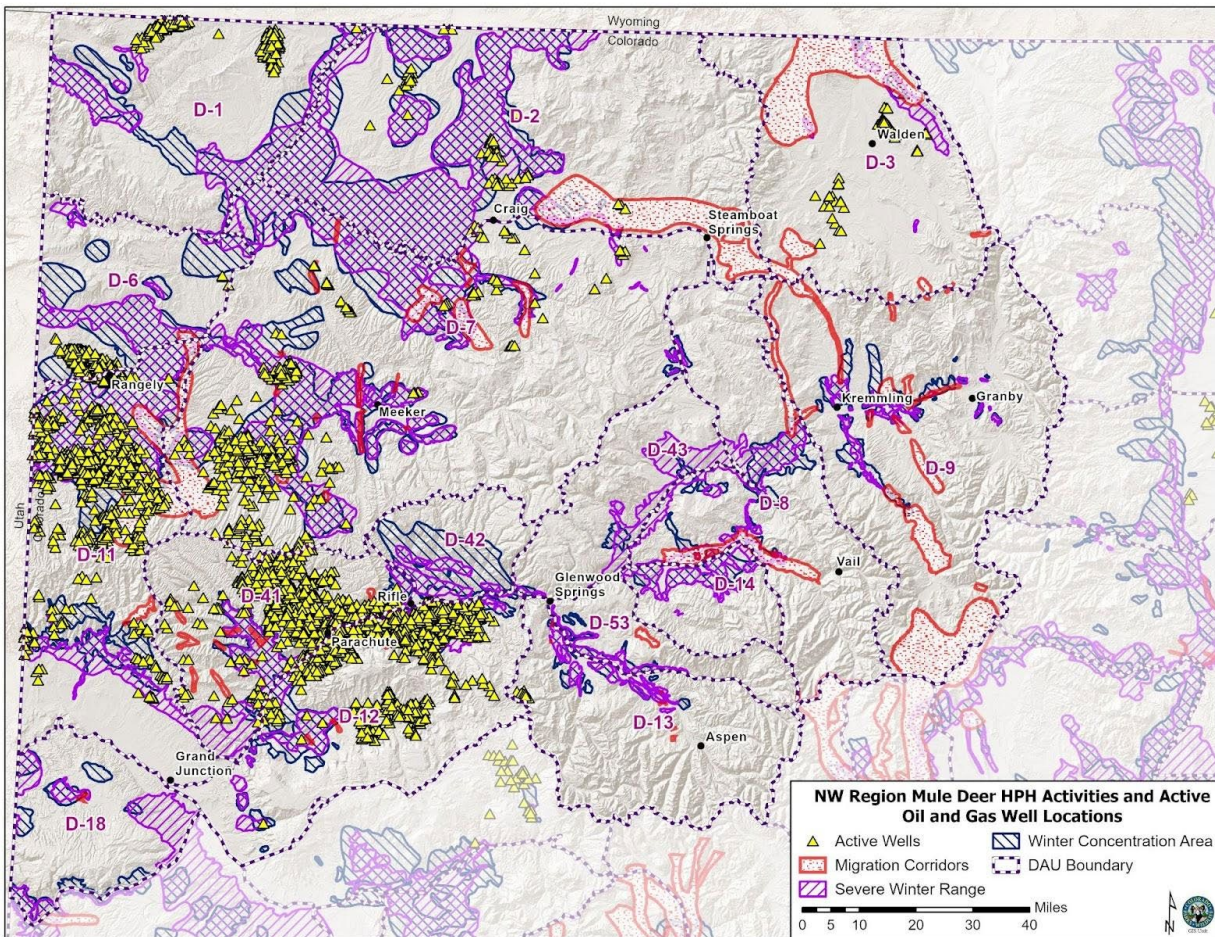


Figure 6. Map of deer DAUs in northwest Colorado overlaid with high priority habitat (HPH) layers and active oil and gas wells.

Renewable Energy

Proposed renewable energy projects have increased significantly in the past several years, with a focus on utility-scale photovoltaic (PV) solar projects in Western Colorado. CPW’s Northwest Region has consulted on approximately six proposed solar projects that are greater than 1,000 acres in size during calendar years 2021 and 2022. Of particular concern for big game species, the National Electric Code (NEC) requires that solar energy facilities be fenced for security purposes. This exclusionary fencing requirement results in a complete loss of habitat for big game, and oftentimes creates a significant barrier to daily and/or seasonal movement patterns.

When siting locations for utility-scale solar projects, developers typically seek areas close to existing electrical transmission lines and substations, flat topography, southern exposures, and limited forest canopy cover. Frequently, these landscape characteristics are also representative of high-quality winter range areas for big game in Western Colorado. Additionally, to avoid lengthy federal permitting processes, most of these proposed projects have been located on privately owned lands with 20-30 year lease agreements.

Urban/Residential Development

Over the past 50+ years, private lands in large portions of Northwest Colorado have transformed from undeveloped or rural/agricultural landscapes into increasingly suburban and even urban areas, dominated by residential and commercial developments and fragmented by roads, highways, and recreational trail networks. These private lands typically lie at lower elevations, coinciding with big game winter ranges. The human population in Northwest Colorado has grown consistently since the 1960s, with marked increases in the 1970s and 1990s-2000s (Figure 7). In the 1970s and 1980s, the growth of the ski industry in Aspen and Vail, and later in Steamboat Springs and Granby, brought an influx of visitors and new residents into these areas, facilitated by the construction of Interstate-70 starting in the late 1960s through the 1990s.

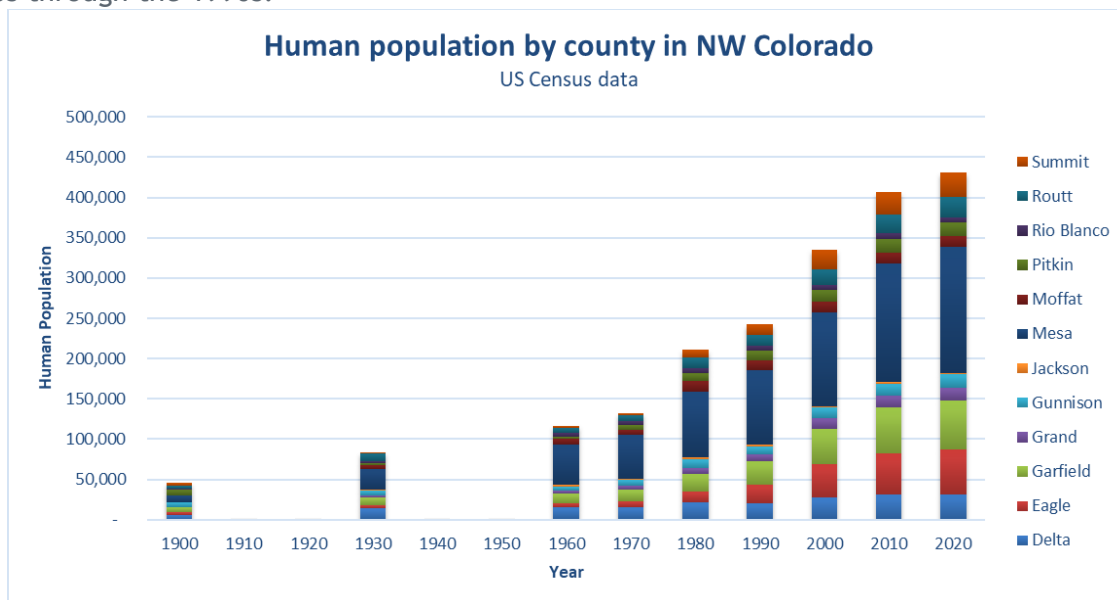
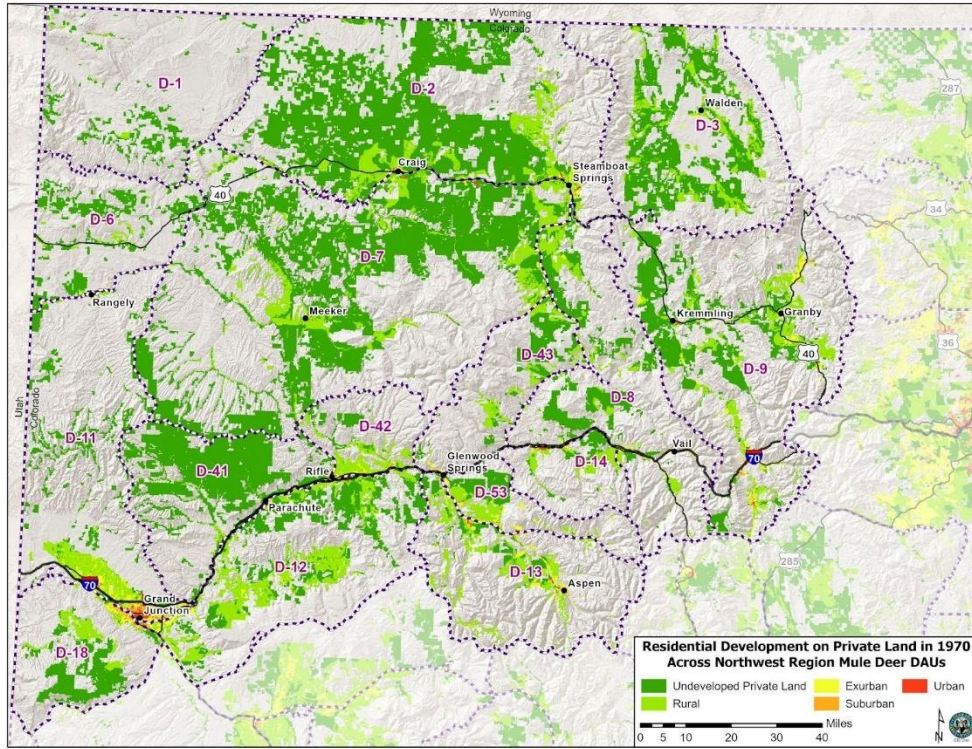
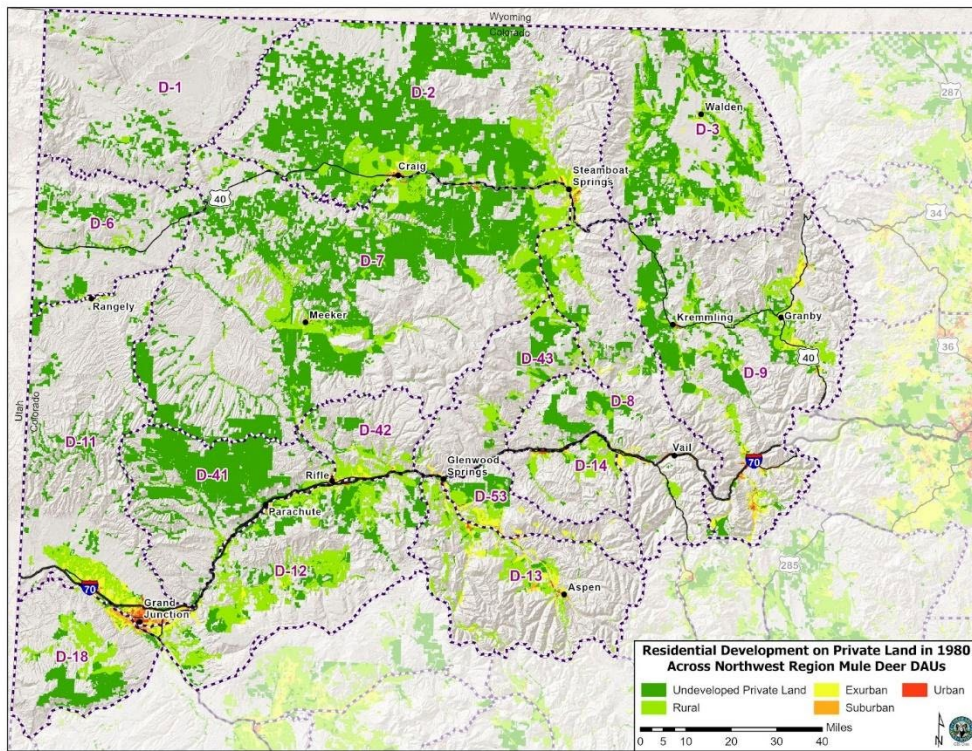


Figure 7. Human population from 1900-2020 based on US Census data in counties overlapping CPW’s Northwest Region.

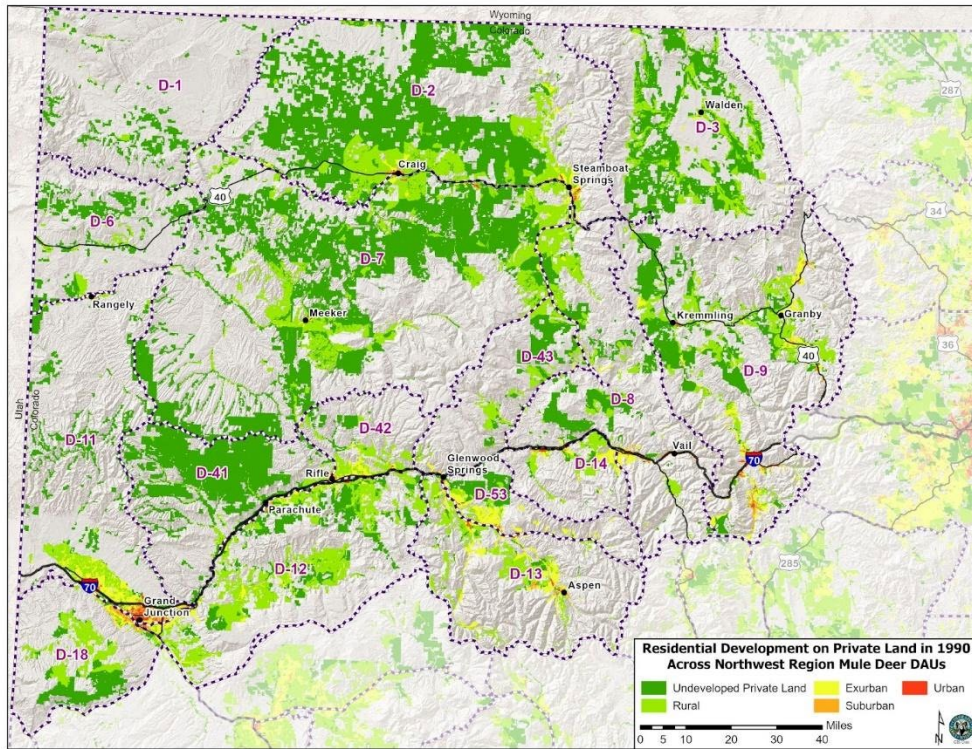
Construction and real estate development are now among the major industries in Northwest Colorado, especially along the Interstate-70 and State Highway 40 corridors. In 1970, 13,242 km² (74%) of private lands on mule deer overall range and 7,274 km² (77%) of mule deer winter range in Northwest Colorado were considered undeveloped (0 housing units/km²). By 2020, almost 30% of undeveloped private land was converted, leaving only 9,492 km² (53%) of mule deer overall range and 5,146 km² (54%) of mule deer winter range left as undeveloped (Figures 6a-f). Increasing residential housing development has been shown to correlate with declining mule deer recruitment rates (Johnson et al. 2017).



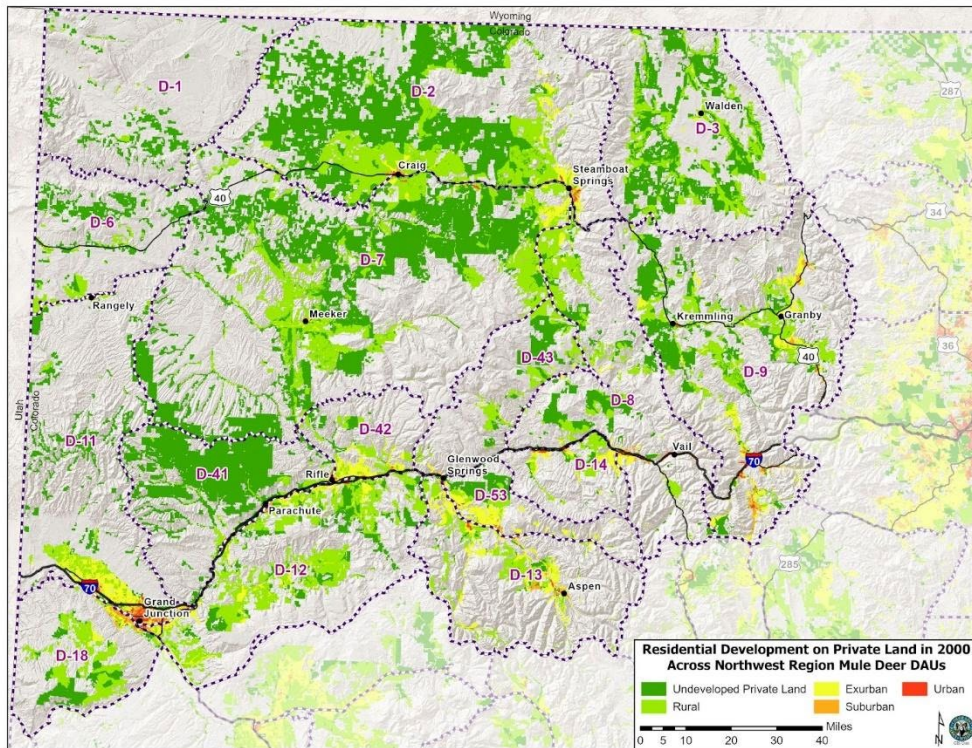
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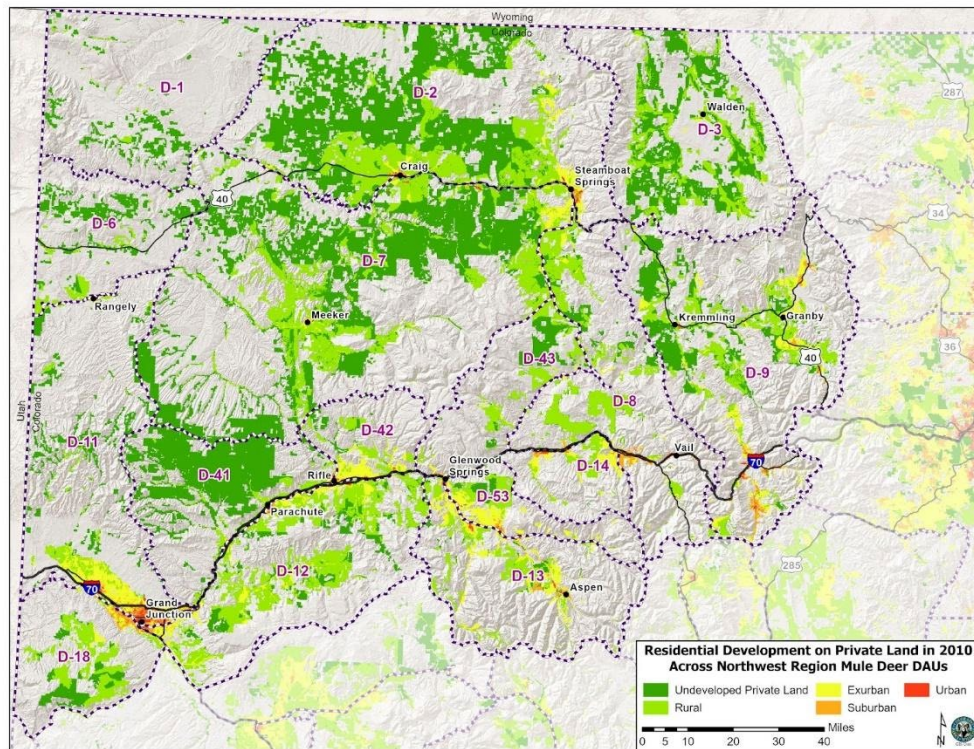
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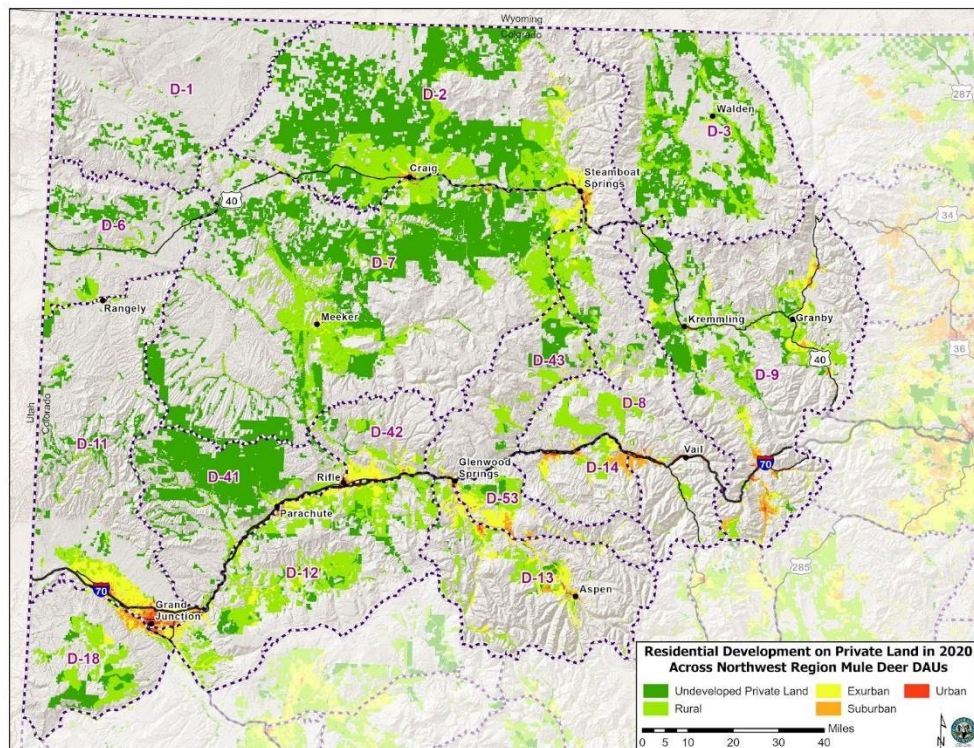
c.



d.



e.



f.

Figure 8(a-f). Maps of housing densities on private lands in Northwest Colorado from 1970-2020. Undeveloped = 0 housing units/km², Rural = <3 units/km², Exurban = 3-59 units/km², Suburban = 60-500 units/km², Urban = >500 units/km² based on Shushinky et al. 2014.



Figure 9. Housing densities on private lands in (a) mule deer overall range, and (b) mule deer winter range) in Northwest Colorado, 1970-2020. Undeveloped = 0 housing units/km², Rural = <3 units/km², Exurban = 3-59 units/km², Suburban = 60-500 units/km², Urban = >500 units/km² based on Shushinky et al. 2014.

Along with the growth of the human residential population has come higher vehicle traffic on roadways, leading to more roadkill of wildlife. Beyond the immediate footprint of habitat loss through land development, there are also larger-scale, indirect effects on the landscape: ever-increasing demand for outdoor recreational access has led to development of trail systems, campgrounds, and access roads, and therefore more human activity on both private lands and surrounding public lands.

Converting rural and agricultural lands that once functioned as wildlife habitat amounts to effectively a permanent loss of habitat. Real estate values have increased exorbitantly, so the financial incentive for ranch owners to subdivide and sell their properties has been immense. The cost to deer and other wildlife is the likely irreversible loss of habitat and therefore decreased carrying capacity across the landscape for many wildlife species.

Conservation of private lands should be a priority in order to protect and maintain connectivity of the remaining undeveloped lands for wildlife use. The Colorado Wildlife Habitat Program (“Habitat Stamp”) and Great Outdoors Colorado (GOCO), as well as federal programs and non-governmental organizations such as land trusts, provide funding and mechanisms to help private landowners set up conservation easements. The challenge, however, is that conservation easement efforts must compete with the extremely high real estate prices in the region.

Elk Competition

In many areas on the Western Slope of Colorado, and in other western mule deer herds, mule deer numbers have decreased as elk numbers have increased. Mule deer competition with elk has been proposed by a number of academics, biologists, and managers in several western states as one factor that may be contributing to a decline in deer numbers. Potential negative interactions with elk include competition for scarce supplies of high-quality forage and behavioral avoidance. However, the existence, nature, and scale of these effects remain theoretical. Predicted impacts are extrapolated from an understanding of mule deer life history and behavior to potential competition events with elk. The actual occurrence of competition resulting in reduced production or survival of mule deer is challenging to detect and measure, and little evidence of competition between elk and mule deer is documented in scientific studies. Further complicating detection of competition effects, there may be undetermined time lags between the occurrence of mule deer/elk competition and some effect on mule deer populations. If competition with elk occurs in western Colorado, it is most likely where key habitats are limited (i.e., on winter ranges, in fawning/calving habitats, in arid environments, etc.).

Elk were eliminated from many areas of Colorado by the early years of the 19th Century, but numbers had increased substantially by the 1920s and 1930s. Elk harvest on traditional mule deer winter ranges around Maybell, CO and Elk Springs, CO in western Moffat County was common during the homestead period of the 1920s, for instance, but elk were largely gone from the area by the end of the 1930s. Elk numbers in many areas of western Colorado remained relatively low during the peak years of mule deer populations in the 1950s and 1960s. Elk populations then increased steadily from the 1970s through 2000. During the winter of 1978-79, Colorado Division of Wildlife field personnel reported the first significant movement of elk in recent memory to the west of Colorado Highway 13, which runs from Rifle to Wyoming through Meeker and Craig. This westward movement of elk was repeated during the severe 1983-84 winter, when snow depths were extreme and therefore elk were artificially fed on many of these extended ranges. By the mid-1990s, this movement of

significant numbers of elk into winter ranges that previously had been exclusively occupied by mule deer had become an annual event. Intentional and aggressive decreases in the size of elk populations have occurred across western Colorado since 2000. However, most declining mule deer populations in western Colorado have not responded positively to these reductions in elk numbers.

The ability of ruminant wildlife to intake forage is driven largely by body size and the fixed rate at which forage is processed by microbes in the rumen to extract energy and nutrition. Smaller animals, including mule deer, are forced by these biological limitations to concentrate on forages of relatively higher quality in order to extract sufficient nutrition through a smaller digestive system. Larger ruminants, particularly elk, will also use these high-quality resources but have substantially greater ability to make use of low quality forages as well. When mule deer and elk occupy the same ranges, particularly when resources are limited as in the winter months, the potential increases for elk to negatively impact mule deer by consuming the high-quality forage required by deer, while supporting themselves on much more abundant low-quality forage.

Elk and mule deer often occur in relatively close proximity. However, they are rarely observed in mixed groups, suggesting that some level of behavioral separation occurs. Where resources are very limited, as on winter feed lines, elk have been observed to physically drive deer away from food. To the extent that competition with elk forces mule deer into less preferred habitats, it may contribute to reduced nutrition or higher predation risk, resulting in reduced production and/or reduced survival of mule deer.

If significant mule deer/elk competition occurs, management of elk to reduce competition with mule deer could be complicated, and perhaps precluded, by the interest in and value of elk as a big game species. Many sportsmen believe that current elk populations are too low. Elk are highly sought after in Colorado for hunting and wildlife watching opportunities and constitute a major economic driver for local communities on the Western Slope.

Efforts to manage potential mule deer/elk competition will require substantial and detailed local knowledge about the ecological interactions of the two species. Managing for healthy populations of both mule deer and elk in western Colorado will require, at a minimum; broad support of management and funding partners (i.e., BLM, USFS, NGOs, etc.); an understanding of current habitat conditions, including the relative value of current habitats to mule deer and elk; the relative distribution of key seasonal habitats; and the relative forage consumption by elk compared to forage removed by other wild and domestic grazing animals; as well as agreement on the desired relative population sizes of mule deer and elk.

Free-roaming Horses

The Bureau of Land Management manages over 82,000 free-roaming horses and burros on 42,300 acres across 10 Western states, including Colorado. The Wild Horse and Burro Program's goal is to manage healthy feral horses and burros on healthy public rangelands. Areas that are managed for free-roaming horses are designated as Horse Management Areas (HMAs). Areas with free-roaming horses and burros but that are not managed for them are designated as Horse Areas (HAs). The BLM determines the Appropriate Management Level (AML), or the number of feral horses the habitat can support with on a given HMA. Since HAs are not managed for feral horses and burros, and they are not intended to be present on these lands, AMLs are not designated for these areas.

The BLM in Colorado manages four wild horse herd management areas on 424,505 acres with an additional five Horse Areas where horses are not managed ranging 426,770 acres (USDI Bureau of Land Management 2022) (Figure 1). These areas cover critical deer habitat, specifically winter ranges. As of March 2022, combined populations in Colorado were estimated at 1,873 horses with the appropriate management level for all HMAs in the state at 827 animals.

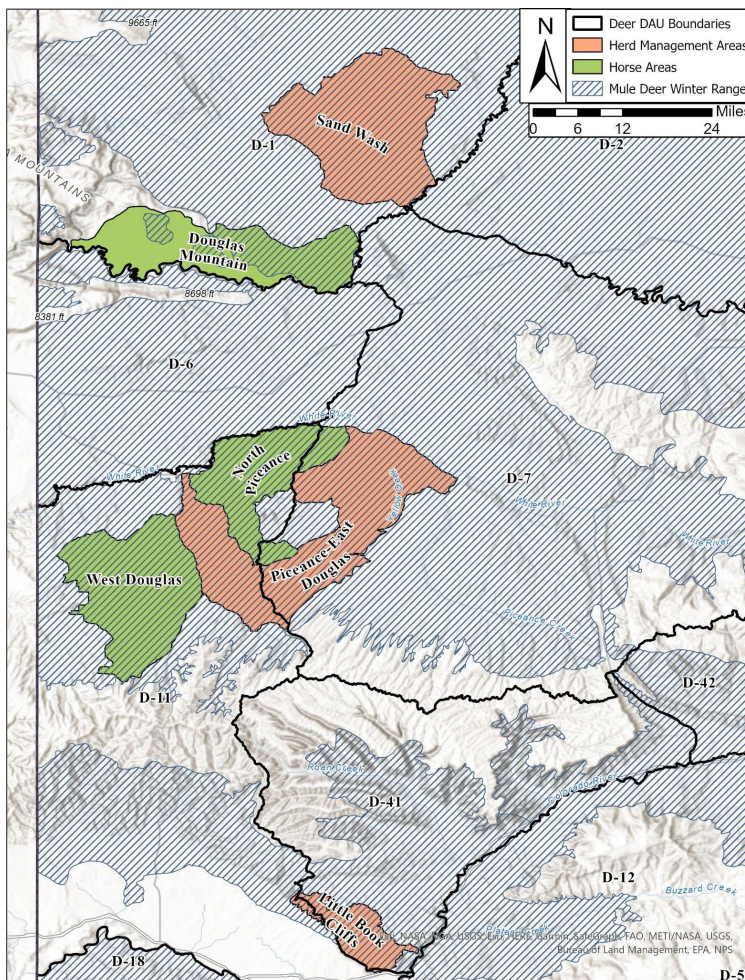


Figure 10. Herd Management Areas (HMAs) and Horse Areas (HAs) in Colorado overlapping deer DAUs and winter ranges.

As part of their management strategy, BLM gathers horses from HMAs that exceed appropriate management levels and allow adoption to the public (Table 1). Some HAs have also had gathers in recent years. The West Douglas Creek HA horses were gathered in 2021. The BLM gathered 451 horses there, when they expected the population to be about that number. Their goal was to remove horses from that HA. The HMAs have also seen some gathering projects in recent years (Table 1).

Table 2. Statistics on Herd Management Areas (HMAs) in Colorado as of March 2022 (BLM).
*Spring Creek Basin HMA is located in the Southwest Region.

Herd Management Area Name	Affected Deer DAUs	Total Acres	High Horse AML	2022 Estimated Horse Population	% of AML	Year of Last Gather	Horses Removed
Little Book Cliffs Wild Horse Range	D11, D41	52,634	150	175	117%	2018	96
Piceance-East Douglas Creek	D7, D11	160,841	235	1,150	489%	2021	867
Sand Wash Basin	D1	156,502	362	291	Within AML	2021	684
Spring Creek Basin*	D24	54,528	80	73	Within AML	2019	166
Totals		424,505	827	1689			1813

Negative impacts from free-roaming horses to wildlife and wildlife habitat include spatial, water source, and forage competition, and habitat degradation (Hall et al. 2016, Boyd et al. 2017, Danvir 2018). The areas used by horses overlap with mule deer winter range, winter concentration areas, and severe winter range. These areas are critical to the sustainability and resilience of deer herds and the high levels of non-designated horse use contribute directly to habitat degradation. Free-roaming horses degrade sagebrush habitats and riparian areas and can impact the amount of forage available to mule deer and other grazing ungulates (Baur 2016).

Management of free-roaming horse populations is highly controversial. Proposed gathers to manage horse populations often end up in litigation. The inability to manage wild horse populations to herd objectives has had negative impacts on range conditions. This in turn creates challenges for land managers when trying to balance permitted livestock use within these allotments with competing free-roaming horse use resulting in further range degradation.

Recreation

Human recreation causes both direct loss of habitat from the development of infrastructure (roads, trails, parking areas, etc.), as well as indirect loss of habitat through the behavioral avoidance of these areas by wildlife. Human presence on the landscape in the form of recreation evokes a physiological stress response for mule deer that impacts habitat usage, activity times, competition, foraging, reproduction, and body condition. Wild animals minimize energy expenditure by reducing their spatial and temporal activity, but human disturbance disrupts this energy-saving behavior by causing extra movement to escape or find cover. Deer react to the presence and activity of humans either by fleeing or by being vigilant, both of which detract from the animal's ability to feed and rest. These disturbances on the scale of individual encounters between an animal and a human recreationist may seem minor in isolation, but when translated to the lifetime of the animal or even to the scale of the whole deer population, the cumulative effects of year-round disturbance will lead to lower recruitment of fawns, higher mortality, and overall decline in population fitness over

time. Disturbance from human activity can make what would otherwise be suitable habitat from a forage standpoint into poor quality habitat from a behavioral standpoint. Avoidance of recreationalists effectively decreases the carrying capacity of an area, as mule deer and elk generally do not habituate to hiking or mountain biking. Distances from roads and trails are an important habitat feature for wildlife, and large-scale patches of land that remain un-fragmented by routes in Colorado are becoming increasingly hard to find, even in protected areas such as Wilderness. When route densities increase to the point that the predicted behavioral avoidance zone overlaps or intersects with another route, habitat effectiveness is severely reduced or eliminated and can result in a barrier to seasonal migrations for ungulates. Figure 11, illustrates the densities of roads and trails across northwest Colorado. The cumulative effects of multiple routes with intersecting and overlapping avoidance buffers can impact a substantially larger area compared with the habitat loss from direct disturbance from the miles routes. Increased recreational activity associated with increased density of routes (roads and trails) leads to both immediate and long-term effects on individual animals and populations by displacing wildlife into less optimal habitats. The result is a decrease in available energy for winter survival, growth and reproduction, and ultimately reduced fitness of a population.

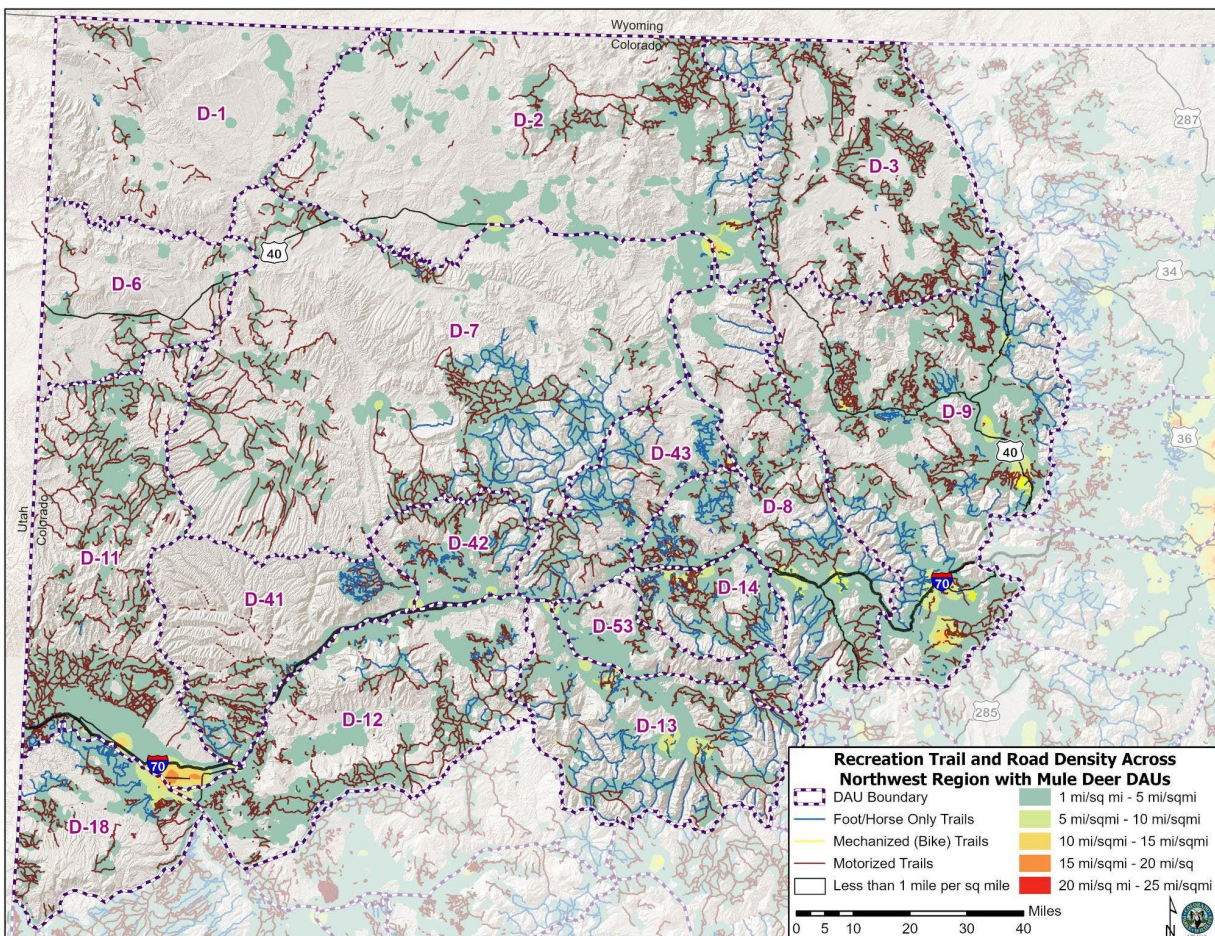


Figure 11. Recreation trail and road density across northwest Colorado.

Winter range forage and habitat for mule deer is becoming increasingly limited in Colorado due to recreation, roads, and residential development. Mule deer are highly vulnerable to disturbance during the winter and early spring when they are struggling to maintain body

condition and have limited energy reserves. Snow depths restrict animals to lower elevations where higher densities of roads and trails exist, and subsequently have greater human use. The combination of deep snow, cold temperatures and limited forage require animals to expend higher amounts of energy for thermal regulation, daily movement and feeding. Recreation on winter ranges, including hiking, snowshoeing, snow/fat-biking, skiing and snowmobiling, can negatively impact ungulate behavior by causing them to flee and altering their feeding, resting and travel patterns. When a deer is disturbed, it forgoes foraging in favor of hiding until the disturbance has ended. Even low levels of disturbance from human recreation can negatively impact mule deer during winter months and decrease survival. While some animals show no apparent behavioral response, ungulates may still experience physiological stress and elevated heart rates, resulting in relatively high energy expenditures.

The presence of dogs accompanying recreationists increases the zone of influence, flushing distances and temporal displacement for ungulates. Dogs are efficient at chasing deer, causing extreme energy expenditure and potential mortality, particularly for fawns. Deer concentrated on winter ranges are especially vulnerable to harassment and predation by dogs. Avoidance behavior can be critically impactful during the winter if deer spend time and energy evading dogs when they need to be foraging for food and expending as little energy as possible.

Predation

Mule deer are prey animals for the mid to large-sized predators of western North America. In Colorado, the primary predators of mule deer are mountain lions, coyotes, bobcats, and black bears. Predators may limit or regulate mule deer populations. All predators are opportunistic and will take advantage of individual prey that provide the easiest opportunity for a meal. Coyotes and bobcats tend to take young mule deer (fawns) or adults in poor condition, black bears prey primarily on young-of-the-year during spring but will take adults on occasion, and mountain lions will prey on all sex/age classes of mule deer. The influence of predators on mule deer populations is variable and based on several factors:

- The relationship of the deer population to the amount and quality of forage on seasonal ranges,
- The presence and location of hiding and stalking cover relative to feeding and resting areas,
- Abundance and distribution of alternate prey populations, and
- Number, abundance, and distribution of predator species that inhabit the mule deer range.

When mule deer populations are close to the forage capacity of the range, predation tends to have less influence on the population, and reductions in predator numbers have limited success in increasing the mule deer population. When mule deer numbers are relatively low and the forage capacity can sustain higher deer numbers, predator control can be more advantageous. Winter habitats with deep snow can limit mobility and increase vulnerability to predation. When alternate prey species occupy the same habitats as mule deer, predator populations have more prey from which to select. In those instances when mule deer decline, predators may switch to a more abundant species of prey, thereby reducing the effects of predation on remaining mule deer. Conversely, this ability to switch prey may result in stable and high predator numbers, which can in turn limit mule deer population growth when

conditions otherwise favor mule deer. In mule deer ranges with multiple predators, those predators may compete with one another, which may influence their abundance (e.g., increased coyote numbers may result in decreased bobcat numbers). In short, the relationship between predator and prey is complex, and can be challenging to address successfully.

Predation management is intended to affect change in predation to ultimately increase prey populations. Predation management is most effective when deer numbers are below the forage capacity of the range and predation is limiting population growth, control efforts sufficiently reduce the predator population, timing of predator removal is optimal (e.g., spring), and control efforts are spatially focused. Predation management appears ineffective when deer populations are limited by available forage and not predation, an insufficient number of predators are removed, and where large-scale, non-focused predation management is applied. Knowledge about predator/prey interactions is critical, yet challenging, for successful predation management.

Fencing

Highway fencing is becoming more of an issue to ungulates. While highway fencing can help with reducing vehicle collisions with deer and elk, the fencing can also inhibit mule deer migration corridors and access to important seasonal habitats. Under-passes and overpasses can help mule deer move over or under highways to access important seasonal habitats, while still minimizing vehicle collisions.

While supporting large and diverse wildlife populations, the region is also important agriculturally and supports numerous cattle and domestic sheep operations. As such, hundreds of miles of wire fence crisscross the landscape, allowing for a sustainable livestock industry which can effectively manage grazing, but also posing a hazard to wildlife. In the only published study on fence-related ungulate mortality, Harrington and Conover (2006, *Wildlife Society Bulletin*) conducted research in northwest Colorado and northeast Utah and documented one ungulate (elk, deer, or pronghorn) mortality for every 4 km (2.5 miles) of fence. Multiplied out across this vast landscape, potential fence-related ungulate mortality becomes staggering. Fences can also have sub-lethal effects on big game species by causing injury or hair loss during crossing efforts, separating calves/fawns from adults where crossings are difficult, inhibiting seasonal migration activities, and increasing the energetic costs of moving through the landscape. Several recent published studies (e.g. Jones et al. 2019 [*Ecosphere*]; Segar and Keane 2020 [*Conservation Science and Practice*]) have addressed and highlighted the magnitude of potential sub-lethal effects of wire fences on ungulates inhabiting rangelands in the American West. While fences provide necessary infrastructure to manage grazing effectively, which ultimately supports quality wildlife habitat, numerous miles of old abandoned and obsolete fences that no longer serve a management purpose currently exist in northwest Colorado.

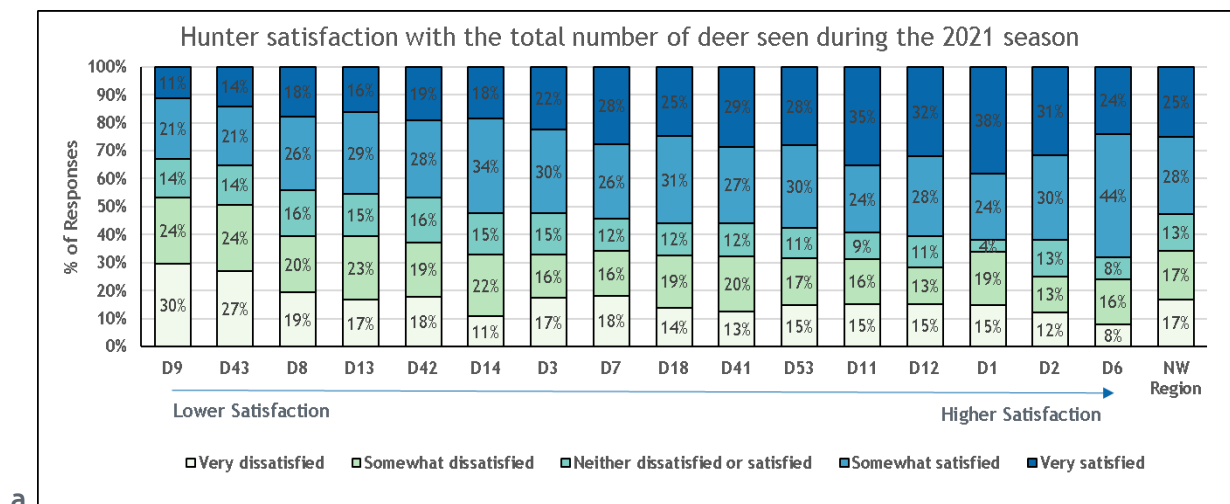
Deer Herd Management Plans for Northwest Colorado

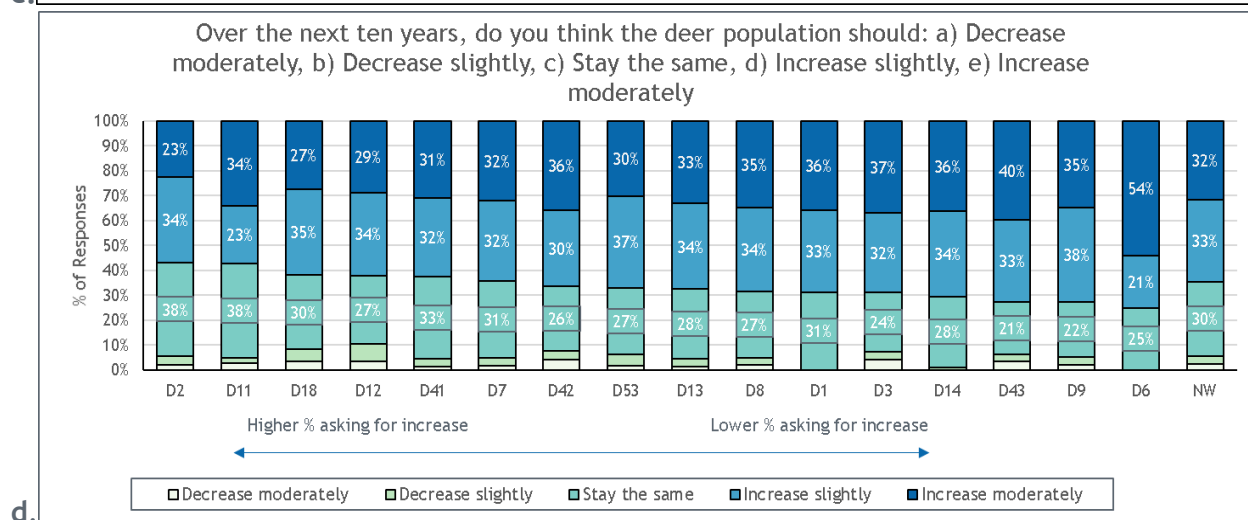
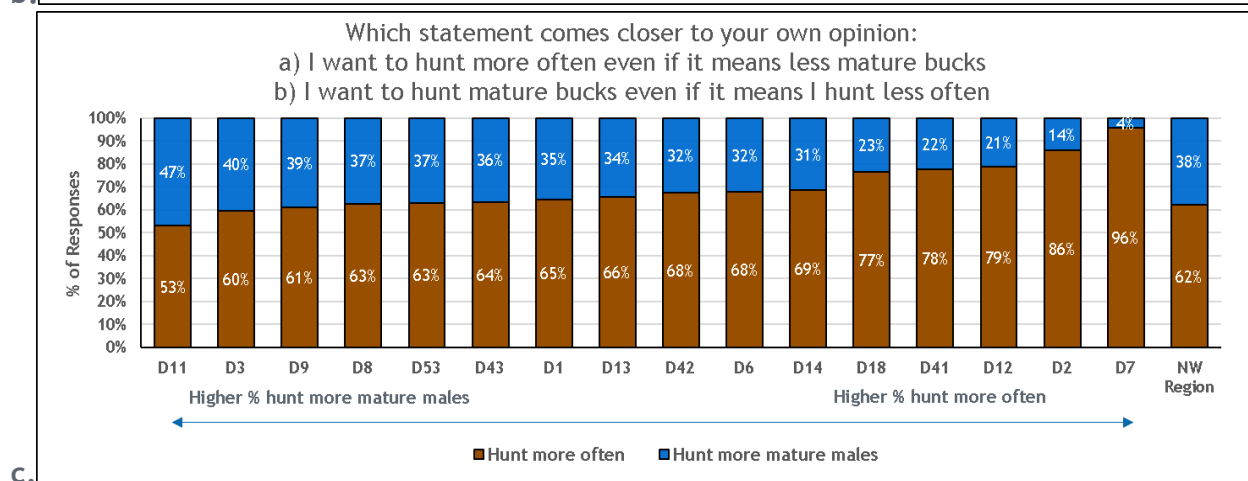
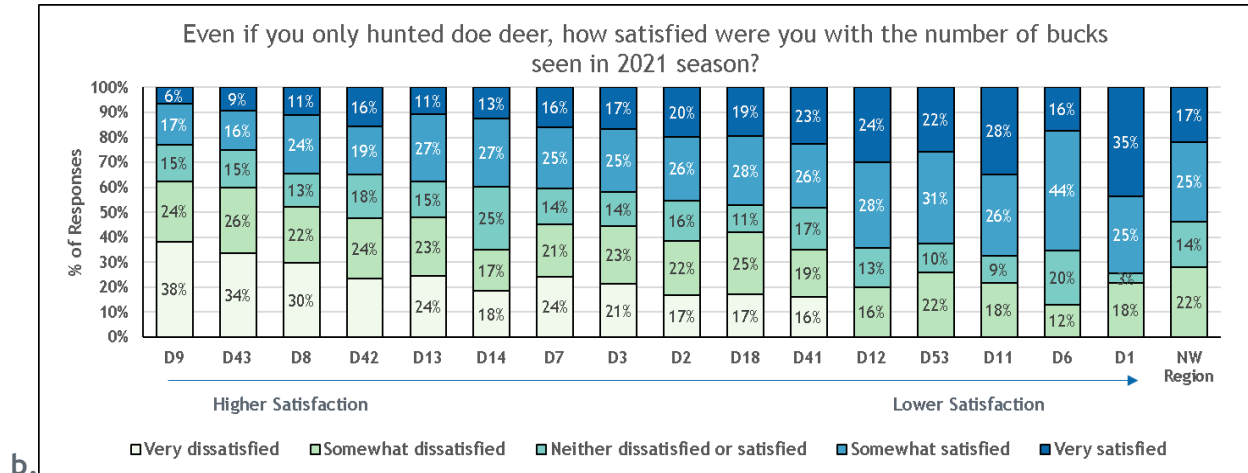
Public Input

There are 16 deer DAUs in northwest Colorado. The following section is comprised of the 16 individual deer HMPs with proposed objectives and justification. Seven of the sixteen deer herd management plans have been approved within the last 3 years and will be extending those objectives as status quo. The other nine HMPs have proposed population and sex ratio objectives. Public meetings have been held in Craig, Grand Junction, Glenwood, and Walden to collect input on the status of local deer populations, management concerns, and provide direction for future management.

In addition to the public meetings, CPW staff have reviewed new optional hunter harvest attitude survey data to capture input from hunters on their experience during the 2021 hunting season. Of the 29,124 deer license holders in northwest Colorado in 2021, 5,283 hunters opted in for the additional hunter harvest attitude survey. The seven graphs below depict the hunters' responses to seven questions relating to their hunting experience and observations in the 16 different DAUs in northwest Colorado. The DAUs in each graph are ranked from least satisfied to most satisfied.

The draft plan will be posted for 30 days for the public to provide additional comments on the proposed objectives for each DAU from mid November to mid December 2022. The plan has or will be presented to county commissioners, Habitat Partnership Program (HPP) committees and federal agencies for additional input. After all of the input is collected, it will be incorporated into the final draft plan and presented to the Colorado Parks and Wildlife Commission this winter with a tentative plan to present the first time in February and for approval in March.





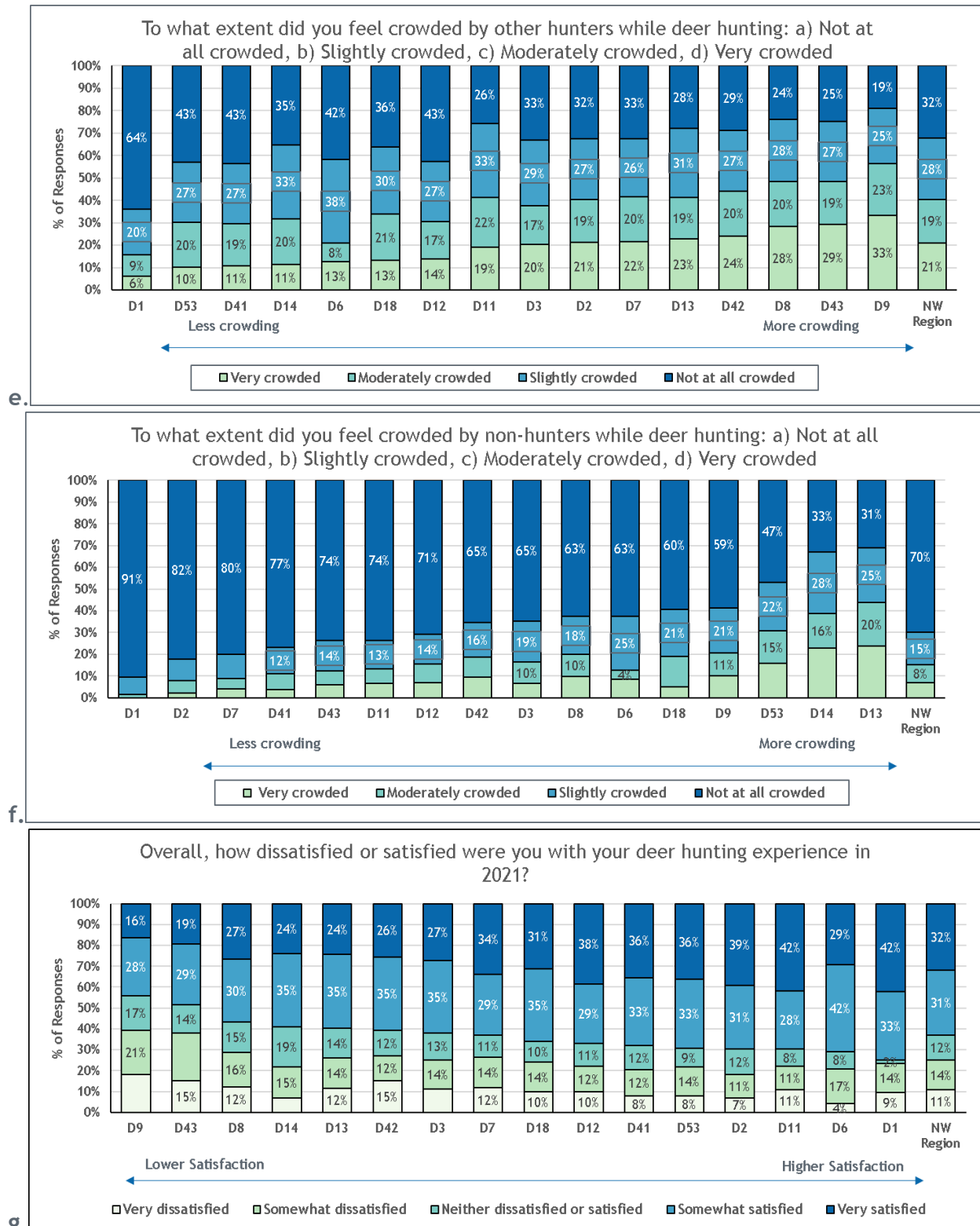
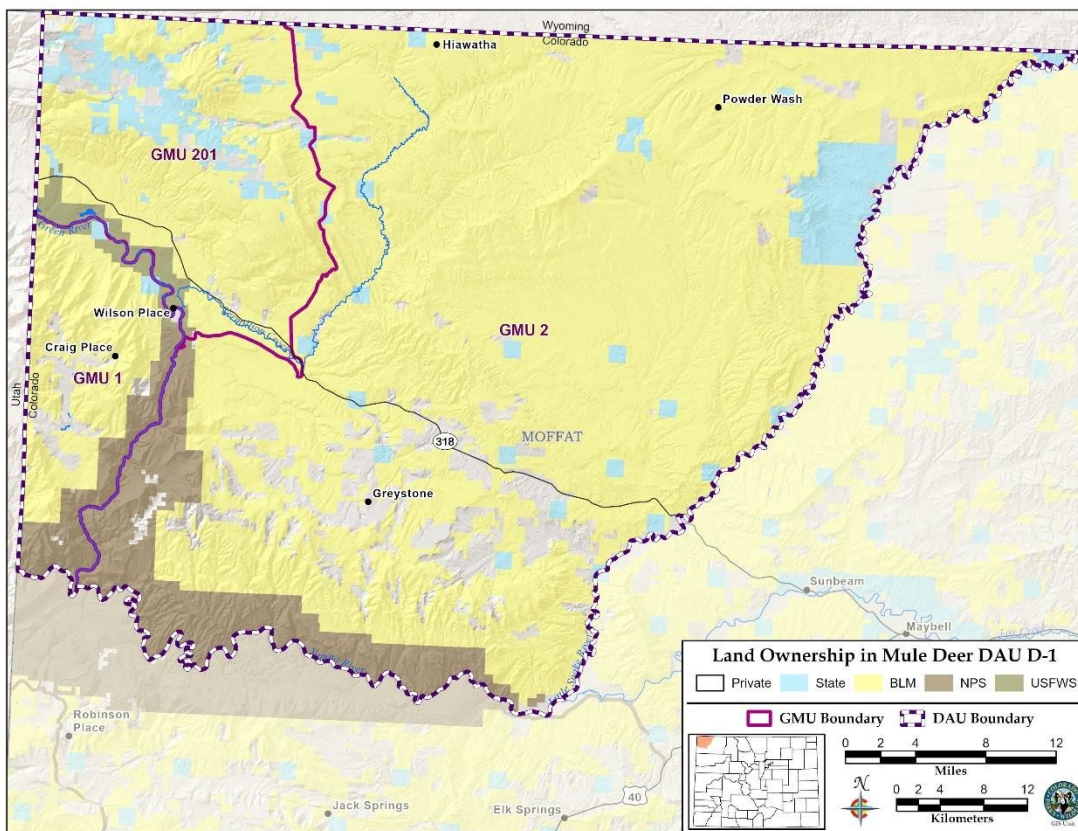


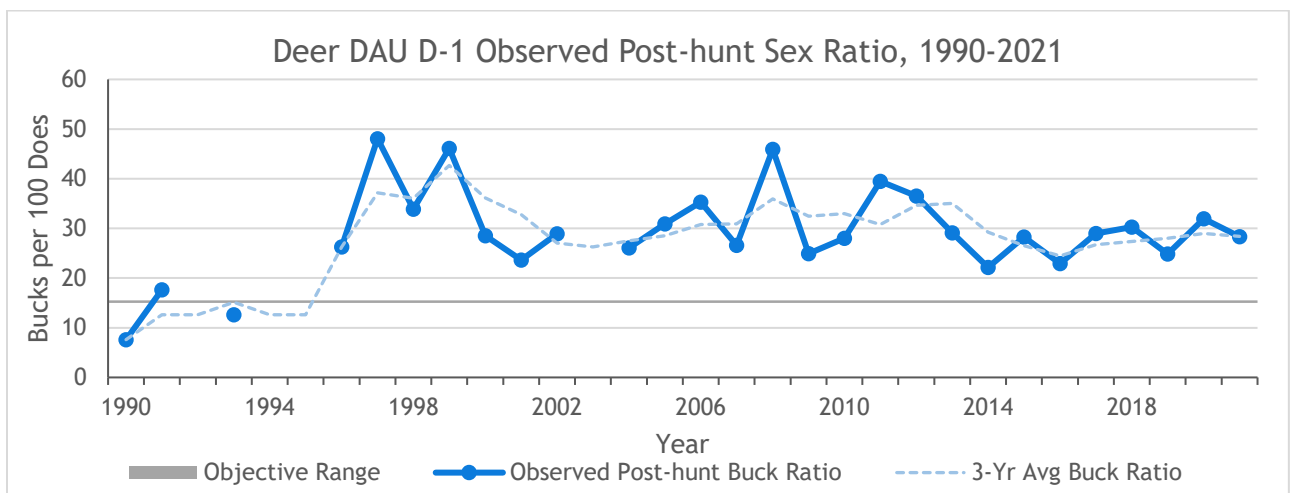
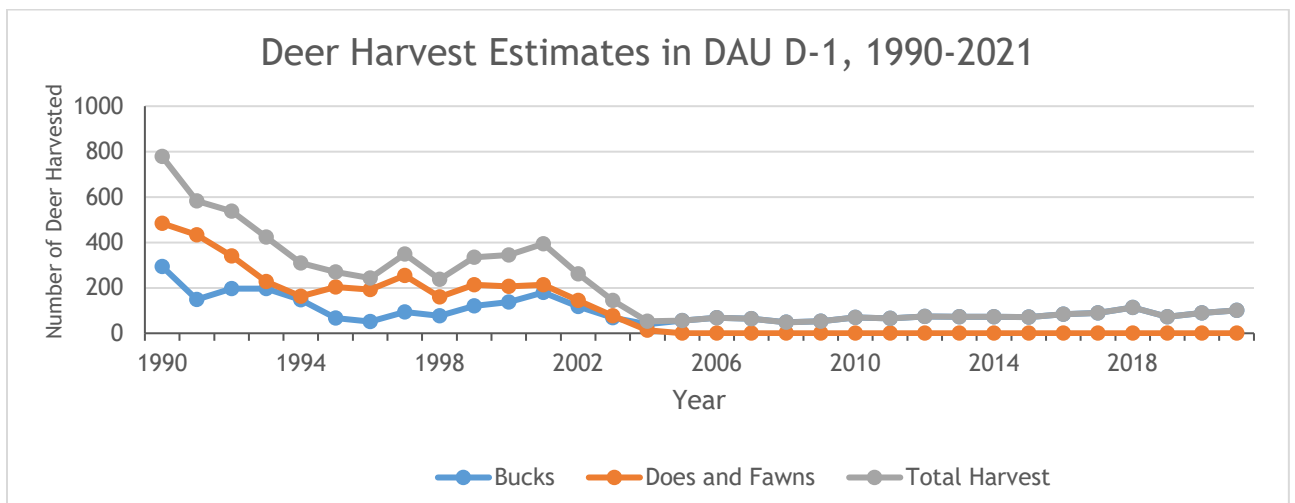
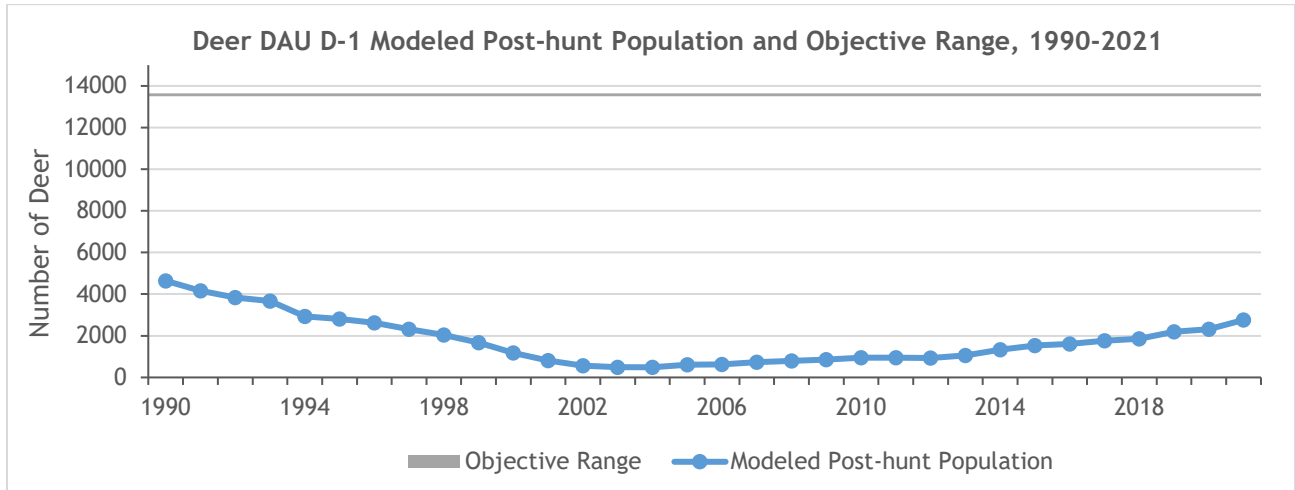
Figure 12 (a-g). Hunter harvest attitude survey questions and results for the 16 deer DAUs ranked from low DAU to high DAU (left to right) in relation to the specific question.

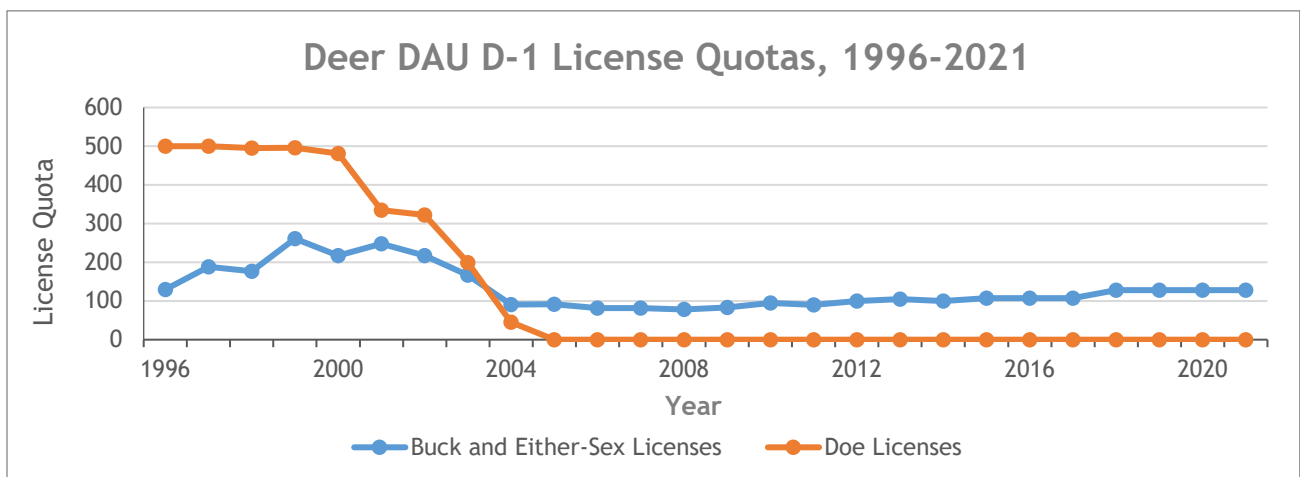
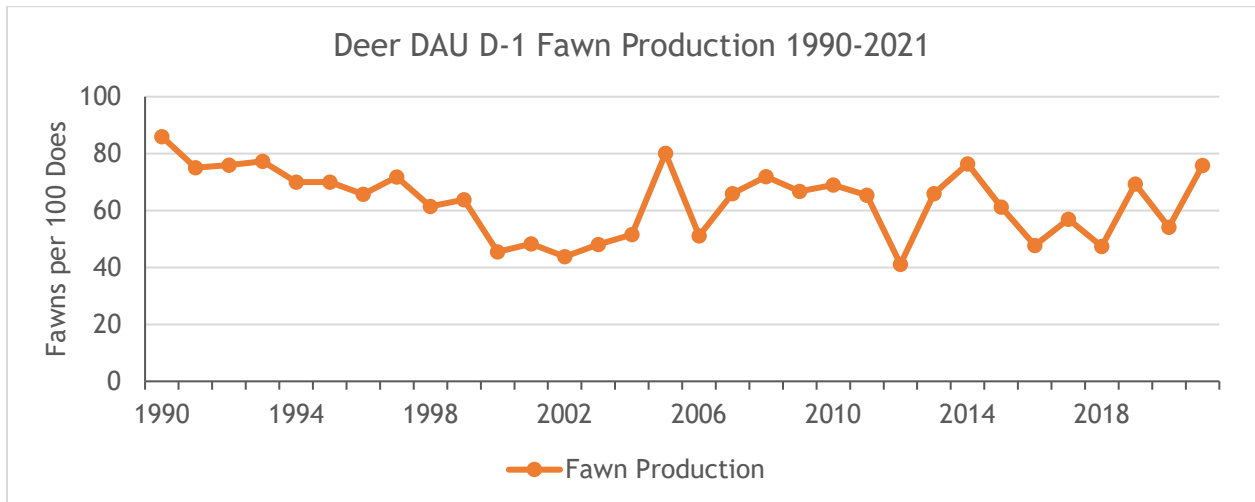
LITTLE SNAKE MULE DEER HERD MANAGEMENT PLAN DATA ANALYSIS UNIT D-1

Darby Finley, Wildlife Biologist, Meeker

Little Snake Mule Deer Herd (DAU D-1)	GMUs: 1, 2, 201
Post-hunt population:	
Current (no plan) Population Objective:	13,500 deer
Post-hunt 2021 Population Estimate:	1600-2300 deer
Proposed New Population Objective	1,500-3,500 deer
Post-hunt Sex Ratio (Bucks:100 Does):	
Current (no plan) Sex Ratio Objective:	15 bucks per 100 does
Most Recent 3-year Average of Observed Sex Ratio:	28 bucks per 100 does
Proposed New Sex Ratio Objective:	15-25 bucks per 100 does







Background

The Little Snake Mule Deer DAU, D-1, is located in northwest Colorado and includes portions of Moffat county. The DAU includes Game Management Units (GMU): 1, 2, 201.

The Little Snake deer DAU covers 1563 square miles. Of this, 9% (208 mi²) is private property, 76% (1186 mi²) is Bureau of Land Management (BLM) land, 6% (90 mi²) is State Land Board land, 8% (126 mi²) includes Dinosaur National Monument administered by the National Park Service, and <1% is Colorado Parks and Wildlife property.

Resident mule deer within D-1 will migrate short distances from summer ranges at higher elevations on Cold Springs and Douglas Mountains to lower elevations surrounding these high mountain plateaus. Migratory deer from adjacent DAUs D-2, D-7 and Wyoming will move into the eastern portions of the DAU to winter along the Little Snake River corridor. A significant number of deer will also migrate into Brown’s Park to winter from Utah, especially in the Diamond Breaks in GMU 1 and along the lower stretches of Beaver Creek in GMU 201 along the UT-CO state line.

Significant Issues

The most significant issue concerning the D-1 herd is the sustained stagnant state of population growth this herd has experienced for the past two decades. Much of the herd unit has been within severe to extreme drought conditions since the late-90s. As a result, range conditions have become less productive and degraded due to the loss of browse from shrub mortality and the growing population of feral horses within the Sand Wash Basin. In addition, cheat grass and other invasive annuals dominate much of the herbaceous understory within Browns Park. These conditions have reduced the nutritional carrying capacity across winter ranges throughout the DAU and made achieving historic population levels unachievable. Despite the population, appearing to be in a capacity driven slump, there has been minimal harvest applied to the herd and the population has remained stagnant. In fact, there has been no antlerless harvest since 2005 and antlered harvest has been minimal. The combination of poor range conditions, predation, and elk population levels are all playing a role in the ability for this deer population to grow and contributing to the lower sustainable deer population.

Management Objective Recommendations

CPW recommends a population objective range of 1,500-3500 deer. This recommendation is lower than the current objective of 13,000 set back in 1994. The recommended population objective range will allow for management more in line with habitat carrying capacities as a result of persistent drought. Licenses will be issued annually to manage to a target population size within the population objective range and CWD prevalence threshold of 5% or less.

CPW recommends a sex ratio objective to 15-25 bucks:100 does. The current sex ratio objective is 15 bucks:100 does. The current 3-year average buck ratio, 28 bucks:100 does. Currently, CWD prevalence is less than 5% in the DAU with a two-year average of 3.7% prevalence. It is important to note that the distribution of animals that tested positive were likely migratory deer that had moved into the eastern portion of D-1 from D-2, which has high CWD prevalence.

Strategies to Address Issues and Management Concerns and to Achieve Herd Management Objectives

CPW will continue to work collaboratively with our partners in the federal land management agencies, private landowners, county governments, local municipalities and NGOs to protect and enhance the remaining mule deer habitat. Important habitat conservation methods include habitat treatments, conservation easements or land acquisitions, maintaining landscape connectivity and movement corridors, and adhering to seasonal recreation closures on winter range areas.

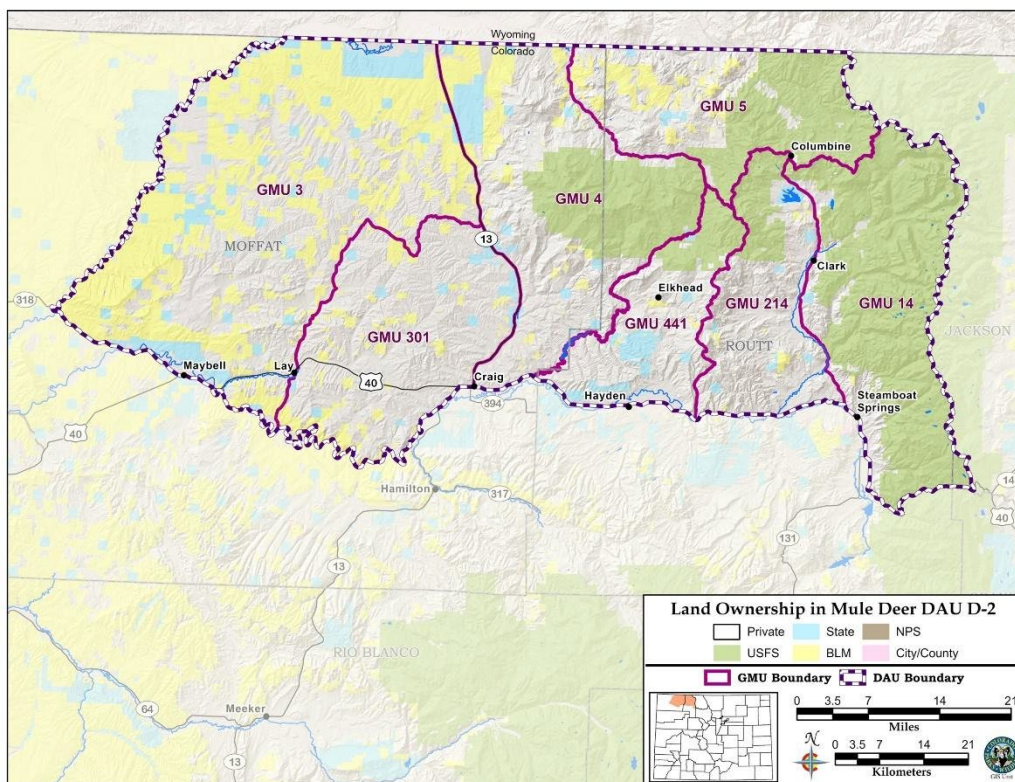
A population objective range of 1,500-3,500 will allow population levels to be managed in line with habitat carrying capacity. Management actions recommended to achieve the population objective are to apply habitat treatment strategies that will improve habitat conditions across winter ranges. Improving habitat conditions will be a challenge considering drought conditions so maintaining both mule deer and elk populations at nutritional carry capacities the winter range can support through harvest management may be the most effective tool to allow for reduced browsing pressure on drought stressed winter ranges.

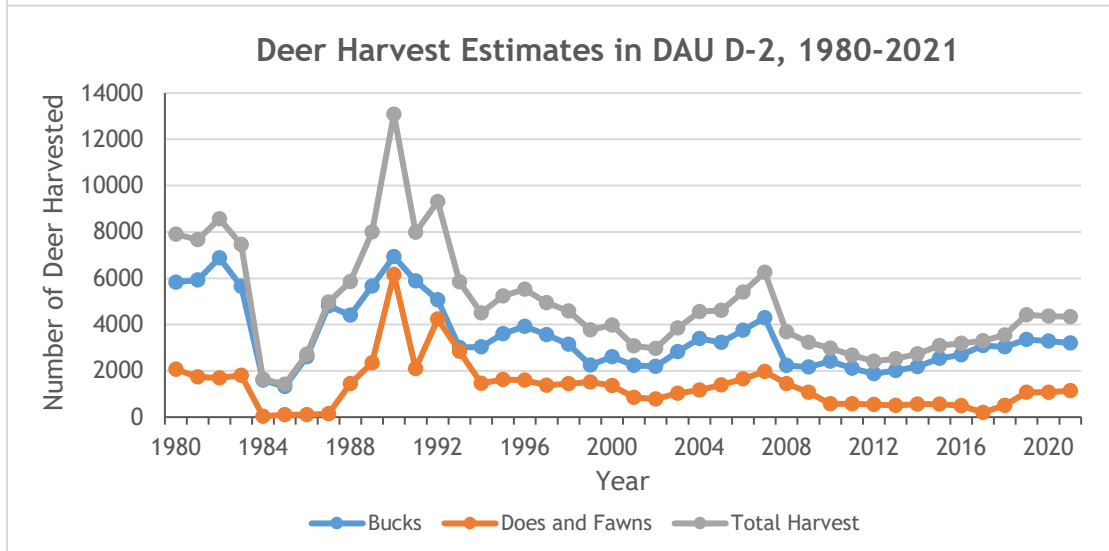
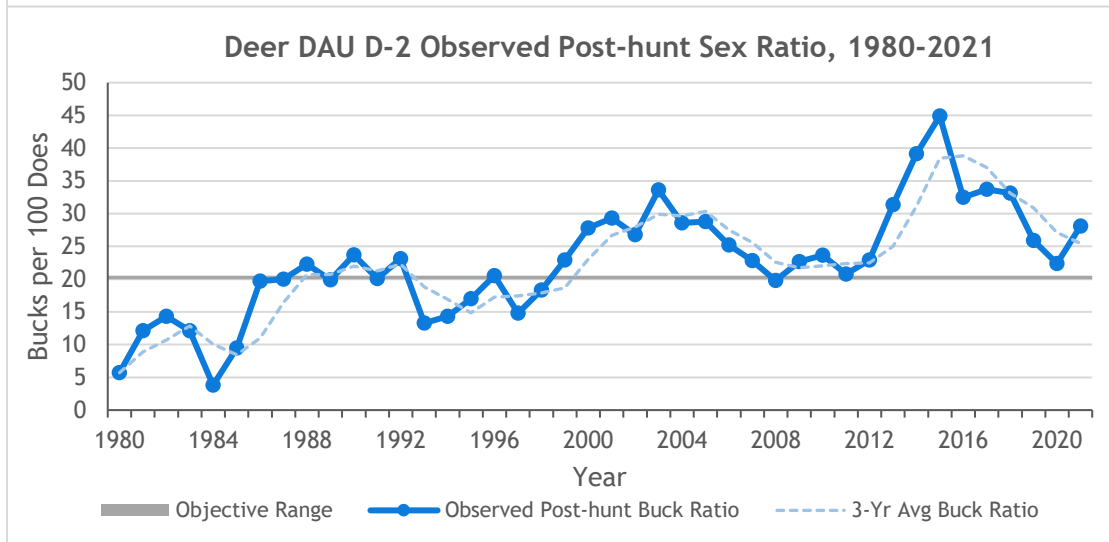
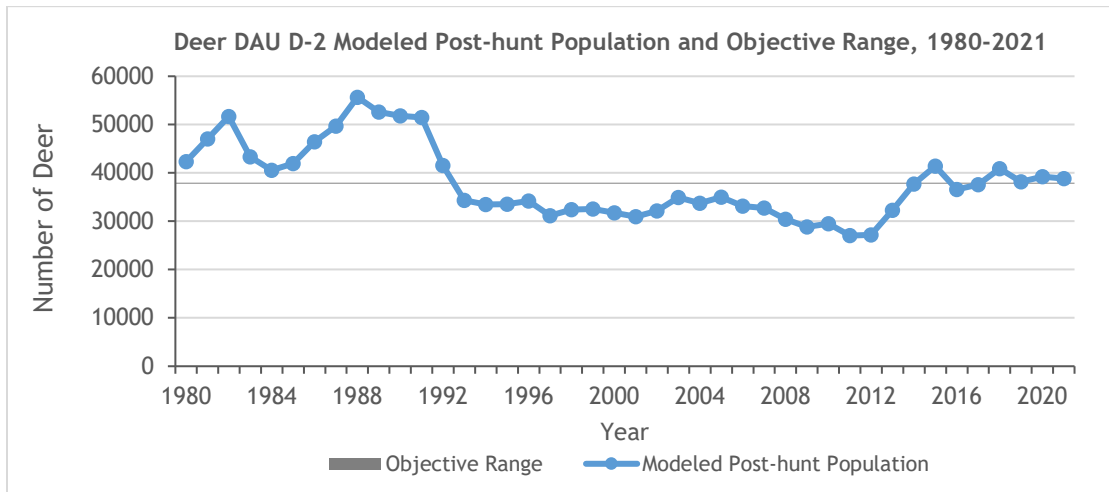
The recommended sex ratio objective will allow the ability to address management concerns regarding CWD prevalence rates if increased prevalence becomes a concern. CWD prevalence will continue to be monitored through periodic mandatory testing and through voluntary sample submissions.

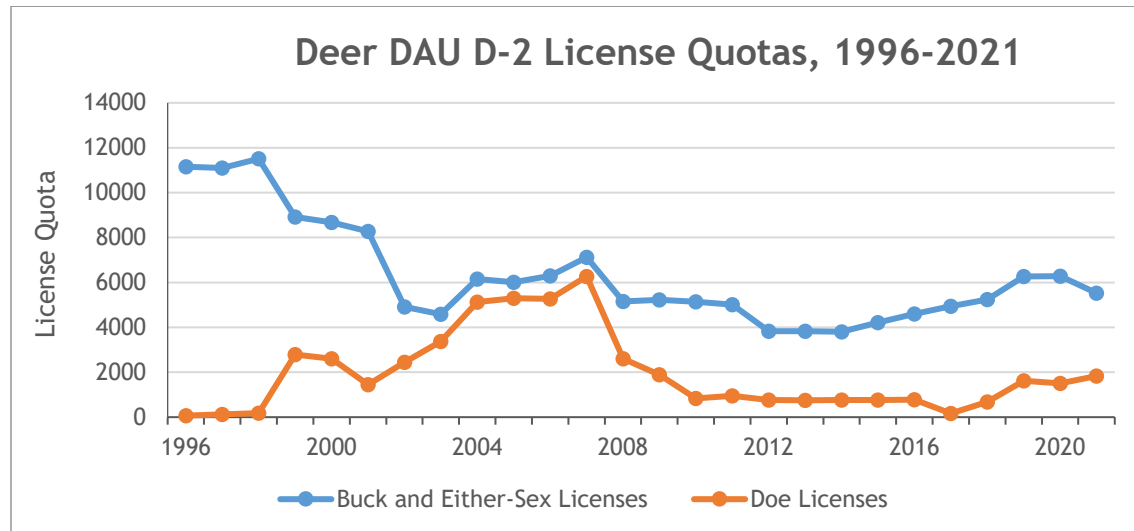
BEAR'S EARS MULE DEER HERD MANAGEMENT PLAN DATA ANALYSIS UNIT D-2

Darby Finley, Wildlife Biologist, Meeker

Bear's Ears Mule Deer Herd (DAU D-2)	GMUs: 3, 4, 5, 14, 214, 301, 441
Post-hunt population:	
Current (1994 plan) Population Objective:	37,800 deer
Post-hunt 2021 Population Estimate:	37,000-40,000 deer
Proposed New Population Objective	25,000-35,000 deer
Post-hunt Sex Ratio (Bucks:100 Does):	
Current (1994 plan) Sex Ratio Objective:	20 bucks per 100 does
Most Recent 3-year Average of Observed Sex Ratio:	25 bucks per 100 does
Proposed New Sex Ratio Objective:	15-25 bucks per 100 does







Background

The Bear’s Ears Mule Deer DAU, D-2, is located in northwest Colorado and includes portions of Routt and Moffat counties. The DAU is comprised of 7 Game Management Units (GMUs): 3, 4, 5, 14, 214, 301, and 441. The towns of Craig, Steamboat Springs and Maybell are located on the southern periphery of the DAU. Ownership patterns vary across mule deer seasonal ranges within the DAU comprised of private, state and federal lands. Half of all mule deer winter range within the DAU is on private property, 40% is managed by BLM, and the remaining 10% is a mix of state and county owned lands. Summer range includes the entire DAU.

Mule deer within D-2 are migratory, moving from higher elevation summer ranges in eastern portions of the DAU to lower elevation winter ranges in the western portions of the DAU. Migratory distances vary greatly with some deer moving 60 to 70 miles between seasonal ranges while others move relatively short distances, 10 to 20 miles or are year-round resident herds.

The average decadal population size has declined from 48,000 in the 1980s, to 38,000 in the 1990s, to the mid-30,000s in the 2000s and 2010s. The population objective was lowered from 42,000 to 37,800 in 1994. Throughout the decades of a steady overall population decline, deer herd numbers stabilized for a short period from 1993-2000 before rebounding slightly from 2001-2006. This increase was due, in part, to an increased number of bucks recruited into populations after the limitation of deer licenses statewide in 1999. The increasing trend was short-lived. Coming out of the drought in the early 2000s, deer numbers were at the highest population level since the early 1990s entering the severe winter of 2007-2008. Population dynamics within the herd changed after this severe winter. Contributing factors to these changes within the herd were the combination of high deer numbers and drought stressed winter ranges leading into the severe winter. The poor range conditions could not support the high winter deer densities resulting in further range degradation. Ultimately, this has resulted in long-term reductions in the nutritional carrying capacities across winter ranges within the DAU. A population range objective will allow for management flexibility in response to changes in habitat conditions, CWD prevalence, and changes in population size due to severe winter events and drought.

Historically, various management strategies have been implemented to achieve sex ratio objectives in D-2 ranging from unlimited buck hunting with a minimum 5-inch antler regulation for yearling bucks, to 3-point antler restrictions, to limited season lengths, and finally, totally limited licensing. All management strategies have presented challenges in maintaining sex ratio objectives. The D-2 herd has been over the current sex ratio objective since 1999 when all deer licenses became limited. Excellent fawn recruitment from 2013 - 2015 boosted buck ratios to an all-time high in 2015 with observed post-hunt sex ratios of 45 bucks per 100 does. The current 3-year average buck ratio is 25 bucks per 100 does. Given the significant increase in CWD prevalence within D-2 over the past 20 years, consideration must be given to management strategies that will reduce buck ratios to within sex ratio objective ranges in an attempt to reduce CWD prevalence rates.

Since 2008, license allocations have been conservative with management actions aimed at maintaining the herd at the population objective. These management actions have included antlerless license reductions up to 98% and antlered license reductions up to 64%. The results of these license reductions reduced harvest rates to minimal levels. Despite these efforts, growth of the deer herd was fairly stagnate until 2013 when the population began to rebound. Since 2014, the population has been stable with some fluctuation occurring due to persistent drought and severe winters.

Significant Issues

There is a growing concern over increasing CWD prevalence in D-2. CWD was first discovered within the herd in early 2002. Surveillance efforts from mandatory testing in 2018 solidified concerns about increasing prevalence rates revealing an 18% CWD prevalence rate in the D-2 herd. The adjacent DAU D-7 has a similarly high rate of 15%, there is significant movement, and interaction of deer especially on winter ranges between the two DAUs. CWD prevalence rates of >5% can lead to rapid spread of the disease within a herd and will have population-level impacts through higher mortality of adult deer and a decline in the age structure of a population. This high CWD prevalence rate is contributing to lower than average adult survival and overall herd-level resilience within D-2.

Another issue of concern for the D-2 herd is the degradation and loss of critical winter range due to drought, wildfire, and overuse. There is a sentiment to maintain or grow the deer herd from current population levels even though the cyclical weather pattern of summer drought and above average winter snowfall has been consistent since 2007, resulting in reduced nutritional carrying capacities across winter ranges.

Biological carrying capacity is not static. Rather, carrying capacities fluctuate annually based on multiple factors and generally trend over time. Weather patterns, wildlife densities, wildfires, and grazing practices all influence year-round forage conditions, long-term range productivity, and the numbers of animals it can support. In addition, the direct and indirect impacts of fragmentation from energy development (oil and gas, solar, wind, etc.), trail development for recreation, and rural residential development reduces habitat function. Managing wildlife populations to be commensurate with nutritional carrying capacities through harvest management on annual basis is extremely difficult, especially in reaction to ever-changing range conditions influenced by such dynamic variables. Thus, managers prefer to manage wildlife populations with a sustained effort through time approach in which some level of harvest pressure is applied to the female segment of the herd.

The most recent potential land use change in D-2 is the conversion of large ranches to solar and wind developments. Two large transmission lines are currently being constructed through the western portion of D-2 with completion dates of 2023 and 2025. Along with those transmission lines is the prospect of wind and solar development as two large coal mines are scheduled to cease coal production by 2030 with the closure of the Craig power plant. The extent to which solar and wind development will occur is unknown but these developments have the potential to occupy large tracts of critical winter range and impact big game migration routes.

The cumulative effects of all of the aforementioned factors have played a role in the challenges to sustain historic or desired population levels in DAU D-2.

Management Objective Recommendations

CPW recommends a new population objective range of 25,000-35,000 deer. The current objective is a point estimate of 37,800 deer. The recommended population range will allow for management flexibility in response to changes in habitat conditions, CWD prevalence, and changes in population size due to severe winter events and drought. Licenses will be issued annually to manage to a target population size within the population objective range and CWD prevalence threshold of 5% or less.

CPW recommends a sex ratio objective to 15-25 bucks:100 does. The current 3-year average buck ratio, 25 bucks:100 does. Given the significant increase in CWD prevalence within D-2 over the past 17 years, consideration must be given to management strategies that will reduce buck ratios to within sex ratio objective ranges in an attempt to reduce CWD prevalence rates.

Strategies to Address Issues and Management Concerns and to Achieve Herd Management Objectives

CPW will continue to work collaboratively with our partners in the federal land management agencies, private landowners, county governments, local municipalities and NGOs to protect and enhance the remaining mule deer habitat. Important habitat conservation methods include habitat treatments, conservation easements or land acquisitions, maintaining landscape connectivity and movement corridors, and adhering to seasonal recreation closures on winter range areas.

A population objective range of 25,000-35,000 would allow for increased flexibility in management options if desired CWD prevalence rate reductions were not being achieved. In addition, it would allow further population reductions to address density-dependence mortality factors. Management actions recommended to achieve the population objective and reduce CWD prevalence rates include: increased female and/or either sex hunting licenses, increased harvest in later season or in high CWD prevalence areas, increase private land only license availability, and increase harvest within targeted high-density mule deer winter ranges. The specific areas in which increased harvest on high-density mule deer winter ranges would be determined based on data from winter classification flights. Moderate incremental increases in license recommendations would be utilized to achieve desired objectives.

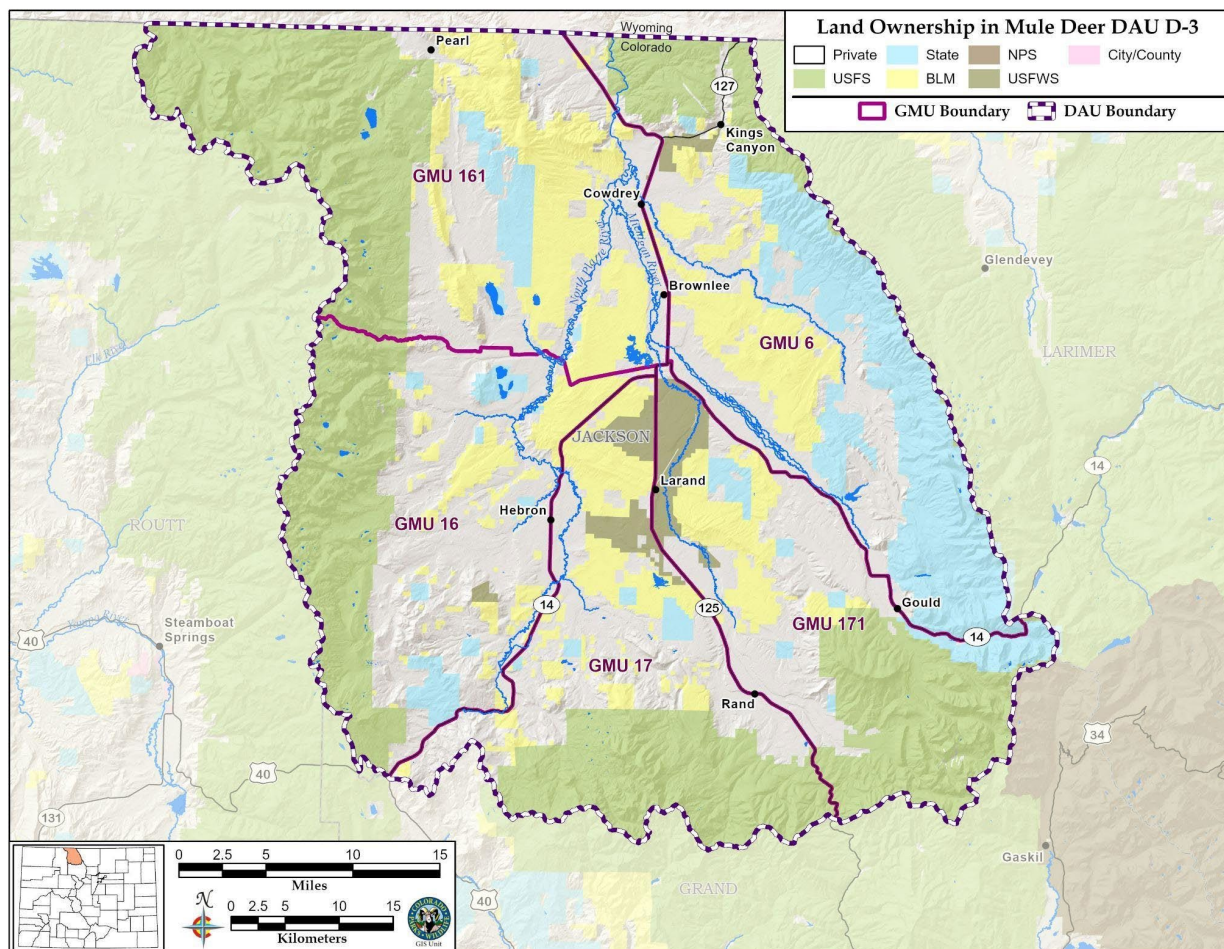
The recommended sex ratio objective would allow the ability to address management concerns regarding high CWD prevalence rates. Management actions implemented to achieve sex ratio objectives and reduce CWD prevalence rates would include: reduce male:female ratios, change age structure, and maximize ability to remove diseased animals at smallest scale possible. Management tactics to achieve sex ratio objectives and CWD prevalence rates will include disease management hunts and/or increasing and/or shifting male hunting licenses into later seasons and creation or modification of hunt code groupings for more targeted harvest. The lower end of the sex ratio would allow for management flexibility if CWD prevalence thresholds were not met despite a reduction in overall sex ratios. CWD prevalence will continue to be monitored through periodic mandatory testing and through voluntary sample submissions.

NORTH PARK DEER HERD MANAGEMENT PLAN

DATA ANALYSIS UNIT D-03

Eric VanNatta, Wildlife Biologist, Area 10 Steamboat Springs

North Park Deer Herd (DAU D-03) Approval Year for last HMP: 2002	GMUs: 6, 16, 17, 161, 171
Post-hunt population: Current (2002 plan) Population	5,400 - 6,400 deer
Objective: Post-hunt 2021 Population Estimate:	5,750 deer
Proposed New Population Objective	<u>4,400 - 6,400 deer</u>
Post-hunt Sex Ratio (Bucks:100 Does): Current (2002 plan) Sex Ratio	30-40 bucks per 100 does
Objective: 2021 3-year Average of Observed Sex Ratio:	45 bucks per 100 does
Proposed New Sex Ratio Objective:	<u>30-40 bucks per 100 does</u>



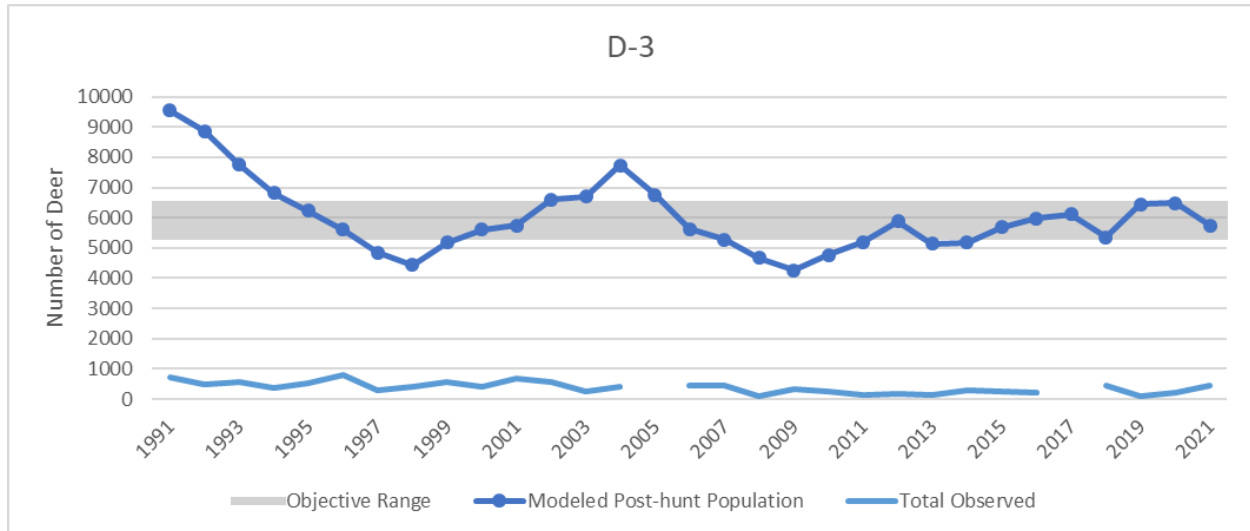


Figure D3-1. Deer DAU D-03 modeled post-hunt population size and objective range, years 1991-2021. Note the low annual sample size (observations), typically less than 500 animals seen during classification flights.

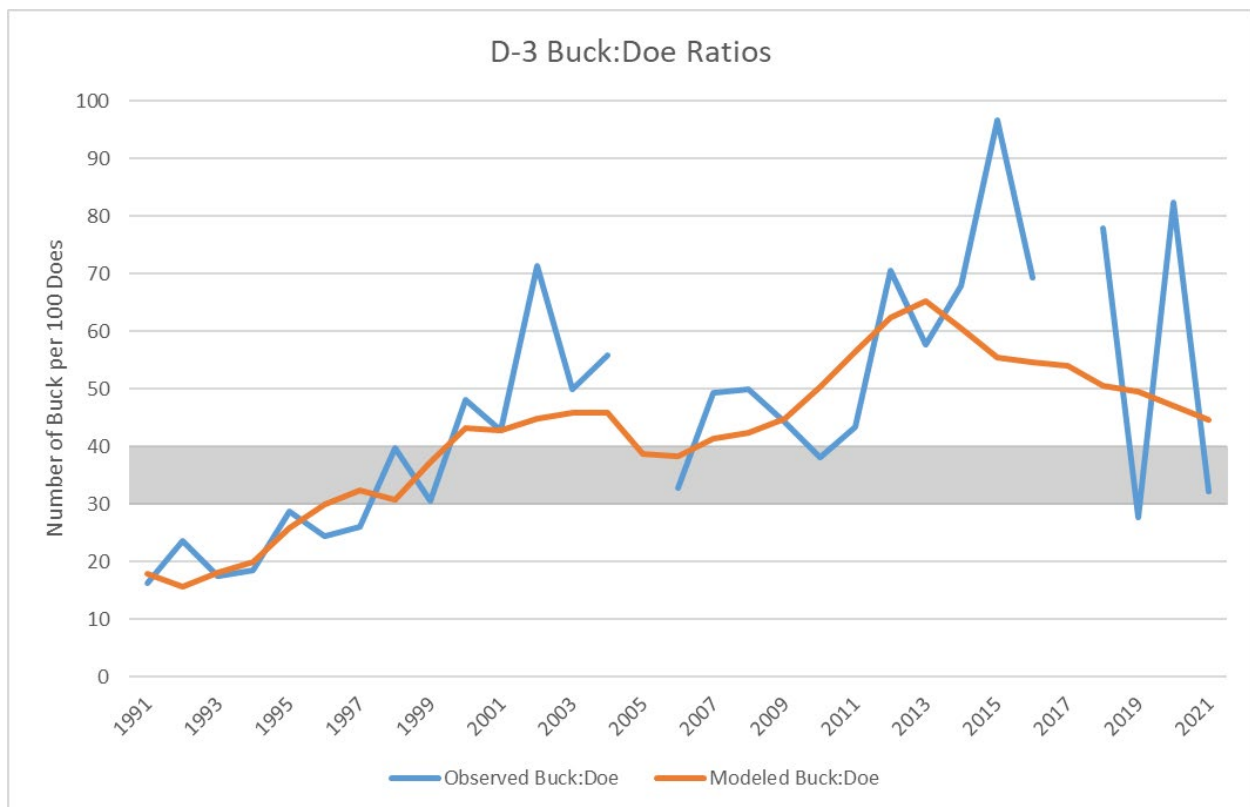


Figure D3-2. Deer DAU D-03 observed and modeled post-hunt sex ratio (bucks:100 does), years 1991-2021. 2002 HMP sex ratio objective range of 30-40 bucks:100 does.

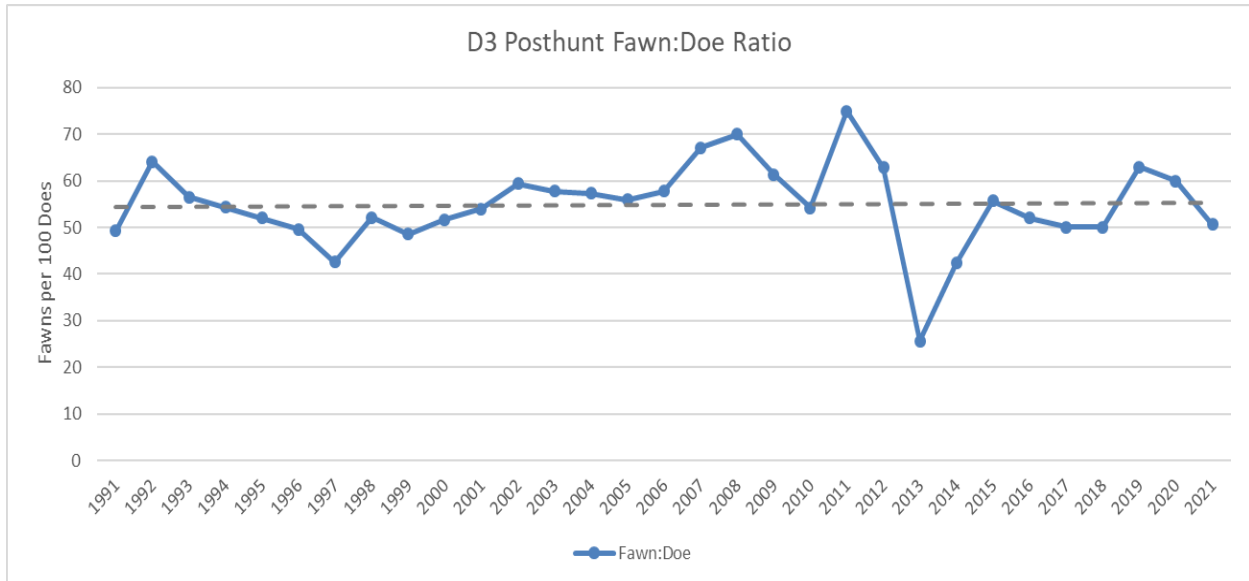


Figure D3-3. Deer DAU D-03 fawn production (observed post-hunt fawns:100 does ratio), years 1991-2021. Dashed line represents the average trend.

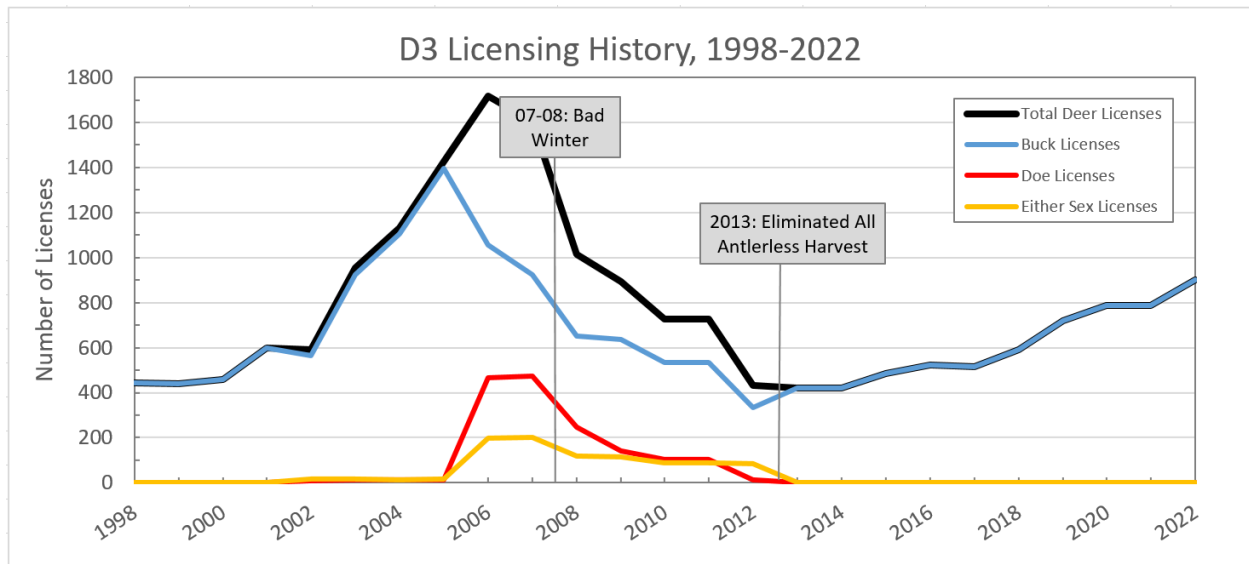


Figure D3-4. License quotas for D-03, years 1991-2021.

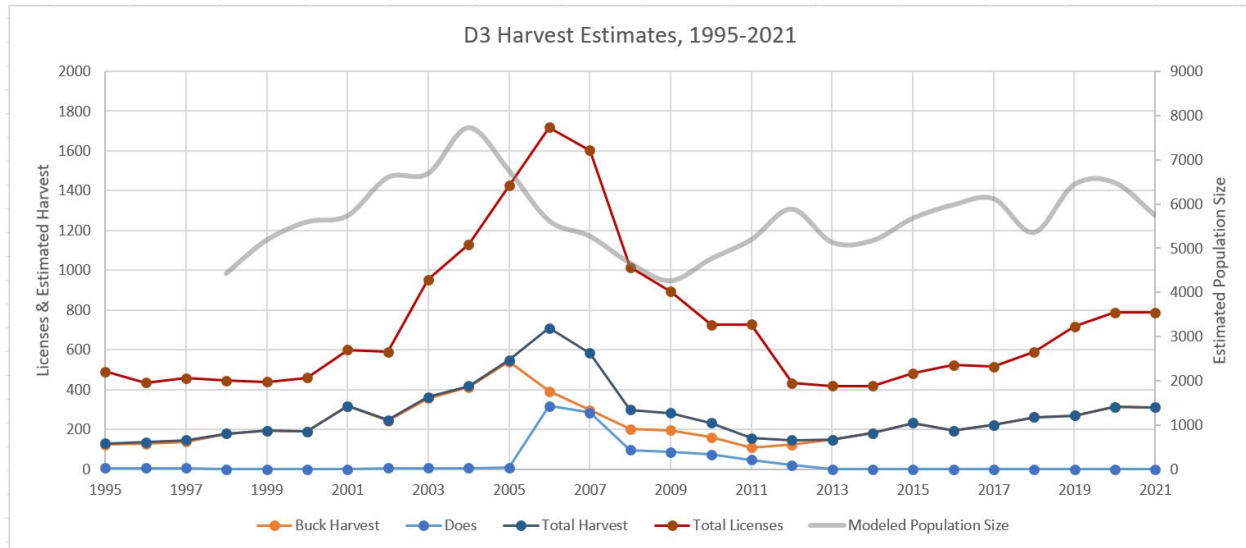


Figure D3-4. D3 harvest estimates, years 1995-2021.

Background Information

Mule deer Data Analysis Unit (DAU) D3 is located in North-Central Colorado and encompasses all of Jackson County, commonly called North Park. D3 consists of Game Management Units (GMUs) 6, 16, 17, 161, and 171, all of which converge on the primary population center in the DAU, Walden. North Park is an intermountain park on the east side of the Continental Divide containing the headwaters of the North Platte River, and ranges in elevation from approximately 7,800' - 13,000' above sea level. Major tributaries that make-up the North Platte drainage include Grizzly Creek, the Illinois River, the Michigan River, the Canadian River, and the North Fork of the North Platte River. North Park is bounded to the north by the Wyoming state line, to the east by the Medicine Bow and Never Summer Ranges, to the south by the Rabbit Ears Range, and to the west by the Park Range. D3 encompasses 1.036 million acres (1,618 square miles) and has a mosaic of land ownership including 35.9% private land, 31.9% USFS, 18.2% BLM, 12% State, and 1.7% ANWR. D3 also contains portions of the Mt. Zirkel, Platte River, Rawah, Neota, and Never Summer Wilderness Areas.

During summer months, mule deer can be found throughout the entire DAU. However, higher concentrations tend to exist at the interface between sagebrush communities and aspen-conifer forests between 8,000' - 10,000' elevation. Starting as early as October, most mule deer migrate north out of D3 towards winter range along the North Platte River in Wyoming (i.e. Beaver Hills, Bennett Peak, Baggot Rocks, etc.) near the communities of Encampment and Saratoga. Additionally, smaller cohorts of deer migrate south to Middle Park, southeast to Estes Park, or east down the Cache La Poudre River canyon towards Rustic and Stove Prairie. Due to the timing and extent of these migrations, modeled population estimates and buck:doe ratios for this herd should be interpreted with some level of caution. Input data for these models are collected during classification flights flown in December and January, and may not always accurately represent summer population demographics. As relics of a very different winter range distribution during the mid-late 1900's, a small number of deer (likely <500) may also winter in North Park near the sand dunes in GMU 6, or on Independence Mountain in GMU 161. However, data collected from GPS collars suggest many of these deer eventually travel north during late winter months (following severe storm events) and occupy winter range in Wyoming.

D3's post-hunt modeled population estimate for 2021 is 5,750 deer (Figure D3-1), and has remained relatively static over the past decade. Prior to the current (2002) D3 management plan, which managed for a population objective range of 5,400-6,400 animals, the population size of D3 may have historically been in excess of 10,000 animals. The post-hunt modeled sex ratio estimate for 2021 was 44.7 bucks per 100 does (Figure D3-2). This estimate is below the highest modeled estimate of 65 bucks in 2013, yet is still above the current management objective range of 30-40 bucks. Observed buck ratios from classification flights have been recorded as high as 96 bucks in 2015 and 82 bucks in 2020, however these observations likely reflect a mismatch between true summer population demographics and what is observed during winter surveys. Given that bucks tend to migrate after does and fawns, it is likely that observed buck ratios above 50 reflect years where the majority of does and fawns have already migrated. This nuance highlights the importance of evaluating multi-year trends in classification data, rather than scrutinizing a single year's observation. Fawn:doe ratios have remained quite stable in D3 since the early 1990's. Most recently, 51 fawns per 100 does were observed post-hunt in 2021, which is just below a 30-year average of approximately 55 fawns (Figure D3-3).

All five GMUs in D3 have historically been managed for high quality, late-season buck hunting opportunities during the mule deer rut. As such, 3rd and 4th rifle season buck tags have low quotas and usually require multiple preference points to acquire. For example, in 2021, the 3rd rifle season buck tag for GMU 6 required 5 preference points, and the 4th rifle season buck tag (valid DAU-wide) required 8 preference points. Opportunity is slightly higher for archery, muzzleloader, and 2nd rifle seasons which required 1, 1, and 3 preference points during the same year, respectively. As interest in hunting deer in D3 appears to gradually increase each year, the amount of preference points required for each hunt code is also expected to increase. In 2021, a total of 789 buck deer tags were available (Figure D3-4), including 4 allocated to the Ranching for Wildlife Program (Silver Spur Outfitters). Since 2002, total tag allocation has ranged widely, between 400 - 1,700 licenses. D3 has not offered any doe licenses since 2013 in an effort to increase the number of resident wintering deer and the overall population size, a decision that has generally been supported by the public. Total harvest was 294 bucks in 2021, and has ranged from approximately 175 - 700 animals since 2002, though harvest has not been above 300 animals in over a decade (Figure D3-5). Although D3 has not historically managed for white-tailed deer (hereafter 'whitetails'), a small, isolated population of whitetails have existed in D3 for many years. During winter months, whitetails congregate on private land near, or within, the town of Walden. These deer are not targeted during classification flights, however, anywhere between 5-30 animals are spotted each year with little variation in distribution. By most anecdotal accounts, this subpopulation has remained stable or is increasing slightly. Whitetail bucks are legal to harvest with any valid buck tag in the DAU although very few, if any, have even been taken by hunters. Beginning in 2023, D3 will offer a list B, private land, late-season antlerless whitetail-only hunt, with a small harvest quota and preference given towards youth. This tag is designed to be used as a management tool to reduce whitetail densities near the town of Walden when needed for reducing the risk of vehicle collisions, damage to landscaping and agriculture, and disease transmission (i.e. CWD).

Significant Issues

Resident Deer & Winter Range

The total number of deer residing in D3 has decreased substantially over the past 50-75 years, particularly the number of resident wintering deer in North Park. Don Gore, a retired North

Park district wildlife manager, reported up to 10,000 deer wintering in North Park during ground counts in the late 1950's and early 1960's. During this same time period, hunters were allowed to purchase as many as three licenses in an effort to reduce the deer population. A record harvest occurred in 1956, which included an 88 day rifle season. In this single year, 5,357 deer hunters harvested 3,515 deer in North Park. In GMU 6 alone, hunters harvested 2,114 deer. Today fewer than 500 deer are classified in winter classification counts, and fewer than 300 deer are harvested annually.

Reasons for this winter resident population decline are likely attributed to several factors. The severe winters of 1983-84, 1992-93, 1995-96, 2007-08, and 2010-11 killed many fawns and adult deer. After each harsh winter, the population failed to recover to previous numbers. Over-hunting of resident deer, in particular, up through the early 1970's likely contributed to a long term decline in deer wintering in North Park. Perhaps a substantial amount of harvest on non-migratory deer during October and November eliminated those individuals with learned behavior for this wintering strategy. Migratory deer during this time may have been less vulnerable to harvest, and thus became the dominant cohort within this population. In addition to severe winters and potential over-harvest, elk and pronghorn populations increased during this time period, and moose were introduced to North Park. A net increase in interspecific ungulate competition may have influenced mule deer wintering behavior. Today, substantial winter range remains in North Park, though it is underutilized by mule deer.

Migratory Deer Management

The apparent shift in mule deer wintering behavior in D3 also presents challenges associated with interstate deer management. Location data from multiple collaring studies since 2000 (Appendix II) have demonstrated that the bulk of mule deer leave North Park in early October for the North Platte Valley of Wyoming, or Middle Park Colorado for winter. North Park deer are clearly a southern extension of the North Platte deer herd in Wyoming. This behavior reduces deer vulnerability to harvest in Colorado, but increases vulnerability to harvest in Wyoming under Wyoming Game and Fish Department's current season structure. Current management in Colorado is geared toward stabilizing and reversing the decline in deer numbers and will require collaborating on strategies with Wyoming Game & Fish.

Chronic Wasting Disease

Similar to other deer herds in Colorado, CWD is another major management issue for the D3 herd. Prior to 2020, there has not been any mandatory CWD testing for deer or elk in North Park. The total number of harvested deer and elk submitted for testing each year during this time has never exceeded 40 animals. Given these small sample sizes, and the likelihood of bias towards testing visually sick animals, results from these tests are not useful for population level monitoring and management. However, D3 was selected for mandatory testing (i.e. all rifle harvested bucks) during the 2020 and 2021 hunting seasons. Results from 2020 yielded a DAU CWD prevalence rate of 5.9% (n=135), and results from 2021 yielded a prevalence rate of 11.4% (n=185). Taken together, the overall CWD prevalence rate for the D3 herd was 9.1% (n=320). These results are comparable with prevalence rates from mule deer harvested from the North Platte Valley of Wyoming from 2019-2021 (6.9%; personal comm. with Teal Cufaude, WGFD Biologist), which further highlights the connectivity between these areas, and underscores the value in cooperation between Wyoming Game & Fish and CPW. CWD prevalence rates >5% can lead to rapid spread of the disease within a herd and will have population-level impacts through higher mortality of adult deer and a decline in the age

structure of a population. It remains unclear if a prevalence rate of 9.1% is a recent phenomenon, or if CWD has existed in this population at this level for some time. D3 is scheduled for mandatory CWD testing again in 2023 and 2028. Results from these tests will be highly informative in describing whether prevalence rates are increasing, stable, or decreasing, and at some level will likely influence license allocation.

Increased Predation Pressure

In addition to human harvest and winter kill, predation from black bears, mountain lions, and coyotes is a notable source of deer mortality in D3. In rare cases, bobcats and golden eagles may also take small or injured deer.

Since the early 2000's, multiple gray wolf sightings have been confirmed in North Park. Most recently, two wolves arrived in North Park from Wyoming and successfully reared a litter in 2021, thus establishing Colorado's first wolf pack since approximately 1945. Regardless of human tolerance and future outlook for this wolf pack, the probability of wolves existing in North Park for years to come appears high as there seems to be a natural corridor into North Park used by wolves dispersing from Wyoming.

Currently, CPW biologists and wildlife managers do not feel that wolves will add a significant amount of additive mortality to D3. Though wolves are expected to prey on mule deer, most research conducted in the Rocky Mountains indicates that wolves will target elk over mule deer if both are available. While it will be important to monitor impacts of all predation sources, CPW has prioritized resident wintering deer, potential complications with interstate management, and CWD prevalence as the most important issues for D3.

Management Objective Recommendations

Given the history, current status, and significant issues impacting deer in D3, CPW recommends a new population objective range of 4,400-6,400 deer. This objective drops the lower end of the current objective of 5,400-6,400 deer. Lowering the bottom end of this range provides more flexibility in managing a herd with high CWD rates. The population might decline on its own due to CWD-related mortalities and/or we might need to intentionally reduce deer densities for several years to drive the CWD rate below 5%. Assuming that the CWD rate can be reduced through harvest management, the population could also grow back to the upper end of the population objective range.

Although CWD is a concern for the future of this deer herd, and lowering buck ratios can be an effective tool for reducing CWD prevalence, CPW recommends the sex ratio objective range remain status quo at 30-40 bucks per 100 does. Nuances associated with the timing of classification surveys and population models complicate the interpretation of modeling results. It is likely that current buck:doe ratio estimates are biased high as buck observations are often inflated during classification surveys. As such, rather than dropping the objective range for this metric, we intend to bring observed buck:doe ratios down into the established range, rather than allow it to remain above (has been above objective since 2007). By employing this effort, the population's buck:doe ratio will be lowered, hopefully providing some reduction in CWD prevalence. If future CWD prevalence rates fall below 5%, CPW may manage for the upper end of this objective range to maintain high quality buck hunting opportunities.

Stakeholder Outreach and Input

These proposed objectives were presented at a public meeting held in Walden on August 9th, 2021. Only 2 members of the public attended, and one survey response form was completed and returned. This participant's response favored CPW's HMP recommendations. Additional outreach was completed in July 2017 for the then draft version of this plan. Area 10 biologist Jeff Yost held two public meetings, one on July 14th, 2017 in Walden and another on July 17th, 2017 in Fort Collins. At that time, proposed management alternatives were a population objective of 5,400-6,400 deer, and a sex ratio of 30-40 bucks per 100 does. Overall, 4 members of the public attended the meeting in Walden, and 2 attended in Fort Collins. In addition, CPW solicited input from USFS - Parks District, BLM - Kremmling, State Land Board, Colorado Bowhunters Association, NE and NW Colorado State Representatives, North Park HPP Committee, Colorado Muzzleloaders Association, and the Jackson County Planner. From this outreach effort, the North Park HPP Committee responded with approval for the proposed herd objectives.

Strategies to Address Issues and Management Concerns and to Achieve Herd Management Objectives

Fewer deer wintering in D3 is likely the result of a combination of factors including habitat quality/quantity, competition from other ungulates, and the result of over shooting local deer. In addition, severe winters may compound each of these factors by increasing nutritional stress and lowering survival rates. The elimination of antlerless harvest has been in effect for 10 years, however this has not appeared to have increased the number of deer on the landscape. Therefore, CPW managers may decide to bring back a small level of antlerless harvest to increase hunting opportunity as public interest and herd health allows. Habitat studies to investigate forage utilization and possible competition among herbivores may provide some clarification on the interactions among the four ungulate species that utilize North Park's winter range. Other opportunities to study the effects of the fire on both habitat succession and deer utilization are currently available in GMUs 161 and 6, as recent wildfires have occurred there. Other habitat improvement techniques such as fertilization, rejuvenating bitterbrush, or mechanical disturbance of forage could be implemented.

CPW will continue to work collaboratively with federal land management agencies, private landowners, county governments, local municipalities and NGOs to protect and enhance the remaining mule deer habitat. Important habitat conservation methods include habitat treatments, conservation easements or land acquisitions, maintaining landscape connectivity, studying movement corridors, and adhering to seasonal recreation closures on winter range areas.

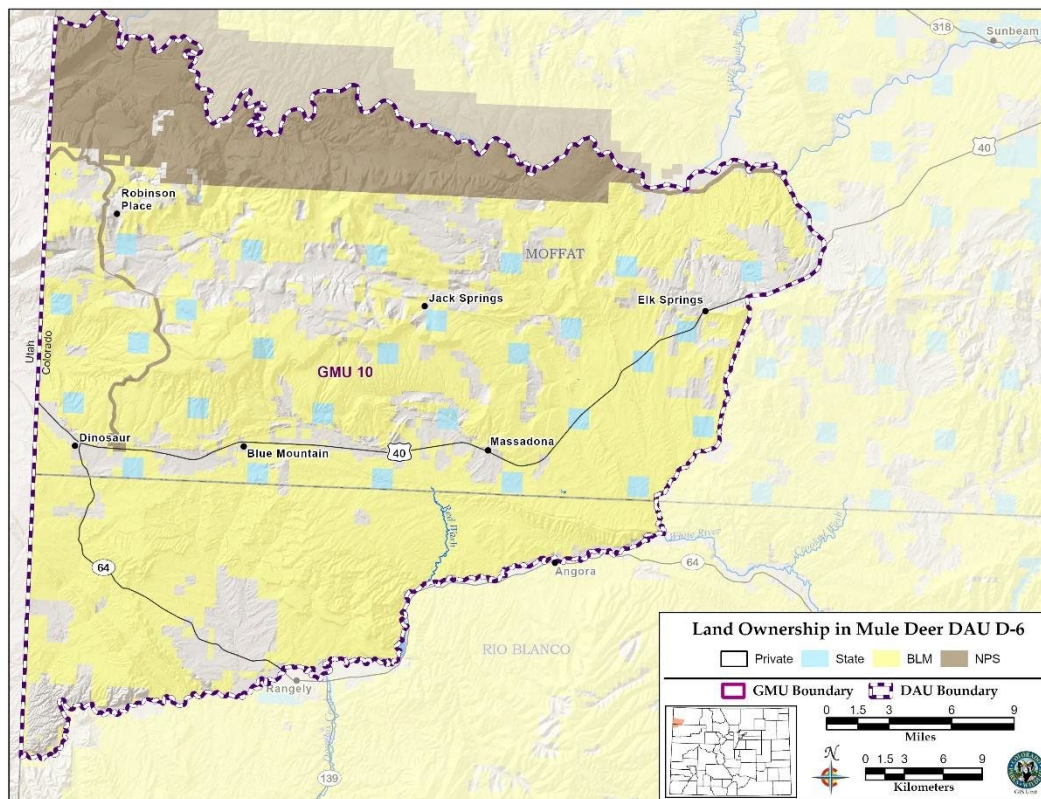
To achieve the updated population objective and to maintain the current sex ratio objective, CPW will continue to set licenses annually to both provide hunting opportunities and manage for low CWD rates. CWD prevalence will continue to be monitored through periodic mandatory testing and voluntary sample submissions.

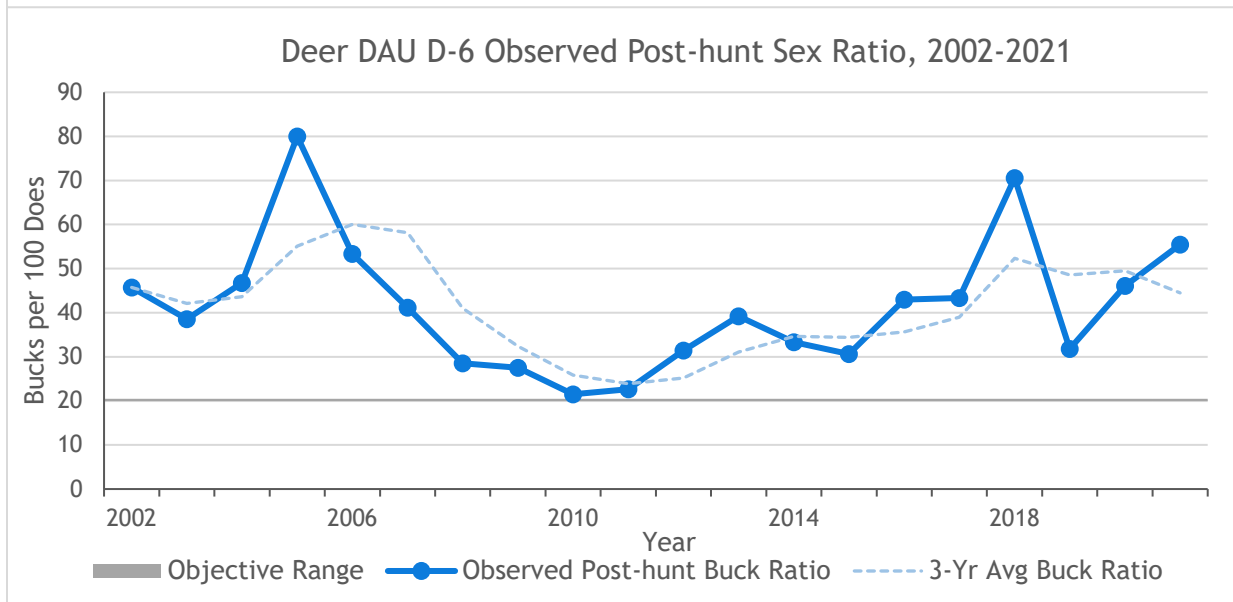
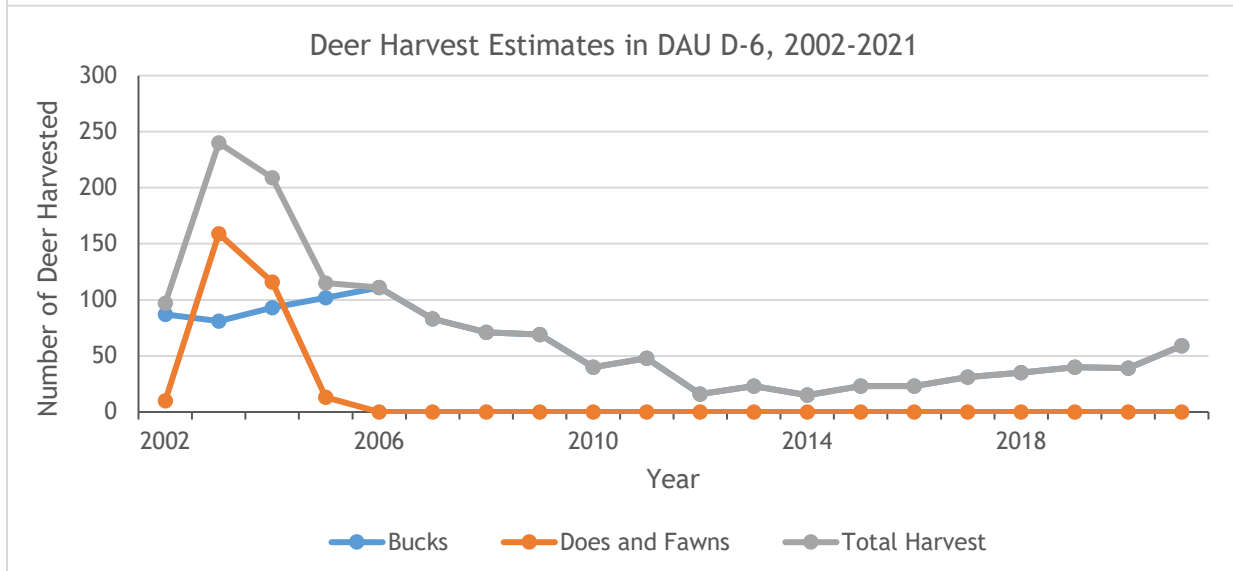
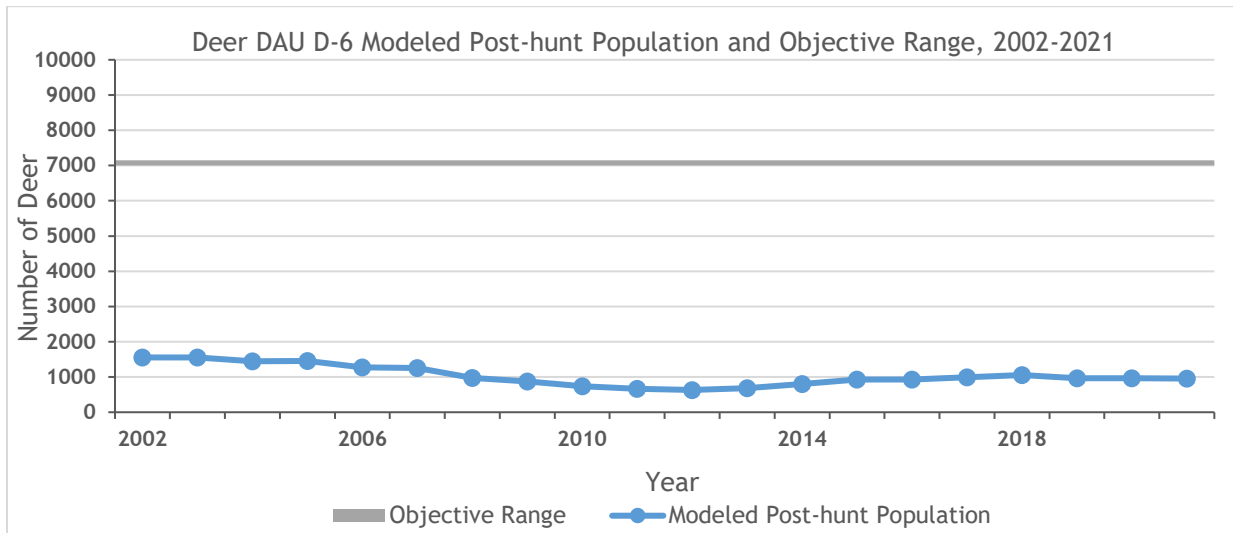
RANGELY MULE DEER HERD MANAGEMENT PLAN

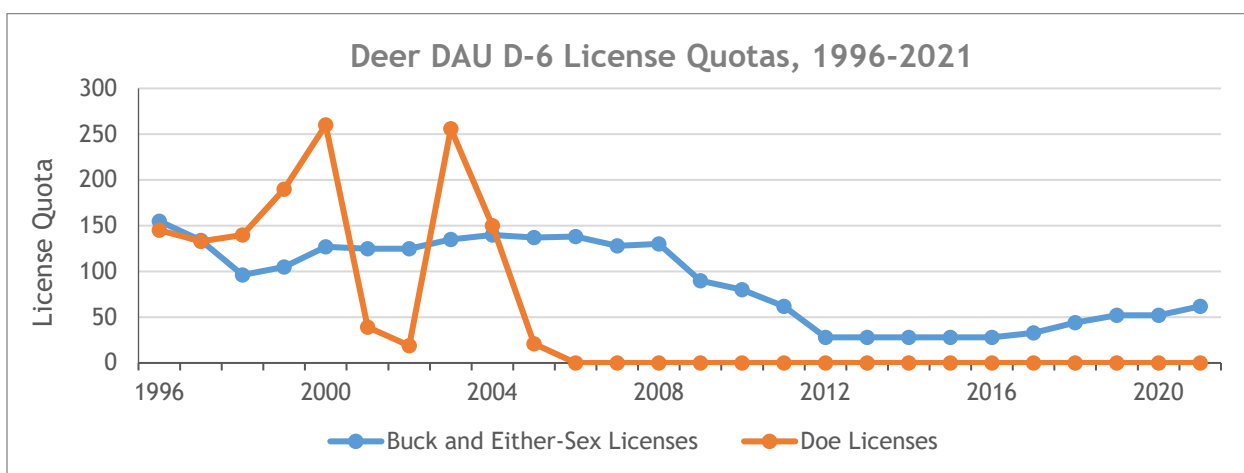
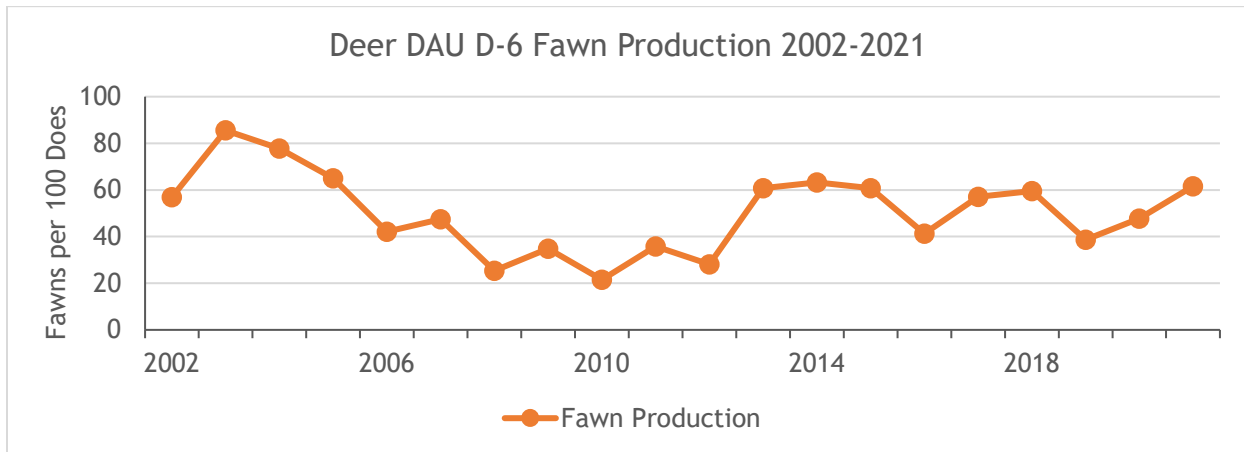
DATA ANALYSIS UNIT D-6

Darby Finley, Wildlife Biologist, Meeker

Rangely Mule Deer Herd (DAU D-6)	GMUs: 10
Post-hunt population:	
Current (no plan) Population Objective:	7,000 deer
Post-hunt 2021 Population Estimate:	900-1100 deer
Proposed New Population Objective	1,500-3,500 deer
Post-hunt Sex Ratio (Bucks:100 Does):	
Current (no plan) Sex Ratio Objective:	20 bucks per 100 does
Most Recent 3-year Average of Observed Sex Ratio:	44 bucks per 100 does
Proposed New Sex Ratio Objective:	25-35 bucks per 100 does







Background

The Rangely Mule Deer DAU, D-6, is located in northwest Colorado and includes portions of Moffat and Rio Blanco counties. The DAU includes a single Game Management Unit (GMU): 10. The towns of Rangely and Dinosaur are located on the periphery of the DAU.

The Rangely deer DAU covers 832 square miles. Of this, 21% (178 mi²) is private property, 62% (513 mi²) is Bureau of Land Management (BLM) land, 3% (27 mi²) is State Land Board land, and 14% (114 mi²) of the DAU includes Dinosaur National Monument administered by the National Park Service. Ownership patterns vary across mule deer seasonal ranges within the DAU comprised of private, state and federal lands.

Resident mule deer within D-6 will migrate short distances from summer ranges at higher elevations on Blue Mountain to lower elevations surrounding the high mountain plateau. Migratory deer from adjacent DAUs D-2 and D-7 will also move into the eastern portions of the DAU to winter.

Significant Issues

The most significant issue concerning the D-6 herd is the sustained stagnant state of population this herd has experienced for the past two decades. Much of the herd unit has

been within severe to extreme drought conditions since the late-90s. As a result, range conditions have become less productive and degraded due to the loss of browse from shrub mortality and the conversion of herbaceous understories to a monoculture of cheat grass and other invasive annuals. These conditions have reduced the nutritional carrying capacity across winter ranges throughout the DAU and made achieving historic population levels unachievable. Despite the population, appearing to be in a capacity driven slump, there has been minimal harvest applied to the herd and the population has remained stagnant. In fact, there has been no antlerless harvest since 2007 and antlered harvest has been minimal. The combination of poor range conditions, predation, and elk population levels are all playing a role in the ability for this deer population to grow and contributing to the lower sustainable deer population.

Management Objective Recommendations

CPW recommends a population objective range of 1,500-3500 deer. This recommendation is lower than the current objective of 7,000 approved in 2021. The recommended population objective range will allow for management more in line with habitat carrying capacities as a result of persistent drought. Licenses will be issued annually to manage to a target population size within the population objective range and CWD prevalence threshold of 5% or less.

CPW recommends a sex ratio objective to 25-35 bucks:100 does. The current sex ratio objective is 20 bucks:100 does. The current 3-year average buck ratio, 44 bucks:100 does. Currently, CWD prevalence is low within the DAU at 1.3% prevalence based on mandatory testing results from 2017.

Strategies to Address Issues and Management Concerns and to Achieve Herd Management Objectives

CPW will continue to work collaboratively with our partners in the federal land management agencies, private landowners, county governments, local municipalities and NGOs to protect and enhance the remaining mule deer habitat. Important habitat conservation methods include habitat treatments, conservation easements or land acquisitions, maintaining landscape connectivity and movement corridors, and adhering to seasonal recreation closures on winter range areas.

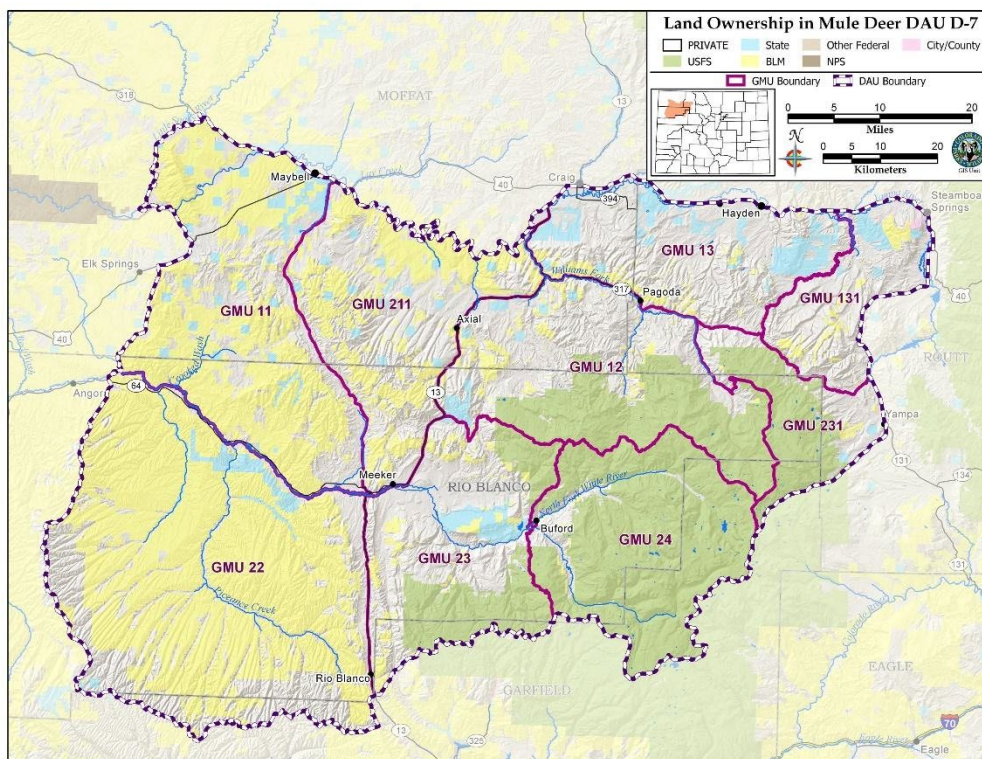
A population objective range of 1,500-3,500 will allow population levels to be managed in line with habitat carrying capacity. Management actions recommended to achieve the population objective are to apply habitat treatment strategies that will improve habitat conditions across winter ranges. Improving habitat conditions will be a challenge considering drought conditions so maintaining both mule deer and elk populations at nutritional carry capacities the winter range can support through harvest management may be the most effective tool to allow for reduced browsing pressure on drought stressed winter ranges.

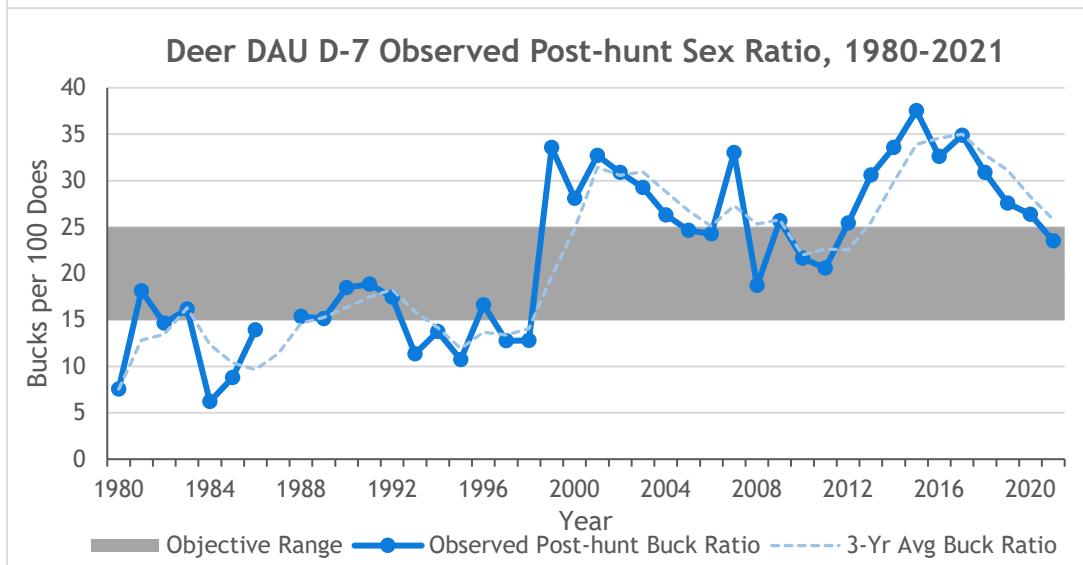
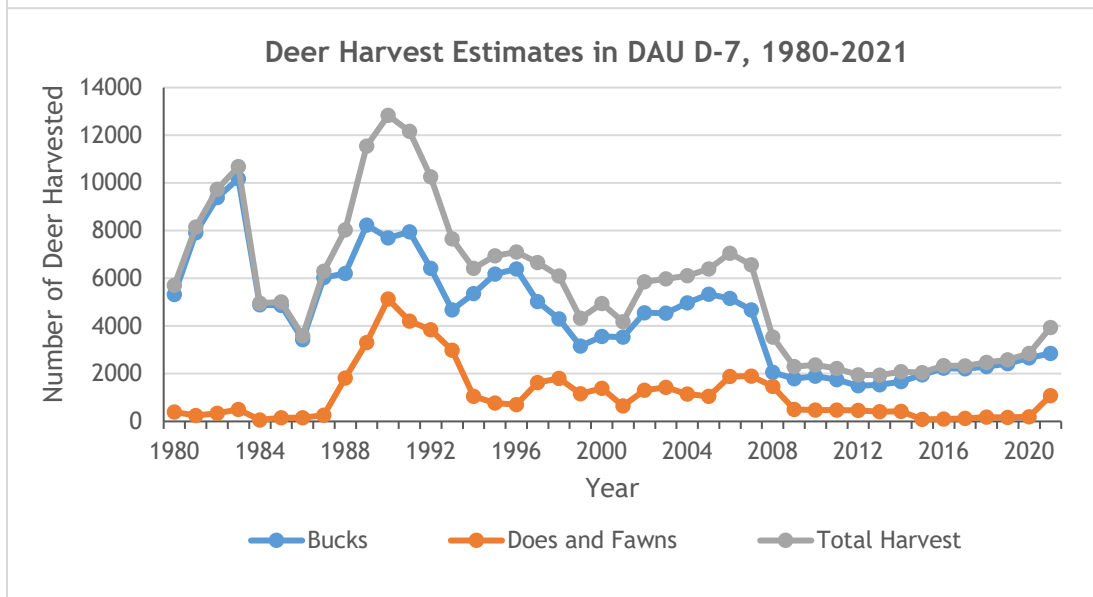
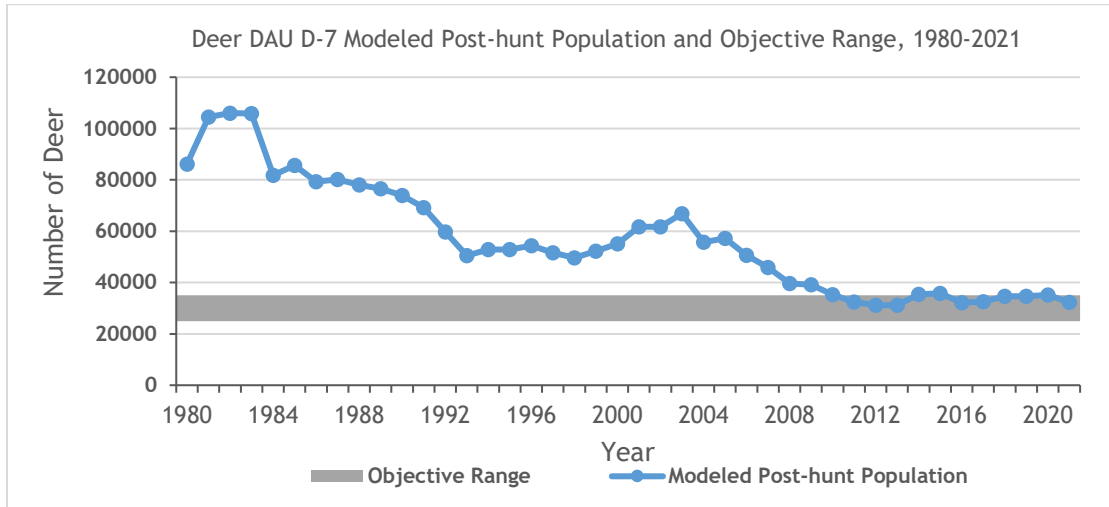
The recommended sex ratio objective will allow the ability to address management concerns regarding CWD prevalence rates if increased prevalence becomes a concern. CWD prevalence will continue to be monitored through periodic mandatory testing and through voluntary sample submissions.

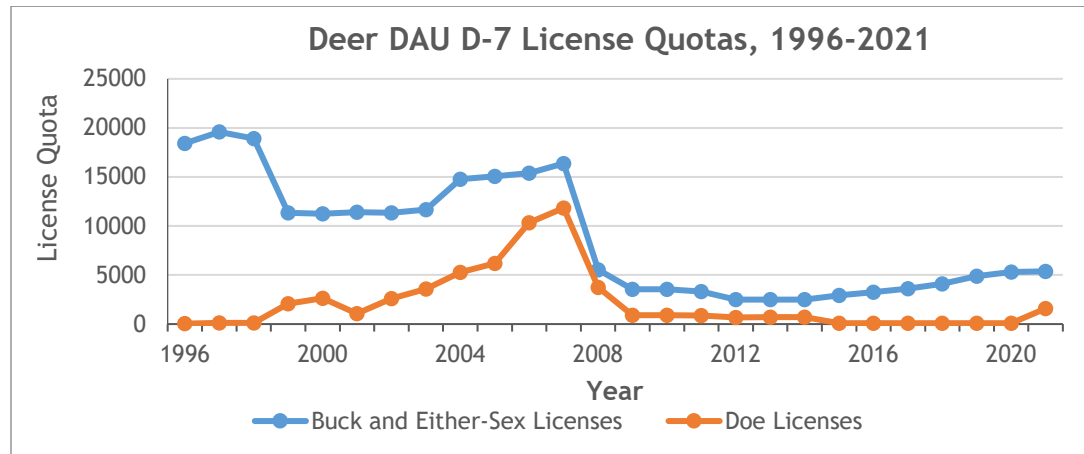
WHITE RIVER MULE DEER HERD MANAGEMENT PLAN DATA ANALYSIS UNIT D-7

Darby Finley, Wildlife Biologist, Meeker

White River Mule Deer Herd (DAU D-7)	GMUs: 11, 12, 13, 22, 23, 24, 131, 211, 231
Post-hunt population:	
Current (2020 plan) Population Objective:	25,000-35,000 deer
Post-hunt 2021 Population Estimate:	32,000-35,000 deer
Extension Population Objective	<u>No change, 25,000-35,000 deer</u>
Post-hunt Sex Ratio (Bucks:100 Does):	
Current (2020 plan) Sex Ratio Objective:	18-25 bucks per 100 does
Most Recent 3-year Average of Observed Sex Ratio:	26 bucks per 100 does
Extension Sex Ratio Objective:	<u>No change, 15-25 bucks per 100 does</u>







Background

The White River Mule Deer DAU, D-7, is located in northwest Colorado and includes portions of Routt, Moffat, Rio Blanco, and Garfield counties. The DAU is comprised of 9 Game Management Units (GMUs): 11, 211, 12, 13, 22, 23, 24, 131 & 231. The towns of Craig, Steamboat Springs, Yampa, and Oak Creek are located on the periphery of the DAU and Meeker is centrally located within the DAU.

The White River deer DAU covers 4,120 square miles. Of this, 42% (1,714 mi²) is private property, 33% (1352 mi²) is Bureau of Land Management (BLM) land, 21% (856 mi²) is administered by the United States Forest Service (USFS), 3% (116 mi²) is State Land Board land, and less than 2% (78 mi²) is Colorado Parks and Wildlife (CPW) land (Figure 5 & 6). Ownership patterns vary across mule deer seasonal ranges within the DAU comprised of private, state and federal lands. Half of all mule deer winter range is managed by BLM and the other half is primarily private property with minimal state owned lands. Summer range is primarily comprised of private property and Forest Service lands.

Mule deer within D-7 are migratory, moving from higher elevation summer ranges in eastern portions of the DAU to lower elevation winter ranges in the western portions of the DAU. Migratory distances vary greatly with some deer moving 60 to 70 miles between seasonal ranges while others move relatively short distances, 10 to 20 miles or are year-round resident herds.

Significant Issues

Characteristic of deer populations throughout Colorado and elsewhere in the West, population trends within the D-7 herd are cyclical (Gill et al. 2001). These cyclical trends are most affected by severe winters and drought. Historically, the White River deer herd was very robust, likely exceeding 100,000 deer in the early-1960s. More favorable habitat (early seral stage vegetation) and widespread poisoning to control predators during this time likely created a situation in which deer populations were unnaturally high. The most recent population peak occurred in the early-1980s with modeled estimates consistently predicting the population at over 100,000 deer. Since the early-80s, population estimates have shown a steadily declining trend. The declining trends in the modeled estimates are consistent with on the ground observations. Going into the severe winter of 1983-84 the D-7 deer herd was at an all-time high and has not rebounded to those population levels since.

The average population size has declined from 92,000 in the 1980s, to 61,000 in the 1990s, to 53,000 in the 2000s, and to 34,000 in the 2010s. In turn, population objectives for the D-7 herd have also been set lower. The population objective prior to 1990 was 85,000 deer and in 1994, the objective was lowered to 67,500. Throughout the decades of a steady overall population decline, deer herd numbers stabilized for a short period from 1993-2000 before rebounding slightly from 2001-2006. This increase was due, in part, to an increased number of bucks recruited into populations after the limitation of deer licenses statewide in 1999. The increasing trend was short-lived. Coming out of the drought in the early 2000s, deer numbers were at the highest population level since the early 1990s entering the severe winter of 2007-2008. Population dynamics within the herd changed after the severe winter of 2007-2008. Contributing factors to the changes within the D-7 herd were the combination of high deer numbers and drought stressed winter ranges leading into the severe winter. The poor range conditions could not support the high deer densities resulting in further range degradation. Ultimately, this has resulted in long-term reductions in the nutritional carrying capacities across winter ranges within the DAU. Over-winter survival rates from radio collared fawns prior to 2007 averaged 72.2%. Post 2007, over-winter fawn survival has averaged 59.7%. Furthermore, annual adult doe survival pre and post 2007 went from an average of 85.6% to 79.8%, respectively. Cause specific mortality rates from malnutrition doubled for both does and fawns after the 2007-2008 winter. It appears, based on evidence from radio-collared deer, the cumulative effects weather (drought and severe winters), habitat conditions, and disease (specifically, CWD) all appear to be contributing to the declining population trend in the D-7 herd. In recent years (likely since 2010s) chronic wasting disease has contributed in partially additive way to lowered doe survival. This is likely affecting population performance and preventing rebounds in the population even when habitat conditions temporarily improve (i.e. reducing herd resilience). In the last decade, the herd has not exceeded 40,000 animals.

Biological carrying capacity is not static. In reality, carrying capacities fluctuate annually and trend over time. The declines observed within the D-7 mule deer herd are evidence the carrying capacity is, and has been, on a downward trend. Sustaining historic or desired population levels can be difficult or impossible due to habitat constraints. The cumulative effects of all human related activities lower habitat capability and ultimately reduce the size of big game populations the habitat can sustain. In addition, drought plays a significant role in habitat capability by affecting winter and year-round forage condition. The direct and indirect impacts of fragmentation from energy development (oil and gas, solar, etc.), trail development for recreation, and rural residential development reduces habitat function. Drought in combination with overuse by livestock, wild horses, and wildlife effects habitat quality. Fire suppression has increased canopy cover reducing winter range quality and in other areas, wildfire has resulted in significant losses of browse on critical winter range and increased competition from invasive annual grasses. Compounding the impacts of wildfire has been increased elk competition on winter ranges.

CWD was first discovered within the D-7 herd in early 2002. A cluster of CWD cases was unexpectedly detected in mule deer entrapped in a captive elk facility in GMU 12 near Pagoda in the Williams Fork drainage. The initial management approach after discovering CWD was an attempt to eradicate the disease. Focused culling efforts were initiated to try to control CWD from spreading. However, testing results from hunter-harvested animals during the 2002 hunting season revealed the disease was more widespread within the DAU than initially thought. While CWD was present in D-7, prevalence rates in the herd were low, ~1%. Throughout the early 2000s, heightened hunter awareness about CWD, free testing, liberal license allocations, and relatively high harvest rates resulted in high hunter submission rates

for CWD testing. Surveillance efforts indicated prevalence rates remained low within the D-7 herd from 2002-2007. With CWD prevalence rates remaining relatively low, hunters and managers became apathetic. In turn, hunter interest in having animals tested for CWD waned and hunter-harvested submission rates declined. From 2009-2016 hunter-harvested submissions remained low while prevalence rates showed an increasing trend. The increasing trend in CWD prevalence was cause for concern among wildlife managers and in 2017, mandatory testing was required for all deer harvested in D-7. The 2017 sampling effort solidified concerns about increasing prevalence rates revealing a 15.3% CWD prevalence rate in the D-7 herd, a 10-fold increase in 15 years. At this observed level of prevalence, CWD appears likely to be contributing to recent declines in adult deer abundance and herd-level resilience in those portions of the D-7 herd outside of the Piceance Basin.

Management Objective Recommendations

CPW recommends extending the population objective range of 25,000-35,000 deer. This recommendation is status quo from the current objective range approved in 2020. The recommended population range will allow for management flexibility in response to changes in habitat conditions, CWD prevalence, and changes in population size due to severe winter events and drought. Licenses will be issued annually to manage to a target population size within the population objective range and CWD prevalence threshold of 5% or less.

CPW recommends extending the sex ratio objective to 15-25 bucks:100 does. The current sex ratio objective is 18-25 bucks:100 does. The current 3-year average buck ratio, 26 bucks:100 does. Given the significant increase in CWD prevalence within D-7 over the past 19 years, consideration must be given to management strategies that will reduce buck ratios to within sex ratio objective ranges in an attempt to reduce CWD prevalence rates.

Strategies to Address Issues and Management Concerns and to Achieve Herd Management Objectives

CPW will continue to work collaboratively with our partners in the federal land management agencies, private landowners, county governments, local municipalities and NGOs to protect and enhance the remaining mule deer habitat. Important habitat conservation methods include habitat treatments, conservation easements or land acquisitions, maintaining landscape connectivity and movement corridors, and adhering to seasonal recreation closures on winter range areas.

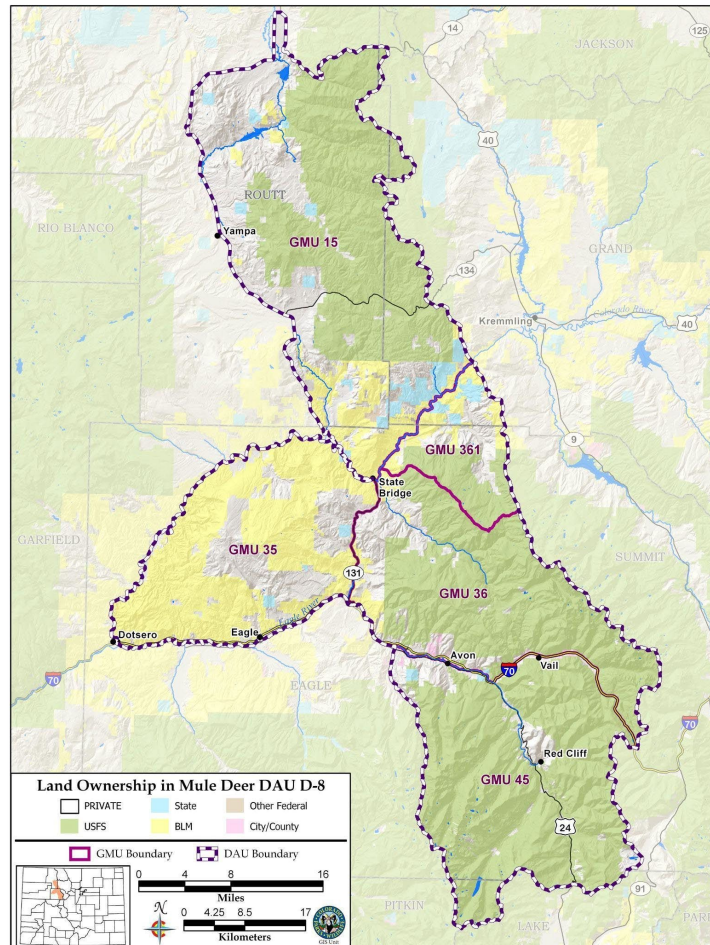
A population objective range of 25,000-35,000 will allow for increased flexibility in management options if desired CWD prevalence rate reductions were not being achieved. In addition, it would allow further population reductions to address density-dependence mortality factors. Management actions recommended to achieve the population objective and reduce CWD prevalence rates include: increased female and/or either sex hunting licenses, increased harvest in later season or in high CWD prevalence areas, increase private land only license availability, and increase harvest within targeted high-density mule deer winter ranges. The specific areas in which increased harvest on high-density mule deer winter ranges would be determined based on data from winter classification flights. Moderate incremental increases in license recommendations would be utilized to achieve desired objectives.

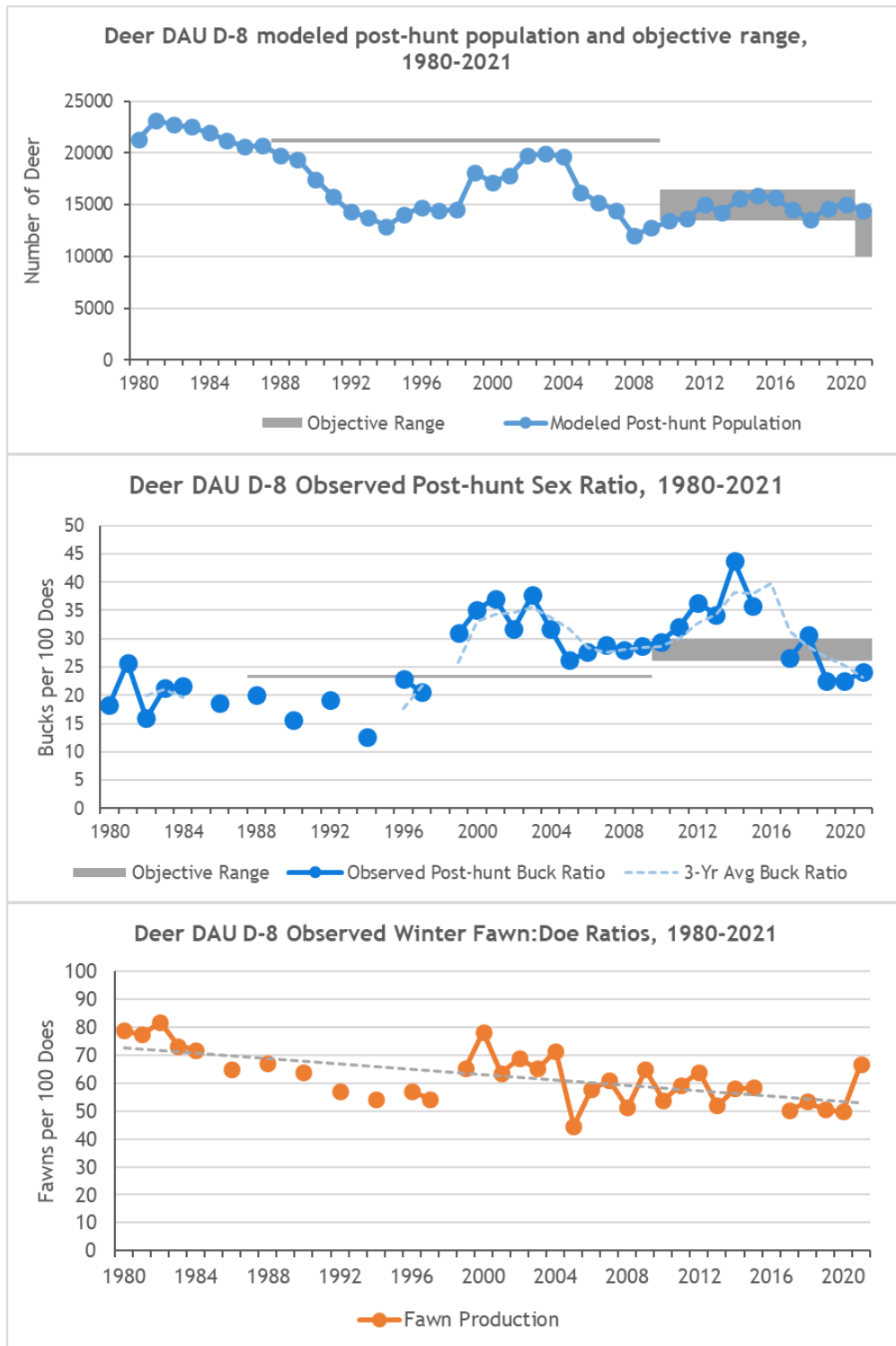
The recommended sex ratio objective would allow the ability to address management concerns regarding high CWD prevalence rates. Management actions implemented to achieve sex ratio objectives and reduce CWD prevalence rates would include: reduce male:female ratios, change age structure, and maximize ability to remove diseased animals at smallest scale possible. Management tactics to achieve sex ratio objectives and CWD prevalence rates will include disease management hunts and/or increasing and/or shifting male hunting licenses into later seasons and creation or modification of hunt code groupings for more targeted harvest. The lower end of the sex ratio would allow for management flexibility if CWD prevalence thresholds were not met despite a reduction in overall sex ratios. CWD prevalence will continue to be monitored through periodic mandatory testing and through voluntary sample submissions.

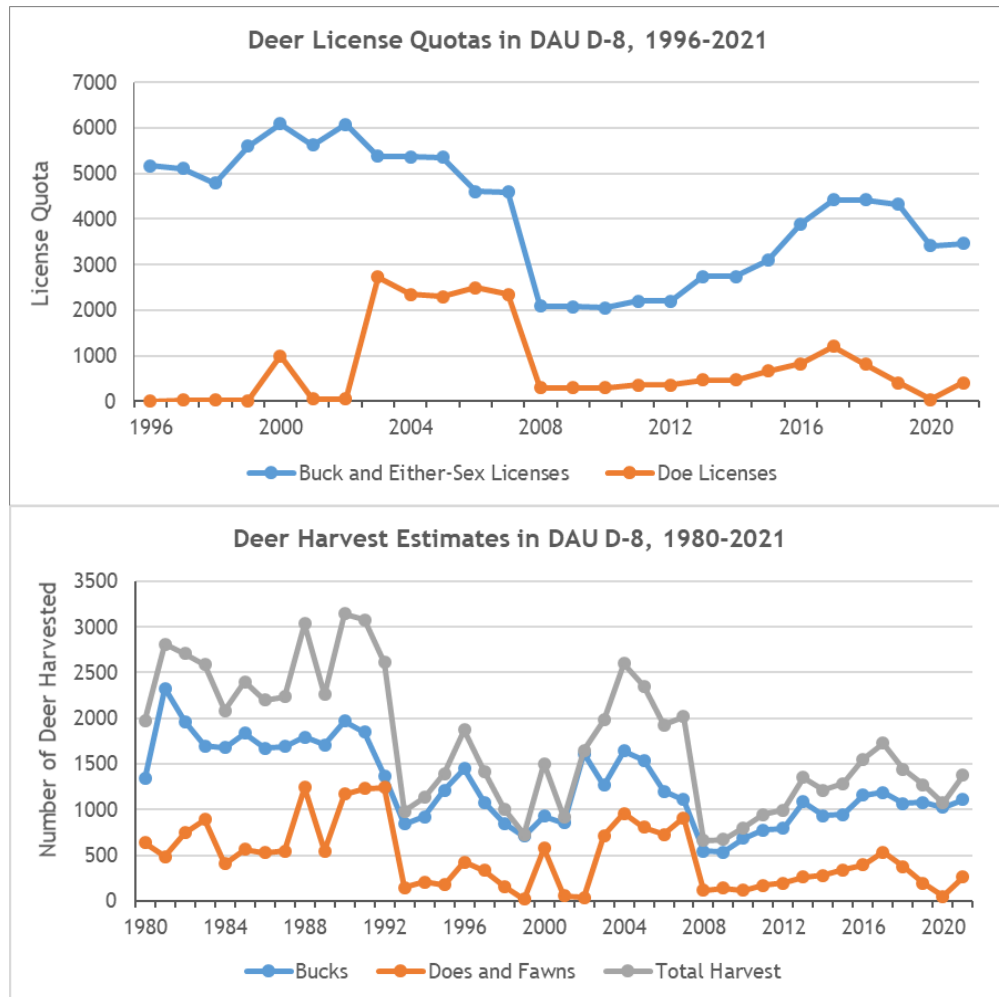
STATE BRIDGE MULE DEER HERD MANAGEMENT PLAN DATA ANALYSIS UNIT D-8

Julie Mao, Wildlife Biologist, Glenwood Springs

State Bridge Deer Herd (DAU D-8) Approval Year for last HMP: 2020	GMUs: 15, 35, 36, 45, and 361
Post-hunt population: Current (2020 plan) Population Objective:	10,000-14,000 deer
Post-hunt 2021 Population Estimate:	14,463 deer
Extension Population Objective	<u>No change: 10,000-14,000</u>
Post-hunt Sex Ratio (Bucks:100 Does): Current (2020 plan) Sex Ratio Objective:	26-30 bucks per 100 does
Most Recent 3-year Average of Observed Sex Ratio:	23 bucks per 100 does
Extension Sex Ratio Objective:	<u>No change: 26-30 bucks per 100 does</u>







Background

The State Bridge DAU (D-8) is located in northwest Colorado and consists of GMUs 15, 35, 36, 45, and 361. D-8 contains parts of the Eagle, Colorado, and Yampa River watersheds. Counties included in the DAU are Routt, Grand, Eagle, and Pitkin. The towns of Vail, Minturn, Avon, Edwards, Eagle, and Gypsum lie along Interstate-70, which cuts through the central-southern portion of the DAU. D-8 covers a land area of 3,765 sq. km (1,453 sq. miles), approximately 80% of which is public lands.

In the [2020 D-8 herd management plan](#), CPW lowered and widened D-8’s population objective range to 10,000-14,000 deer. This objective range takes into account the changes in land use, especially the increase in recreation activity and resulting decline in habitat quantity and quality, that have occurred over the previous decade. D-8’s most recent population estimate in 2021 is 14,463 deer, which is within the current objective range.

The herd’s sex ratio objective was maintained in the 2020 DAU plan at a range of 26-30 bucks:100 does. This is the same objective that was set earlier in the 2009 plan and has been a good balance between providing adequate hunter opportunity, buck quality, and maintaining chronic wasting disease (CWD) prevalence in the herd below 5%. The current 3-

year (2019-2021) average is 23.1 bucks:100 does, slightly below the objective range. In 2020 and 2021, buck and either-sex licenses were reduced from the earlier higher quotas from 2017-2019 to bring the sex ratio back up into objective range.

Significant Issues

D-8 is one of the larger deer herds in the state, but as with many herds in western Colorado, the cumulative impacts of decades of human population growth and the direct and indirect impacts of human activities have continued to diminish both the quality and quantity of habitat and its carrying capacity for deer. Land development, fragmentation by roads and trails, increased human activity on public lands, and suppression of large-scale wildfires have long-term and perhaps even irreversible effects on the landscape. The proliferation of all forms of outdoor recreation on public lands has continued since the 2009 herd management plan. Continued conversion of habitat on private lands into residential housing developments is expected over the next decade or so, especially in the units near Interstate-70, leading to further loss of mule deer winter and summer range habitat. Vehicle traffic also continues to increase as the region's human population grows, and wildlife-vehicle collisions continue to be a concern. CWD prevalence rate in harvested bucks was 4% as of the most recent mandatory check year (2018) for this DAU.

Management Objective Recommendations

CPW recommends maintaining the objective range of 10,000-14,000 deer that was established in the recent (2020) D-8 herd management plan. This objective range manages for a population level slightly below habitat carrying capacity and gives CPW sufficient latitude in maintaining license quotas at a more consistent level, which in turn gives D-8 hunters more predictability from year to year when applying for licenses.

CPW recommends maintaining the current sex ratio objective of 26-30 bucks:100 does that was originally set in the 2009 D-8 Plan and carried forward in the 2020 D-8 Plan. This range is a moderate sex ratio at which the herd is still managed primarily for ample buck hunting opportunity. The maturity of available bucks would be about the same as it currently is. Buck license quotas would likely remain similar to the recent few years' quotas to keep the observed sex ratio within the objective. We expect that by managing for this moderate sex ratio, chronic wasting disease (CWD) prevalence rate in bucks in D-8 will remain below 5%. However if the CWD prevalence rate reaches 5% or higher, then other measures including a revision of the sex ratio objective downward may be needed to suppress CWD in the herd.

Stakeholder Outreach and Input

For the 2020 Plan, CPW conducted public outreach in a variety of approaches, including:

- an online survey sent to 1,000 randomly selected D-8 hunters,
- presentations to the various boards of county commissioners,
- presentations to the Routt County Recreation Roundtable and Eagle County Community Wildlife Roundtable,
- presentations to 3 Habitat Partnership Program (HPP) Committees: Middle Park, Lower Colorado River, and Upper Yampa River
- a general public meeting
- outreach to local BLM and USFS staff

There was a wide variety of viewpoints represented among the comments we received (see Appendices B-F in the [2020 D-8 plan](#)). The majority of opinions supported CPW staff recommendations on the preferred alternatives for the herd management objectives.

Strategies to Address Issues and Management Concerns and to Achieve Herd Management Objectives

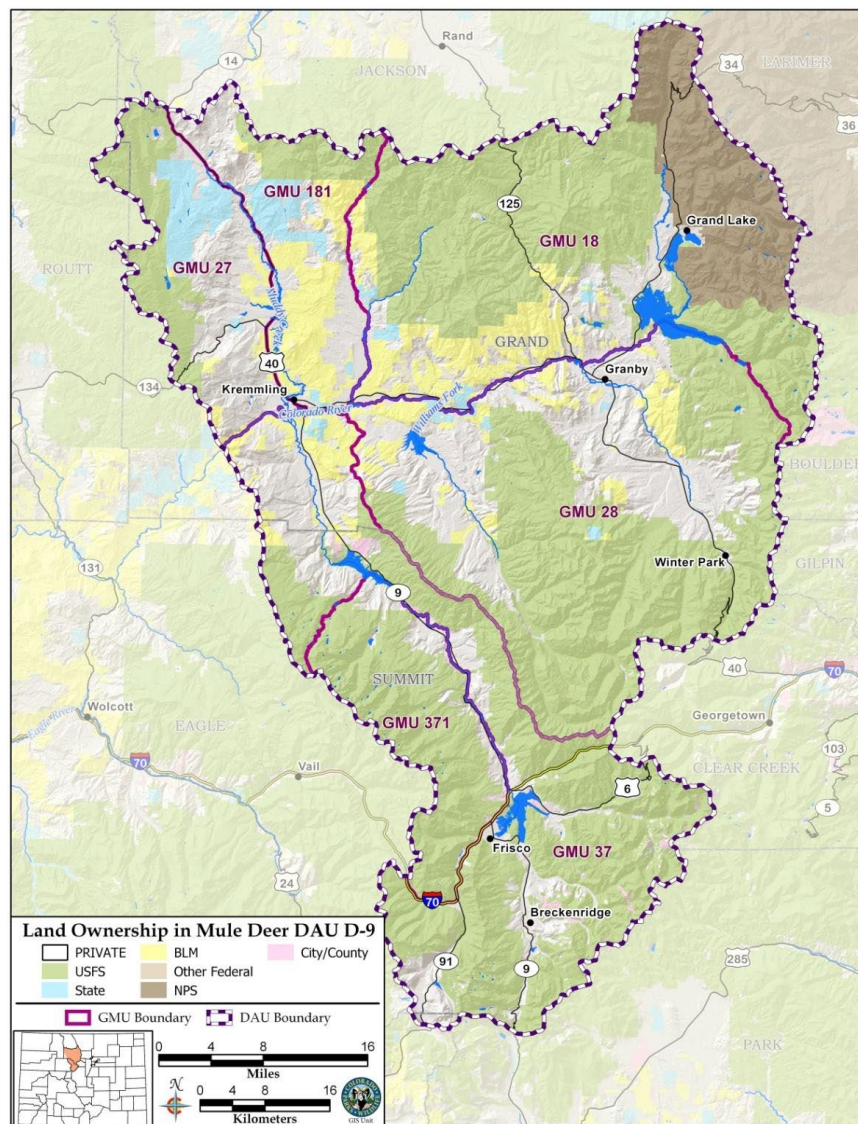
CPW will continue to work collaboratively with our partners in the federal land management agencies, private landowners, county governments, local municipalities and NGOs to protect and enhance the remaining mule deer habitat. Important habitat conservation methods include habitat treatments, conservation easements or land acquisitions, maintaining landscape connectivity and movement corridors, and adhering to seasonal recreation closures on winter range areas.

To achieve the updated population objective and to maintain the current sex ratio objective, CPW will continue to set licenses annually to provide sufficient buck and doe hunting opportunity for the public and to use hunting as a management tool to keep deer densities and buck ratios at moderate levels to discourage the spread and prevalence of chronic wasting disease. CWD prevalence will continue to be monitored through periodic mandatory testing and through voluntary sample submissions.

MIDDLE PARK MULE DEER HERD MANAGEMENT PLAN DATA ANALYSIS UNIT D-9

Elissa Slezak, Wildlife Biologist, Hot Sulphur Springs

Middle Park Deer Herd (DAU D-9)	GMUs: 18, 27, 28, 37, 181, 371
Approval Year for last HMP: 2020	
Post-hunt population:	
Current (2020 plan) Population Objective:	10,500-14,000 deer
Post-hunt 2021 Population Estimate:	13,994 deer
Extension Preferred Alternative:	No change, 10,500-14,000 deer
Post-hunt Sex Ratio (Bucks:100 Does):	
Current (2011 plan) Sex Ratio Objective:	30-35 bucks per 100 does
Post-hunt 2021 Sex Ratio:	observed: 28; modeled: 35
Extension Preferred Alternative:	No change, 30-35 bucks per 100 does



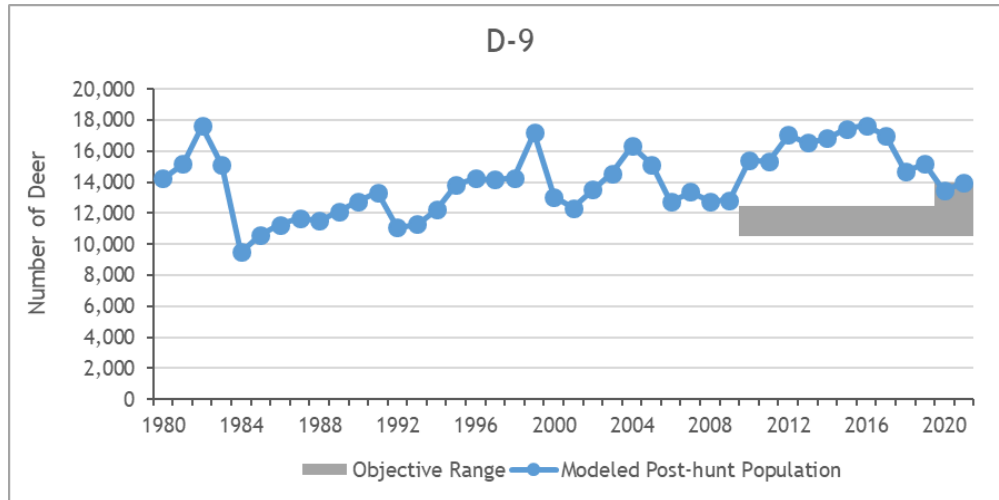


Figure D9-1. Mule deer DAU D-9 modeled post-hunt population and objective range, years 1980-2021.

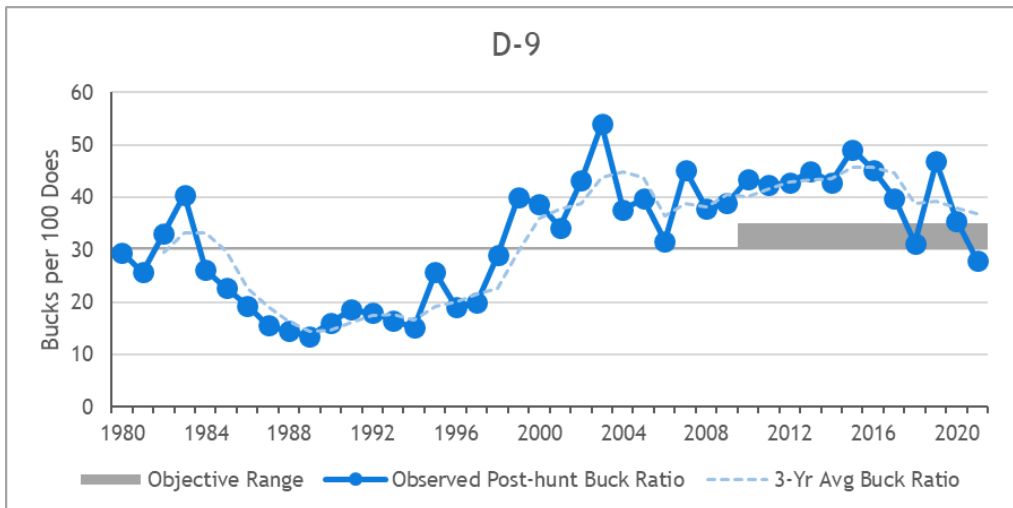


Figure D9-2. Mule deer DAU D-9 observed post-hunt sex ratio (bucks:100 does), years 1980-2021.

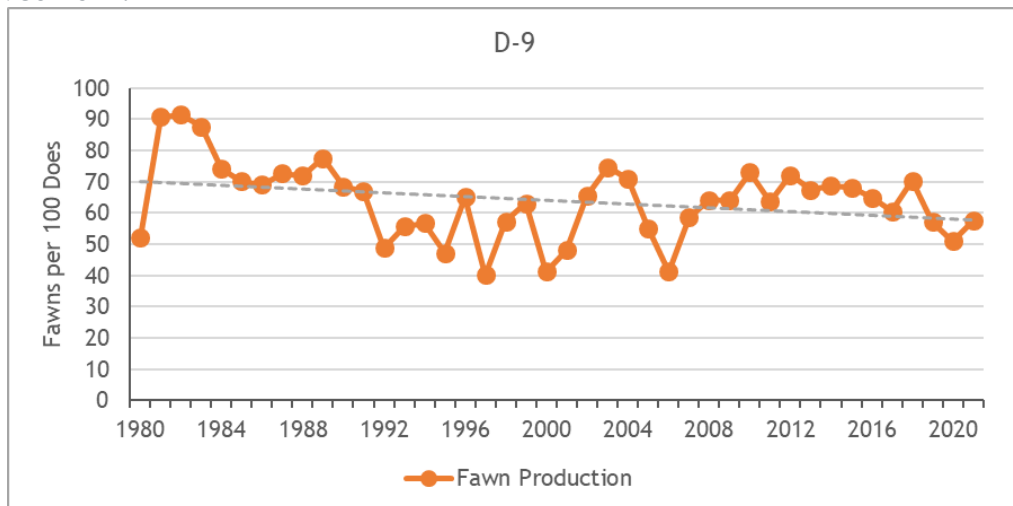


Figure D9-3. Mule deer DAU D-9 fawn production (pre-hunt fawns:100 does), 1980-2021.

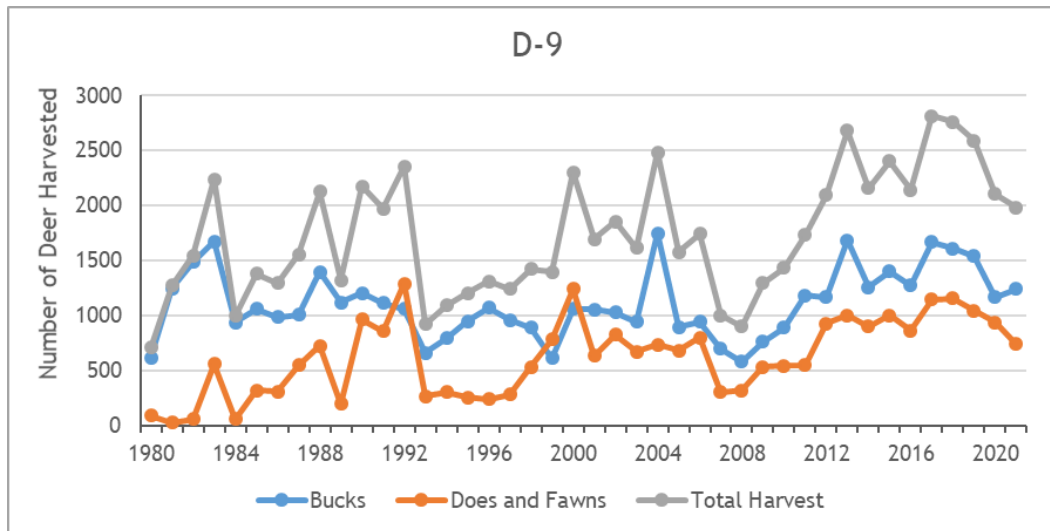


Figure D9-4. Mule deer harvest estimates in D-9, years 1980-2021.

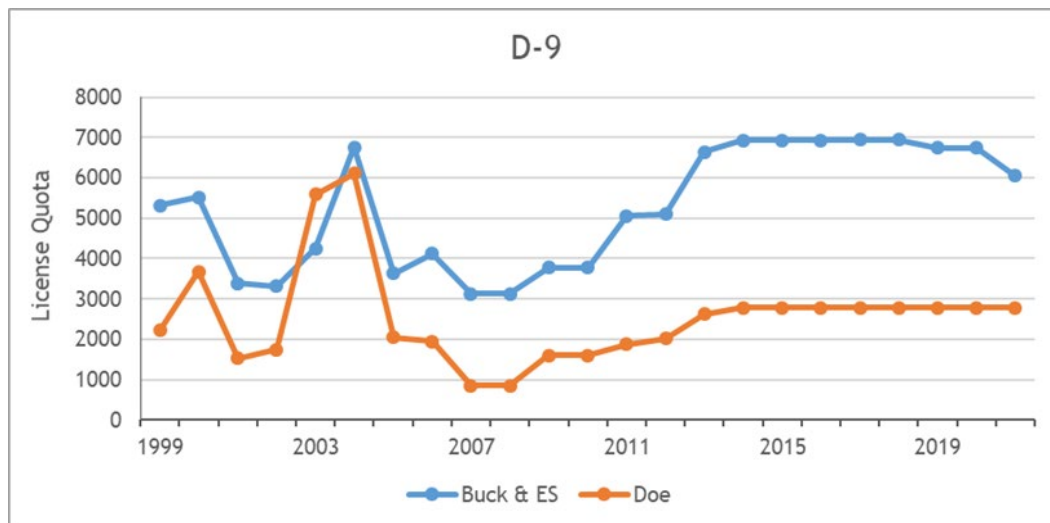


Figure D9-5. License numbers in D-9, years 1980-2021.

Description

D-9 is approximately 2,387 square miles, and land ownership is 25% Private, 9% BLM, 56% USFS, 6% NPS, 3% State Land Board, and <1% CPW. D-9 is bounded on the east and south by the Continental Divide, on the north by Hwy 40 and the Continental Divide, and on the west by the Gore Range Divide and Eagle River-Tenmile Creek Divide. D-9 includes all of Summit County, most of Grand County, and a small portion of Routt and Jackson Counties. Major towns include Kremmling, Hot Sulphur Springs, Granby, Fraser, Grand Lake, Silverthorne, Frisco, Dillon and Breckenridge. Major highways that traverse the DAU include U.S. Highway 40 from Berthoud Pass to Rabbit Ears Pass; Interstate 70 from the Eisenhower Tunnel to Vail Pass; Highway 9 from Kremmling to Hoosier Pass; and Highway 91 from I-70 to Fremont Pass. D-9 is bordered on the northeast by Rocky Mountain National Park. Middle Park is a large basin surrounded on all sides and intersected by high mountain ranges. The Gore Range, Tenmile Range and Continental Divide all have peaks exceeding 13,000 feet in elevation. The valley floor at Kremmling is 7,300 feet in elevation. Major drainages in Middle Park include the

headwaters of the upper Colorado River, the Fraser River, the Williams Fork River, Troublesome Creek, Muddy Creek, and the Blue River.

Climate

The Middle Park climate is generally dry and cold, with a majority of annual precipitation falling as snow. Drought conditions have persisted in recent decades, and Middle Park has experienced significant wildfires in recent years. Extreme temperature inversions occur during winter months, with average nighttime low temperatures between -20° to -30°F, and recorded winter temperatures as low as -64° F. The growing season is extremely short and variable. Summer daytime temperatures at lower elevations can reach into the 90° F range; however, valleys become significantly cooler than uplands during the night as colder air settles.

Precipitation ranges from only 11 inches of moisture per year in Kremmling to 20 inches per year in Grand Lake, Fraser and Summit County. A majority of the annual precipitation falls as snow between October to late April. Winter snow accumulations of 30" are typical at 9,000 to 10,000 feet in elevation. At higher elevations, more than 20 feet of snow can fall over the course of winter. Mule deer move to lower elevations as snow accumulates, seeking south facing slopes or wind-blown ridges where the snow dissipates more quickly.

Vegetation

Vegetation in Middle Park can be categorized into five broad types:

1. Cropland
2. Wetland/riparian
3. Rangeland - Sagebrush Steppe, Mountain Shrub and Grassland
4. Forestland - Pinyon-juniper, Lodgepole Pine, Aspen and Spruce-fir
5. Alpine Tundra

Seasonal Ranges

During the summer months, deer are distributed throughout the entire DAU. In the winter, deer migrate from productive summer range habitat as snow accumulates at higher elevations, shifting to limited and lower quality winter range at lower elevations. While there are some relatively large contiguous blocks of suitable winter habitat, some of these areas are in poor condition due to ongoing drought, senescence and succession of plant communities.

Deer winter range comprises 19% of the DAU's total area, with a majority occurring on BLM and private lands. Deer utilize winter ranges from about mid-December to mid-May. Major wintering areas for deer include the southern end of GMU 18, GMU 27, and GMU 181; and the northern end of GMU 37 and GMU 28. There are 139 mi² (88,814 acres) of winter concentration areas. DAU D-9 contains 38 mi² (23,070 acres) of severe winter range. During severe winters (e.g., 1983-84, 1992-1993, 2007-2008), the D-9 population has dropped due to low winter survival, particularly among fawns. Lower survival during severe winters is attributed to sustained cold temperatures and snow loads, and limited severe winter range sustaining a high density of deer.

History

CPW has conducted aerial sex and age composition surveys in D-9 since the late 1960's. Middle Park is also one of five Intensive Mule Deer Monitoring Areas in Colorado (see Appendix A).

Population

From 1989-2009, the population objective for D-9 was 10,500 animals. The deer population was relatively high in D-9 during the early 1980's through the early 1990's. In 2009, the population objective was expanded to a range of 10,500-12,500 deer. Since that time, the herd slightly declined, rebounded, and stabilized above the objective range, which was expanded again in 2020 to 10,500-14,000 deer. The current model estimates the deer population at 13,994 animals, at the high end of the current population objective range (Figure 1). Although trends of many mule deer populations have been declining throughout Colorado and the Western U.S., the D-9 DAU has remained productive.

Sex Ratios

The sex ratio has averaged 32 bucks:100 does over the last 40 years (1982-2021). The historic sex ratio objective was 30 bucks per 100 does; D-9 was below objective until 1998 when deer licenses became totally limited. Sex ratios have generally increased and have remained above objective since; objectives were expanded in 2009 to a range of 30-35 bucks:100 does. Post-hunt modeled sex ratio estimates in 2021 were 35 bucks:100 does (Figure 2), with a 3-yr average of 37 bucks:100 does.

Age Ratios (Production)

Fawn production in D-9 has ranged between a low of 40 fawns:100 does and a high of 90 fawns:100 does, averaging 68 fawns:100 does over the past 40 years (1980-2021). Post-hunt modeled fawn:doe ratio estimates in 2021 were 62.4 fawns:100 does (Figure 3), with a 3-yr average of 60.5 fawns:100 does.

Harvest

Deer harvest in D-9 has fluctuated over time, primarily because of license allocation. The 40-year averages for antlered and antlerless deer harvest are approximately 1,100 and 600, respectively (Figure 4). The three-year average for antlered and antlerless deer harvest is 1,600 and 1,100, respectively.

Significant Management Issues

1. *Limited winter range*
2. *Decline in habitat quality due to drought, fire suppression and climax plant communities*
3. *Loss of habitat due to human development*
 - a. From 1970 to 2010, there was a 61% increase in developed areas within the D-9 DAU (Sushinsky et al. 2014).

4. *Habitat fragmentation and disturbance from recreation and human activities*
5. *Highways/Roadkills*
 - a. Roadkill accounts for an average of 2% mortality in Middle Park radio-collared deer for does, fawns, and bucks.
6. *Chronic Wasting Disease*
 - a. CWD was first confirmed in D-9 in 2001.
 - b. 2002 and 2003 prevalence rate ~1%.
 - c. 2018 prevalence rate in mule deer bucks: 3.2% (95% CI 2.3-4.5%, n=1,047).
7. *Competition with Elk*
8. *Predation*
 - a. From 1998-2021, an average of 4.7% of mortalities were caused by coyotes, 2.2% by mountain lions, 0.2% by black bears, and 0.1% by bobcats. 1.0% of mortalities were undetermined predation (see Appendix E).
9. *Livestock Competition*
 - a. BLM currently has 79 active allotments in the DAU and 6 inactive allotments, providing 107,157 AUMs from late June through September.
10. *Human Habituation*

Other Management Considerations

- Middle Park Mule Deer Survival Study (see Appendix A)

Strategies for Addressing Management Issues and Achieving Objectives

D-9 is managed through totally limited licenses for both antlered and antlerless harvest for all manners of take. Archery, muzzleloader, and 2nd, 3rd, and 4th season rifle licenses are available for the D-9 DAU. The 2nd and 3rd season either-sex license quotas may be adjusted to ensure a quality buck hunt for the 4th rifle season. Private land licenses provide hunting opportunities on private lands and help to disperse deer. The current management strategy has been very effective at providing a healthy (low CWD prevalence) and productive herd that offers excellent hunting opportunity. Continuing with a similar management strategy into the future will continue to provide a desired outcome for the majority of the hunting community and managers alike.

Tools to address habitat quality issues include ongoing habitat treatments on both public and private lands (including fertilization, brush beating, Spike, Dixie Harrow, thinning, seeding, burning, and pinyon-juniper thinning), and seasonal closures to protect winter range and transitional ranges during critical times of the year for mule deer.

Stakeholder Outreach and Input

In March 2020, hunters were randomly selected to complete a survey from the 2018 hunting season, and 237 respondents answered the survey. Overall, a majority of respondents were satisfied with their hunting experience, and top concerns among respondents were loss of deer habitat, disturbance, decline in habitat quality, and CWD. Complete survey results and stakeholder letters are available in the 2020 D-9 Herd Management Plan.

In 2021, hunters were randomly selected to complete the 2021 Deer Hunter Attitude Survey after the completion of their hunting seasons, and 899-1,027 respondents answered the opt-in questions for D-9. Approximately 50% of hunters were dissatisfied with the total number of

deer and number of bucks seen in 2021. Slightly more than half would prefer to hunt bigger bucks less often, though a majority of resident respondents would prefer to hunt more often with less opportunity for mature bucks. Nearly 75% of respondents wished to see an increase in deer population over the next 10 years. Approximately 80% of respondents felt slightly to very crowded during their hunt, and about half the respondents were satisfied with their hunt overall, while the other half were dissatisfied.

D9 APPENDICES

APPENDIX D9-A: Middle Park Mule Deer Survival Study

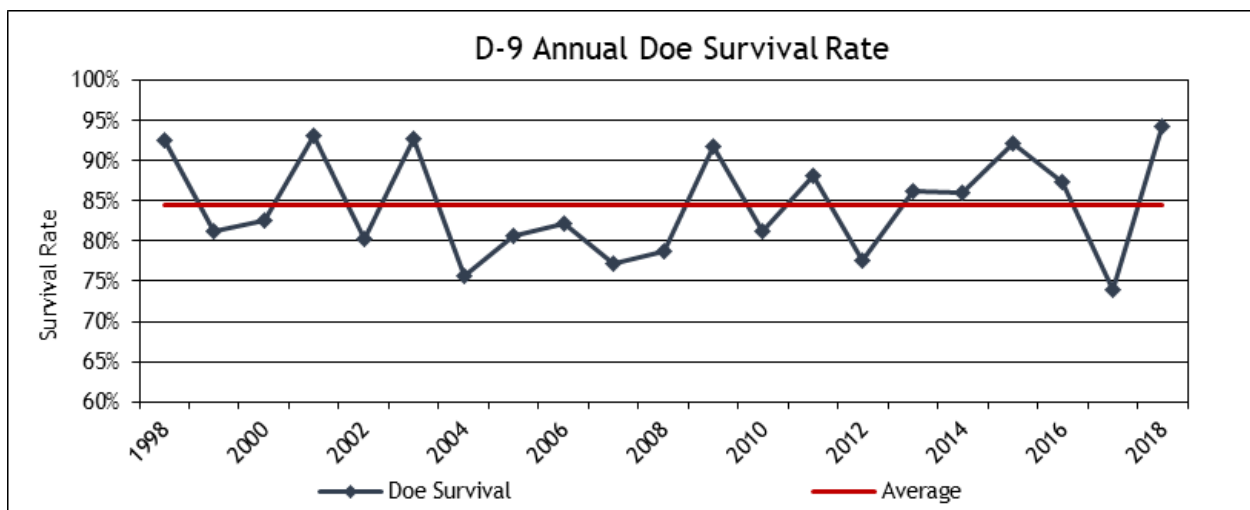
Intensive herd survival monitoring has been conducted in D-9 since 1998, which began with radio-collaring does and fawns. In 2010, bucks were added to this ongoing study. A sample of 60 fawns, 90 bucks and 90 does are maintained each year. Bucks and does are monitored from mid-December to mid-December of the following year, and 6-month old fawns are collared in mid-December and are monitored until mid-June when they are recruited into the adult population and the collars are designed to drop off. Historically, VHF collars were deployed for this study; these are being replaced over the next several years by GPS collars and currently there is a mix of both collar types on deer in D-9. Both GPS and VHF collars are equipped with mortality sensors that detect when movement ceases to occur. All collared animals are monitored throughout the year to assess survival rates and determine causes of mortality. Between 1998-2021, 5,606 mule deer have been monitored for survival.

Objectives of this ongoing survival monitoring study are:

1. To determine survival rates for both the juvenile and adult segments of the D-9 herd.
2. To identify cause-specific mortality factors within the D-9 herd.
3. To identify seasonal habitats and movement patterns of D-9 deer.

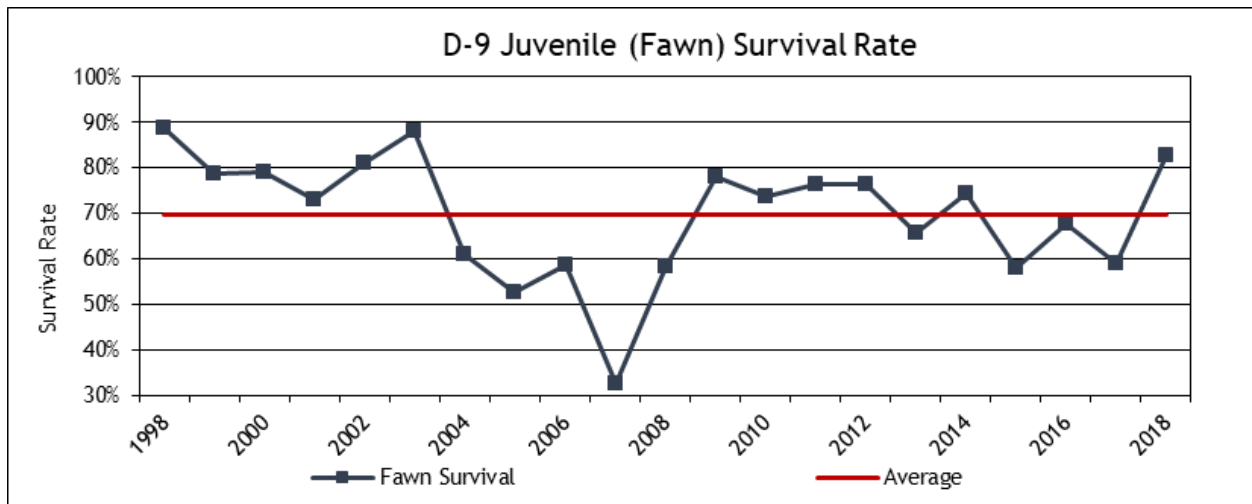
Doe Survival

From 1998-2021, estimated doe survival has fluctuated between a low of 74% survival (2017) to a high of 94% survival (2018). The 20-year average doe survival in the D-9 herd is 85%.



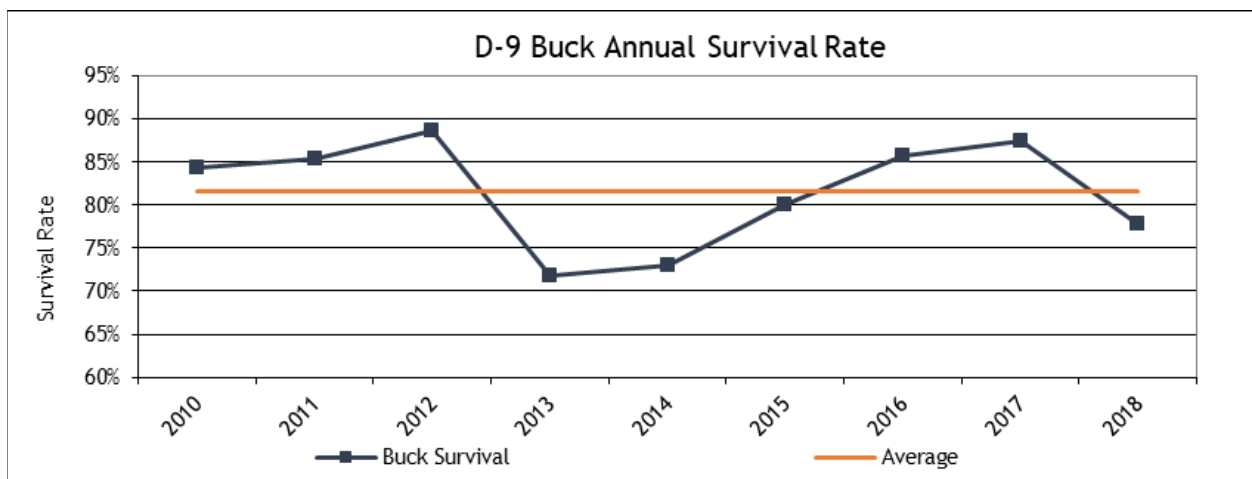
Juvenile (Fawn) Survival

Juvenile survival varies considerably with the severity of the winter, along with other factors. The lowest fawn survival measured was 33% (2007), while the highest was 88% (2003). The 20-year average fawn survival is 70%.



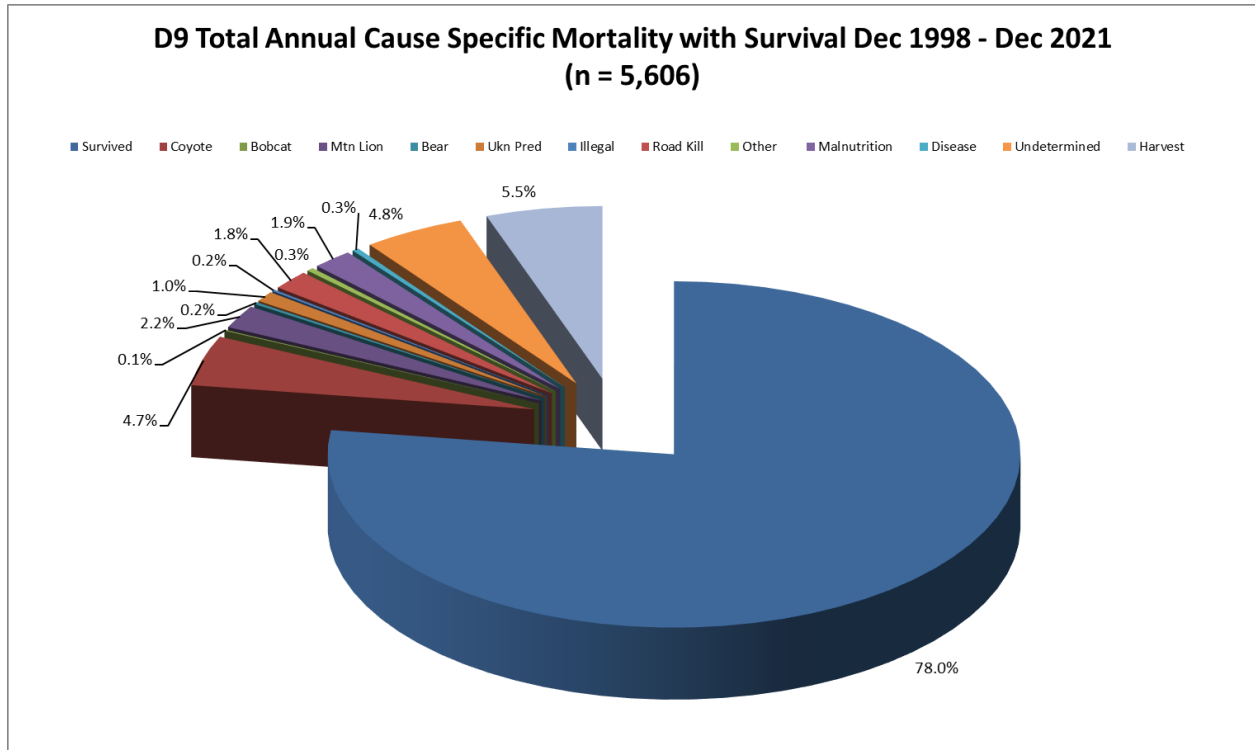
Buck Survival

From 2010-2021, the estimate has fluctuated between a low of 72% survival (2013) to a high of 89% survival (2012). The average buck survival during this time in the D-9 herd is 82%.



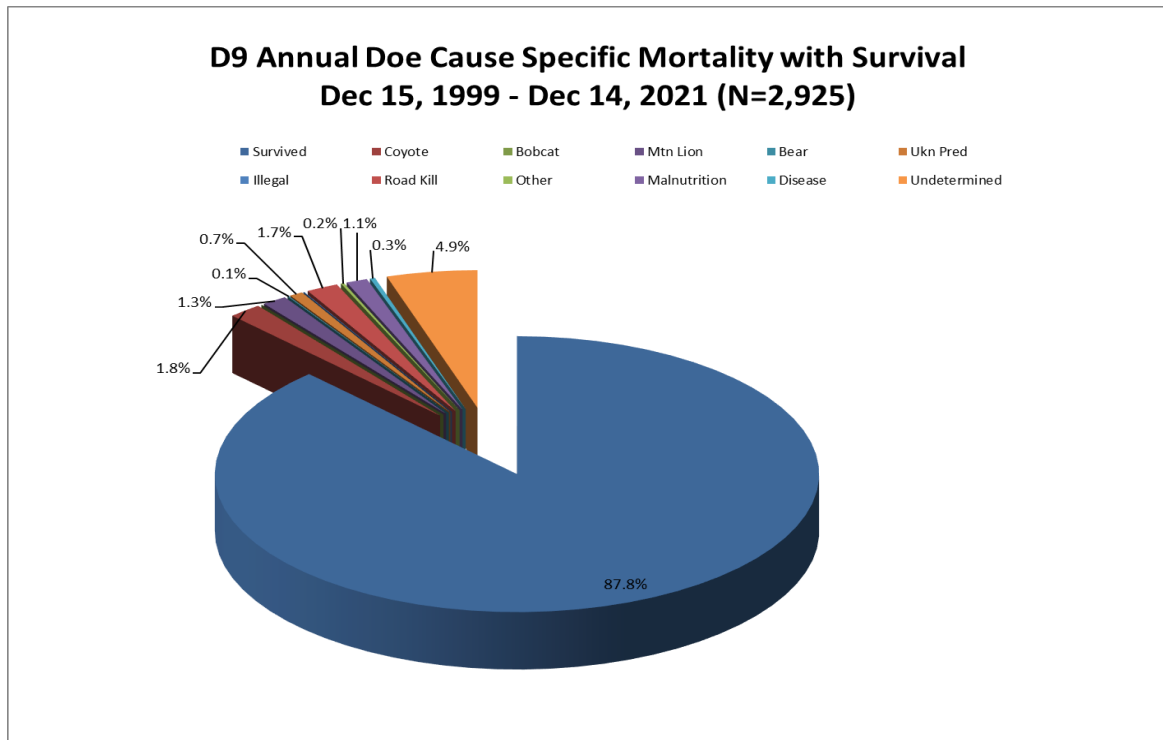
Total D-9 Cause Specific Mortality

Overall survival of D-9 mule deer from 1998-2021 is 78%. Other than hunter harvest, coyote predation and unknown predation constitute the highest causes of mortality over time.



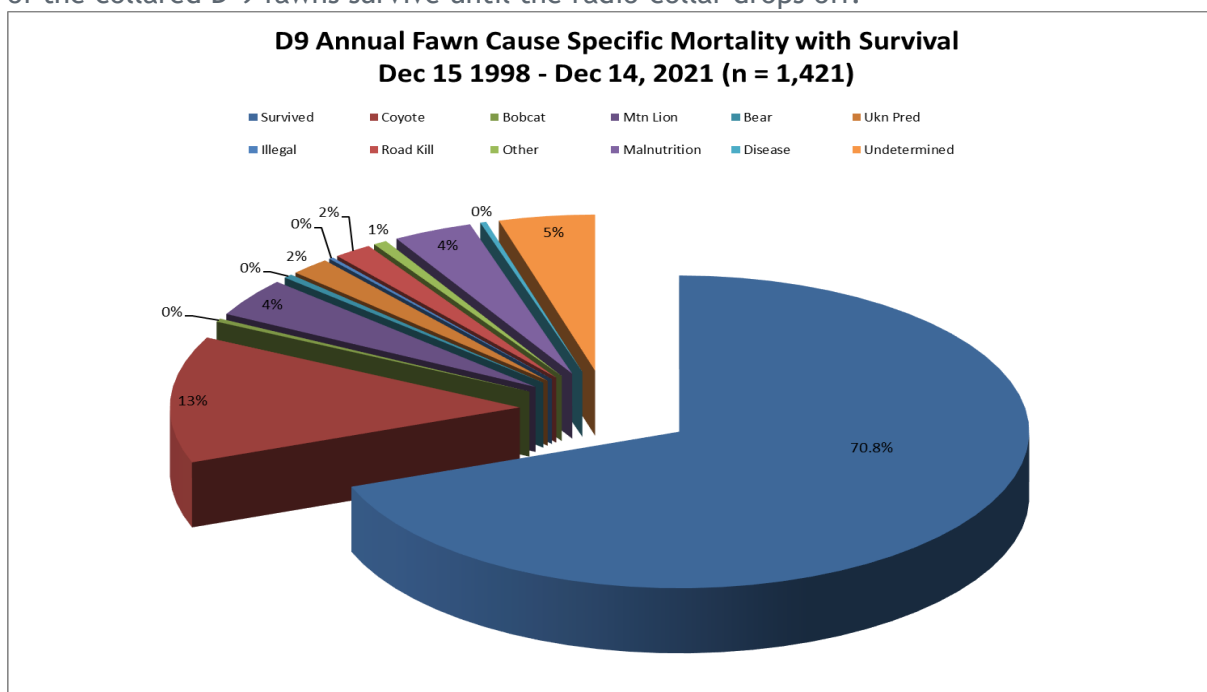
Adult Doe Cause-Specific Mortality

Mortality factors can be identified through timely investigation of mortalities. Two adult does collared during the first year of the study in 1998 were alive and had functioning collars until 2007. The oldest recorded age of a doe was 14+ years, from one of the two aforementioned deer. Hunting harvest is not included in the cause-specific mortality because it can be influenced by license number fluctuations set every year. “Undetermined” accounts for the largest percent of adult mortalities. This is due to the fact that some of the collared does in the study die in the summer and decompose more quickly than during the winter. The transition from VHF to GPS collars will allow for more timely inspection of mortalities and will improve future estimation of causes. The two leading causes of known mortality for adult doe deer in Middle Park are road kills and coyotes. It is important to note that throughout the study, 88% of all collared deer have survived until the radio collar has stopped working.



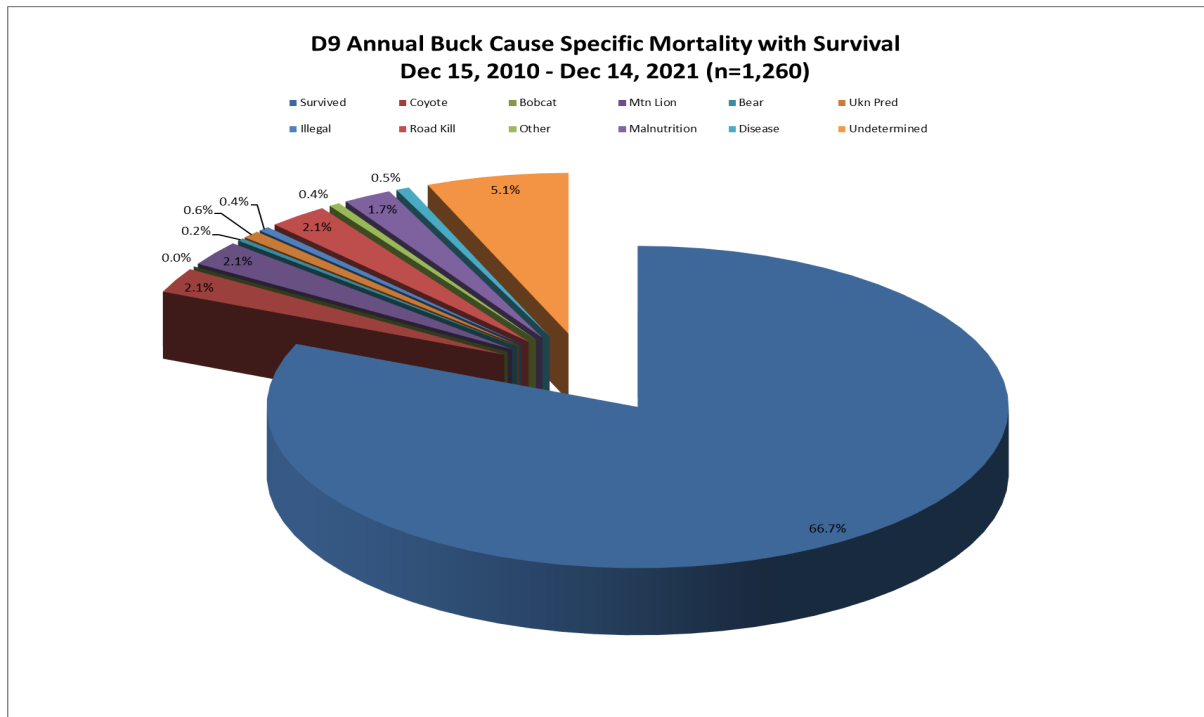
Juvenile Cause-Specific Mortality

Juvenile (fawn) survival is measured from December 15th-June 14th. 6-month old fawns are fitted with radio collars designed to drop-off in June, so as not to interfere with growth. The figure below shows the percentage breakdown of juvenile mortality factors in D-9. Coyote predation accounts for 12% of all measured juvenile mortality in Middle Park. Over time, 72% of the collared D-9 fawns survive until the radio-collar drops off.



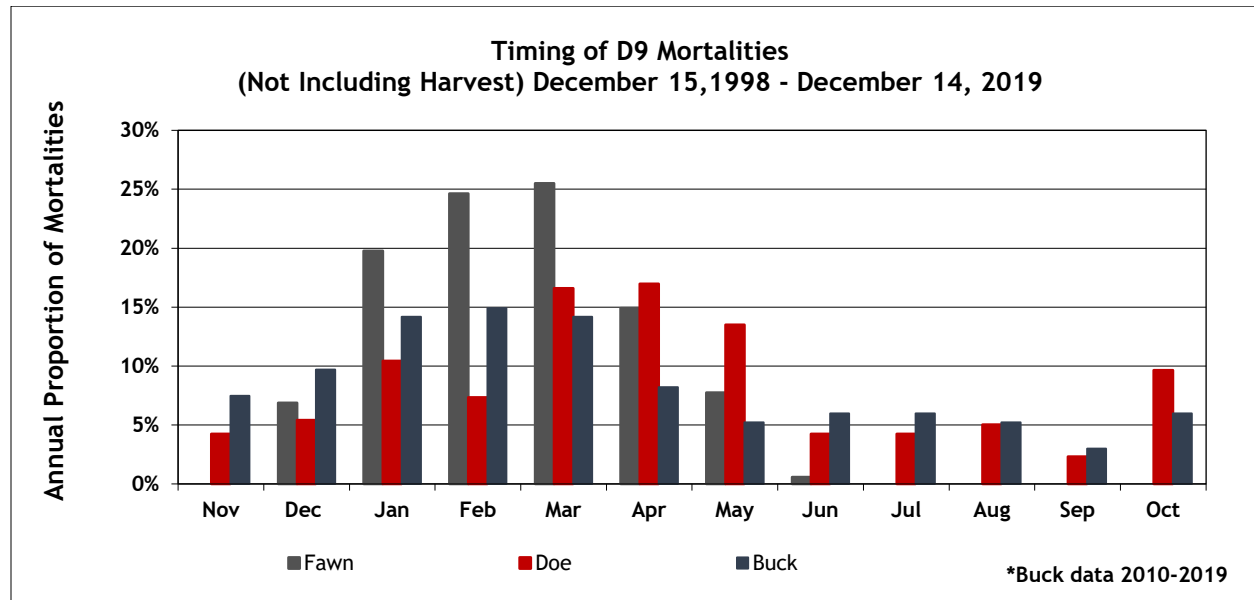
Adult Buck Cause-Specific Mortality

“Undetermined” accounts for the largest percent of buck mortalities. Similar to does, this is due to the fact that some collared bucks die during the summer and decompose before biologists are able to determine a cause. The transition from VHF to GPS collars will allow for more timely inspection of mortalities and will improve future estimation of causes. The three leading causes of known mortality for adult buck deer in Middle Park are road kills, lions and coyotes.



Timing of Mortalities

Along with survival estimates and cause-specific mortality, the survival study has allowed for collection of other pertinent data such as the timing of adult and juvenile mortalities(excluding hunter harvest). Doe deer tend to die more frequently during the late winter months (March-May). Fawn mortality occurs more often in the early winter months (January-March) perhaps due to inexperience with surviving Middle Park winters. It is important to note that once a fawn reaches 1 year of age (June 15 for survival study purposes), it is then classified as an adult until the fawn collar drops off. This explains why there is no juvenile mortality data for the Middle Park Study from June 15 through December 15. Similar to fawns, bucks tend to die at a higher rate during the early winter months (Jan-March); this occurs because during the rut (just before the onset of winter) bucks reduce foraging, invest crucial resources (i.e., body fat), and may become injured while battling, increasing their susceptibility to mortality.



APPENDIX D9-B: D-9 Hunting Licenses and Harvest Statistics

Middle Park Hunting Season History

Hunting seasons and license allocation in Middle Park has evolved since the 1960’s, based on herd productivity and hunting pressure, to the current split deer/elk combined seasons. Prior to 1971, a hunter could harvest two or more deer per year. From 1971 to 2002, hunters were limited to harvesting one deer annually. Since 2003, doe licenses have been List B, meaning hunters may have a doe license in addition to a buck or either sex deer license. In 1986, the Wildlife Commission approved either-sex archery deer licenses, limited muzzleloader deer licenses, and three combined unlimited buck and limited doe seasons as the general statewide season structure. The three combined rifle seasons were 5, 12 and 9 days in length, and were designed to more broadly distribute hunting pressure. While elk herds have generally been stable or increasing since 1986, deer herds have generally been on the decline. Several variations of the three combined rifle seasons have been used by biologists to help improve the deer herds.

In 1986, deer antler point restrictions (APR) were approved statewide, limiting harvest of bucks to those with three points or more on one antler. While APR worked well for elk by allowing yearling spike bulls to grow into branch-antlered bulls at 2 2/1 years of age, bucks did not respond well to this strategy as antler points were not correlated to age in the same way. A majority of yearling bucks grow two-point antlers but some grow 3-4 points per antler; consequently young bucks with high genetic potential were harvested before they could breed, and older bucks that did not grow more than 2 points continued to reproduce. Additionally, hunters mistakenly shot numbers of deer without the legal number of points and many of these deer were abandoned. After the 1991 hunting season, deer APR were abandoned over much of the state.

In 1992, out of a growing concern of declining mule deer populations, much of the state’s deer hunting was restricted to a three-day buck hunt. This structure was very unpopular with

hunters and was abandoned after 1994. In 1995, buck hunting was extended to the first five days of each of the three combined seasons. Buck licenses remained unlimited or over-the-counter until 1998.

Hunting licenses in D-9 became totally limited in 1998 (over-the-counter licenses were no longer issued). In 1999, all deer licenses in the state west of Interstate 25 were changed to totally limited for archery, muzzleloader, and regular rifle seasons. This was done mainly to improve the quantity and quality of the antlered deer hunts. Also, from 1999 - 2001, none of the leftover licenses from the computer drawing process were sold as leftover licenses.

In 2015, CPW began a new 5-year season structure that included:

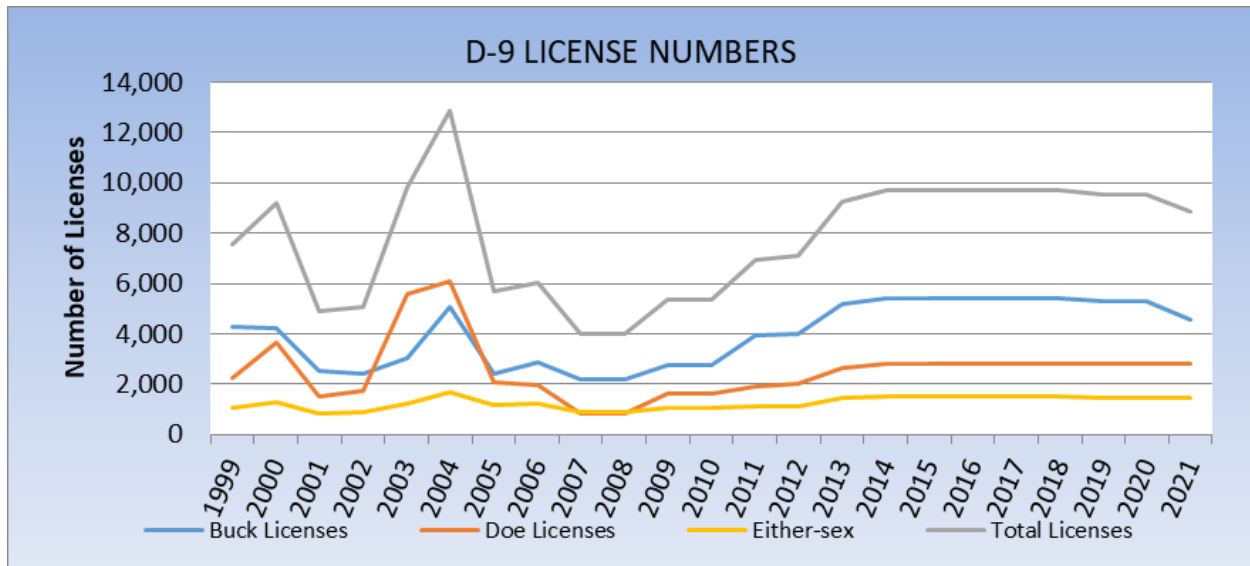
- 1) Limited buck or either-sex archery season
- 2) Limited muzzleloader season for bucks and does
- 3) Limited rifle seasons combined with elk second and third seasons for bucks and does
- 4) Highly limited fourth season for bucks combined with elk fourth season

Criteria for antlerless and 4th season buck seasons:

- 1) Each DAU that offers limited antlerless (doe) deer licenses must be within the population objective range.
- 2) Each DAU that offers a limited 4th season buck deer hunt must average more than 25 bucks:100 does over the previous three years, and be within the long-term sex ratio objective range.

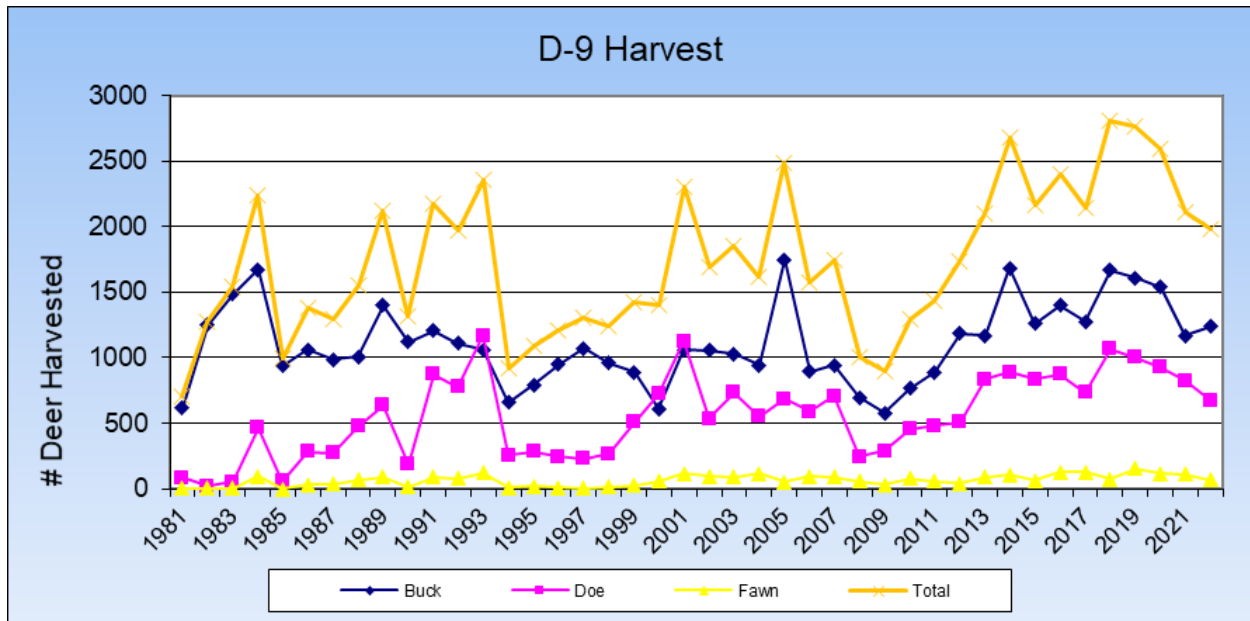
Licenses allocation

Since 1998 when all D-9 licenses became limited (i.e., no over-the-counter), the total number of licenses issued in D-9 has ranged from a low of 3,975 in 2007-2008 to a high of 12,866 in 2004. In 2004, the high number of licenses offered was an effort to reduce the population and bring buck/doe ratios closer to HMP management objectives. CWD was first discovered in D-9 in 2001, shortly before Miller and Conner (2005) determined that prevalence among bucks is twice that of does, and mature bucks have twice the prevalence of young bucks in Colorado. These factors lead CPW staff to intensify efforts to manage to HMP objectives. In 2007-2008, licenses were lowered to 3,975 because of a severe winter that resulted in high mortality. Between 2009 and 2013, licenses were steadily increased as the population rebounded from the winter of 2007-2008, and have remained fairly consistent with an average of 9,629 licenses. In 2021 and 2022, buck licenses were decreased slightly as the population fell within the high end of the objective range.



Harvest

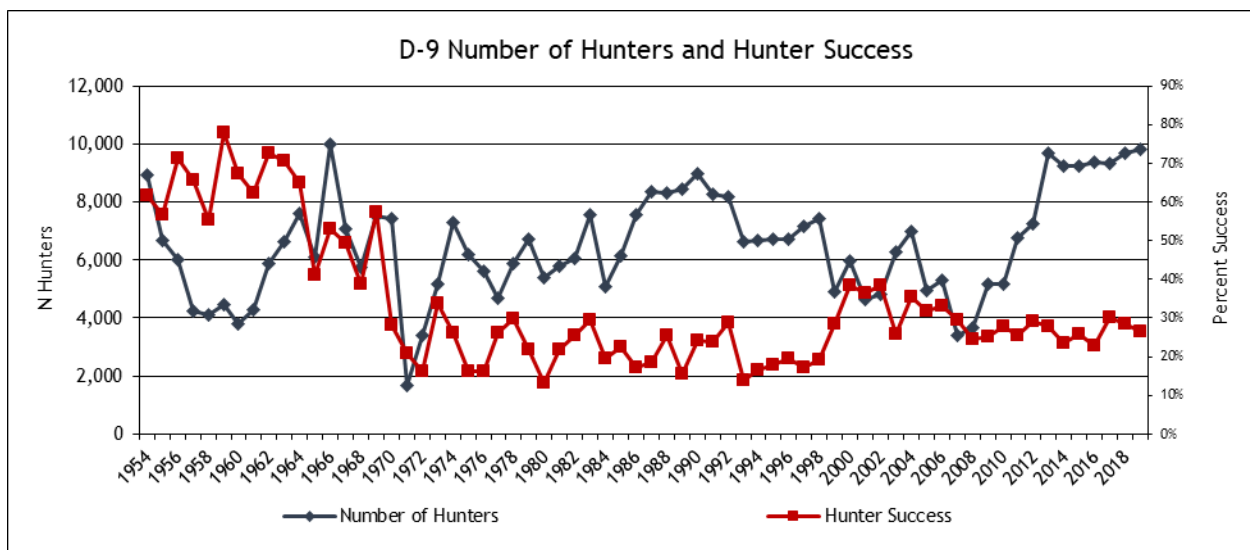
The total deer harvest (bucks, does, and fawns) is a factor that contributes to estimation of population performance over time. Between 1953 and 2021, deer harvest in Middle Park has averaged approximately 1,700 deer per year, or 1,100 antlered (bucks) and 600 antlerless (does and fawns). During the 1950's and 1960's the total harvest in D-9 averaged 3,700 deer. From the 1970's until 2008, average harvest dropped to less than 1,500 total deer per year, less than 40% of the harvest in the 1950's and 1960's. Harvest since 2011 (last ten years) has averaged 1,400 for bucks and 970 for antlerless, 2,370 total deer. This positive trend of increased harvest over the last ten years can be attributed to a productive herd, an increase in licenses issued, hunting season structure, and good hunting conditions some years (i.e., early snow that pushed deer to lower elevations making them more susceptible to hunters). Harvest data from 1953-2021 is summarized below.



Hunter Numbers and Success Rates

Total hunting pressure has remained relatively stable in Middle Park since 1954. Between 1954 and 2019, the number of hunters averaged around 6,500. The lowest number was 1,686 in 1971 when the state was restricted to statewide buck-only hunting. The highest number of hunters occurred in 1966 with 9,987 hunters. Over the last ten years, the number of hunters averaged 8,551.

Since the 1950's and early 1960's, percent success has dropped with declines in deer numbers and harvest. The highest percent success was 78% in 1959 and the lowest was 13% in 1980. During the period 1954-2019 overall success averaged 33%. Hunter success averaged around 27% from 2010-2019.



Demand and Preference Points Required

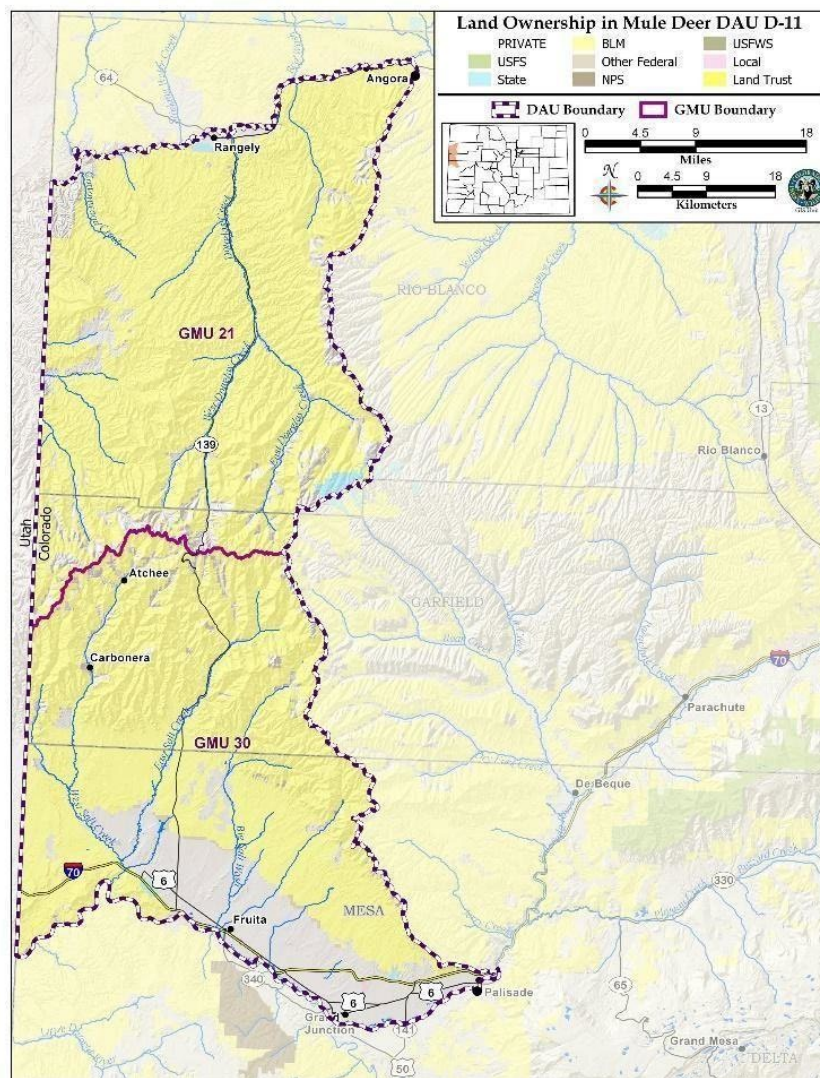
D-9 is managed to provide hunting opportunity and provides ample limited licenses to draw. In 2021, the 018 and 027 hunt code 4th season buck licenses required 2 preference points (both sold out with 1st choice applicants). Muzzleloader and 3rd season buck licenses sold out as 2nd choice, and 2nd season sold out as 3rd choice for both hunt 018 and 027 hunt codes. All antlerless licenses and either sex private land rifle licenses were sold as leftovers.

BOOKCLIFFS HERD MANAGEMENT PLAN

DATA ANALYSIS UNIT D-11

Genevieve Fuller, Wildlife Biologist, Grand Junction

Bookcliffs Deer Herd (DAU D-11)	GMUs: 21 and 30
Approval Year for last HMP: 2021	
Post-hunt population:	
Current (2021 plan) Population Objective:	5,000 - 8,000 deer
Post-hunt 2021 Population Estimate:	8,600 deer
Extension Preferred Alternative:	No change, 5,000 - 8,000 deer
Post-hunt Sex Ratio (Bucks:100 Does):	
Current (2021 plan) Sex Ratio Objective:	27-32 bucks per 100 does
Post-hunt 2021 Sex Ratio:	observed: 32; modeled: 33
Extension Preferred Alternative:	No change, 27-32 bucks per 100 does



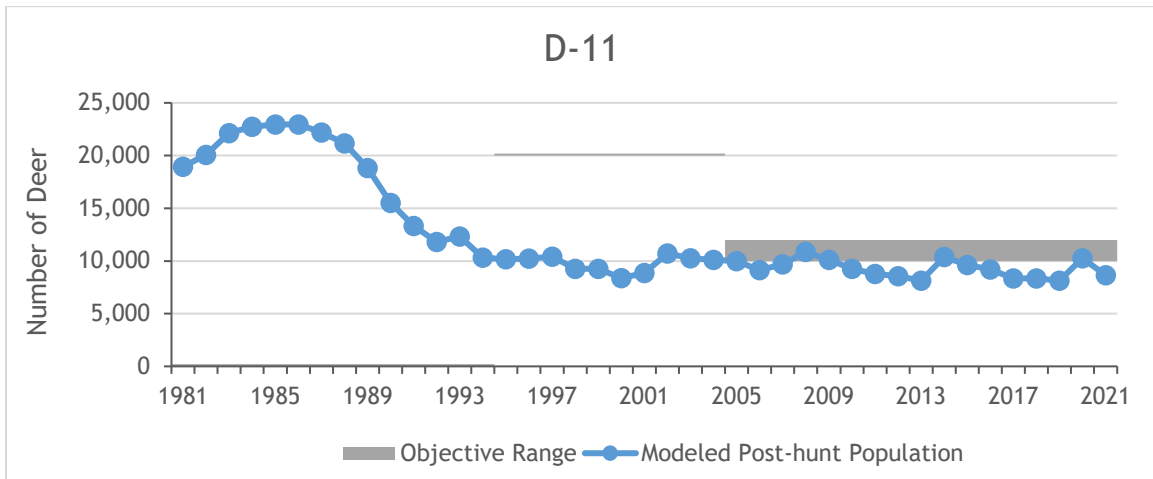


Figure D11-1. Deer DAU D-11 modeled post-hunt population and objective range, years 1981-2021.

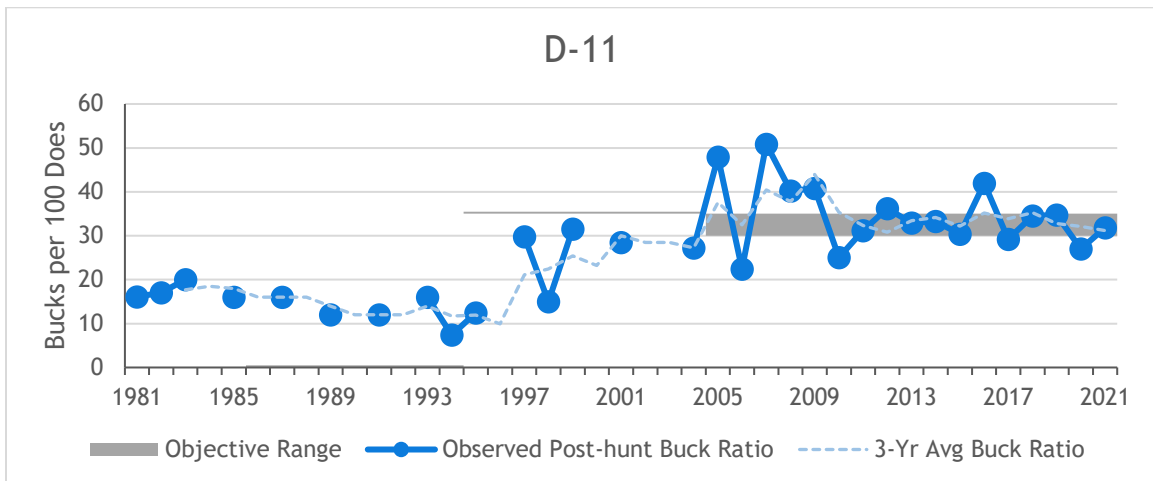


Figure D11-2. Deer DAU D-11 observed and modeled post-hunt sex ratio (bucks:100 does), years 1981-2021.

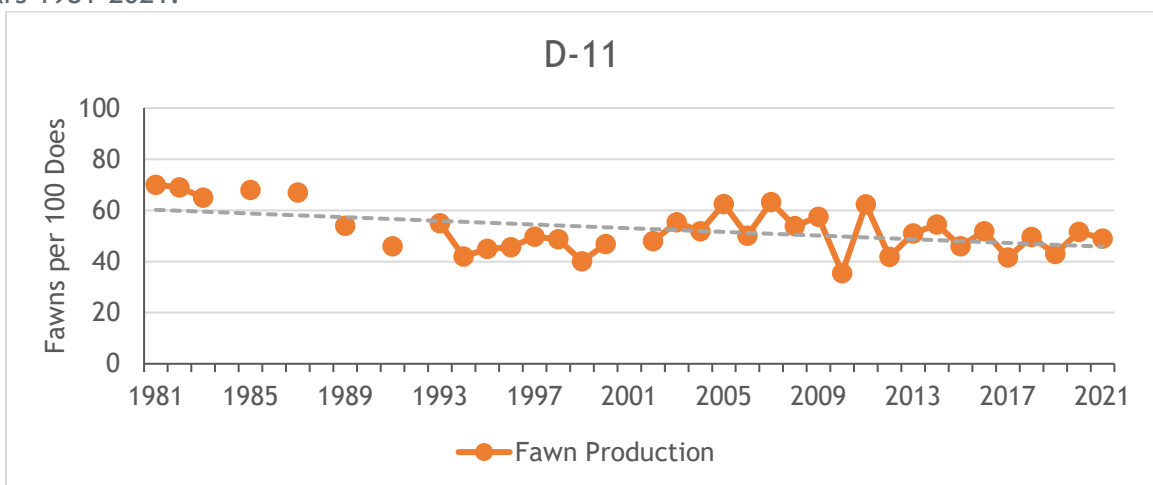


Figure D11-3. Deer DAU D-11 fawn production (observed post-hunt fawns:100 does ratio, years 1981-2021)

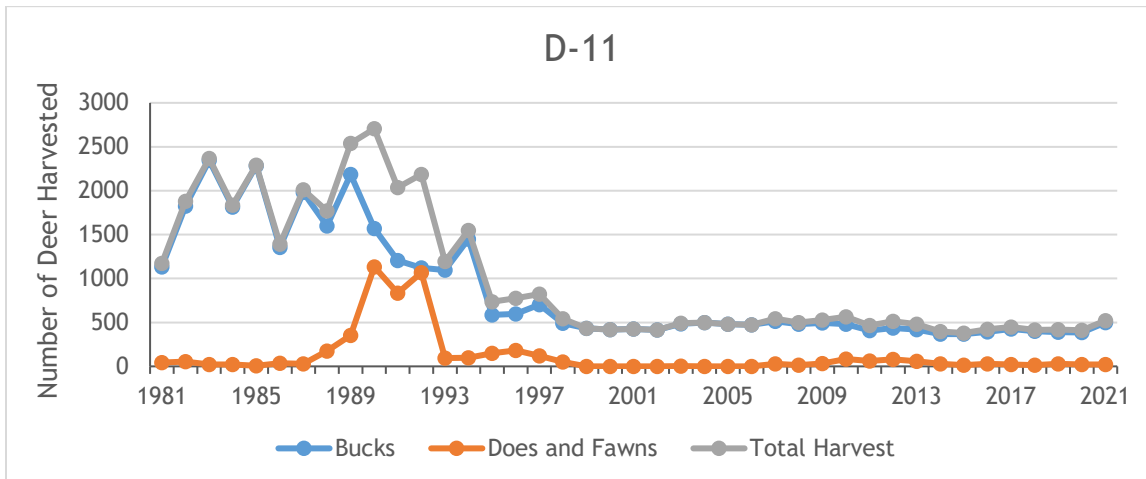


Figure D11-4. Deer harvest estimates in D-11, years 1981-2021.

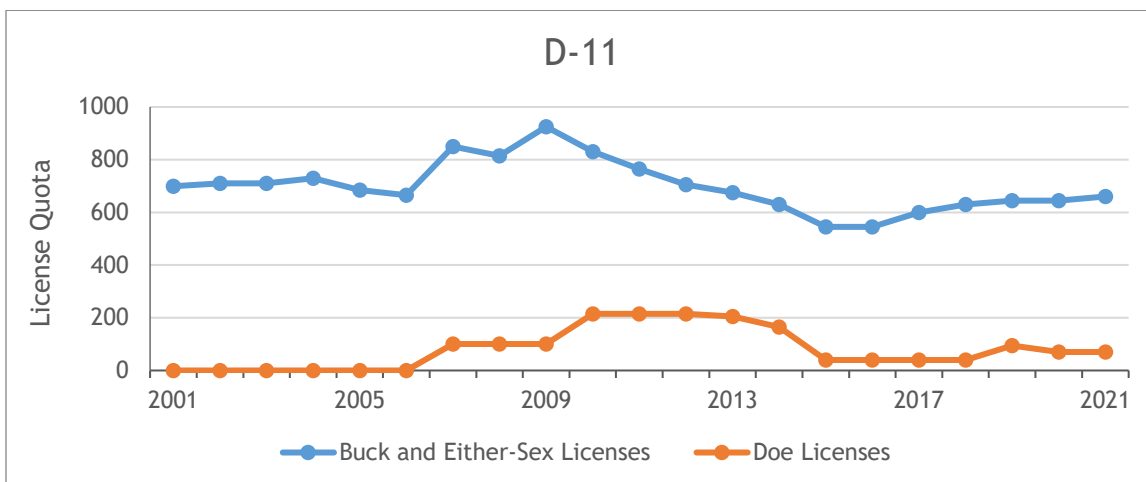


Figure D11-5. Deer License Quotas in D-11, years 2001-2021.

Background Information

The Bookcliffs deer herd (DAU D-11) is located in west central Colorado and includes portions of Mesa, Garfield, and Rio Blanco Counties. The D-11 DAU (Data Analysis Unit) consists of Game Management Units (GMUs) 21 and 30. The Bureau of Land Management (BLM) manages approximately 80% of D-11 and privately owned lands comprise the remaining 19%. The entire DAU encompasses approximately 4,555 km². Human population centers occur on the periphery of the DAU in the cities and towns of Grand Junction, Fruita, and Rangely.

D-11 lies atop significant deposits of natural gas and oil shale that is open to mineral extraction. Livestock grazing is an important land use on public and private lands, while hay and row crops are grown on private lands at lower elevations. Elevations range from approximately 4,600 ft. where the Colorado River meets the Utah state line to over 8,800 ft. along the boundary between the two GMUs. Topography includes flat, low elevation desert and agricultural areas, steep foothills, and narrow ridges often bisected by nearly vertical canyon walls.

Mule deer generally occupy the entire DAU, migrating from low-elevation winter ranges to high-elevation summer ranges in response to available forage and snow conditions. Migration also occurs across the state boundary into Utah. Small resident herds live year-round in the Grand Valley, relying on agricultural and low-density residential developments for forage.

Since 2004, the D-11 herd has plateaued at around 7,000-10,000 deer (Figure 1). Fawn:doe ratios have been declining steadily since 1981, from 70 fawns:100 does in 1981 to 49 fawns:100 does in 2021 (Figure 3). This decline mirrors fawn: doe ratio declines across much of western Colorado. Buck:doe ratios in D-11 have been increasing slowly and are generally within or near the current sex ratio objective range of 30-35 bucks:100 does (Figure 2). This unit has been managed for older age-class and quality buck harvest since 1995.

Significant Issues

Significant issues facing this deer herd include declining fawn:doe ratios, population stagnation, recreation, energy development, disease, and degraded habitats due to feral horses, long-term drought, over-utilization, and wildfire.

The deer population in D-11 has been stagnant at historically low levels for nearly two decades. Fawn:doe ratios are declining and buck:doe ratios are high. The current prevalence of Chronic Wasting Disease (CWD) in D-11 is estimated at 3%, which is below the management intervention threshold of 5%. However, two deer DAUs adjacent to D-11, D-07 and D-41 have a CWD prevalence above 5%.

Much of D-11 lies atop significant deposits of natural gas and oil shale open to mineral extraction. Energy development is concentrated on the state line and Texas Mountain areas. Although inherent fluctuations in commodity prices as well as political considerations affect the demand for oil & gas and resulting development intensity, oil and gas wells and the associated infrastructure have increased dramatically across D-11 since 1970. Over 22% of winter range in D-11 is within 700 m of a well pad, and nearly 80% is within 2,700 m. These calculations do not account for the impact of associated infrastructure such as major roads, they solely account for oil & gas wells.

Within D-11, an estimated 365 feral horses roam across the 517 km² West Douglas Herd Area and are not managed as a Herd Management Area by the BLM. These areas are critical to the sustainability and resilience of the D-11 herd and the high levels of non-designated horse use contribute directly to habitat degradation. The habitat encompassed by the DAU is fragmented and degraded throughout much of the herd's important ranges. Although the condition of the landscape varies across the DAU, much of the habitat in D-11 is degraded due to drought, overgrazing by livestock, energy development, feral horses and conversion from native to invasive plants. Long-term drought and the impacts to the forage and wildlife in D-11 are severe, cumulative, and long-lasting.

Pine Gulch Fire

The Pine Gulch Fire, the third largest wildfire in state history, was sparked by lightning on July 31, 2020. The fire burned more than 567 km² before it was fully contained in late September. Most of the fire burned in D-41 but more than 194 km² in GMU 30 were also burned (Figure 6). Approximately 145 km² of winter range and 90 km² of summer range in D-

11 were impacted. It is likely that the impacts from the Pine Gulch Fire will decrease survival of wintering deer in GMU 30 for the next 20 years.

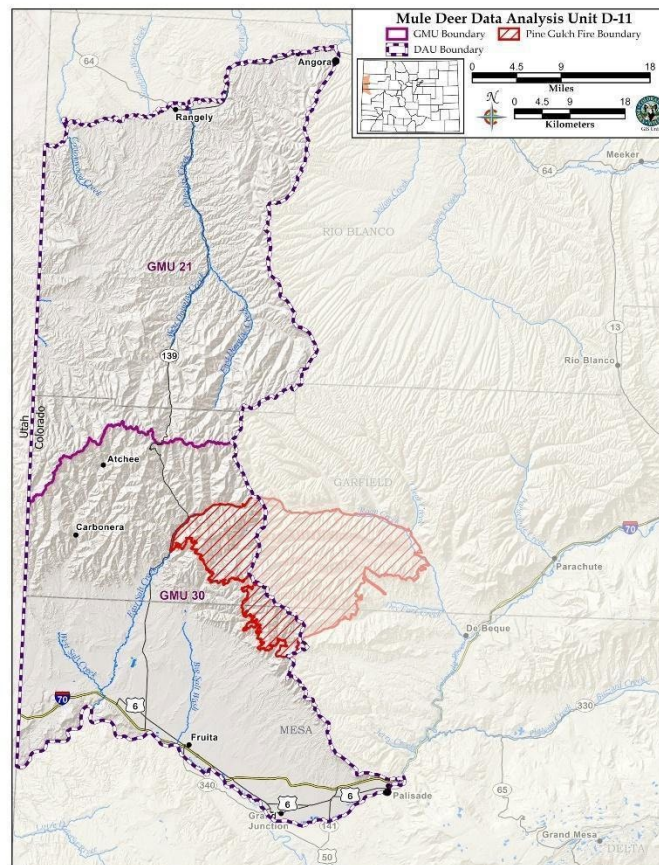


Figure D11-6. Pine Gulch burn location and extent in Data Analysis Unit D-11 in west-central Colorado.

In late 2020, BLM, CPW and private landowners collaborated to identify approximately 20,000 acres of the burned area for re-seeding with native vegetation. Approximately 1,500 acres were identified as high-priority wildlife habitat and received a higher proportion of forb and shrub seeds to have the greatest benefit to deer and elk.

Stakeholder Outreach and Input

An initial public survey was conducted in the summer of 2020 that contacted over 2,000 hunters and other stakeholders. It yielded responses from 481 individuals. A 30-day public comment period was advertised on the CPW website. CPW also sent a draft to the Bureau of Land Management and presented it to the Mesa, Garfield, and Rio Blanco County Commissioners, and the White River Habitat Partnership Program Committee. The feedback from this outreach effort were incorporated into the plan and objective alternatives.

Management Alternatives

The preferred alternatives of 5,000 to 8,000 deer and 27 - 32 bucks:100 does were approved by the commission in May of 2022. We are not seeking to update herd management for D-11 at this time.

2021 CPW Commission Approved Objectives:

Post-hunt Population

5,000-8,000 deer

The D-11 herd, while remaining mostly stable over the last two decades, hovering between 8,000 - 9,000 animals, has shown a slow decline suggesting it has become stagnant. The slightly wider objective range for this alternative would allow for more flexibility in dealing with issues that could change significantly during the 10 years that this herd management plan will be in effect. During times of drought when habitat conditions are poor, the population could be drawn down to levels lower than it currently is by harvesting more bucks, which simultaneously addresses potential disease issues. In the event that drought wanes, competition with feral horses is reduced, and habitat conditions improve, the herd could be allowed to increase back to current or slightly higher levels. Recovery of the Pine Gulch Fire area has potential to see improvements in habitat production for deer over the next 5 - 10 years if given the opportunity to recover.

Post-hunt buck ratio

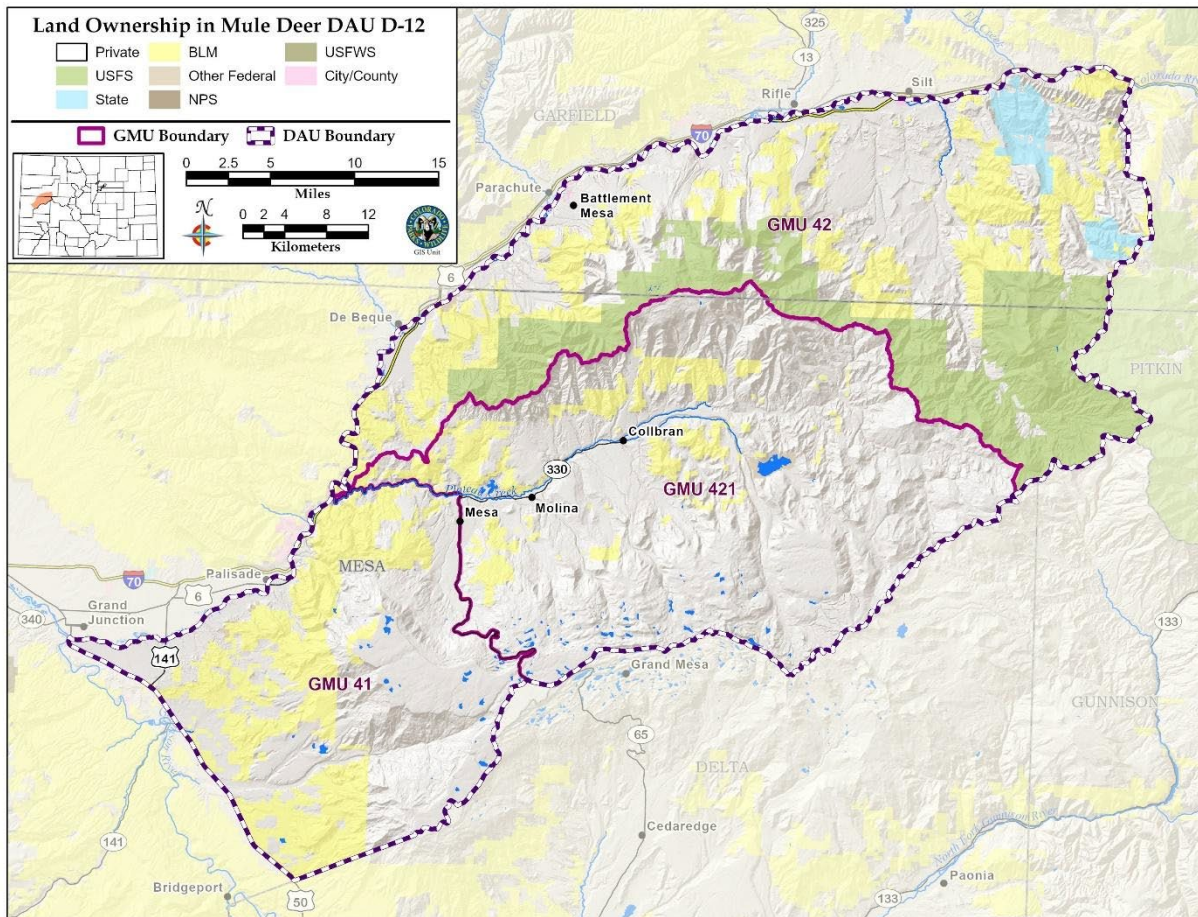
27-32 bucks:100 does

Since 1995, when all deer licenses in D-11 were limited, buck:doe ratios have doubled, while the total population size and winter fawn:doe ratios have decreased approximately 20%. Although high buck: doe ratios are not the singular cause of the diminished and stagnant population size, it may be contributing to the poor herd performance. In addition, low hunting pressure associated with management strategies favoring higher buck:doe ratios are linked with higher prevalence of chronic wasting disease (Miller et al. 2020). Proactive management of chronic wasting disease includes long-term decreases in deer densities and buck:doe ratios. This buck: doe ratio allows CPW to decrease the number of bucks slightly in an effort to reduce the spread of CWD between D-11 and adjacent deer units. Allowing for a small increase in buck harvest may also address pressures from poor range conditions, resulting in improved herd performance.

GRAND MESA NORTH HERD MANAGEMENT PLAN DATA ANALYSIS UNIT D-12

Genevieve Fuller, Wildlife Biologist, Grand Junction

Grand Mesa North Deer Herd (DAU D-12)	GMUs: 41, 42, and 421
Approval Year for last HMP: 2010	
Post-hunt population:	
Current (2010 plan) Population Objective:	17,000 - 23,000 deer
Post-hunt 2021 Population Estimate:	16,500 deer
Preferred Alternative:	17,000 - 23,000 deer
Post-hunt Sex Ratio (Bucks:100 Does):	
Current (2010 plan) Sex Ratio Objective:	25-30 bucks per 100 does
Post-hunt 2021 Sex Ratio:	observed: 25; modeled: 24
Preferred Alternative:	25-30 bucks per 100 does



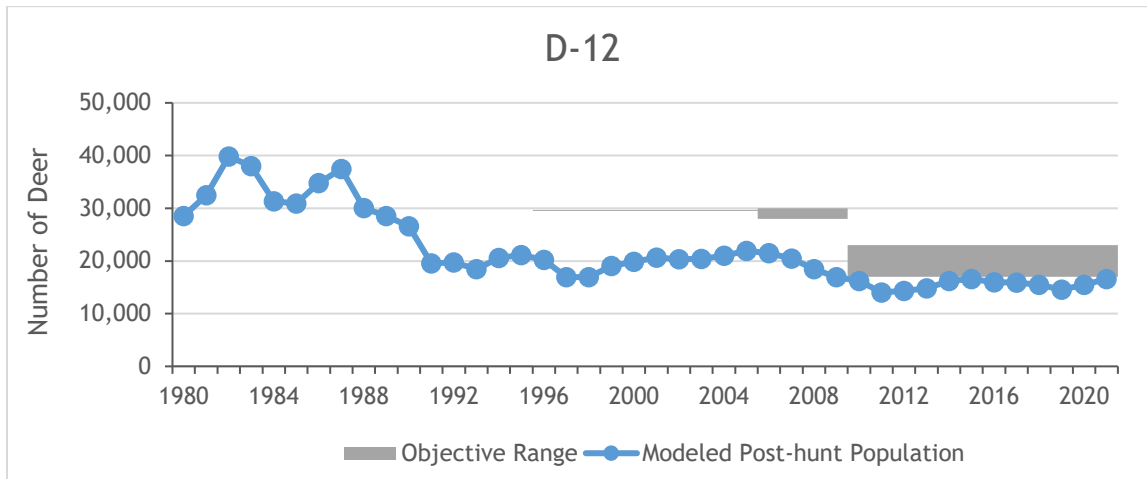


Figure D12-1. Deer DAU D-12 modeled post-hunt population and objective range, years 1980-2021.

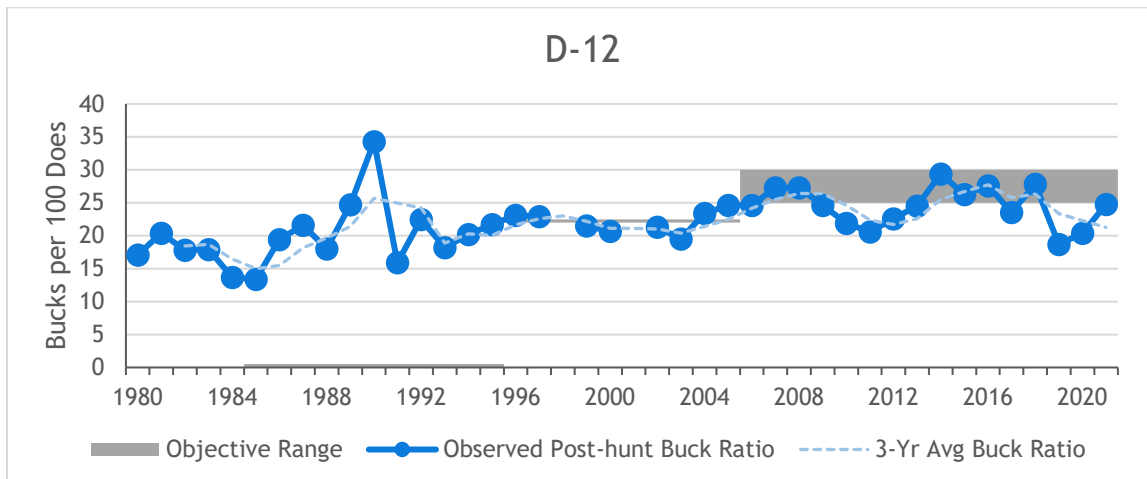


Figure D12-2. Deer DAU D-12 observed and modeled post-hunt sex ratio (bucks:100 does), years 1980-2021.

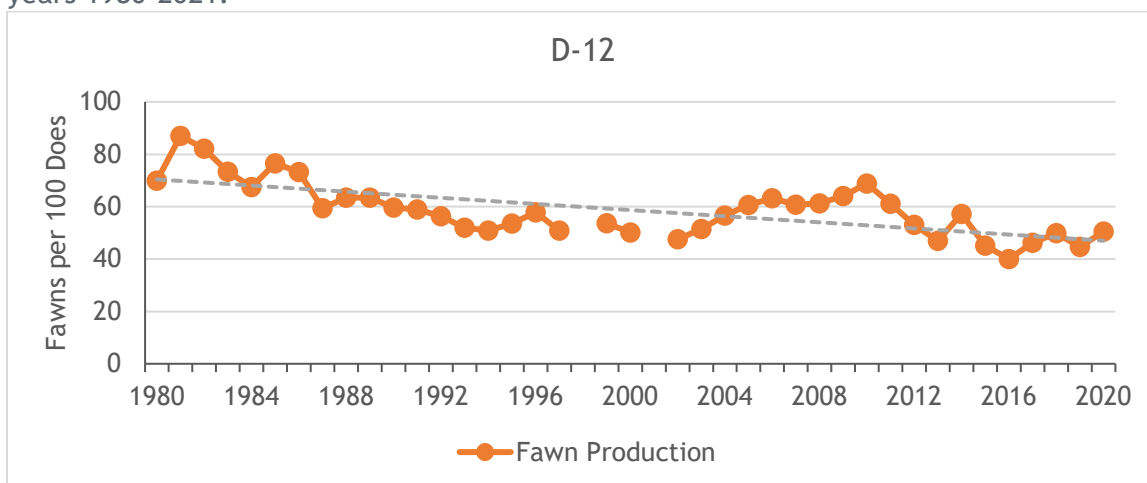


Figure D12-3. Deer DAU D-12 fawn production (observed post-hunt fawns:100 does ratio, years 1980-2021)

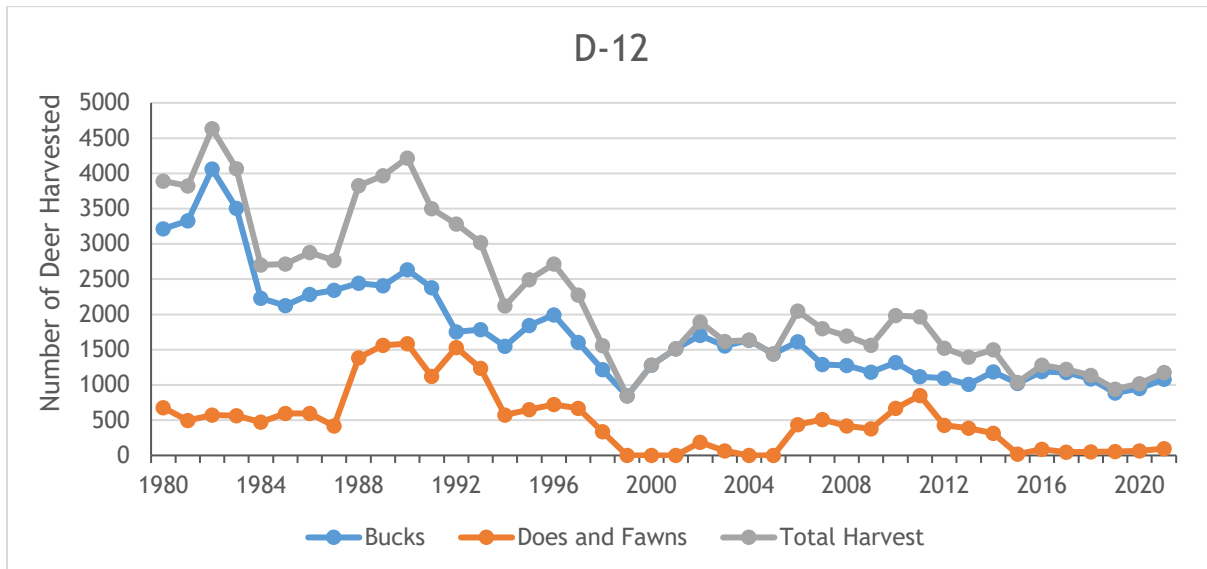


Figure D12-4. Deer harvest estimates in D-12, years 1980-2021.

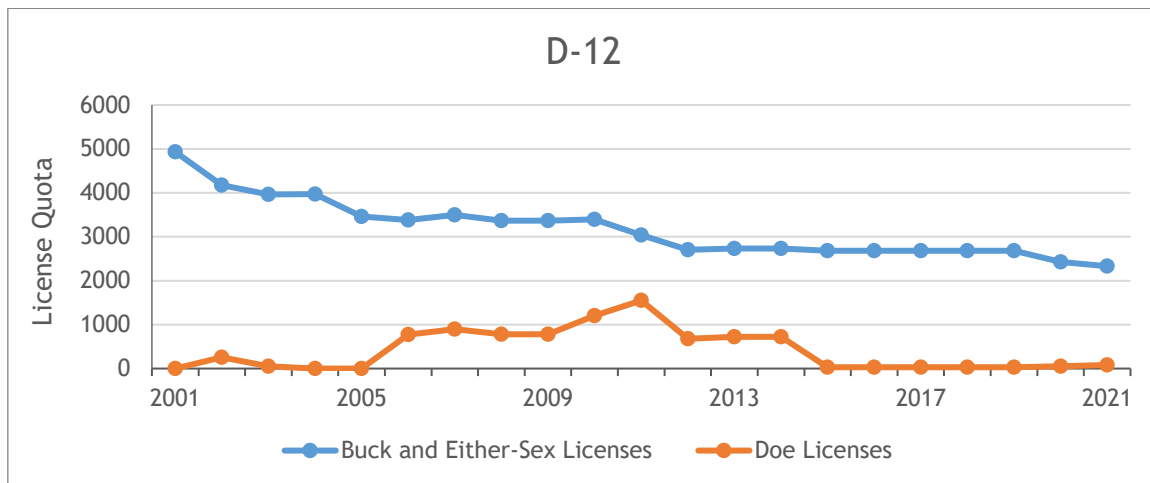


Figure D12-5. Deer License Quotas in D-12, years 2001-2021.

Background Information

The North Grand Mesa D-12 DAU is located in west-central Colorado and includes the north side of the Grand Mesa, directly east of Grand Junction. Approximately 60% of the lands within this DAU are public property. About 38% is managed by the United States Forest Service (FS) and about 21% by the Bureau of Land Management (BLM). Privately owned lands make up 39% of the total. Less than 1% is managed by the State of Colorado.

The main topographic feature of this DAU is the Grand Mesa, which is a high, flat-topped mountain, formed by volcanic basalt activity. Elevations vary from about 11,000 feet on Grand Mesa in the south-central portion of the DAU, to the floodplain of the Colorado River at approximately 4,600 feet near Grand Junction. The Colorado River forms the northern boundary of the DAU. Interstate 70 parallels the Colorado River, forming a significant barrier which restricts deer movements in and out of the DAU throughout the northern portion of the

unit. Along the western boundary and west portions of the southern boundary the desert-like open terrain acts as another natural barrier that inhibits deer movements in and out of the DAU. Deer are forced by deep snows to migrate to lower terrain surrounding the Grand Mesa during the winter.

In the early 2000s, deer numbers increased slightly in D-12, but began to fall in the late 2000s, early 2010s. The population has stagnated just beneath the 2010 population objective of 17,000 - 23,000 deer for the last 10 years. Updated models in use since 2021 estimate approximately 16,550 deer (Figure 1). Fawn production in the DAU has been in decline, much like many other Western deer herds. 2021 estimates put fawn:doe ratios at 58.8 fawns per 100 does (Figure 3). Early records in the 1980's show that total buck: doe ratios were around 17 bucks: 100 does. These ratios have been in large part due to limited male licenses implemented in 1995. This DAU has been managed for hunter opportunity not high quality buck hunting. Post-hunt classifications in 2021 observed 24.7 bucks: 100 does (Figure 2).

Significant Issues

The primary issues involve habitat quality and quantity, particularly on winter ranges, energy development, and increases in housing and recreational development.

In D12, the elk population has increased steadily until just recently. There is some concern that the elk herd has negatively impacted the deer herd through direct competition for spatial and forage resources. Predation by the high density of bears and persistent drought could also be factors in low fawn: doe ratios and population decline.

In many areas in DAU D-12, the range and browse conditions, specifically in winter ranges, are of significant concern. Although browse conditions are generally good, degraded areas are more common on transitional and winter ranges. Generally, the habitat quality and quantity decline has been caused by fire suppression, persistent drought, invasive weeds, and development.

The DAU has had substantial development in areas that were once part of deer winter range, particularly along the I-70 corridor and the areas surrounding Cedaredge, Hotchkiss and Paonia. Ranches have been subdivided and natural habitat quality is significantly reduced by fragmentation. This includes direct loss of habitat and the effective loss of surrounding habitat due to increased human activity. All this new development has combined to reduce the amount of useable winter range. The Rifle, Silt, New Castle, Collbran and Mesa areas have all, in the last decade, seen a rapid development of housing in areas that once were deer winter ranges. Additionally, recreational development in the form of hiking, mountain biking and off-road vehicle trails has increased in the last few years. The usage of these trails has also increased dramatically. Energy development has been an issue in D-12 over the last few decades. Recently, more solar developments have been proposed in winter ranges for deer in the area.

Stakeholder Outreach and Input

In the fall of 2022, these objectives has been presented to the Grand Mesa HPP Committee, Garfield County Commission and Mesa County Commission.

Management Objectives

Considering the current trends, feedback from the public and issues facing this deer herd, CPW has developed preferred objectives for this DAU.

Post-hunt Population

17,000 - 23,000 (Status quo)

For most of the life of the 2010 plan, the population has remained just below objective. Between 1997 and 2010, the average population estimate has held at about 19,000 deer. This is well within the population objectives set in 2010 of 17,000 - 23,000. There is potential within possible habitat improvements and management actions to increase the population within the objective range. The current population estimation of 16,550 is only 450 deer shy of the lower end of the objective range. CPW recommends maintaining a population objective of 17,000 to 23,000 deer.

Post-hunt buck ratio

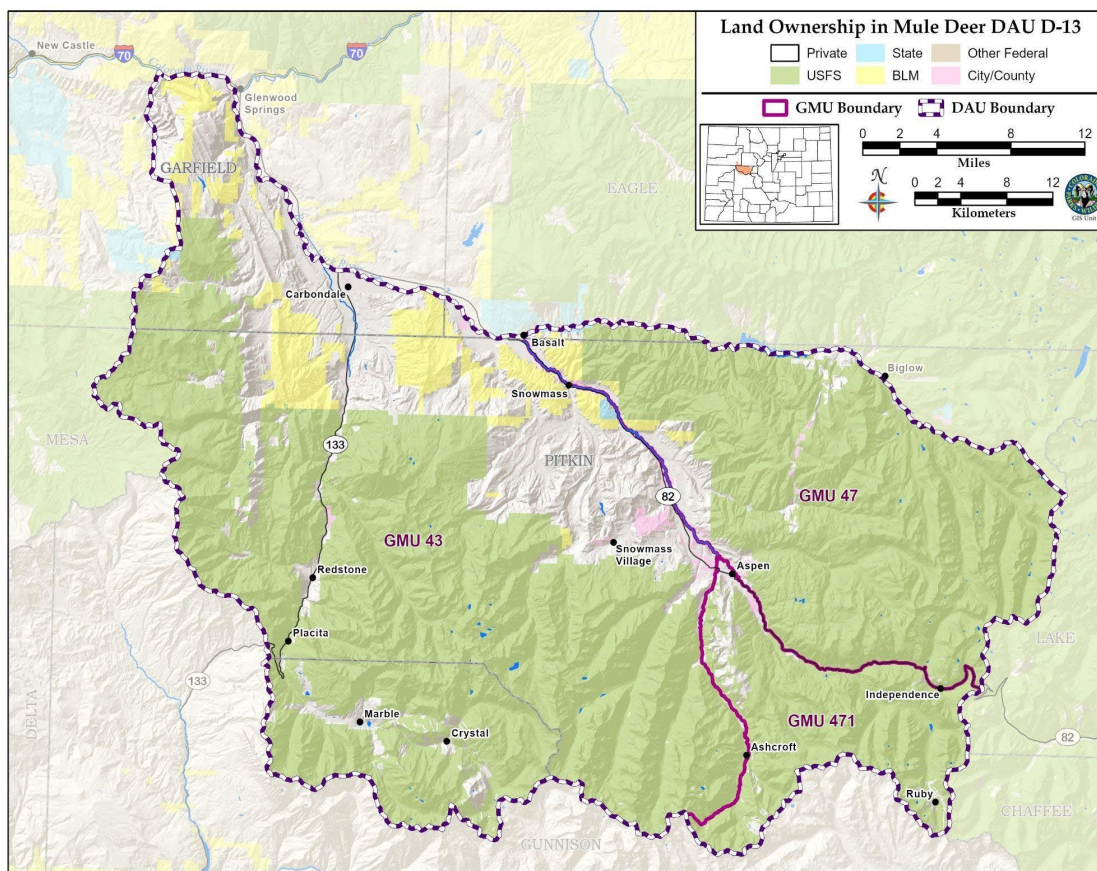
25 - 30 bucks: 100 does (Status quo)

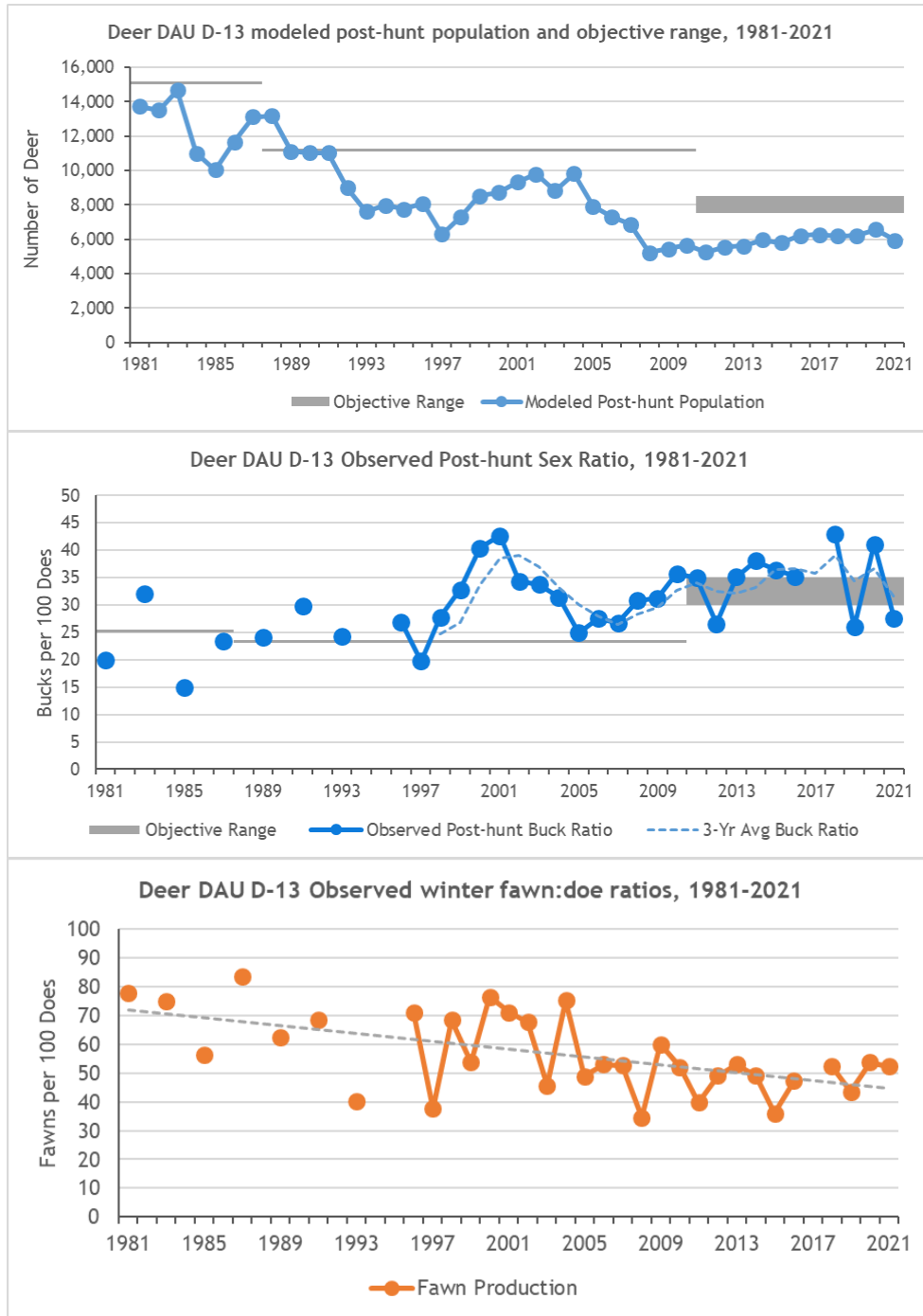
The sex ratio for this DAU has fluctuated in and out of objective for the life of the previous (2010) HMP. The 2021 sex ratio is only slightly outside of objective at 24.7 bucks: 100 does. The current objective range at 25 - 30 bucks per 100 does is a reasonable metric to continue the management of this herd at. This DAU is managed for buck hunting opportunities not mature bucks hunting. CPW recommends status quo for sex ratio objectives.

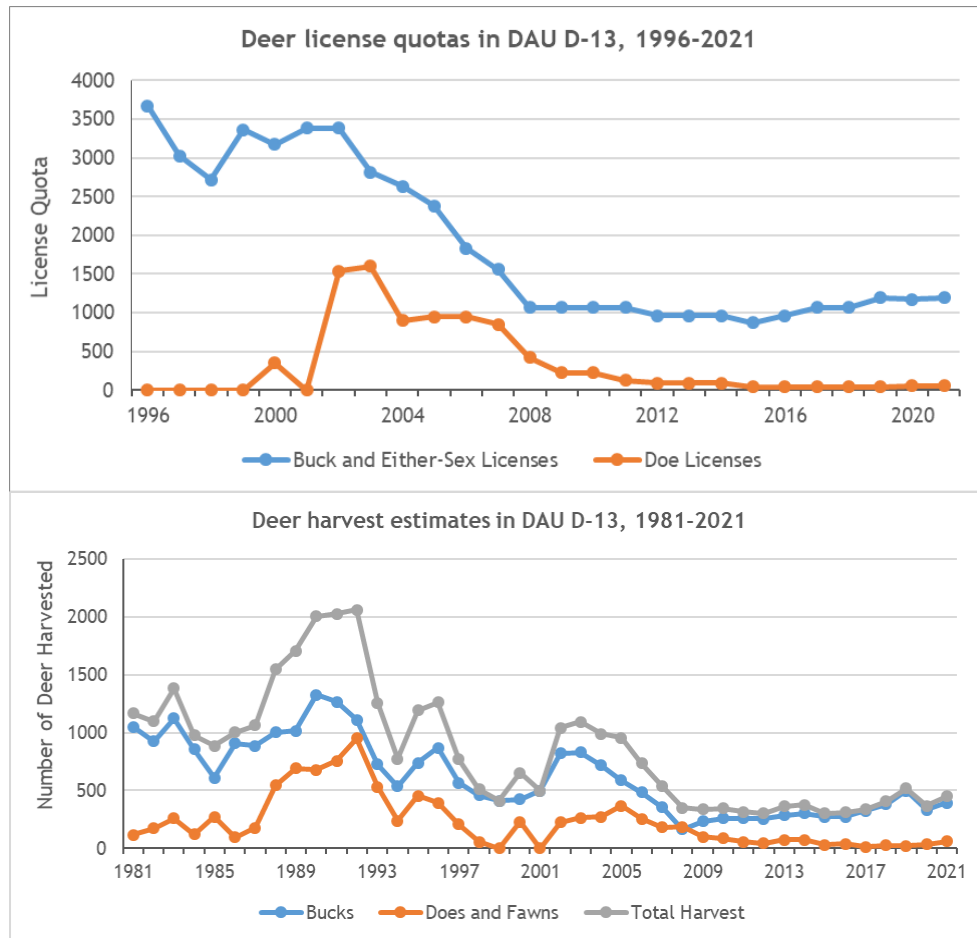
MAROON BELLS MULE DEER HERD MANAGEMENT PLAN DATA ANALYSIS UNIT D-13

Julie Mao, Wildlife Biologist, Glenwood Springs

Maroon Bells Deer Herd (DAU D-13)	GMUs: 43, 47, 471
Approval Year for last HMP: 2011	
Post-hunt population:	
Current (2011 plan) Population Objective:	7,500-8,500 deer
Post-hunt 2021 Population Estimate:	5,931 deer
Proposed New Population Objective	7,000-9,000 deer
Post-hunt Sex Ratio (Bucks:100 Does):	
Current (2011 plan) Sex Ratio Objective:	30-35 bucks per 100 does
Most Recent 3-year Average of Observed Sex Ratio:	32 bucks per 100 does
Proposed New Sex Ratio Objective:	27-32 bucks per 100 does







Background

The Maroon Bells deer herd DAU D-13 is located in northwest Colorado and consists of GMUs 43, 47, and 471. This DAU encompasses the Crystal River watershed and most of the Roaring Fork River watershed, and lies in Pitkin, Gunnison, Eagle, and Garfield Counties. Major towns include Glenwood Springs, Carbondale, Basalt, Aspen, and Snowmass Village. Public lands make up 80% of D-13’s land area. Nearly half of these public lands at higher elevations are wilderness areas, including all of the Hunter-Frying Pan Wilderness, most of the Maroon Bells-Snowmass Wilderness, and parts of the Collegiate Peaks and Raggeds Wilderness Areas. In the 2011 herd management plan, CPW lowered D-13’s population objective to account for the changing landscape and set an objective range of 7,500-8,500 deer. Over the past 10 years of managing for this population objective, the population has been slowly creeping upward in size, but has still remained below the objective. License quotas have remained generally consistent, with buck and either-sex license quotas increasing modestly over the past 5 years and doe licenses remaining minimal. D-13’s most recent population estimate in 2021 was 5,931 deer, which is below the current objective range.

The herd’s sex ratio objective was set in the 2011 DAU plan at a range of 30-35 bucks:100 does. The sex ratio increased over time until the 3-year average exceeded the objective range by 2015. In response, we slightly raised buck and either-sex license quotas incrementally from 2016-2019. The observed sex ratios over the past several years has been

highly variable, but the 3-year average has declined to be within objective. The current 3-year (2019-2021) average is 32 bucks:100 does.

Significant Issues

Winter fawn:doe ratios, which represent a measurement of recruitment of young into the population and provide an index of the herd's productivity, have declined in D-13 by about 50% compared to 3-4 decades ago. Low fawn:doe ratios and the inability of the deer population to grow, despite relatively limited hunting pressure, are likely the result of the transformation of the landscape as the local human population has grown. The major limiting factors for the D-13 herd are (1) disturbance due to ever-increasing numbers of outdoor recreationists on the landscape, as well as (2) the loss of habitat quantity due to land development over the previous 40+ years, and (3) the loss of habitat quality due to long-term fire suppression leading to plant senescence and habitat succession.

Recreation activity in the Roaring Fork Valley has continued to boom over the past decade and is the major economic driver of the local economy. Human population growth rate in this area has slowed in the past 10 years compared to the preceding 3 decades, but tourism and recreation remain the primary attractions for human activity. The public lands that are not developed with buildings are still carved up by roads and trails, creating a fragmented landscape and thus reducing the quality of habitat for wildlife. Although some areas of public lands are closed seasonally for big game winter range protection and for elk calving (which also benefits any does fawning in the same areas), the vast majority of historic winter range has now been developed into housing and commercial use. Furthermore, seasonal closures typically only limit motorized and mechanized activity and still allow recreationists on foot and often do not limit dog walkers. Seasonal closures are often violated and are difficult to enforce by land management agencies' existing staffing, and even small numbers of violators can have a disproportionate effect in disturbing wildlife.

The land development that has occurred to date is effectively irreversible loss of habitat, especially because of the exorbitant monetary value of land and housing in the Roaring Fork Valley. Higher human densities also make prescribed burns increasingly difficult to conduct near these developments, added to the effects of climate change and 2 decades of drought conditions. One potential land development project, natural gas drilling in the Thompson-Divide area of GMU 43 in D-13 and GMU 42 in D-12 which became a concern 10+ years ago when the last plan was written, has not occurred to date. Due to litigation and local community opposition to drilling, some of the mining leases have been canceled, while others remain in place and could be developed in the future.

Ultimately, the ability of this deer herd to persist in sufficient numbers and even to grow will depend on whether or not people are willing to self-regulate our activities on the landscape to provide some remaining habitat and areas of solitude for deer and other wildlife.

Management Objective Recommendations

CPW recommends a new population objective range of 7,000-9,000 deer. This objective widens the current 2011 Plan objective of 7,500-8,500 deer, but retains the midpoint of the objective range at 8,000 deer. The current objective range is relatively narrow compared to the more recent objectives for neighboring deer herds. D-13's population trajectory over the previous 10 years has been slowly increasing, so with continued management and protection

of the remaining habitat, it is possible for the D-13 herd to reach the objective over the next 10 years. If more significant conservation actions (e.g., conservation easements, protection of migration routes, compliance with/enforcement of seasonal closures) can be achieved, then it could be possible for this deer herd to grow more quickly and reach objective sooner than 10 years.

CPW recommends lowering the sex ratio objective of 27-32 bucks:100 does. The current sex ratio from the 2011 Plan of 30-35 bucks:100 does is somewhat high. Although chronic wasting disease (CWD) is not a concern in D-13 at present, CWD is prevalent in nearby deer herds to the north and southwest. Reducing the sex ratio objective to a more moderate range would limit the ability of CWD to spread into D-13, while still allowing for ample buck hunting opportunity.

License quotas for buck, either-sex, and doe tags would likely remain similar to recent years. Buck and either-sex licenses would allow for moderate harvest opportunity, while doe licenses would remain highly limited until the population reaches at least the lower end of the proposed population objective range.

Stakeholder Outreach and Input

These proposed objectives have been presented at a general public meeting held in Glenwood Springs, as well as to the Lower Colorado River Habitat Partnership Program, Eagle County, and Garfield County commissioners.

Strategies to Address Issues and Management Concerns and to Achieve Herd Management Objectives

CPW will continue to work collaboratively with our partners in the federal land management agencies, private landowners, county governments, local municipalities and NGOs to protect and enhance the remaining mule deer habitat. Important habitat conservation methods include habitat treatments, conservation easements or land acquisitions, maintaining landscape connectivity and movement corridors, and adhering to seasonal recreation closures on winter range areas.

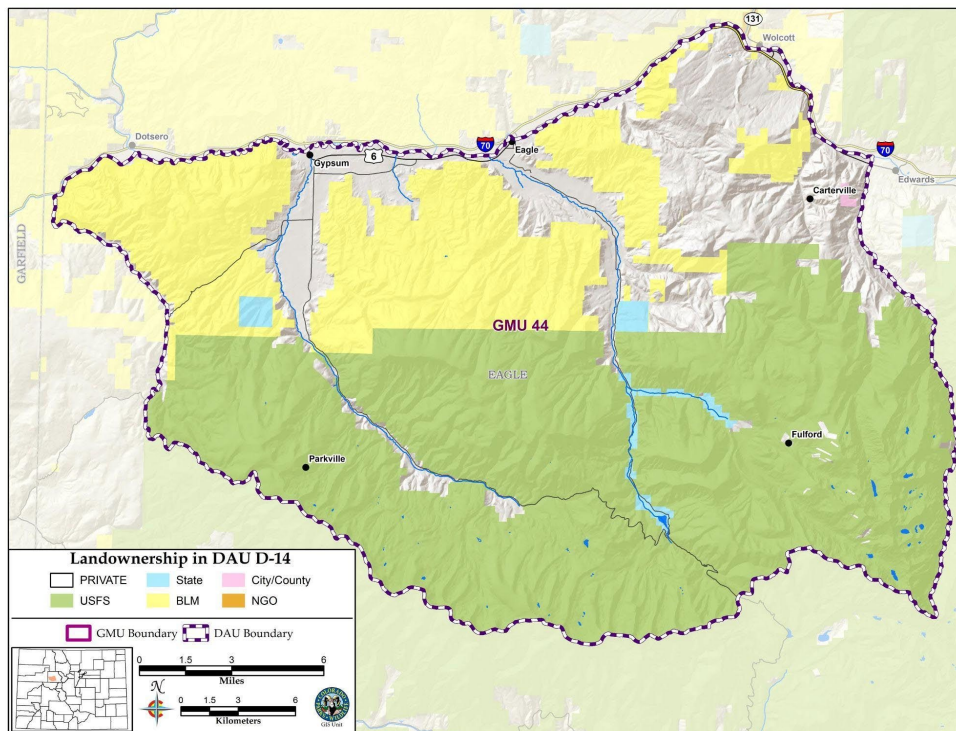
To achieve the updated population objective and to maintain the current sex ratio objective, CPW will continue to set licenses annually to provide sufficient buck hunting opportunity and very limited doe hunting opportunity. CWD prevalence will continue to be monitored through periodic mandatory testing and through voluntary sample submissions.

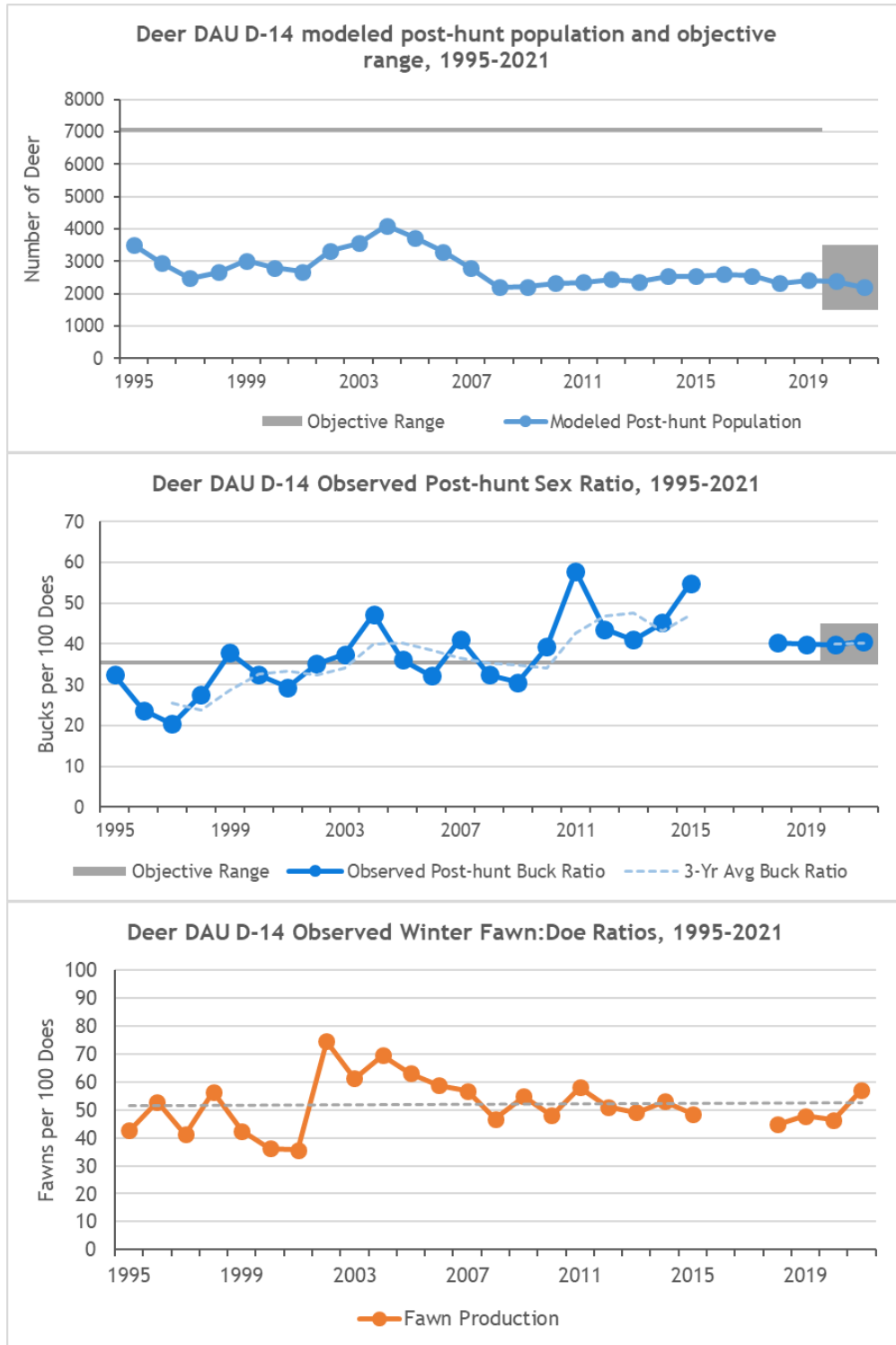
BRUSH CREEK MULE DEER HERD MANAGEMENT PLAN

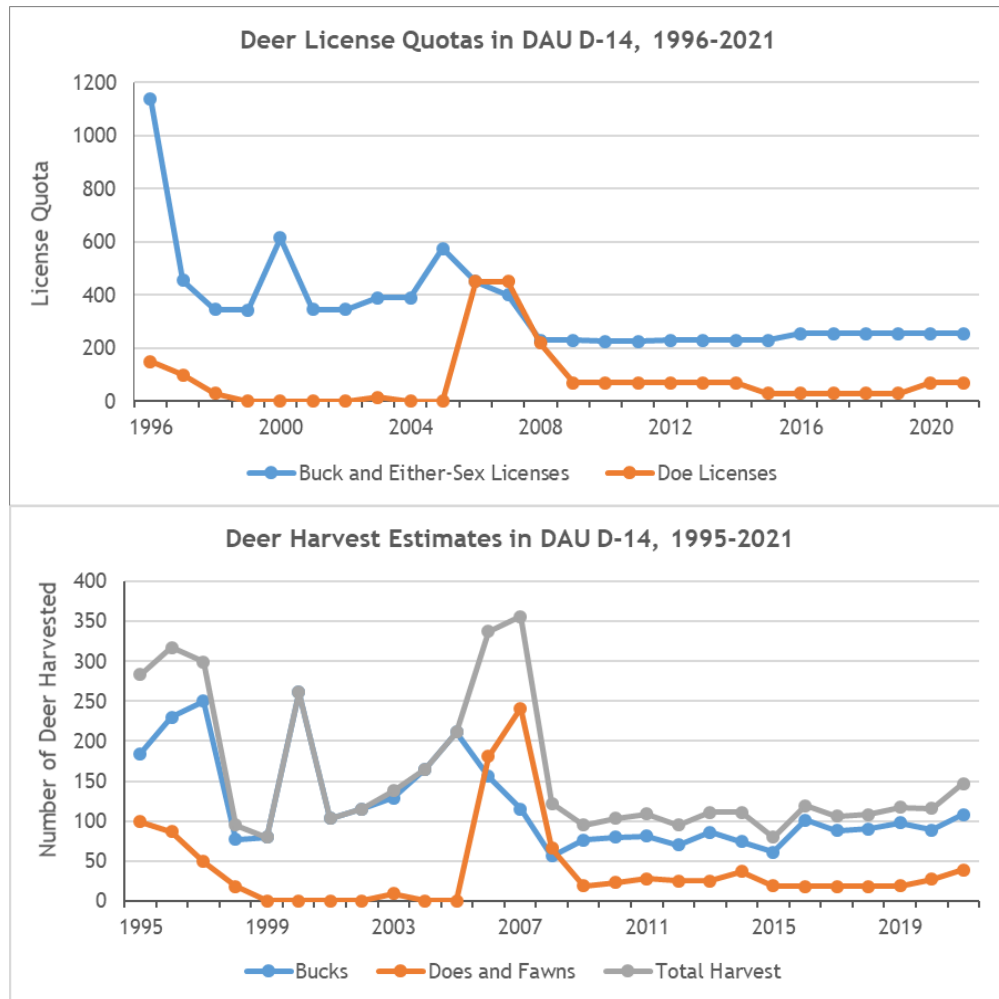
DATA ANALYSIS UNIT D-14

Julie Mao, Wildlife Biologist, Glenwood Springs

Brush Creek Deer Herd (DAU D-14)	GMU: 44
Approval Year for last HMP: 2020	
Post-hunt population:	
Current (2020 plan) Population Objective:	1,500-3,500 deer
Post-hunt 2021 Population Estimate:	2,190 deer
Extension Population Objective	No change: 1,500-3,500 deer
Post-hunt Sex Ratio (Bucks:100 Does):	
Current (2020 plan) Sex Ratio Objective:	35-45 bucks per 100 does
Most Recent 3-year Average of Observed Sex Ratio:	40 bucks per 100 does
Extension Sex Ratio Objective:	No change: 35-45 bucks per 100 does







Background

The Brush Creek mule deer Data Analysis Unit (DAU) D-14 is located in Eagle County in northwest Colorado and consists of Game Management Unit (GMU) 44. D-14 covers an area of 976 km² (377 mi²), over 3/4 of which is public land. It is bounded on the north by the Colorado and Eagle Rivers; on the east by East Lake Creek; on the south by Red Table Mountain ridgeline; and on the west by Red Table Mountain Road, Cottonwood Pass Road, and Cottonwood Creek. Major towns within D-14 include Gypsum and Eagle. The town of Edwards is just outside of, but immediately adjacent to, the northeast part of the DAU. Interstate-70 follows the north edge of the unit. D-14 contains parts of the Colorado River, Eagle River, Lake Creek, and Cottonwood Creek and all of Gypsum Creek, Brush Creek, and Squaw Creek drainages.

This DAU has been managed to provide the highest quality buck hunting experience, defined as accessibility to public land with very low hunting pressure and a higher opportunity to harvest a mature animal. Drawing a 3rd or 4th season buck license in this unit is often perceived as a “once-in-a-lifetime” hunt opportunity.

In the recently updated [2020 D-14 herd management plan](#), the population objective range was lowered to 1,500-3,500 deer, which is a more realistic objective and is where the population

estimate has been sitting for the past decade and half. The most recent (2021) post-hunt population estimate is 2,190 deer.

The 2020 D-14 plan also set a new sex ratio objective range of 35-45 bucks:100 does, managing for a moderately high sex ratio. The average of the most recent 3-year (2019-2021) average of observed sex ratios is 40 bucks per 100 does, mid-way within the current objective range.

Significant Issues

The major issues for this deer herd involve the cumulative effects of decades of human population growth and impacts of human activities on deer habitat in the Eagle River Valley. The result has been a loss of habitat quantity and quality and less solitude from human disturbance. The unit's carrying capacity for mule deer has declined compared to conditions in past decades when the previous objectives were set over 2 decades ago. Significant issues include habitat loss and fragmentation from land development, declining habitat condition, and impacts of human recreation on deer. Other management concerns include competing herd management objectives (managing for a given population size while maintaining a relatively high sex ratio), as well as the potential for chronic wasting disease (CWD). CWD has not yet been detected in this herd, but sampling has been based on a very low sample size of harvested deer because of intentionally limited harvest opportunity in this unit. However, a relatively high sex ratio sets this herd up for a high likelihood of acquiring and spreading CWD in the future.

Management Objective Recommendations

CPW recommends maintaining the population objective range of 1,500-3,500 deer and the sex ratio objective range 35-45 bucks:100 does, set in the recent 2020 herd management plan. This population objective is believed to be reasonably achievable under current habitat and land use conditions. The sex ratio objective will continue to provide high quality buck hunting in the unit, but not be too high to pose problems with the health of the herd and its ability to recover from weather events or be resilient against disease outbreaks and other stressors. CWD should continue to be tested for in this herd, given that the sex ratio objective is moderately high.

Stakeholder Outreach and Input

In 2017 and 2018, CPW conducted public outreach to D-14 license holders and applicants, held a general public meeting, solicited public comments through online questionnaires, presented to the Eagle Board of County Commissioners and the Lower Colorado Habitat Partnership Program, and requested comments from BLM and USFS. Most D-14 hunters and license applicants ranked "obtaining a trophy buck" and "spending time in nature" as the most important reasons to hunt deer in this unit. For more details on public comments, see Appendices B-D of the [2020 D-14 herd management plan](#).

Strategies to Address Issues and Management Concerns and to Achieve Herd Management Objectives

CPW will continue to work collaboratively with our partners in the federal land management agencies, private landowners, county governments, local municipalities and NGOs to protect

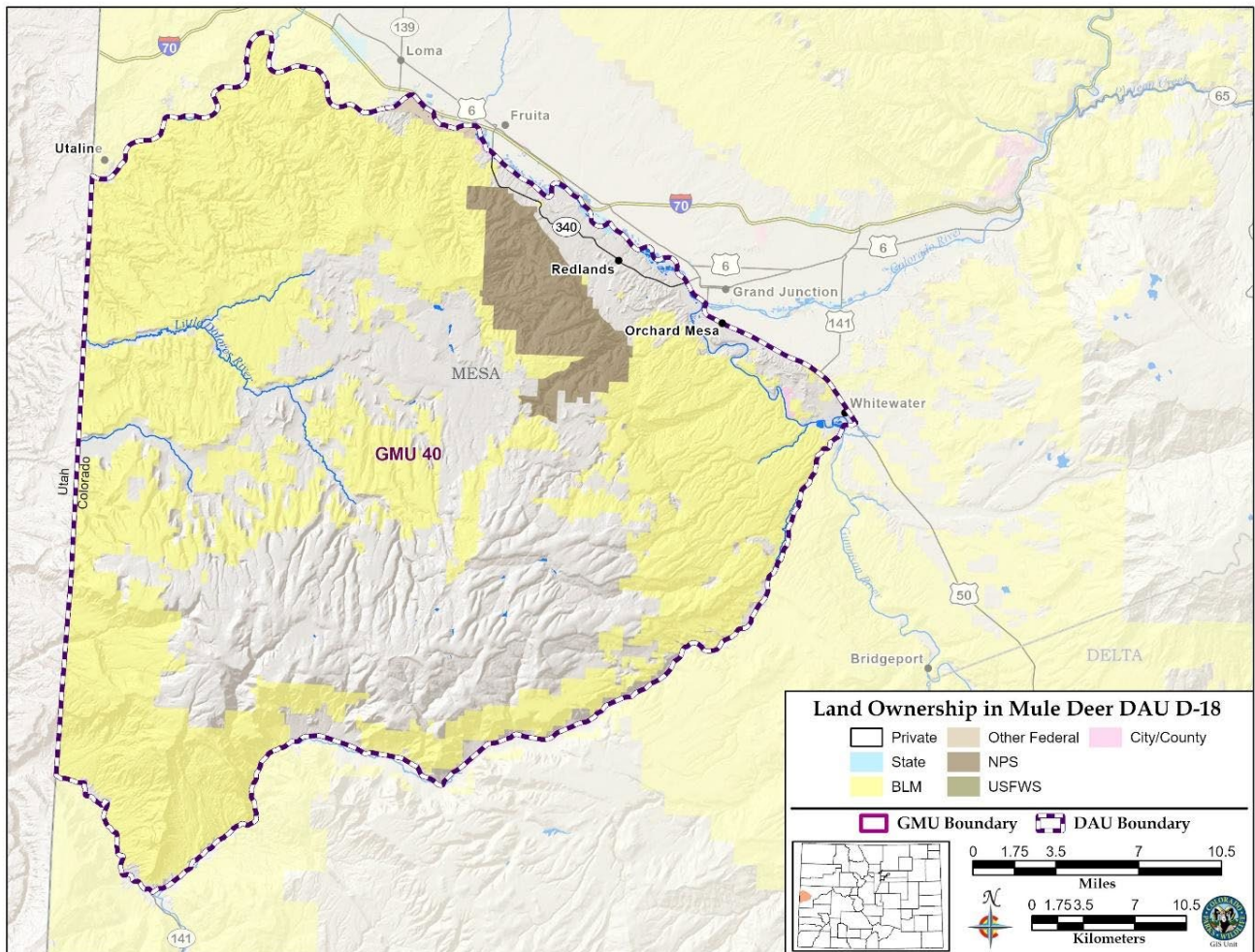
and enhance the remaining mule deer habitat. Important habitat conservation methods include habitat treatments, conservation easements or land acquisitions, maintaining landscape connectivity and movement corridors, and adhering to seasonal recreation closures on winter range areas.

To achieve the population and sex ratio objectives over the next 10 years, CPW will continue to set licenses annually, keeping in mind such issues as Chronic Wasting Disease and achieving a balance between maintaining high quality bucks and providing some additional opportunity for hunters to draw buck licenses in the high-demand seasons.

GLADE PARK HERD MANAGEMENT PLAN DATA ANALYSIS UNIT D-18

Genevieve Fuller, Wildlife Biologist, Grand Junction

Glade Park Deer Herd (DAU D-18)	GMU: 40
Approval Year for last HMP: 2010	
Post-hunt population:	
Current (2010 plan) Population Objective:	6,500 - 8,500 deer
Post-hunt 2021 Population Estimate:	3,900 deer
Preferred Alternative:	4,300 - 8,500 deer
Post-hunt Sex Ratio (Bucks:100 Does):	
Current (2010 plan) Sex Ratio Objective:	30-35 bucks per 100 does
Post-hunt 2021 Sex Ratio:	observed: 26; modeled: 35
Preferred Alternative:	30-40 bucks per 100 does



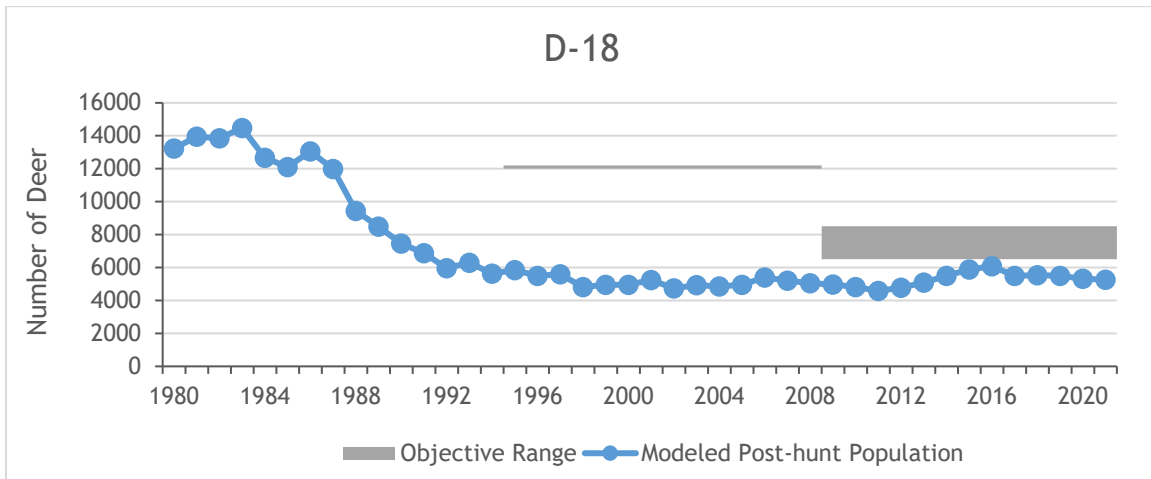


Figure D18-1. Deer DAU D-18 modeled post-hunt population and objective range, years 1980-2021.

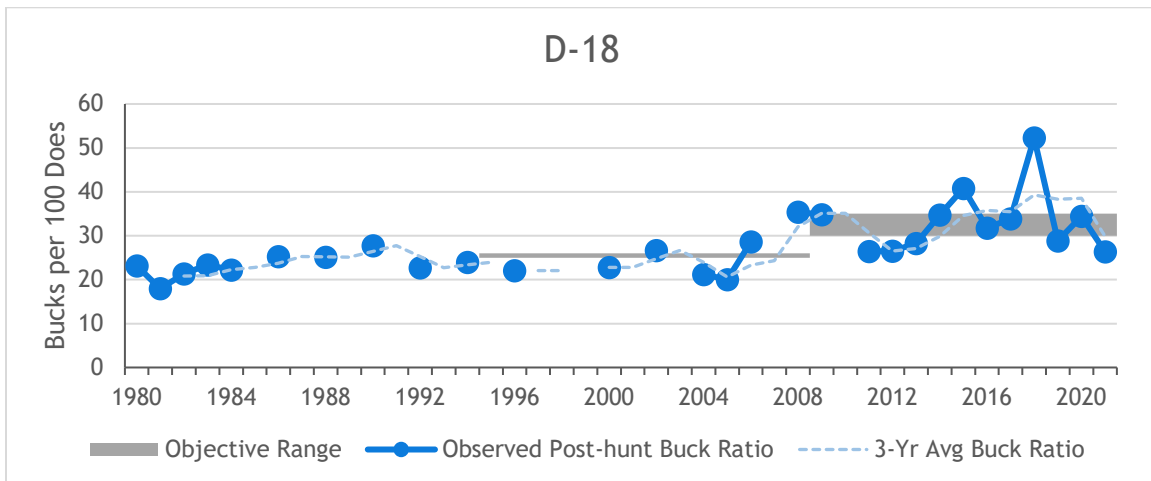


Figure D18-2. Deer DAU D-18 observed and modeled post-hunt sex ratio (bucks:100 does), years 1980-2021.

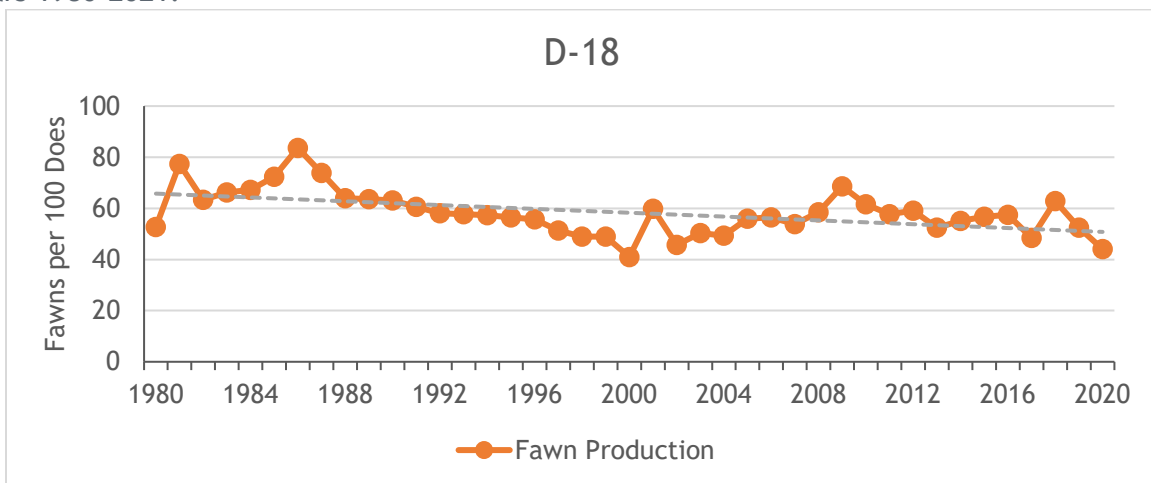


Figure D18-3. Deer DAU D-18 fawn production (observed post-hunt fawns: 100 does ratio, years 1980-2021)

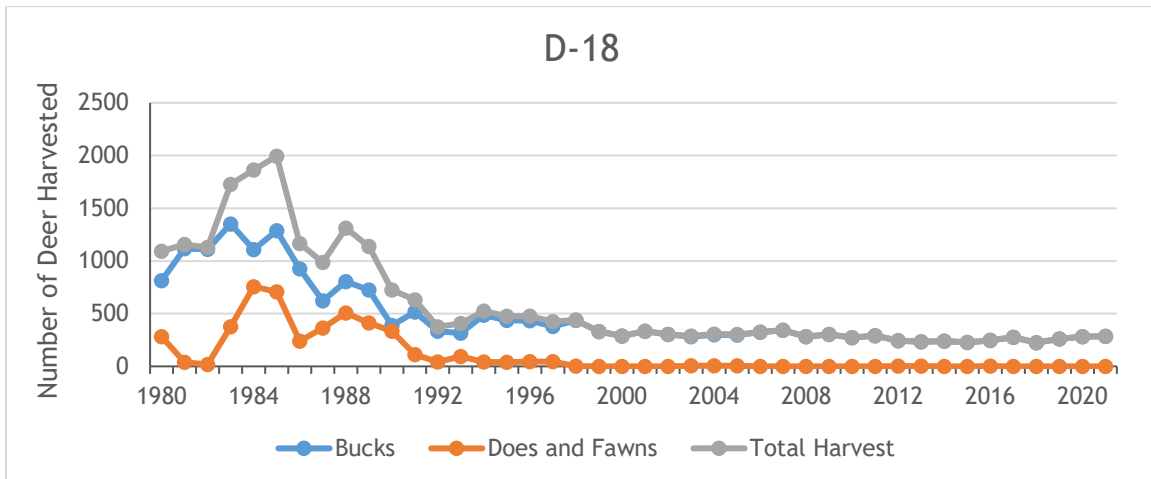


Figure D18-4. Deer harvest estimates in D-18, years 1980-2021.

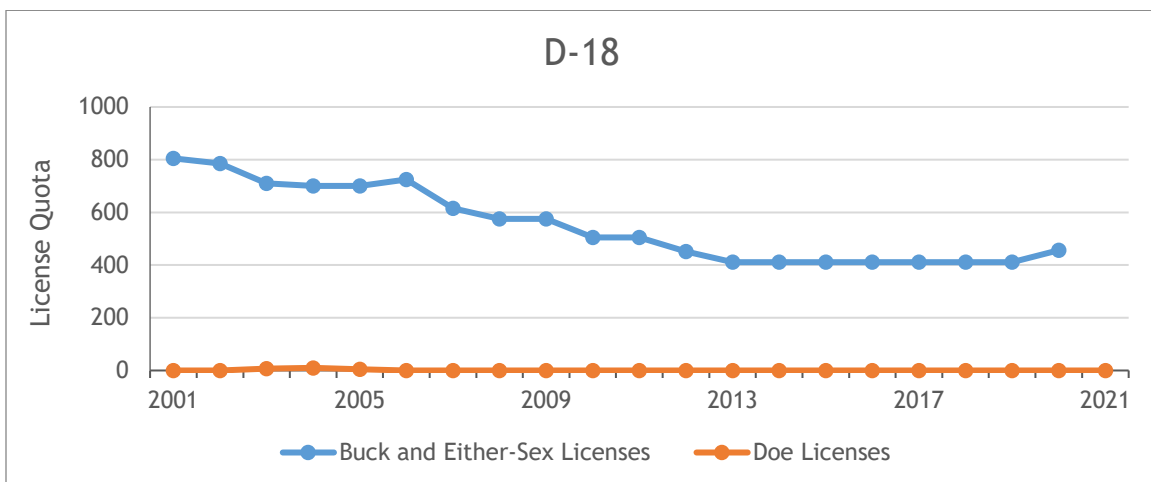


Figure D18-5. Deer License Quotas in D-18, years 2001-2021.

Background Information

The Glade Park D-18 DAU is located in west-central Colorado and includes Glade Park and Pinon Mesa, southwest of Grand Junction, Colorado. This DAU can be broadly divided into two units: Glade Park, in the northern portion and Pinon Mesa rising south and west of Glade Park. The DAU is called both Pinon Mesa and Glade Park and the two are often used interchangeably. The Glade Park D-18 DAU is 744 square miles in size and contains a mixture of public and private lands. Of the overall area, 2% is managed by the United States Forest Service (USFS) and about 56% by the Bureau of Land Management (BLM). The National Park Service owns 4%. Privately owned lands make up 38% of the total.

The topography varies greatly in the DAU. The highest elevations in the DAU are at its center and from there elevation decreases in all directions. The highest point is approximately 9,700 feet at the south-center of the DAU. The lowest point is where the Colorado River meets the UT state line at approximately 4,600 feet. Interstate 70 parallels the Colorado River, forming a significant barrier which restricts deer movements throughout the northern portion of the DAU. Additionally, nearly vertical sandstone canyons on the north end of the unit prohibit

much deer movement to the north. Some of the lower elevations include suburban areas part of Grand Junction where there are scattered residential deer groups.

The deer population was relatively high in D-18 during the early 1980's through the early 1990's. Since that time, the herd declined dramatically, and then stabilized in the last 20 years. The early decline of this herd mirrored the falling numbers in most mule deer populations throughout Colorado and the Western U.S. Current models estimate a population of 3,900 deer.

Early records in the 1980's show that total buck: doe ratios were around 22 bucks: 100 does. These ratios have generally increased to recent levels over 26 bucks: 100 does, in large part due to totally limited male licenses implemented in 1995 and continued through the present. The average buck:doe ratio in the DAU for the last 10 years is 33.8 bucks: 100 does. Post-hunt classifications in 2021 observed 26.4 bucks: 100 does. Fawn production in the DAU have seen a gradual decline, but generally have remained between 40 and 70 fawns: 100 does. Since 2001, production has averaged 54 fawns: 100 does.

Significant Issues

The primary issues involved the low population size, competition with elk, long-term drought, and residential development, particularly on winter range. Habitat quality and quantity have been in decline in part due to an increasingly impactful long-term drought. There is some concern that the drought conditions may be a part of an aridification process occurring in the area. Many landowners have become more interested in habitat projects that benefit elk and deer and fewer cattle have been grazed in the area in the past few years. Additionally, drought tolerant invasive weeds are increasing in frequency. There is also some concern that the elk herd has negatively impacted the deer herd through direct competition for spatial and forage resources.

The DAU has had substantial development in areas that were once part of deer winter range, particularly in the areas surrounding Glade Park. The Unaweep Canyon is also seeing increased development. Ranches have been subdivided and natural habitat quality is significantly reduced by fragmentation. This includes direct loss of habitat and effective loss of surrounding habitat due to increased human activity.

Stakeholder Outreach and Input

In the summer of 2022, the proposed objectives were presented at a public meeting in Grand Junction to 14 stakeholders. They were asked to submit written feedback. Many expressed their concerns about degraded quality and quantity of habitat, long-term drought, and development. Their full responses are included in Appendix

In the fall of 2022, these objectives were presented to the Grand Mesa HPP Committee and the Mesa County Commission.

Management Objectives

Considering the current trends, feedback from the public and issues facing this deer herd, CPW has developed preferred objectives for this DAU.

CPW Preferred Objectives:

Post-hunt Population

4,300 - 6,500 deer (Slight Decrease, 25 year average)

The estimated deer population has been consistently under objective for over 20 years. There has been no doe harvest in over a decade and this population has still not increased. There is no ability for harvest management to have an effect on population growth in this unit.

Limitations on this population are likely due to low quality and quantity of habitat, long-term drought/aridification and competition with livestock and elk. Fawn:doe ratios have been in decline for the last 10 years. CPW would like to increase the deer population, but the current objectives are unattainable given the current conditions. This new objective range centers around the 25 year average, but leaves room for population increases that may come from land management changes in the area.

Post-hunt buck ratio

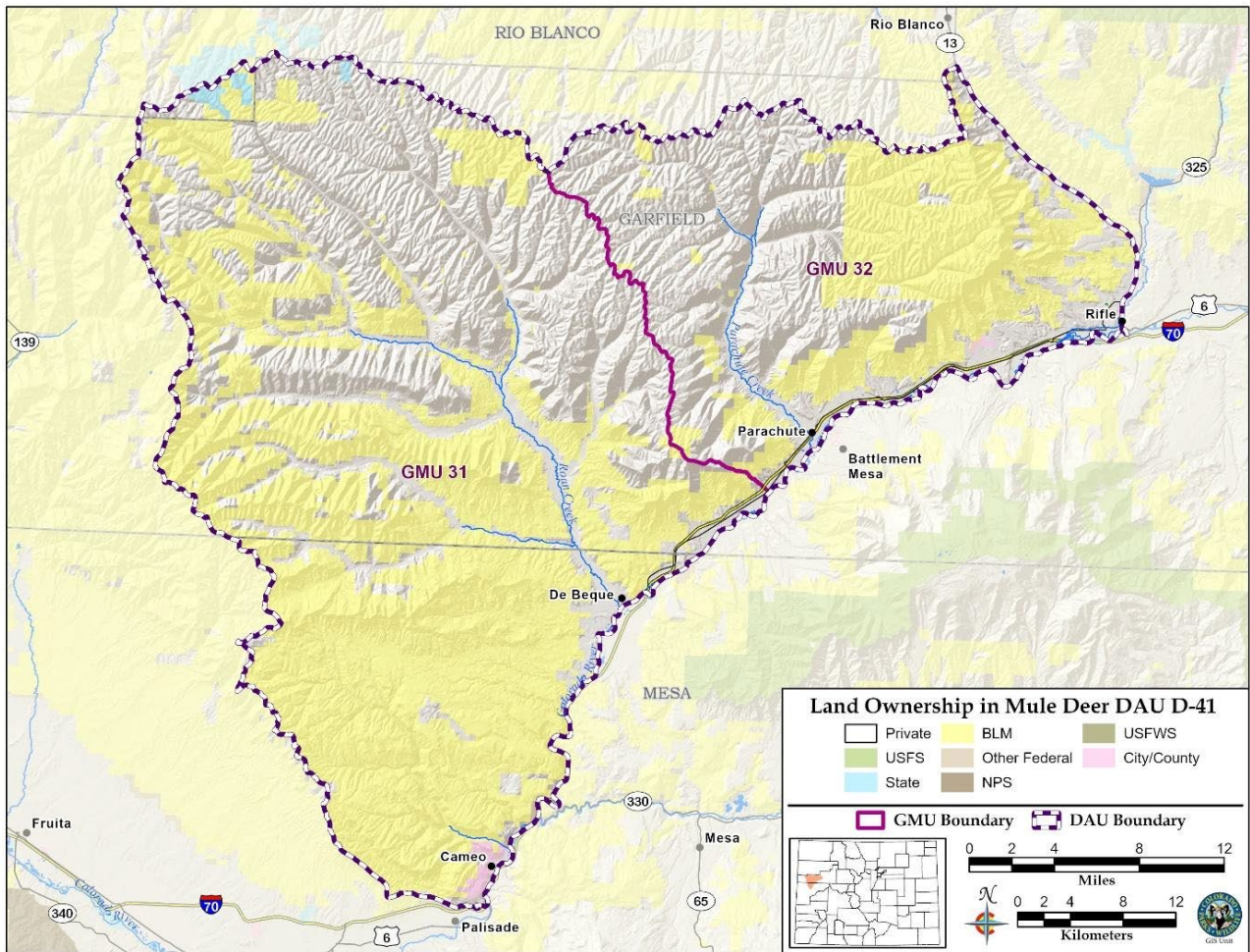
30 - 40 bucks: 100 does (Broader range)

D-18 has not been documented as a quality or mature buck hunt, but in the last 10 or so years, it has been managed as one. Public feedback has also indicated that a majority of hunters would like to see it continued to be managed for mature buck hunting opportunities. The observed sex ratio has fluctuated quite a bit during the previous 10 years. 2020 landed on the high end of objective, while 2021 just below. Expanding this buck:doe ratio range to 30 - 40 bucks:100 does would allow more flexible management, where the seemingly large swings in sex ratio from year to year can continue without precedent for big management actions. This also allows for continued management towards more mature bucks.

LOGAN MOUNTAIN HERD MANAGEMENT PLAN DATA ANALYSIS UNIT D-41

Genevieve Fuller, Wildlife Biologist, Grand Junction

Logan Mountain Deer Herd (DAU D-41)	GMUs: 31 and 32
Approval Year for last HMP: 2012	
Post-hunt population:	
Current (2012 plan) Population Objective:	6,500 - 8,500 deer
Post-hunt 2021 Population Estimate:	4,500 deer
Preferred Alternative:	Status quo, 6,500 - 8,500 deer
Post-hunt Sex Ratio (Bucks:100 Does):	
Current (2012 plan) Sex Ratio Objective:	25-30 bucks per 100 does
Post-hunt 2021 Sex Ratio:	observed: 23; modeled: 24
Preferred Alternative:	Status quo, 25-30 bucks per 100 does



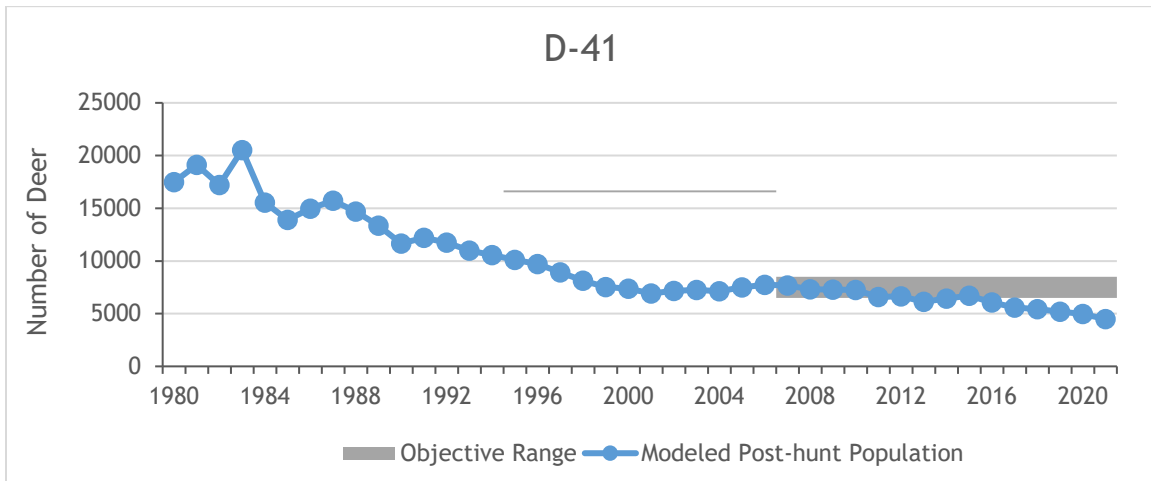


Figure D41-1. Deer DAU D-41 modeled post-hunt population and objective range, years 1980-2021.

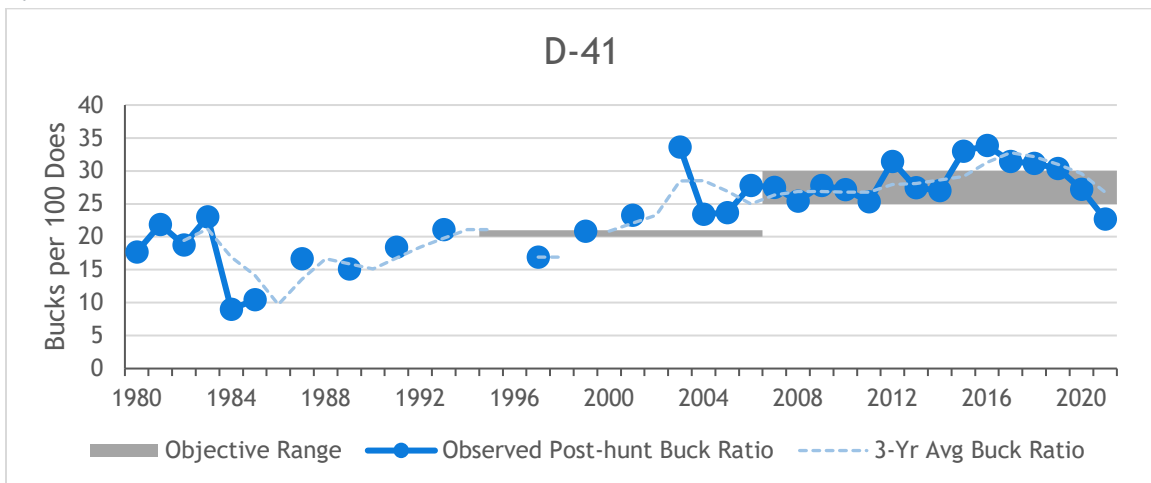


Figure D41-2. Deer DAU D-41 observed and modeled post-hunt sex ratio (bucks:100 does), years 1980-2021.

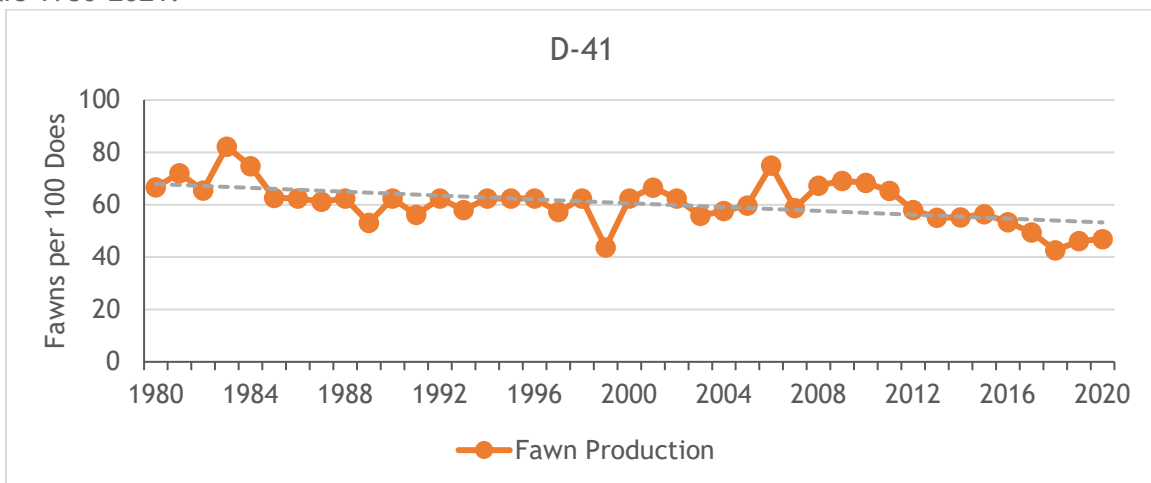


Figure D41-3. Deer DAU D-41 fawn production (observed post-hunt fawns:100 does ratio, years 1980-2021)

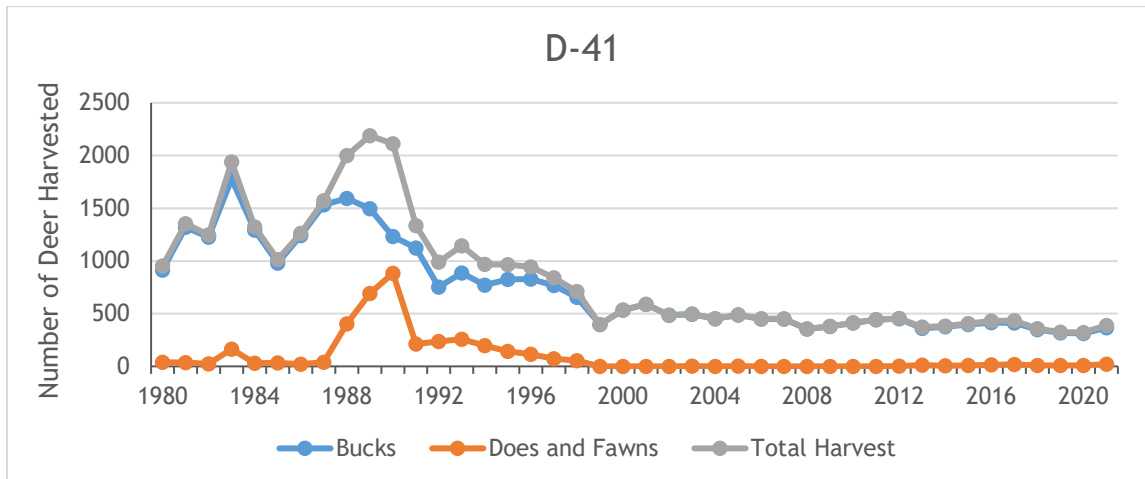


Figure D41-4. Deer harvest estimates in D-41, years 1980-2021.

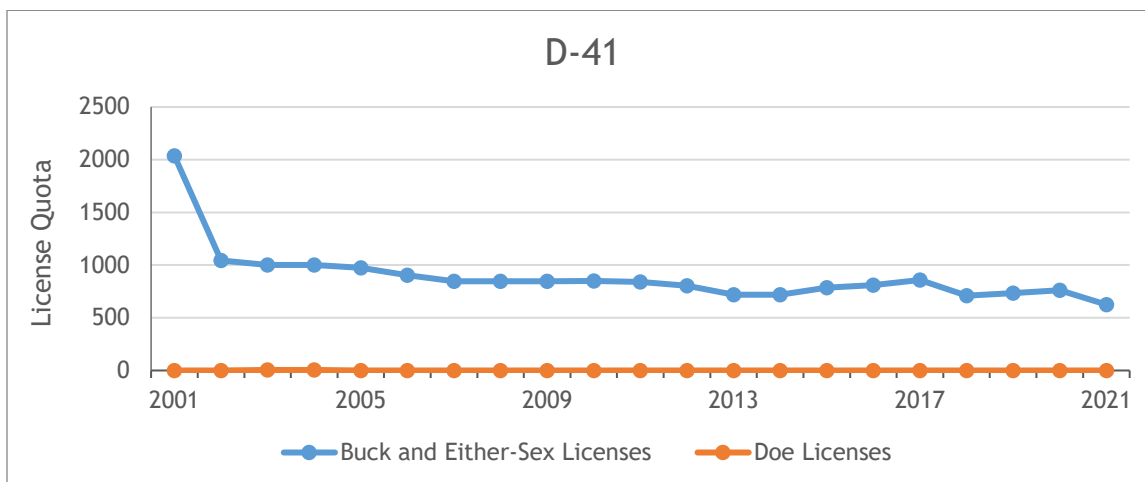


Figure D41-5. Deer License Quotas in D-41, years 2001-2021.

Background Information

Mule deer Data Analysis Unit (DAU) D-41, Logan Mountain, is located in west-central Colorado and includes Game Management Units (GMUs) 31 & 32. The primary geographic features in this DAU include the high elevation, gently sloping Roan Plateau that is bisected by deep drainages that compose Roan and Parachute Creeks. The DAU is approximately 1,004 square miles and is nearly evenly divided between public (Bureau of Land Management) and private ownership. Much of this DAU is used for livestock grazing and oil and gas extraction. The high elevation Roan Plateau is generally cool and receives significantly more moisture than the rest of the DAU. These areas are generally associated with summer and fawning ranges. The lower elevations, particularly near the towns of Debeque and Palisade, are much warmer and drier and provide a greater proportion of winter range. The 2021 post-hunt population estimate is 4,478, which is below the low of approximately 6,000 in the late 1990’s (Figure 1). Fawn production in this DAU has varied over the years with a slight decline and has seen a slight uptick in the last three years. 2021 estimates put fawn:doe ratios at 58.8 fawns per 100 does (Figure 3).

Since antlered licenses were limited in 1999, buck: doe ratios have improved dramatically and have remained 22.7 bucks: 100 does were observed during 2021 post-hunt classification surveys (Figure 2). In the last decade, sex ratios have been largely within or above the objective range of 25 - 30 bucks per 100 does.

Significant Issues

There are several significant issues associated with the mule deer herd in the Logan Mountain area. The most significant issue is the long-term decline and stagnation of the herd. Despite virtually no antlerless harvest in over 25 years, the population has not rebounded from the decline of the 1990's.

Habitat quality and quantity decline resulting from the loss of winter range, feral horse impacts, long-term drought and pinon-juniper encroachment also affects this deer herd. Additionally, landscape-scale energy development is a significant concern. This area has seen a large degree of oil and gas development in the last decade. There are significant natural gas reserves underneath DAU D-41. It is estimated that there are approximately 8.9 trillion cubic feet (TCF) of natural gas underneath in the eastern portion of GMU 32 alone. Of these reserves, approximately 4.2 TCF are under the top of the Roan Plateau (deer summer range) and another 4.7 TCF are under the lands below the rim, including cliffs (deer winter range). Much of the private land D-41 is owned or leased for oil and gas extraction. Due to the large amount of public land with no hunter access, there are challenges for access to harvest opportunities in D-41.

Pine Gulch Fire

The Pine Gulch Fire, the third largest wildfire in state history, was sparked by lightning on July 31, 2020. The fire burned more than 567 km² before it was fully contained in late September. Most of the fire burned in D-41 (Figure D41-6).

Approximately 152 km² of winter range and 309 km² of summer range in D-41 were impacted. It is possible that the impacts from the Pine Gulch Fire will decrease survival of wintering deer in GMU 31 for the next 20 years.

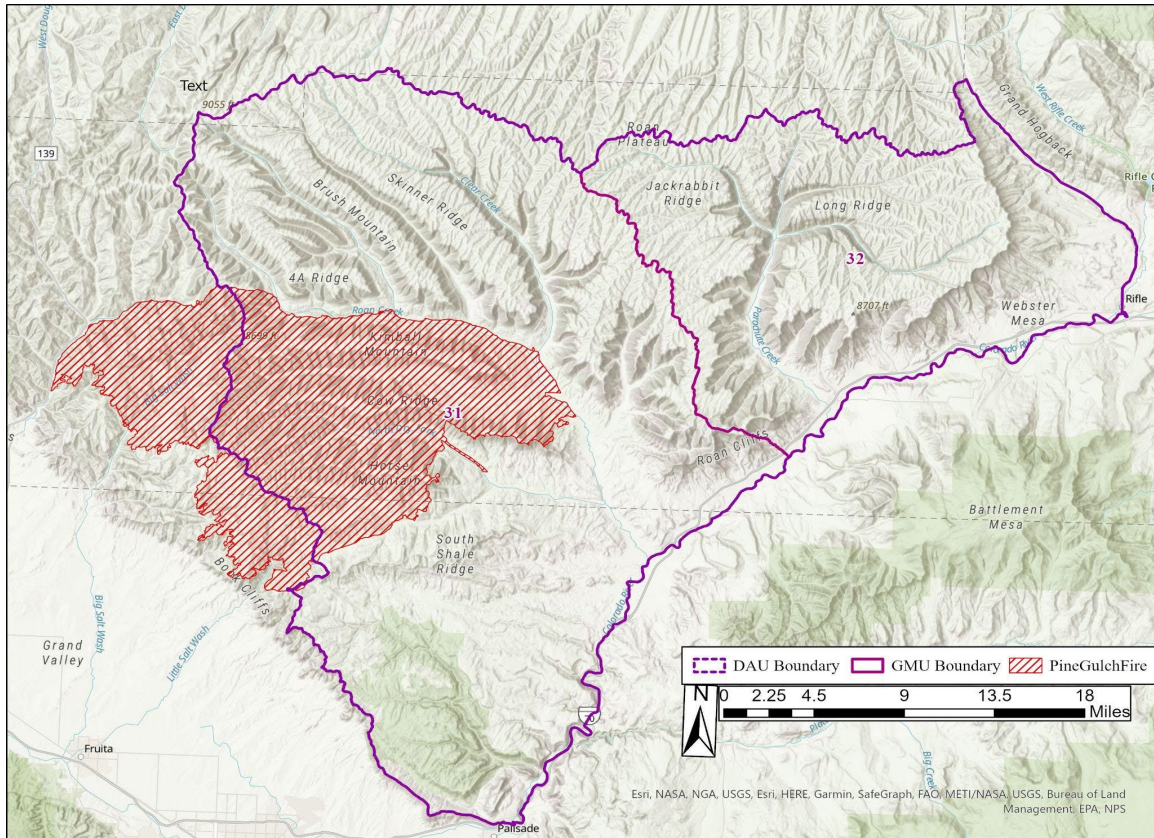


Figure D41-6. Pine Gulch burn location and extent in Data Analysis Unit D-41 in west-central Colorado.

In late 2020, BLM, CPW and private landowners collaborated to identify approximately 20,000 acres of the burned area for re-seeding with native vegetation. Approximately 1,500 acres were identified as high-priority wildlife habitat and received a higher proportion of forb and shrub seeds to have the greatest benefit to deer and elk.

Stakeholder Outreach and Input

In the summer of 2022, the proposed objectives were presented in Grand Junction to 14 stakeholders. They were asked to submit written feedback. Those who responded expressed their concerns about degraded quality and quantity of winter range, long-term drought, predation and development of migration corridors. Their full responses are included in Appendix

In the fall of 2022, these objectives were presented to the Grand Mesa HPP Committee, Garfield County Commission and Mesa County Commission.

Management Alternatives

Considering the current trends, feedback from the public and issues facing this deer herd, CPW has developed preferred objectives for this DAU.

Post-hunt Population

6,500 - 8,500 (Status quo)

For half of the previous plan's life, this population was within objective range. Only in the last 6 years has this population declined below objective. Likely, the combination of drought and increasing elk numbers have created more challenging habitat conditions and competition in winter ranges for deer. Fawn:doe ratios have been in decline, mirroring the population decline. The elk population in this area has increased in size and private lands that bar public hunting access have created refuges for elk that have likely impacted lower harvest success rates for elk. While there are fewer tools available to us with regards to direct management of deer that may result in an increase of this population to the current objective range, the management of habitat, changes in livestock management practices and changes in elk management in the area may provide a boost to deer populations. For the time being, CPW staff recommend maintaining the status quo for population objectives in this DAU.

Post-hunt buck ratio

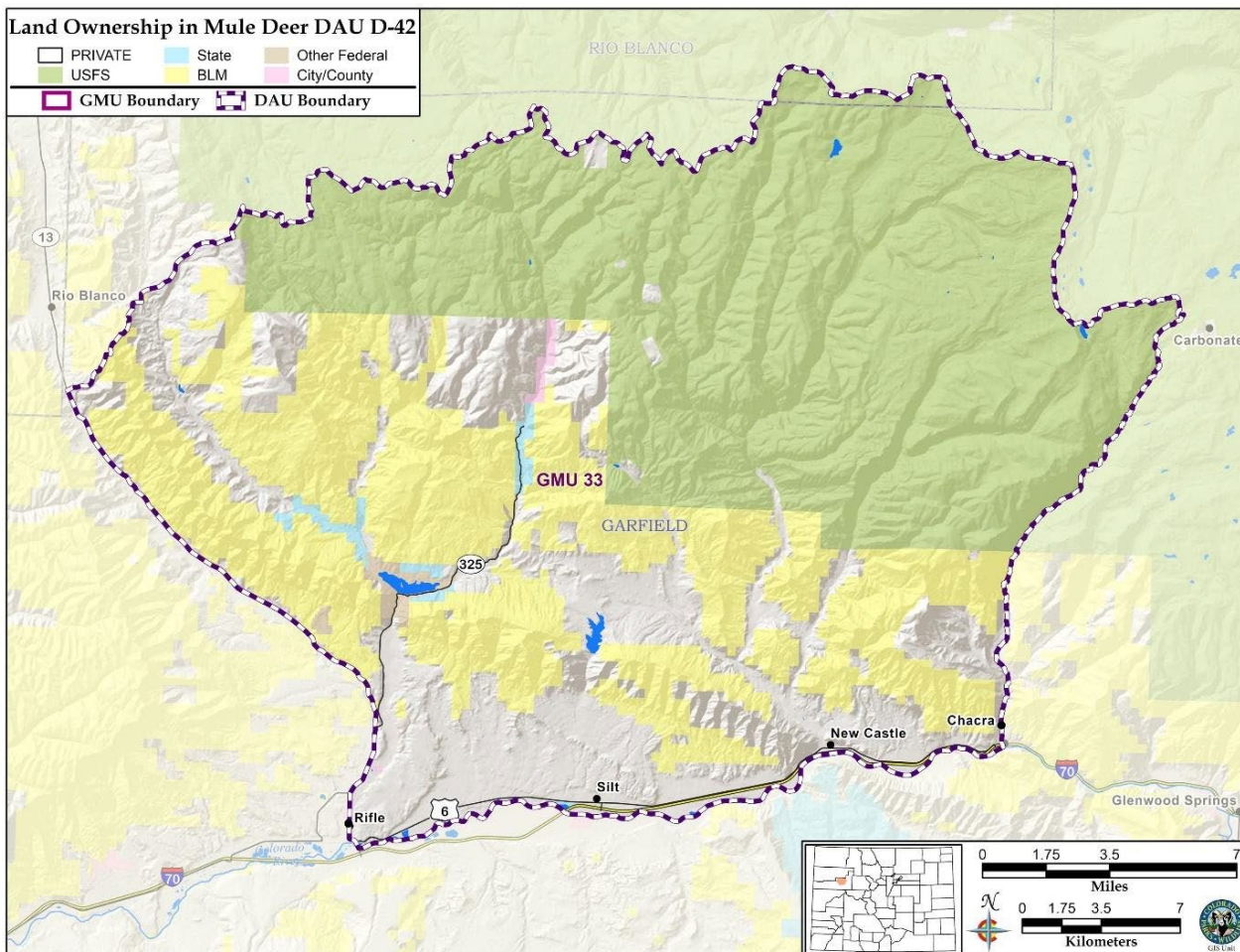
25 - 30 bucks: 100 does (Status quo)

This unit is managed as an opportunity unit with some mature buck hunting options. The buck:doe ratios over the last 10 years have remained within or above the current objective range, barring this previous year. With an increase of CWD prevalence in this unit and a proposed 4th rifle season that provides mature buck hunting opportunities, CPW staff feels that the previous plan's sex ratio objective range is an appropriate range going forward. This is further supported by the hunter attitude survey.

RIFLE CREEK HERD MANAGEMENT PLAN DATA ANALYSIS UNIT D-42

Genevieve Fuller, Wildlife Biologist, Grand Junction

Rifle Creek Deer Herd (DAU D-42)	GMU: 33
Approval Year for last HMP: 2022	
Post-hunt population:	
Current (2022 plan) Population Objective:	6,200 - 8,500 deer
Post-hunt 2021 Population Estimate:	6,400 deer
Extension Population Objective:	No change, 6,200 - 8,500 deer
Post-hunt Sex Ratio (Bucks:100 Does):	
Current (2022 plan) Sex Ratio Objective:	25-32 bucks per 100 does
Post-hunt 2021 Sex Ratio:	observed: 24; modeled: 24
Extension Sex Ratio Objective:	No change, 25-32 bucks per 100 does



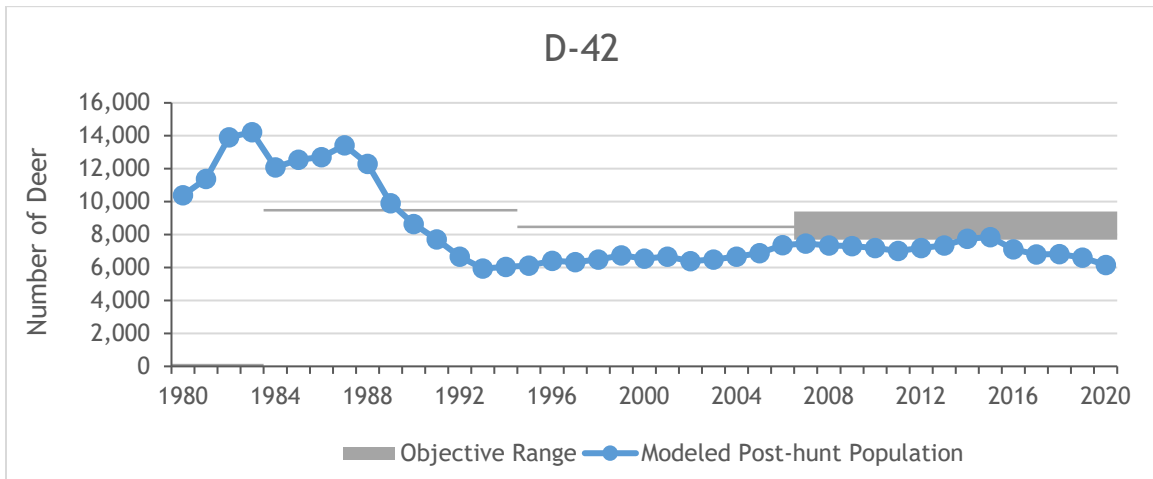


Figure D42-1. Deer DAU D-42 modeled post-hunt population and objective range, years 1980-2021.

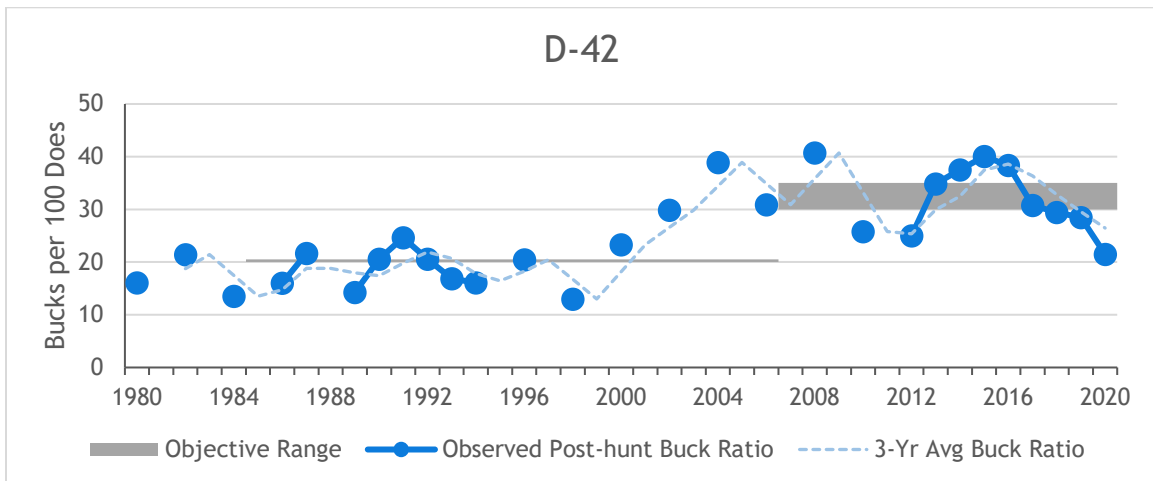


Figure D42-2. Deer DAU D-42 observed and modeled post-hunt sex ratio (bucks:100 does), years 1980-2021.

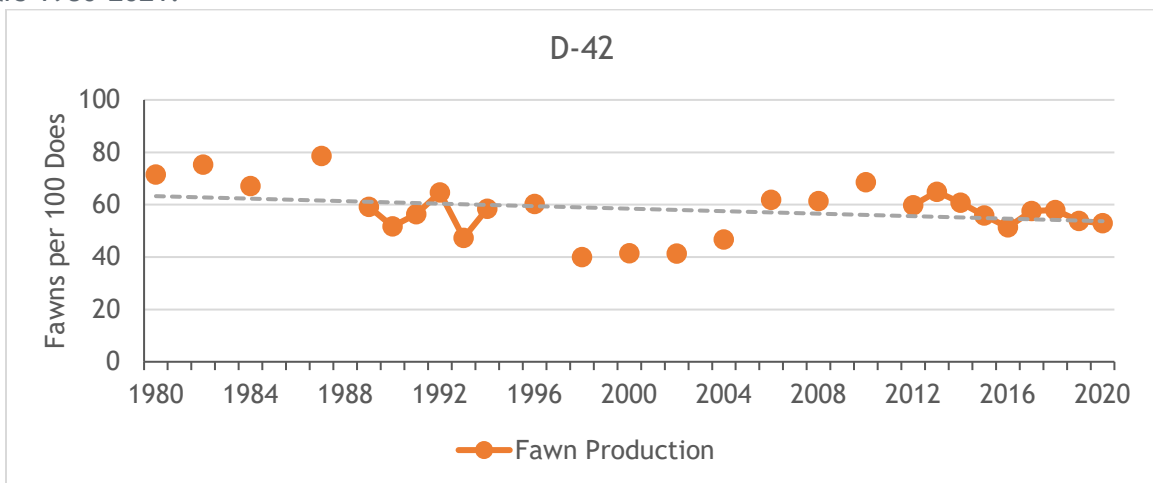


Figure D42-3. Deer DAU D-42 fawn production (observed post-hunt fawns:100 does, years 1980-2021)

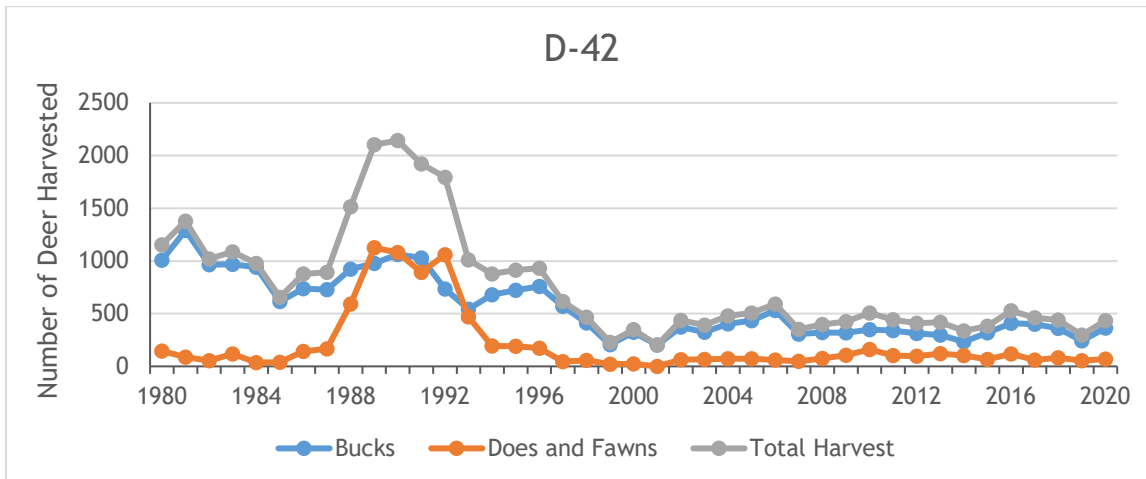


Figure D42-4. Deer harvest estimates in D-42, years 1980-2021.

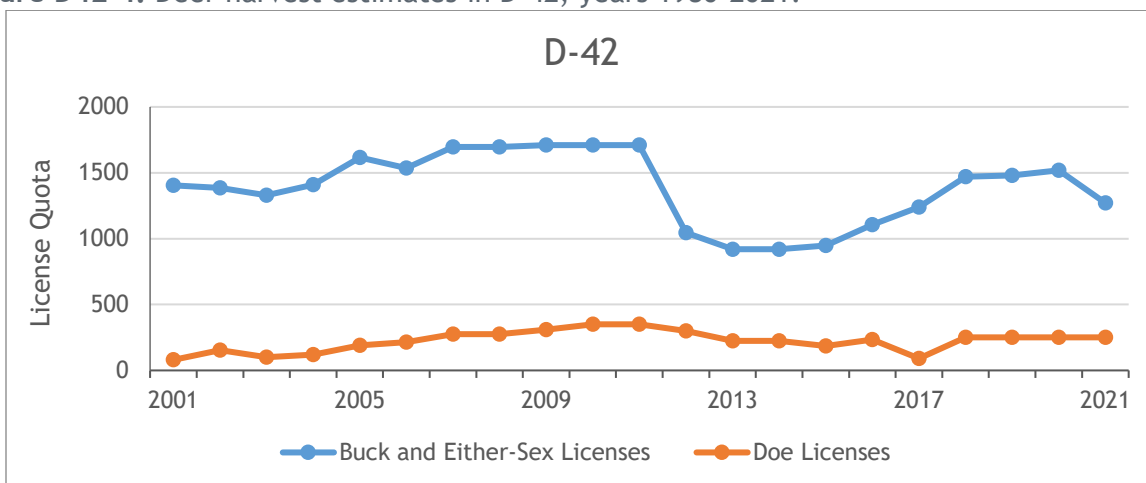


Figure D42-5. Deer License Quotas in D-42, years 2001-2021.

Background Information

The Rifle Creek deer DAU is located in west central Colorado and falls almost entirely within Garfield County except for a very small area within Rio Blanco County. D-42 consists entirely of Game Management Unit (GMU) 33. Approximately 74% of D-42 is public; 29% is managed by the Bureau of Land Management (BLM), and 45% is managed by the US Forest Service. State and federal agencies each own around 1% of D-42. Approximately 25% of the DAU is privately owned. Livestock grazing is an important land use on public and private lands, while hay and alfalfa are grown on private lands at lower elevations.

Mule deer occupy the entire DAU, migrating from low-elevation winter ranges to high-elevation summer ranges in response to available forage and snow conditions. Small resident herds live year-round at low elevations south of the hogback, relying on agricultural and low-density residential developments for forage.

The deer population in D-42 has been stagnant for nearly two decades (Figure 1). Buck: doe ratios in D-42 increased slowly between 1981 and 2015, and were generally within or near the sex ratio objective range of 30 - 35 bucks: 100 does until the last two years (Figure 2). This unit has been managed for older age-class and quality buck harvest since 1999.

Significant Issues

Significant issues facing this deer herd include, disease, degraded habitats due to drought and over-utilization, recreational disturbance, residential development, long-term low fawn:doe ratios, and population stagnation.

Increases in residential development and recreational activities in the area leaves few areas free from human disturbance. Much of the winter range on private lands in D-42 has been converted from agriculture to increasingly dense residential developments. Since only 29% of the DAU is privately owned, the actual footprint of the residential development is relatively small. However, much of that area is in traditionally important winter range and the loss is both direct and cumulative. The entirety of D-42 receives some form of recreation pressure at some point during the year. The area is attracting more and more users to the hiking, mountain biking and camping opportunities in D-42, causing higher degrees of disturbance to wildlife.

Drought plays a role in the amount quality habitat and water available to mule deer in D-42. While this area has regularly seen periods of drought, in recent years, the area has seen more severe drought conditions. The habitat is fragmented and degraded throughout much of the herd's important ranges.

Mandatory testing in 2017 estimated the chronic wasting disease (CWD) prevalence at 10% in adult male deer, which is above the threshold to trigger management actions to reduce the prevalence. Stakeholders are concerned about the long-term effects of the disease on this herd.

Stakeholder Outreach and Input

From August 6 to September 5, 2021 over 2,000 resident and non-resident hunters from the last three years in D-41 and landowners in this area were invited through email to provide perspectives on hunting, disease and management of the Rifle Creek deer herd through an online public survey. The survey was also announced and posted on the CPW website for anyone to participate in. 316 individuals responded to the survey.

In consideration of public interests and staff knowledge of the mule deer herd and management issues, a preferred alternative was identified and a draft plan was posted for public comment for 30 days. In addition, the plan was submitted to local BLM and USFS offices, as well as being presented to Garfield County Commissioners and local Habitat Partnership Program (HPP) committee.

The comments received addressed a number of concerns about the management of D-42, the management of deer in Colorado and other issues facing deer across the state. There was some support for the preferred alternatives as well as some concern about reducing the objectives for this herd and other deer herds across the state. These stakeholders would like to see status quo maintained. The issues that were mentioned in these comments as concerns include migration corridor loss to development, reintroduction of wolves to the state, other predation impacts, current habitat conditions, chronic wasting disease, and increasing human disturbance.

Management Alternatives

The preferred alternatives of 6,200 to 8,200 deer and 25- 32 bucks:100 does (in bold below) were approved by the commission in May of 2022. We are not seeking to update herd management for D-42 in this year's plan, just to extend the plan objectives.

2021 CPW Commission Approved Objectives:

Post-hunt Population

6,200 - 8,200 deer

The population for the D-42 herd has been largely stable since 2006 at an average population estimate of 7,194 deer. With the current amount of usable deer habitat throughout the DAU, the high prevalence of chronic wasting disease, and the pressures of recreation and other land uses, this alternative population objective range is more indicative of the amount of deer the land can currently sustain. This objective range was not a reduction of the deer population, but rather a management of the population at the level it has been stable at for the last 20 or so years. The current population estimate is at the lower end of this range.

Post-hunt buck ratio

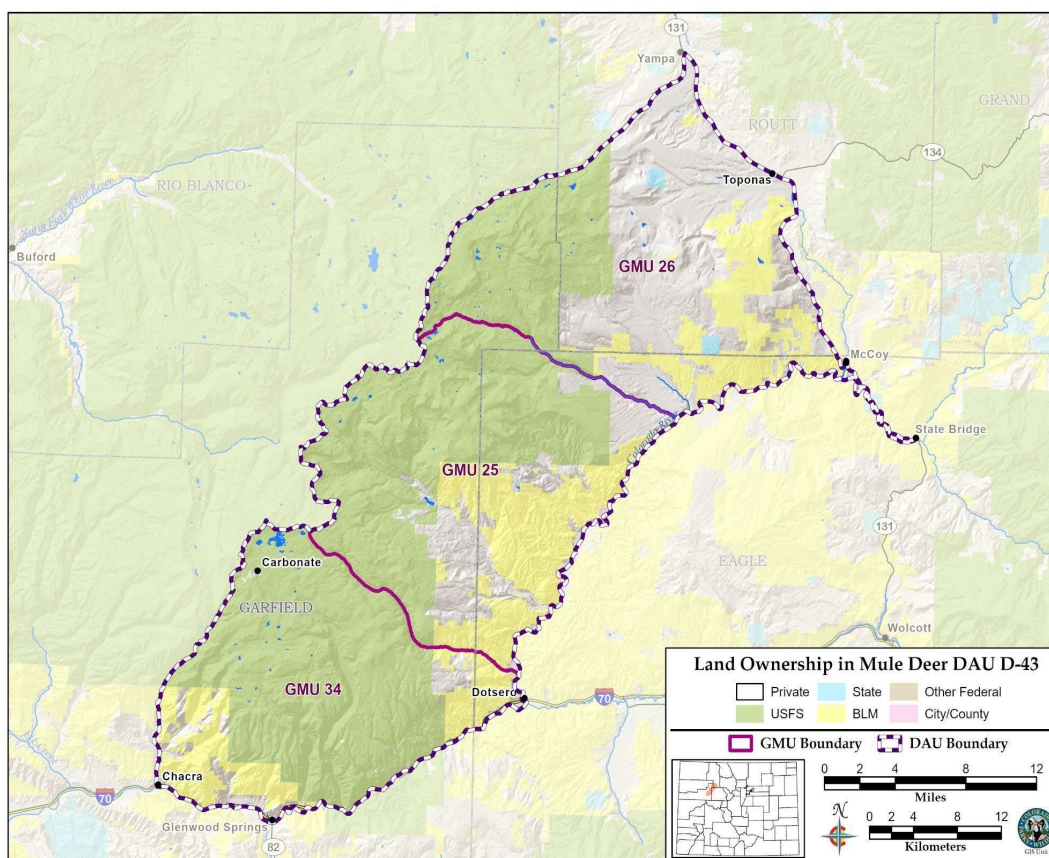
25 - 32 bucks: 100 does

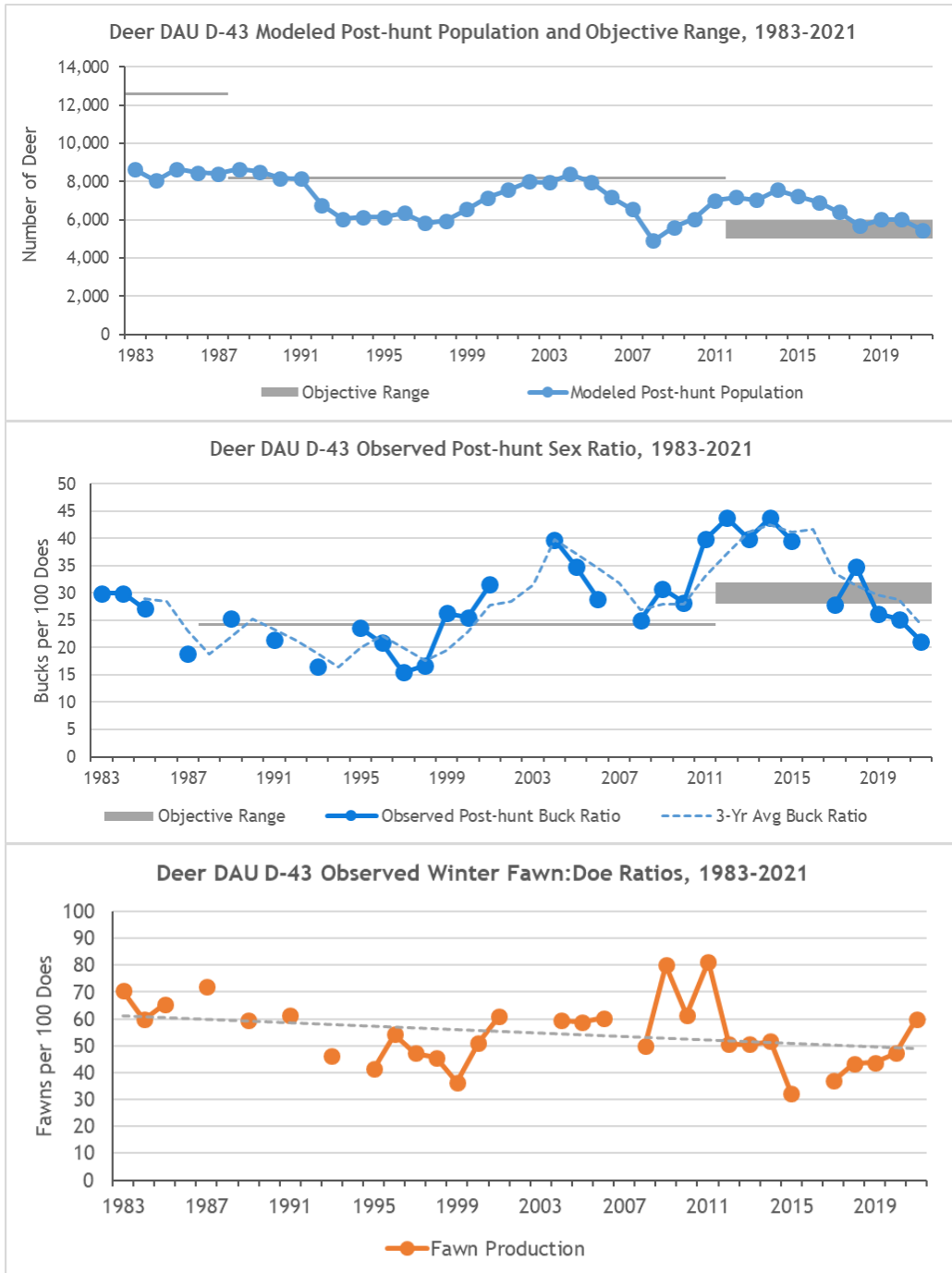
As of 2021, the post-hunt observed 3-year average sex ratio was 24.5 bucks per 100 does. Most stakeholders would like to see CPW strike a balance between reducing CWD prevalence and maintaining mature buck harvest in this DAU. The sex ratio objective range of 25 - 32 bucks: 100 does attempts widens the sex ratio for CPW to make adjustments as prevalence of the disease fluctuates over time. This objective range gives CPW the flexibility to manage at the lower end of the range when CWD prevalence is high and manage at the higher end of the range when CWD prevalence is low.

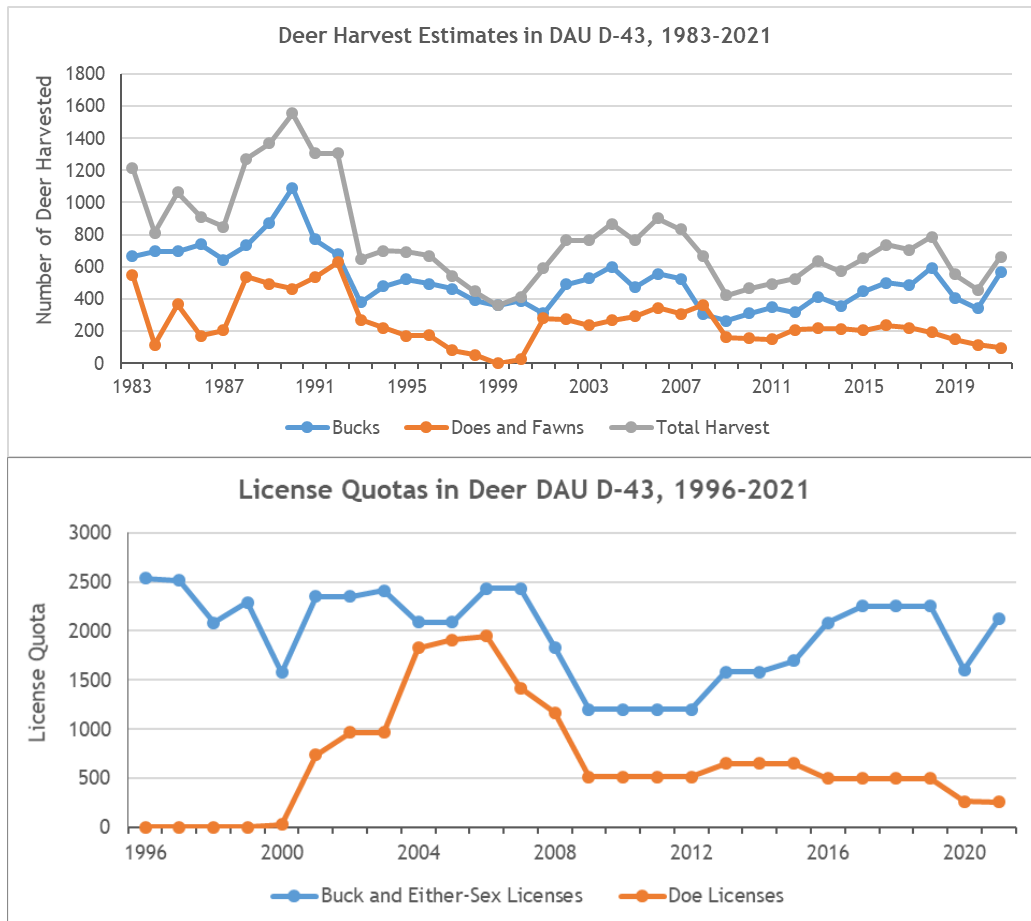
SWEETWATER CREEK MULE DEER HERD MANAGEMENT PLAN DATA ANALYSIS UNIT D-43

Julie Mao, Wildlife Biologist, Glenwood Springs

Sweetwater Creek Deer Herd (DAU D-43)		GMUs: 25, 26, 34
Post-hunt population:		
Current (2011 plan) Population Objective:	5,000-6,000 deer	
Post-hunt 2021 Population Estimate:	5,464 deer	
Proposed New Population Objective	4,000-6,000 deer	
Post-hunt Sex Ratio (Bucks:100 Does):		
Current (2011 plan) Sex Ratio Objective:	28-32 bucks per 100 does	
Most Recent 3-year Average of Observed Sex Ratio:	24 bucks per 100 does	
Proposed New Sex Ratio Objective:	18-25 bucks per 100 does	







Background

The Sweetwater Creek mule deer DAU D-43 in northwest Colorado consists of Game Management Units (GMUs) 25, 26, and 34, and is located in Garfield, Eagle, and Routt counties. The DAU extends from the southeast portion of the Flat Tops Wilderness Area to the Colorado River. Glenwood Springs is the major town in the DAU. Some of the smaller towns within and adjacent to the DAU include Dotsero, Burns, McCoy, and Toponas. Public lands comprise 74% of the lands in the DAU.

In the 2011 herd management plan, CPW lowered D-43’s population objective to account for the changing landscape and set an objective range of 5,000-6,000 deer. Over the past 10 years of managing for this population objective, the population has varied both above and within the objective range. In the past 4-5 years, the population has declined within objective and some years the population estimate has come close to even dropping below objective. D-43’s most recent population estimate in 2021 was 5,464 deer, which is within the current objective range. However, considering longer term trends, the current objective range is too narrow to capture both the natural fluctuations in population size as well as the negative population effects of chronic wasting disease (CWD).

The herd’s sex ratio objective was set in the 2011 DAU plan at a range of 28-32 bucks:100 does. Due to conservative buck harvest for several years following the severe winter of 2008,

the sex ratio climbed quickly to 40-45 bucks per 100 does from the period 2011-2015. As buck and either-sex license quotas were ratcheted upward since 2013, the sex ratio has dropped within and then below the objective range. The current 3-year (2019-2021) average is 24 bucks:100 does. Because of high CWD prevalence (discussed further below) in the DAU, since 2021 we have intentionally managed below the current sex ratio objective.

Buck and either-sex license quotas were increased incrementally from 2013-2107 and held steady through 2019. As the sex ratio and hunter success rates declined in 2019, buck and either-sex license quotas were cut in 2020. However, with the discovery in the 2020 mandatory CWD testing for the unit that the CWD prevalence rate in bucks was very high at 14%, we raised buck and either-sex license quotas back up to the 2017-2019 levels in order to manage the sex ratio downward to reduce the CWD rate. D-43 will be a mandatory CWD test unit again in 2022. Doe license quotas were maintained at a fairly stable level throughout most of the past 10 years with some minor adjustments to maintain the population within objective range.

Significant Issues

Chronic wasting disease is currently the major management issue for the D-43 herd. Although CWD was known to occur in the unit, it was not until the mandatory CWD testing in 2020 that the current high prevalence rate of 14% was discovered. The adjacent DAU D-7 had a similarly high rate of 15% and there is likely movement and interaction of deer between the two DAUs in the Flattop Mountains. CWD prevalence rates of >5% can lead to rapid spread of the disease within a herd and will have population-level impacts through higher mortality of adult deer and a decline in the age structure of a population. The high CWD rate may in part explain why the population declined since 2015 despite little change in doe license quotas and even reductions in doe licenses and harvest in recent years.

The primary land use change in the DAU is the acquisition of Sweetwater Lake by Eagle Valley Land Trust from a private landowner and its establishment in 2022 as a State Park managed jointly by USFS and CPW. On the one hand, the conversion of the property from private to public land may have averted the development of the parcel into a private commercial/residential resort. However, on the other hand, recreation activity on the lake and on surrounding USFS lands is expected to increase significantly with its status and publicity as a State Park. CPW, USFS, and the public need to be cognizant of the potential detrimental effects of increased recreation on habitat quality and loss of areas of solitude for wildlife. Often as recreation activity increases and people feel crowded by fellow recreationists, there is a “shifting baseline syndrome” of creating more trails and more access to accommodate growing demand for recreation opportunities. However, this would come at a long-term and likely irreversible cost to mule deer and other wildlife, as has happened elsewhere in Colorado.

Another potential land use change in D-43 is conversion and subdivision of the large ranches in GMU 26 and other smaller private parcels in GMU 25. Many of these ranches today are still operating livestock ranches that incidentally function as wildlife habitat, especially winter range for deer, elk, and other species. Continued economic viability for these ranches will be an important way to maintain these properties as habitat, rather than developing them into housing subdivisions and other non-habitat uses. If game damage occurs due to deer or elk occupying ranch lands and consuming excessive forage on private lands, CPW has mechanisms

through the Game Damage Program to compensate landowners and incentivize them to maintain their lands as habitat for both wildlife and livestock.

Finally, as elsewhere in Colorado and throughout the Western US, long-term fire suppression has led to over-mature shrubs and habitat succession such as pinon-juniper encroachment into sagebrush communities. Hotter summers, two decades of drought, and increased vehicle traffic and human activity are conditions that set up a situation ready for wildfires, such as the Grizzly Creek Fire of 2020 in GMU 34. Overall, wildfires are more of a benefit in the long run than a short-term hazard to wildlife and their habitat, but after decades of accumulation of dry fuel loads, wildfires today can burn hotter and more catastrophically for people and our infrastructure. Prescribed burns and mechanical treatments can however benefit wildlife habitat in a more planned and controlled way.

Management Objective Recommendations

CPW recommends a new population objective range of 4,000-6,000 deer. This objective widens the lower end of the current 2011 Plan objective of 5,000-6,000 deer. The current objective range is relatively narrow compared to the more recent objectives for neighboring deer herds. Lowering the bottom end of the objective range provides more flexibility in managing a herd with high CWD rates. The population might decline on its own due to CWD-related mortalities and/or we might need to intentionally reduce deer population density for several years to drive the CWD rate below 5%. Assuming that the CWD rate can be reduced through harvest management, the population could also remain or grow back to the mid/upper end of the population objective range.

CPW recommends lowering the sex ratio objective to 18-25 bucks:100 does primarily to manage CWD rates downward. This proposed objective range is the same as neighboring deer DAU D-7's. CWD in deer is twice as prevalent in bucks than does, and is also higher in prevalence in older versus younger bucks. Reducing the sex ratio by harvesting more bucks will help to reduce the CWD rate. Harvesting older bucks, who tend to be more vulnerable to harvest in the later rifle seasons during the rut, will also help with CWD management. Geographic hotspots of CWD, if identified, should also be targeted for increased buck harvest. Based on the initial 2020 mandatory CWD testing, all of the positive samples came from GMUs 25 and 26; however, lack of detection in GMU 34 could have been due to a small sample size. Because buck and either-sex license quotas were increased already in 2021, back up to the previous 2017-2019 levels, and the current 3-year average sex ratio has declined to 24 bucks per 100 does, there will likely be no need for any further increases in licenses. Doe licenses likewise will likely remain similar. Depending on the results from the 2022 mandatory CWD testing, we will adjust licenses accordingly to adapt to CWD management needs within the context of the new objectives.

Stakeholder Outreach and Input

These proposed objectives have been presented at a general public meeting held in Glenwood Springs, as well as to the Lower Colorado River Habitat Partnership Program, Eagle County, and Garfield County commissioners.

Strategies to Address Issues and Management Concerns and to Achieve Herd Management Objectives

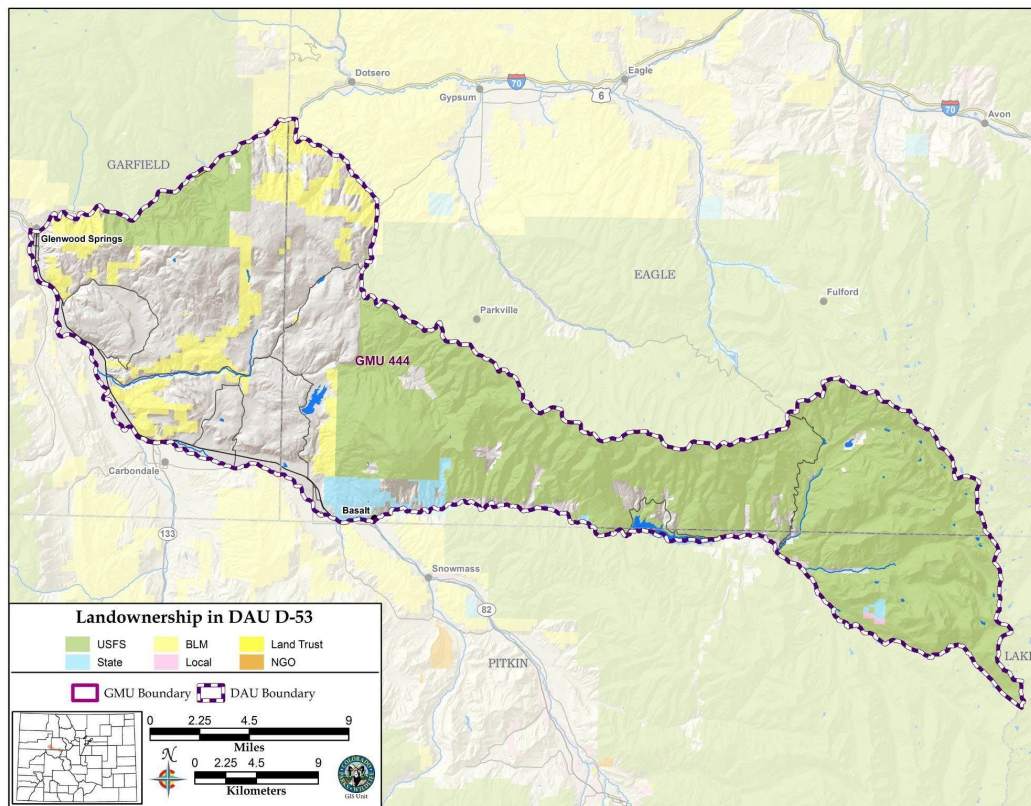
CPW will continue to work collaboratively with our partners in the federal land management agencies, private landowners, county governments, local municipalities and NGOs to protect and enhance the remaining mule deer habitat. Important habitat conservation methods include habitat treatments, conservation easements or land acquisitions, maintaining landscape connectivity and movement corridors, and adhering to seasonal recreation closures on winter range areas.

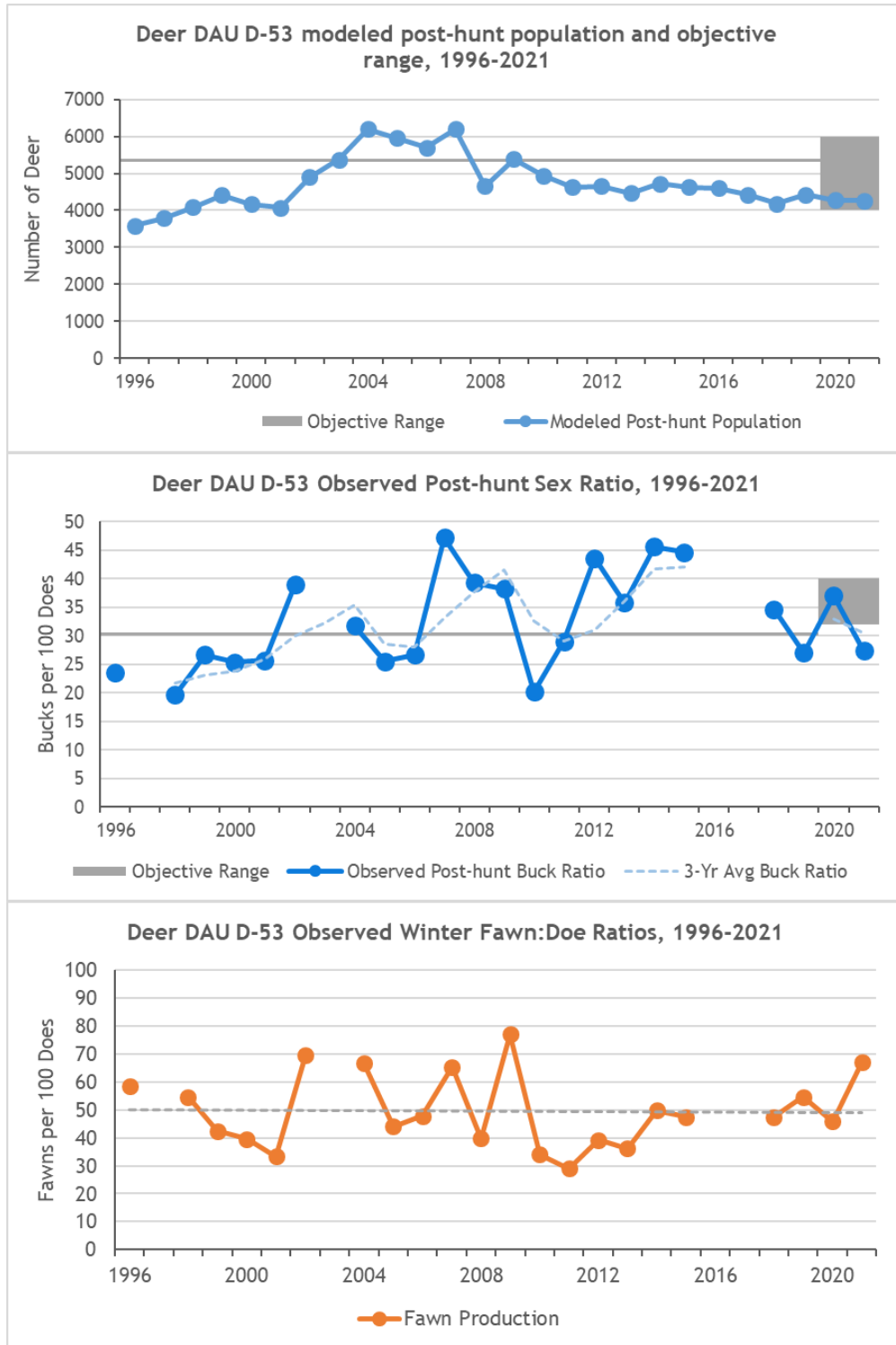
To achieve the updated population objective and to maintain the current sex ratio objective, CPW will continue to set licenses annually to both provide hunting opportunities and to manage for low CWD rates. CWD prevalence will continue to be monitored through periodic mandatory testing and through voluntary sample submissions.

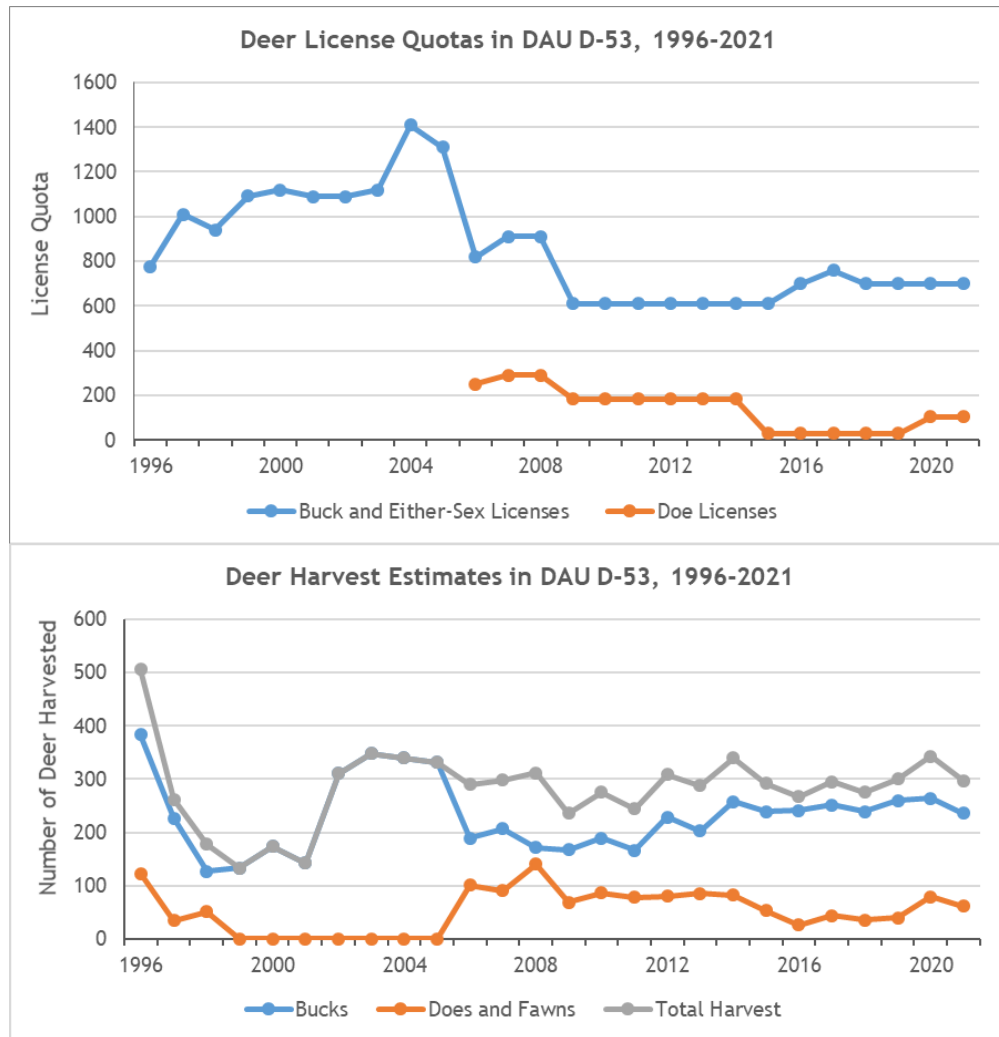
BASALT MULE DEER HERD MANAGEMENT PLAN DATA ANALYSIS UNIT D-53

Julie Mao, Wildlife Biologist, Glenwood Springs

Basalt Deer Herd (DAU D-53)	GMU: 444
Approval Year for last HMP: 2020	
Post-hunt population:	
Current (2020 plan) Population Objective:	4,000-6,000 deer
Post-hunt 2021 Population Estimate:	4,262 deer
Extension Population Objective	<u>No change, 4,000-6,000 deer</u>
Post-hunt Sex Ratio (Bucks:100 Does):	
Current (2020 plan) Sex Ratio Objective:	32-40 bucks per 100 does
Most Recent 3-year Average of Observed Sex Ratio:	31 bucks per 100 does
Extension Sex Ratio Objective:	<u>No change, 32-40 bucks per 100 does</u>







Background

The Basalt mule deer Data Analysis Unit (DAU) D-53 is located in Pitkin, Eagle, and Garfield Counties within northwest Colorado and consists of Game Management Unit (GMU) 444. The unit covers 960 km² (371 mi²), 65% of which are public lands. D-53 is bounded roughly in the area between the Fryingpan River, Roaring Fork River, Colorado River, the top of Red Table Mountain, and the ridgeline of the Sawatch Range. Major towns within and adjacent to the unit include Basalt, El Jebel, Carbondale, Glenwood Springs, as well as the smaller communities of Meredith and Thomasville.

The objectives for this herd were revised recently in the [2020 D-53 herd management plan](#), which set an updated population objective range of 4,000-6,000 deer and a sex ratio objective of 32-40 bucks:100 does. The 2021 post-hunt population estimate was 4,262 deer, within the population objective range. The most recent 3-year (2019-2021) average is 31 bucks per 100 does, just slightly below the sex ratio objective range.

Significant Issues

The major issues for this deer herd involve the cumulative effects of decades of human population growth and impacts of human activities on deer habitat in the Roaring Fork Valley. The result has been a loss of habitat quantity and quality and less solitude from human disturbance. The unit's carrying capacity for mule deer has declined compared to conditions in past decades when the previous objectives were set over 2 decades ago. Significant issues include habitat loss and fragmentation from land development, declining habitat condition, and impacts of human recreation on deer. CWD prevalence in this herd is not well characterized due to low sample size. One CWD-positive deer has been detected, a buck that was culled and tested due to observable symptoms. So far, no CWD-positive deer have been detected among the mandatory checks of harvested deer.

Management Objective Recommendations

CPW recommends maintaining the recently updated objectives for D-53 that were set in the [2020 herd management plan](#). The population objective of 4,000-6,000 deer provides the most flexibility in population management relative to the herd's current status. Within this objective range, the herd could either remain stable or be allowed to increase if habitat conditions, land use changes and/or weather conditions are favorable for population growth. The sex ratio objective range of 32-40 bucks:100 does balances the hunting public's desire for quality bucks while still maintaining enough buck licenses to provide hunting opportunities every year or few years. Because of limited public lands in the western one-third of the unit, managing lower than this sex ratio objective range would likely increase hunter crowding and private land trespass issues to undesirable levels. With minimal documented CWD in this unit so far, a slightly higher sex ratio can be sustained; but if the CWD prevalence rate reaches 5% or higher, then a revision of the sex ratio objective may be needed to adjust the sex ratio downward.

Stakeholder Outreach and Input

In 2017 and 2018, CPW conducted public outreach to D-53 license holders and applicants, held a general public meeting, solicited public comments through online questionnaires, presented to the Eagle, Garfield, and Pitkin Boards of County Commissioners and the Lower Colorado Habitat Partnership Program, and requested comments from BLM and USFS. Most hunters ranked "spending time in nature" and "spending time with family/friends" as the most important reasons to hunt deer in D-53, while "contributing to wildlife management of deer" and "obtaining a trophy buck" were not as important for most D-53 hunters. For more details on public comments, see Appendices B-D of the [2020 D-53 herd management plan](#).

Strategies to Address Issues and Management Concerns and to Achieve Herd Management Objectives

CPW will continue to work collaboratively with our partners in the federal land management agencies, private landowners, county governments, local municipalities and NGOs to protect and enhance the remaining mule deer habitat. Important habitat conservation methods include habitat treatments, conservation easements or land acquisitions, maintaining landscape connectivity and movement corridors, and adhering to seasonal recreation closures on winter range areas.

To achieve the objectives of a population size of 4,000-6,000 deer and a sex ratio of 32-40 bucks per 100 does over the next 10 years, CPW will continue to set licenses annually, keeping in mind such issues as providing sufficient hunting opportunity for both buck and doe harvest, and sustaining a stable, if not growing, deer herd.

Literature Cited

Baur, Lauren, M. D. Smith, K. A. Schoenecker, P. Meiman, 2016. Effects of Feral Horse Herds of Plant Communities Across a Precipitation Gradient. Colorado State University.

Boyd, C. S., K. W. Davies, and G. H. Collins. 2017. Impacts of Feral Horse Use on Herbaceous Riparian Vegetation Within a Sagebrush-Steppe Ecosystem. *Rangeland Ecology and Management* 70:411-417.

Colorado Parks and Wildlife. 2018. Chronic wasting disease response plan. Denver, Colorado, USA.

Danvir, R. E. 2018. Multiple-use management of western U.S. rangelands: Wild horses, wildlife, and livestock. *Human-Wildlife Interactions* 12:5-17.

Hall, L. K., R. T. Larsen, C. C. Westover, R. N. Knight, and B. R. McMillan. 2016. Influence of exotic horses on the use of water by communities of native wildlife in a semi-arid environment. *Journal of Arid Environments* 127:100-105.

Johnson, H. E., J. R. Sushinsky, A. Holland, E. J. Bergman, T. Balzer, J. Garner, and S. E. Reed. 2017. Increases in residential and energy development are associated with reductions in recruitment for a large ungulate. *Global Change Biology* 23:578-59.

Lendrum, P.E., Anderson, C.R., Monteith, K.L., Jenks, J. A., Bowyer, R. T. 2013. Migrating Mule Deer: Effects of Anthropogenically Altered Landscapes. *PLOS ONE*. 8(5) pp. 1-10.

Olson, R. 1992. Mule deer habitat requirements and management In Wyoming. Department of Renewable Resources, College of Agriculture, University of Wyoming, Laramie, USA.

Sawyer, H., Kauffman, M. J., Middleton, A. D., Morrison, T. A., Nielson, R. M., and Wyckoff, T. B. 2012. A framework for understanding semi-permeable barrier effects on migratory ungulates. *Journal of Applied Ecology*. pp. 1-11

Tollefson, T. N., L.A. Shipley, W. L. Myers, and N. Dasgupta. 2011. Forage quality's influence on mule deer fawns. *The Journal of Wildlife Management*, 75:919-928.