

BIG THOMPSON DEER HERD MANAGEMENT PLAN

DATA ANALYSIS UNIT D-10

GAME MANAGEMENT UNIT 20



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Background and Management Issues

The Big Thompson deer herd is located in southern Larimer and northern Boulder counties. The previous herd management plan was implemented in 2002 to focus on management of chronic wasting disease (CWD). However, the previous population and sex ratio objectives were not obtainable due to refuges from hunting created by hunting restrictions on city and county open space, private land and Rocky Mountain National Park. Refuges lead to high concentrations of deer, high buck: doe ratios and the establishment of resident herds. Refuges also complicate management of CWD by creating conditions favorable for high CWD prevalence (high buck: doe ratios). This herd consistently ranks high for CWD prevalence. Contrary to refuge areas, hunters complain about the lack of deer and difficulty of harvesting deer on public land open to hunting. Loss, degradation, and fragmentation of habitat due to human population growth and development remain major concerns. Development has occurred most extensively in the eastern two-thirds of the data analysis unit (DAU).

According to the public input process, the majority of respondents would like to see an increase in the size of the deer herd and to maintain or increase the proportion of males in the herd. Respondents would like to see the deer herd at levels similar to what was on the landscape prior to population reductions related to CWD management in the mid 2000s. In addition, people are concerned about habitat loss from development, revenue generated from deer-related tourism and deer-vehicle collisions. The majority of respondents stated that the opportunity to see large-antlered male deer was most important to their wildlife viewing experience, but the majority of respondents also supported male and population reductions to manage CWD.

Post-hunt Population Objective Alternatives

Alternative 1: 7,000 - 9,000

Alternative 2: 8,000 - 10,000 - Selected

This alternative will result in intermediate levels of hunting, harvest, viewing opportunity and human-deer conflicts relative to the other population objective alternatives. This alternative will result in fewer licenses available in the short-term, but once the population objective range is achieved, more licenses will be available in the long-term. This alternative is preferred because the public input process clearly indicated a public desire to increase the size of the herd. This alternative will increase hunting, harvest and viewing opportunities.

Alternative 3: 9,000 - 11,000

Post-hunt Herd Composition Objective Alternatives

The observed and modeled sex ratio estimates will both be considered in managing for the sex ratio objective.

Alternative 1: 20 - 25 bucks: 100 does

Alternative 2: 25 - 30 bucks: 100 does, with 10% CWD prevalence trigger - Selected

This alternative will result in intermediate levels of male hunting opportunity, male harvest success, viewing opportunity and number of males on the landscape. This alternative is preferred because it provides a balance between public desire for more bucks in the herd, with the goal of reducing or stabilizing CWD prevalence in the herd. If CWD prevalence exceeds triggers specified in the Colorado Chronic Wasting Disease Response Plan, appropriate adaptive management actions listed in that plan will be implemented. In addition, if CWD prevalence is $\geq 10\%$ in adult males, the sex ratio will be managed to lower end of the herd composition range at 25 bucks: 100 does. If CWD prevalence is $< 10\%$ in adult males, the sex ratio will be managed to 30 bucks: 100 does.

Alternative 3: 30 - 35 bucks: 100 does

Strategies to Achieve Objectives

Population

Initially, antlerless licenses will be reduced to move the population within the objective range. Once the population objective is achieved and to maintain the population within the objective range, doe harvest will be adjusted as needed; this will be accomplished through allocation of antlerless licenses in 2nd, 3rd, 4th and private-land-only seasons. Municipalities with large open space tracts will continue to be encouraged to include active management of deer in their plans.

Herd Composition

To achieve the herd composition objective range, buck harvest will be increased in those areas with high deer densities and high buck: doe ratios. This will be accomplished primarily through collaboration with open space programs to obtain the necessary harvest of buck deer. Ultimately, this will be accomplished through allocation of buck licenses in the rifle and private-land-only seasons.

This herd management plan was approved by the Colorado Parks and Wildlife Commission on 16 November 2018.

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INTRODUCTION AND PURPOSE

Colorado Parks and Wildlife (CPW) manages wildlife for the use, benefit and enjoyment of the people of the state in accordance with 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 public demands and growing human impacts. To manage big game populations, CPW uses a "Management by Objective" approach (Figure 1).

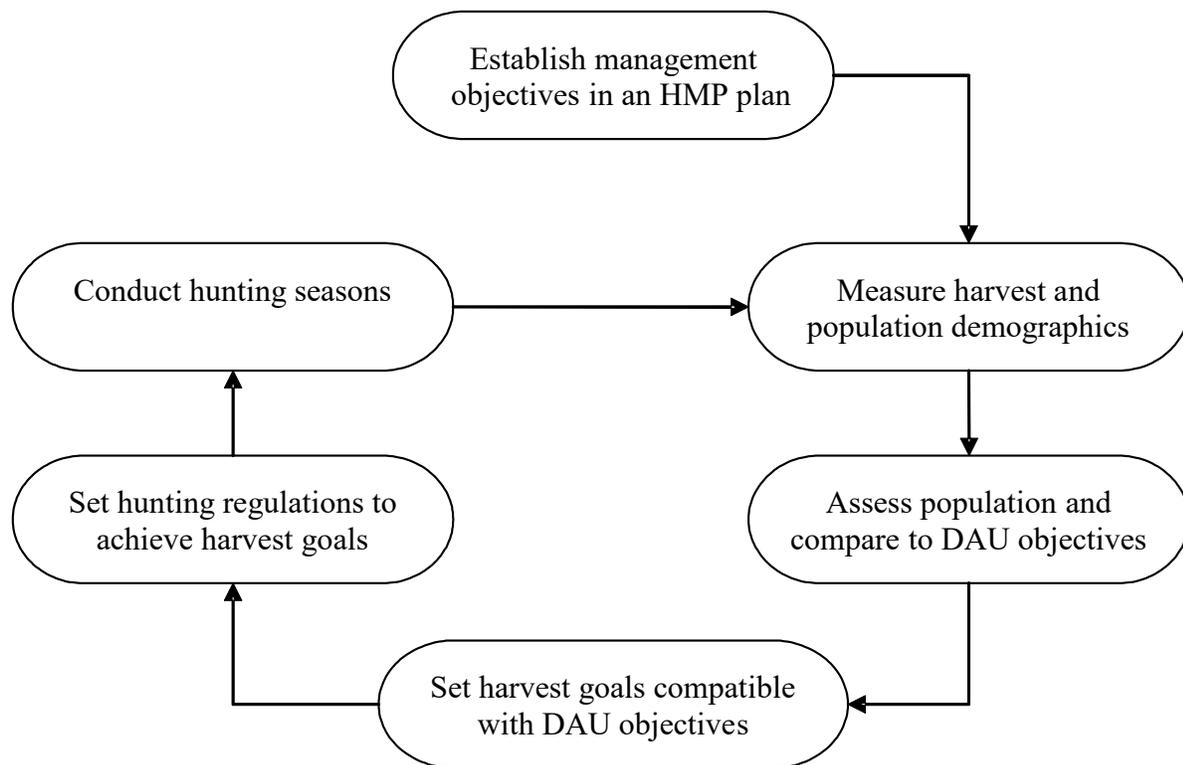


Figure 1: Management by Objective process used by Colorado Parks and Wildlife to manage big game populations by Data Analysis Unit (DAU).

Using this approach, big game populations are managed to achieve herd objectives established for a Data Analysis Unit (DAU). A DAU is the geographic area which encompasses the majority of the year-round range of a herd. The majority of individuals in a particular herd are born, live, and then die within their respective DAU. The boundary of a DAU attempts to delineate the seasonal ranges of a specific herd, while minimizing interchange of adjacent herds. Data Analysis Units may be divided into several game management units (GMUs) in order to distribute hunters and harvest within the herd DAU.

Management decisions within a DAU are based on the herd management plan (HMP; formerly DAU plans). Herd management plans identify issues, suitable habitat, limiting factors, conservation efforts, priority areas and provide herd management

history. The primary purpose of an HMP is to establish 1) a population size objective range, 2) a herd composition objective range (i.e., the sex ratio or the number of males per 100 females), and 3) other population performance metrics for the herd. There are many factors that are considered when selecting objectives for a particular DAU, including the social and biological carrying capacities of the area, population dynamics and the concept of sustained yield (Appendix A).

The selection of objectives drive important decisions in the big game season setting process, specifically, how many animals need to be harvested to maintain or move towards the objectives and what types of hunting seasons are required to achieve the harvest objective. The HMP describes the strategies and techniques that will be used to achieve the herd objectives. As such, the HMP is the basis for the annual herd management cycle. In this cycle, the size and composition of the herd is assessed and compared to the objectives defined in the HMP. Hunting seasons are then set and licenses are allocated to either maintain or move toward those objectives. Herd management plans are approved by the Parks and Wildlife Commission and are reviewed and updated approximately every 10 years.

During the herd management planning process, public input is solicited and collected by way of surveys, public meetings and comments to the Parks and Wildlife Commission in order to select the herd objectives. The capabilities of a herd are integrated with the concerns and ideas of various stakeholders including the United States Forest Service (USFS), the Bureau of Land Management (BLM), hunters, guides and outfitters, private landowners, local chambers of commerce and the general public. In preparing an HMP, CPW attempts to balance those biological capabilities of the herd and the habitat with the public's demand for wildlife-based recreation.

DESCRIPTION OF THE DATA ANALYSIS UNIT

Location

The Big Thompson deer herd, DAU D-10, consists of GMU 20 and is located in the north-central Front Range (Figure 2). D-10 encompasses southern Larimer and northern Boulder counties and is approximately 1,206 mi² (3,123 km²). The area is bounded on the north by Larimer County Roads 44H (Buckhorn), 27, 38E, 19, and Harmony Road; on the east by Interstate 25; on the south by Colorado Highway 52, U.S. Highway 287, Boulder County Road 34 (Niwot/Neva roads), U.S. Highway 36, Boulder County Roads 94, 81, 106, and 95 (Lefthand Canyon Drive), 102 (Brainard Lake Road), and the ridge line from Brainard Lake west to Pawnee Peak; on the west by the Continental Divide, Rocky Mountain National Park Boundary, and Pennock Creek-Elk Creek divide. The above has been the boundary of the herd management area since 1988. Prior to 1988, the DAU was approximately 340 mi² smaller. The eastern boundary was formerly U.S. Highway 287, which is 4 to 7 miles west of the current boundary. Prior to 1988, the southern boundary was U.S. Highway 66 to U.S. Highway 7 to U.S. Highway 72 to the middle St. Vrain Creek to the Continental Divide. This boundary was 5 to 8 miles north of the current boundary. The Big Thompson, Little

Thompson, and St. Vrain are major drainages. Municipalities include Berthoud, Estes Park, Fort Collins, Longmont, Loveland, and Lyons.

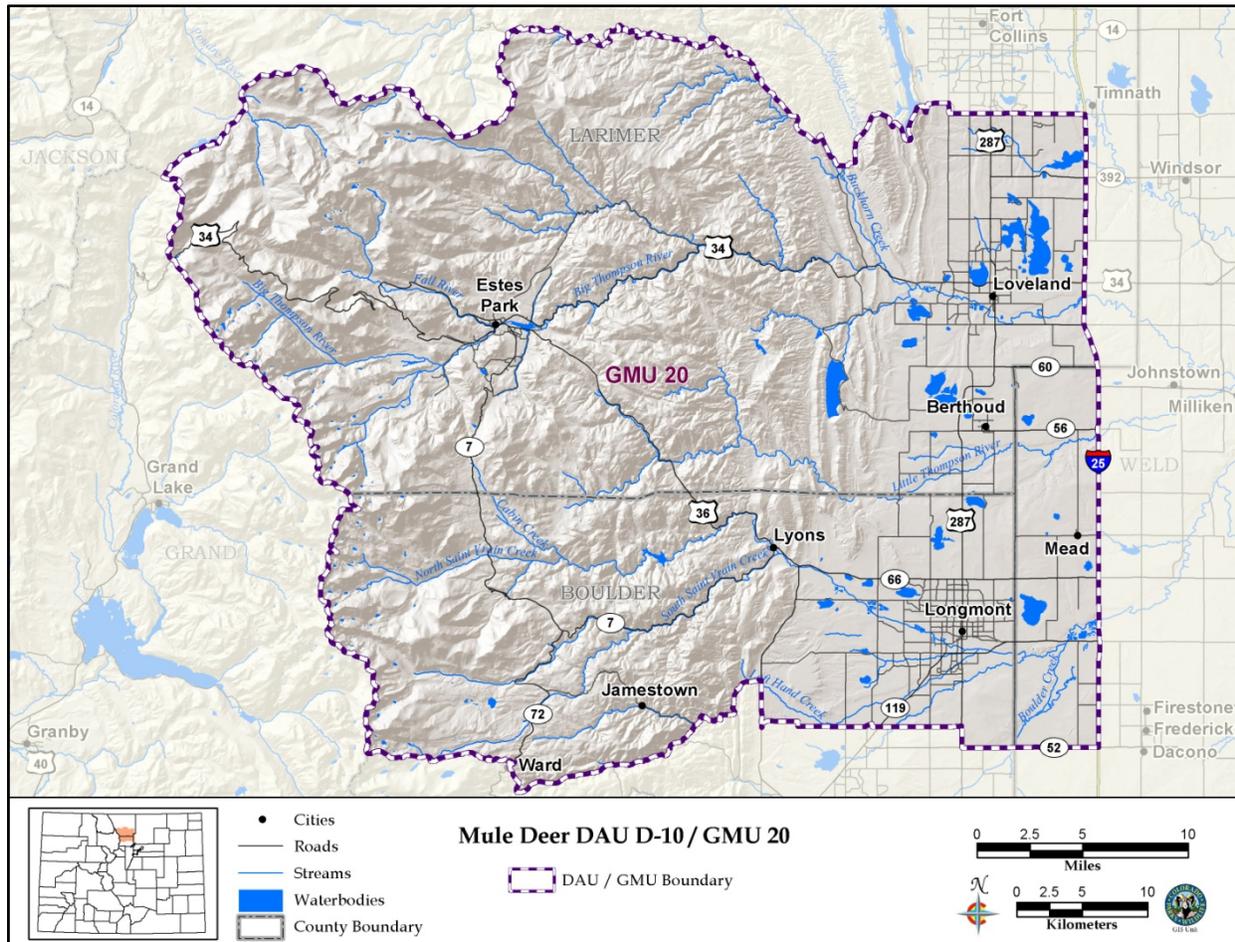


Figure 2: Geographic location of the Big Thompson Deer Herd, Data Analysis Unit (DAU) D-10, composed of Game Management Unit (GMU) 20.

Land Ownership

Land ownership is diverse (Figure 3 and Table 1). Private land and city and county open space are concentrated in the eastern half of the DAU, but occur throughout. A little less than one-half of the DAU is private land (44%). City and county open space (i.e., local) are approximately 8% of the DAU. Public land, open to hunting, occurs mostly in the central and south-west area of the DAU. The vast majority of the public land open to hunting is USFS (25%) managed by the Canyon Lakes and Boulder Ranger Districts of the Arapaho and Roosevelt National Forest. Portions of USFS Comanche Peaks and Indian Peaks Wilderness occur in the north-west and south-west areas of the DAU, respectively. Rocky Mountain National Park, managed by the National Park Service, is approximately 22% of the DAU. Colorado Parks and Wildlife manages very little of the land in area (<1%).

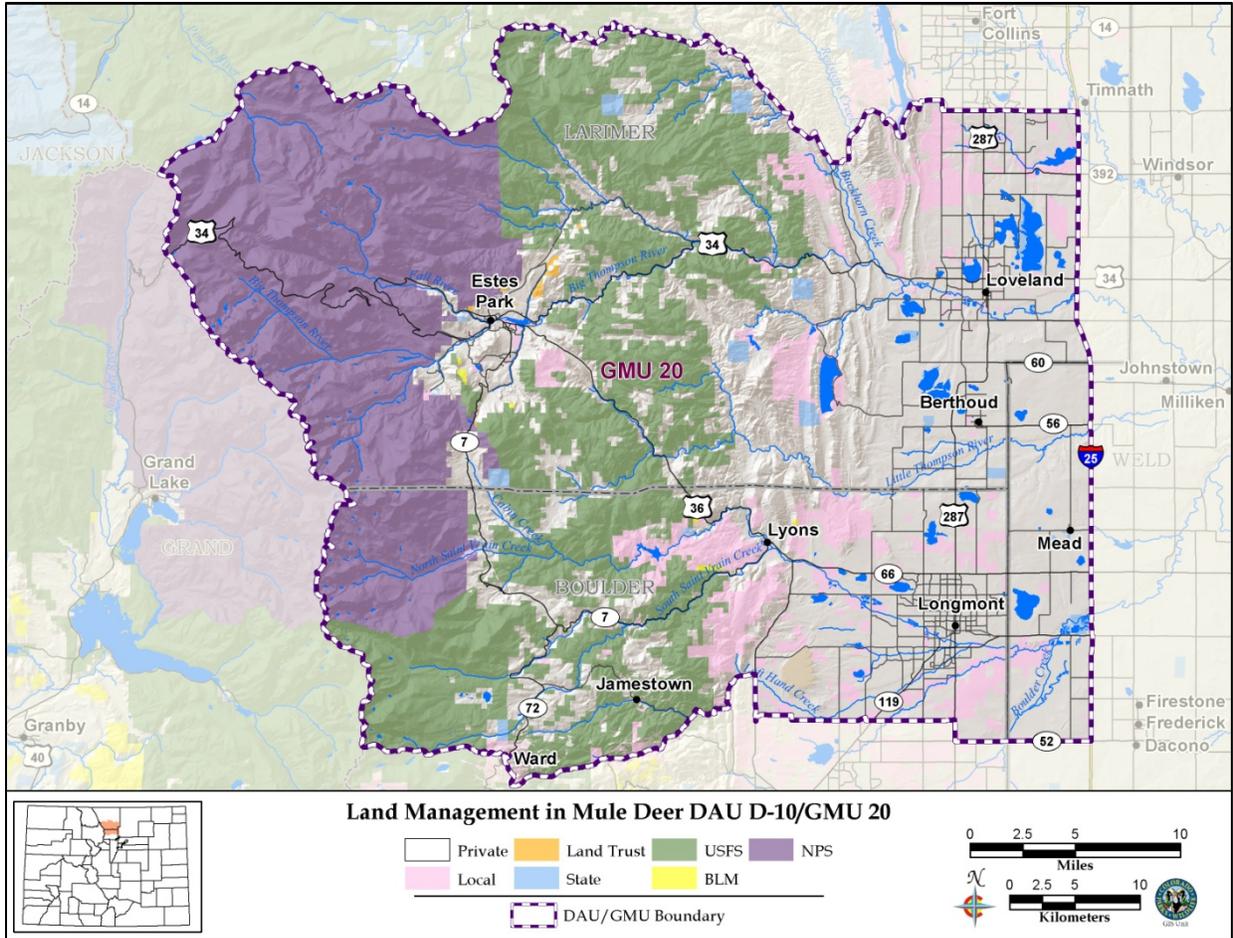


Figure 3: Land ownership within the Big Thompson Deer Herd, Data Analysis Unit (DAU) D-10, composed of Game Management Unit (GMU) 20.

Table 1: Land ownership within the Big Thompson Deer Herd, Data Analysis Unit (DAU), D-10. D-10 is composed of Game Management Unit (GMU) 20.

LAND OWNER	% of DAU	mi ²
Private	44	525
USFS	25	299
NPS	22	264
Local City and County	8	96
State Land Board	<1	9
Other Federal	<1	7
CPW	<1	<2
BLM	<1	<1
Other	<1	3

Land Use

Land use within D-10 is diverse including, but not limited to, industrial, commercial, residential and public land managed for multiple-use, wilderness and preservation. Human population growth and concurrent development, along with associated road

infrastructure, have resulted in substantial habitat loss, degradation, and fragmentation. Much of the private land has been, or has the potential to be, developed. Approximately 16% of the DAU is been developed (Simpson et al. 2013). This includes dryland and irrigated agriculture lands. According to the Colorado Department of Local Affairs (<http://www.colorado.gov/cs/Satellite/DOLA-Main/CBON/1251593300013>), the human population in Larimer and Boulder counties has increased from 380,168 in 1985 to 652,009 in 2015 (Figure 4). Development has occurred throughout the DAU, but most pervasively in the eastern area. Due to development, most areas east of the foothills no longer provide suitable big game habitat. Development continues to advance into the more mountainous areas in the west.

Outdoor recreation on public lands is extensive and omnipresent. Due to the proximity to the metropolitan Front Range, most lands open to public outdoor recreation are heavily used. The amount of outdoor recreation occurring, impacts habitat and its use by most wildlife species. The USFS lands provide hiking, horseback riding, hunting, fishing, biking, off-road vehicle use, camping, backpacking, skiing, and watchable wildlife opportunities. Outdoor recreation also occurs on private land.

Agriculture production also occurs in the DAU. Just over 13% of the DAU is in fallow, dryland, and irrigated croplands (Simpson et al. 2013). Agricultural operations in the plains include livestock and human food-crops and livestock production. The foothills and mountains include grass hay production and grazing on private lands up to ~8,000 ft. However, few large traditional ranching operations still exist. There are currently five cattle grazing allotments in the DAU, all managed by the Canyon Lakes Ranger District (Table 2). Limited timber harvest also occurs on private and public lands. Mining stone is an important industry. Real estate development and construction are also important industries.

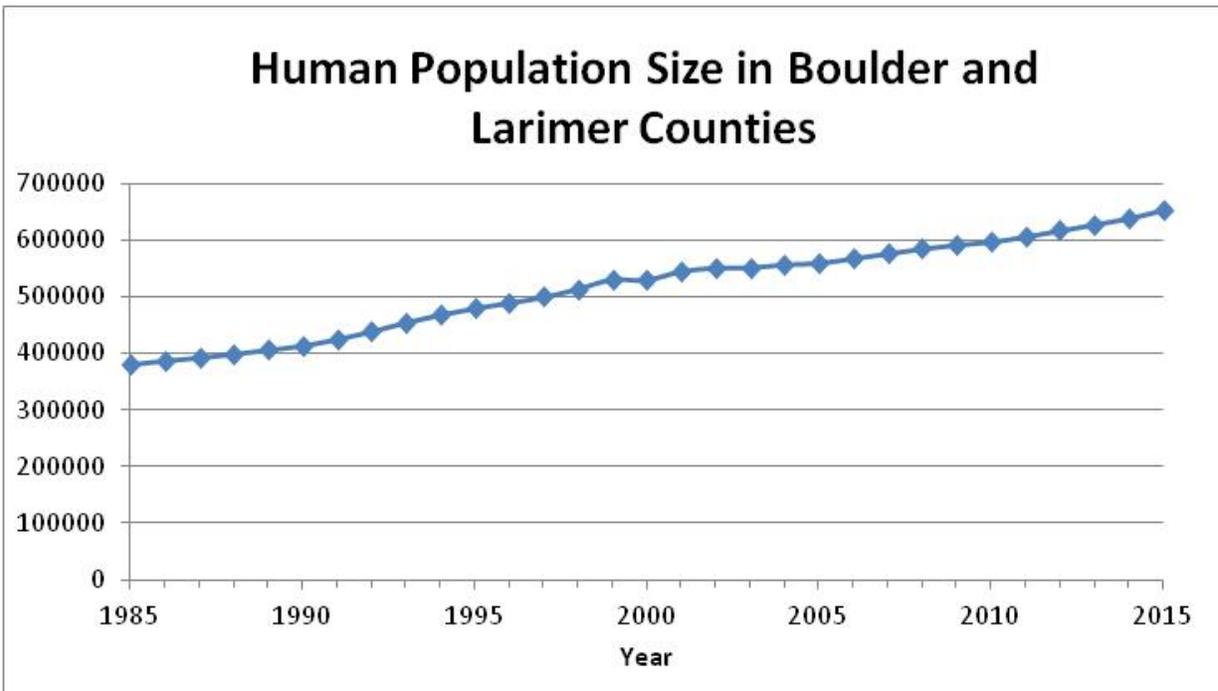


Figure 4: Human population estimates from 1985 to 2015 in Larimer and Boulder counties. Source, the Colorado Department of Local Affairs.

Table 2: Grazing allotments in the Big Thompson deer herd, Data Analysis Unit (DAU) D-10. D-10 is composed of Game Management Unit (GMU) 20.

Allotment	USFS Acres	% of Allotment Used	Type	Stocking Number	Duration (months)
Baldrige	7,652	100%	Cattle	25	4
Cedar Creek	4,884	63%	Cattle	35	2
Dunraven	2,119	48%	Cattle	24	4.8
Stone Mountain	1,554	36%	Cattle	5	3
Twin Sisters/Cabin Creek	9,062	90%	Cattle	36	2.7
Total	25,271				

Topography, Climate and Vegetation

Elevation in the DAU occurs along a gradient, ranging from over 14,000 feet in the west to approximately 5,000 feet in the east. Climate varies across the DAU as a function of elevation. Conditions in the eastern area are typical of the foothills/short-grass prairie interface, with relatively milder winters, lower snow accumulation, and hotter summers than in the western portions of the DAU. The higher elevation portions in the west experience a harsher climate, with colder winters, abundant snowfall and cool summers. Wind, in combination with mild and sunny conditions on southern and western aspects, maintain snow-free areas during much of the winter. Temperatures on deer winter range are comparatively mild and winter weather moderate. Snowfall events are usually followed by quick warming and snowmelt. Weather-related winter mortality is not thought to be as significant a mortality source, as in other deer herds of western Colorado.

Vegetation in the DAU is diverse, also depending on elevation, aspect and associated climate. Accordingly, classification of ecoregions by the Environmental Protection Agency (EPA) follows the elevation gradient (Chapman et al. 2006). The EPA classifies six different level IV ecoregions within the herd management area (Table 3). The western most ecoregion is the alpine zone, followed to the east by the subalpine forests, mid-elevation forests, foothill shrublands, Front Range fans and then the flat to rolling plains (Figure 5). The Front Range fans and flat to rolling plains ecoregions have mostly been lost as habitat to development.

Table 3: Total area (mi²) and percent of area in the Big Thompson deer herd, Data Analysis Unit (DAU) D-10, designated by level IV ecoregions according to the Environmental Protection Agency (EPA). D-10 is composed of Game Management Unit 20.

Level IV Ecoregion	mi ²	% of Total Area
Alpine Zone	131	11%
Crystalline Subalpine Forests	207	17%
Crystalline Mid-Elevation Forests	427	35%
Foothill Shrublands	95	8%
Front Range Fans	241	20%
Flat to Rolling Plains	105	9%

In the western most areas of the DAU, the alpine zone occurs at the highest elevations on high mountain peaks and basins. Grass/forb, coniferous, and barren cover types are the most frequent vegetation types in the alpine. High-altitude alpine tundra plant communities include grasses, forbs, sedges, shrubs, and willows, krummholz, meadow complexes, shrubby riparian corridors, rock, talus, scree, perennial snow fields, bare soil, and high elevation lakes. The alpine tundra contains rare plants and communities due to unique microclimates.

Just below the alpine and predominantly east, subalpine forests occur from timberline (~11,600 ft.) to ~9,000 ft. Spruce (*Picea sp.*)/fir (*Pseudotsuga menziesii*) stands interspersed with meadows dominate the higher subalpine areas up to timberline. Stands of limber (*Pinus flexilis*) and bristlecone pine (*Pinus arista*) also occur at higher elevations. Below this, lodgepole pine (*Pinus contorta*) stands mixed with aspen (*Populus tremuloides*) are dominant up to 10,500 ft. Aspen, Douglas-fir, lodgepole pine, and ponderosa pine (*Pinus ponderosa*) occur in mixed and single species stands at the lower elevations. The coniferous vegetation types are by far the most common followed by deciduous, grass/forbs, and mixed forest types. Lodgepole/spruce/Douglas-fir stands, Engelmann Spruce (*Picea engelmannii*)/fir, lodgepole pine, aspen, and ponderosa pine stands make up the majority of the forest. Riparian communities are found along streams, wetlands and irrigation channels from 11,600 to 5,000 ft. Riparian communities support the greatest diversity of plant and animal species. Willow (*Salix sp.*), chokecherries (*Prunus sp.*), alders (*Alnus sp.*), and cottonwoods (*Populus sp.*) are common species.

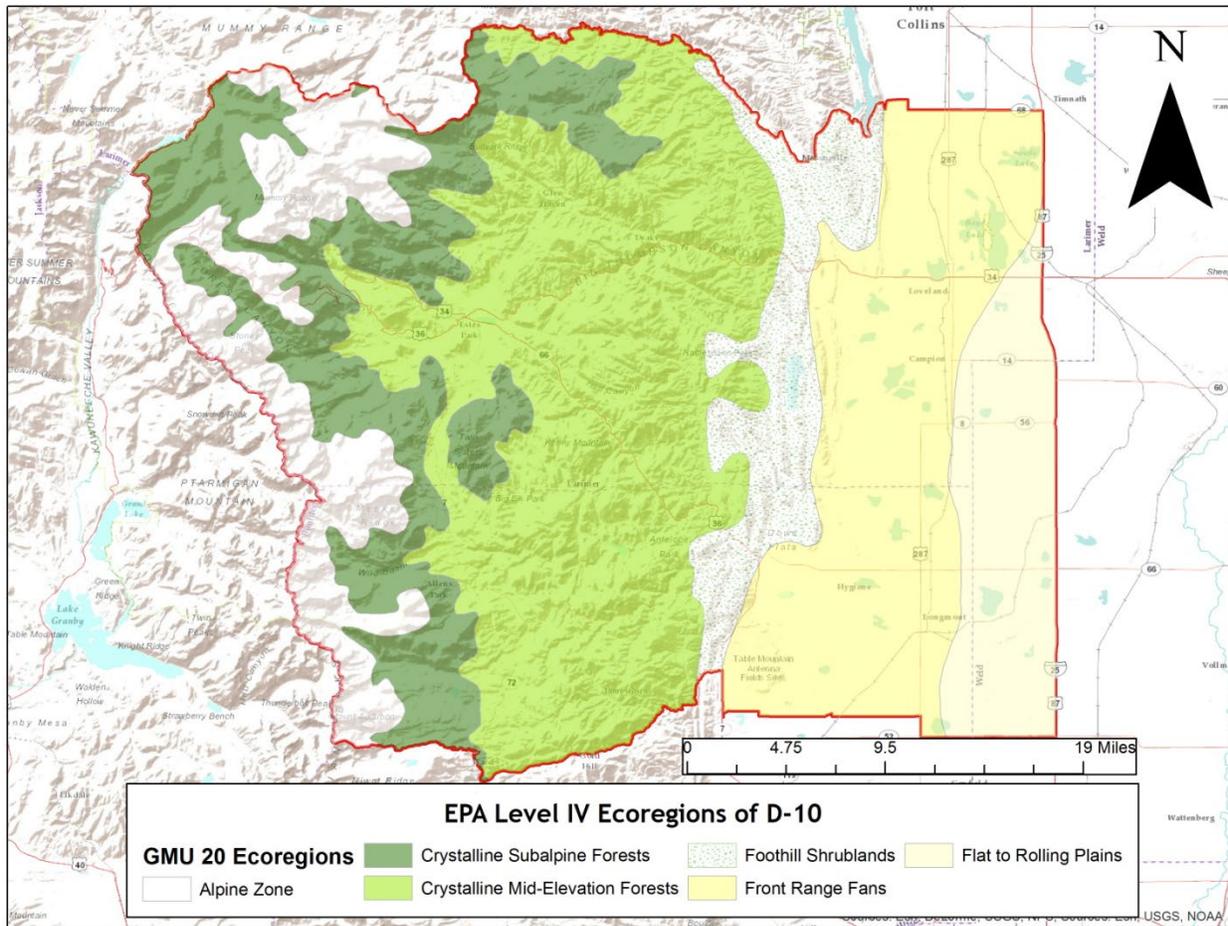


Figure 5: Environmental Protection Agency (EPA) level IV ecoregion designation within Data Analysis Unit (DAU) D-10. D-10 is composed of Game Management Unit (GMU) 20. Data compiled from Chapman et al. 2006.

East and lower in elevation (~9,000 ft. - ~6,000 ft.), montane mid-elevation forest occurs. Often Douglas-fir stands begin to occur in this zone and continue up to 9,000 feet. Ponderosa pine communities occur throughout and continue to elevations above 8,500 feet, with Douglas-fir occupying many north-facing slopes in the foothills. Both aspen and lodgepole pine appear as early colonizer species, inhabiting areas of disturbance. In this ecoregion, conifer stands are again the most common vegetation type, but grass/forb, shrub/scrub, and riparian vegetation become more common. Ponderosa pine, ponderosa pine/Douglas-fir, Douglas-fir, grassy meadows, lodgepole pine, grass/forb meadow complexes, and mixed coniferous/deciduous forests stands are common vegetation types. There are some agricultural fields, mainly pasture crops, found in suitable areas primarily below 9,000 ft. Noxious weeds are an issue in this ecoregion.

Further east and lower in elevation, foothill shrublands range from approximately 7,000 ft. up to 5,500 ft. In the foothill shrublands, forest transitions to grass/forbs and shrub/scrub rangelands moving east. Residential and commercial development also becomes more prevalent. Grass and grass/forb meadows, ponderosa pine/shrub,

and mixed shrublands communities are common. Common shrubs include mountain mahogany (*Cercocarpus sp.*), antelope bitterbrush (*Purshia tridentata*), snowberry (*Symphoricarpos sp.*), serviceberry (*Amelanchier sp.*), sagebrush (*Artemisia sp.*), currant (*Ribes sp.*), juniper (*Juniperus sp.*), and rabbitbrush (*Chrysothamnus sp.*). Wild plum (*Prunus Americana*), chokecherry (*Padus virginiana*) and currants (*Ribies sp.*) are present, although the localized diversity varies greatly. Noxious weeds are also a problem in this ecoregion.

In the eastern most area of the DAU, where the elevation is lowest (~5,500 ft. - ~5,000 ft.), the Front Range fans and flat to rolling plains ecoregions occur. Vegetation is composed of short-grass prairie shrubs and plants. Non-native grasslands, croplands and city and town development dominate much of the area, with areas of rabbitbrush and cacti. Cottonwoods, alders and willows inhabit riparian areas. Noxious weeds are again an issue in those ecoregions.

Deer Species

In most Colorado deer herds, mule deer and white-tailed deer are managed as if a single species. Population estimates, harvest estimates and licensing encompass the entire DAU, with no distinction between species. In the Big Thompson deer herd, mule deer are, by a large amount, the predominant *Odocoileus* species. However, historically, white-tailed deer have been observed occasionally in the DAU. Localized white-tailed deer herds occur most notably in the riparian areas at the foothills/plains interface and the periphery of urban areas. These small localized herds are currently not thought to be a substantial concern for hybridization or competition with mule deer. Any perceived white-tailed deer expansion will be evaluated. Because white-tailed deer are harvested in conjunction with mule deer on deer licenses, harvest pressure and habitat may act in combination to limit white-tailed deer range.

Habitat and Seasonal Range

Based upon observed and modeled population metrics (population size and recruitment), habitat conditions and prior harvest, it is likely that the Big Thompson deer herd is within the DAU's biological carrying capacity. No recent studies have been conducted, but based upon anecdotal observation of the DAU in its entirety, overutilization of important forage resources is not currently thought to be an issue. However, high utilization of forage resources in and around refuge areas and subdivisions is occurring in areas along the foothills.

With the exception of development in and around cities and towns, the entire DAU falls under the category of overall deer range (Figure 6). Overall deer range is defined as the area which encompasses all known seasonal activity areas within the observed range of a deer population. Snow and winter weather force deer east to winter range at lower elevations. Winter range is roughly 51% of the DAU. Winter range is defined as that part of the overall range of a species where 90% of the individuals are located during the average five out of ten winters from the first heavy snowfall to spring green-up, or during a site specific period of winter as defined for each DAU. Roughly 20% of the DAU is composed of winter concentration areas.

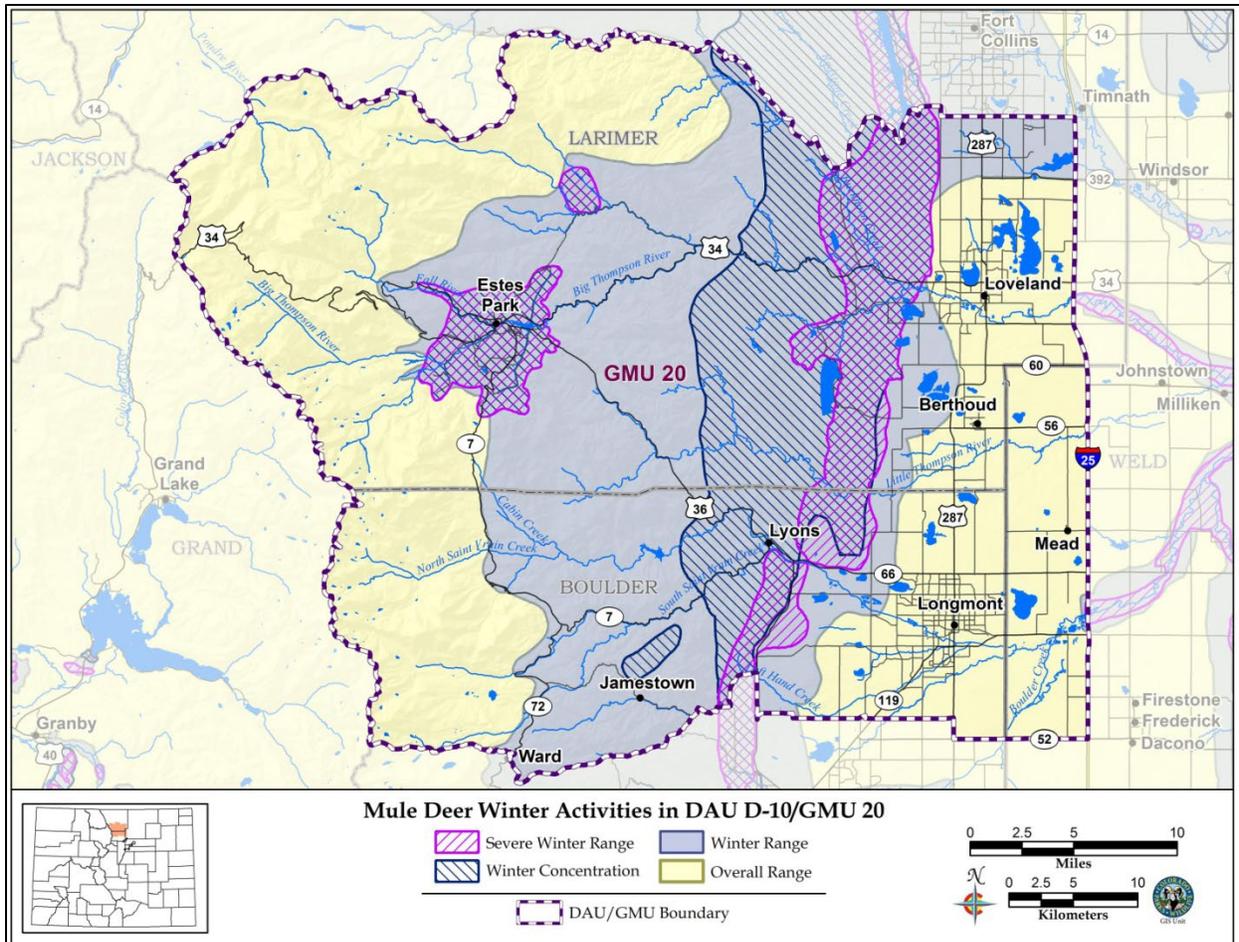


Figure 6: Overall, summer, and winter ranges of the Big Thompson deer herd, Data Analysis Unit (DAU) D-10, composed of Game Management Unit (GMU) 20.

Winter concentration areas are defined as that part of the winter range of a species where densities are at least 200% greater than the surrounding winter range density during the same period used to define winter range in the average five out of ten winters. Winter concentration areas occur along the foothills, in the Estes Valley and around Glen Haven and Jamestown. Only 10% of the DAU is considered severe winter range. Severe winter range is defined as that part of the range of a species where 90% of the individuals are located when the annual snow pack is at its maximum and/or temperatures are at a minimum in the two worst winters out of ten. Severe winter range occurs along the foothills. Resident deer herds also occur year-round along the foothills, particularly on city and county open space. The alpine and subalpine areas provide excellent summer range because of the high quantity and quality of forage available, security cover provided and refuge from insects. However, it is possible that high levels of outdoor recreation are reducing the availability of summer range to deer through displacement and avoidance. Aspen and aspen/conifer stands also provide productive understory, which provides forage and cover during the summer and fall.

Winter range is likely the most limiting factor of the herd. However, the relationship between winter range and deer population dynamics in D-10 is not as direct a relationship as is observed in deer herds in western Colorado. In D-10, winters are mild compared to most of the mountainous areas in the state. However, habitat loss, degradation, and fragmentation from development have reduced the quantity of available winter habitat. While housing sprawl has had an overall detrimental effect of displacing deer, some deer have adapted to living in and around residential areas. In certain areas, the secondary effects of residential development may have artificially increased habitat productivity by increasing forage quality. The extensive road network in the DAU has added to habitat fragmentation and increased mortality due to vehicle strikes.

The habitat quality of winter and transitional range is fair. Fire suppression has decreased range productivity through succession and maturation of plant communities. During the last century, succession has decreased the amount and quality of deer forage. However, in areas where wildfires, controlled burns, and mechanical habitat treatments have occurred, habitat quality has improved. Large-scale habitat improvements, in those habitats that historically experience regular disturbances (e.g., ponderosa pine stands), are beneficial for all wildlife in the area.

Conflicts with Agriculture

Deer game damage claims in the DAU are very rare. One game damage claim has been filed since 1998. This claim occurred in 2014 in an orchard and totaled \$16,000. Game damage licenses issued to mitigate deer-agriculture conflicts are rare in the DAU due to lack of conflicts.

Opinions of agriculture producers regarding the appropriate social carrying capacity of deer are mixed. In areas where deer densities are low or have been historically higher, producers voice concern about the low number of deer on the landscape. In areas where sedentary-resident deer herds occur in and around developed areas, some producers feel there are too many deer.

HERD MANAGEMENT HISTORY

Estimating numbers of wild animals over large geographic areas is a difficult and approximate science. Numerous attempts have been made to accurately count known numbers of wild animals in large fenced areas. All of these efforts have failed to count 100% of the animals. Colorado Parks and Wildlife recognizes the difficulties of estimating the size of big game populations as a challenge in managing populations. The agency continually attempts to maximize the accuracy of those estimates by using the latest technology and inventory methodology available. As better information and techniques become available (e.g., new estimates of survival/mortality, wounding loss, sex ratios, density, or new modeling techniques and software), they are evaluated and used where appropriate.

Population estimates are derived from population models. Starting in the early 1970s, CPW biologists derived population estimates with ONE POP software. In the early 1980s, population estimation software was updated to the POP II software. After 1999, spreadsheet models replaced POP II. In 2008, the spreadsheet models were standardized based upon population modeling methods developed by White and Lubow (2002). This latest approach integrates multiple biological factors, including mortality rates, initial population size, sex ratio at birth, observed sex and age ratios, hunter harvest, and wounding loss. The models are aligned on post-hunt sex ratios observed during winter classification. For some herds, abundance estimates are derived from quadrat or line transect surveys.

When herd management plans are revised, a suite of population models is constructed and the best model(s) are selected. During the population modeling process, new models may fit better than old models and provide new and different population and sex ratio estimates. The process of altering population estimates when new and better models and/or data become available is termed indexing. When indexing occurs, adjustments to population objectives and estimates can occur in the absence of changes to license numbers. The population estimates presented in this document should, therefore, not be considered a completely accurate enumeration of the animals in the herd.

Post-hunt Population Size

As mentioned above, the boundary of the DAU changed in 1988, so comparisons between pre- and post 1988 must be general. In addition, population inventory data on the Big Thompson deer herd are sparse due to budget constraints and the difficulty of flying in windy conditions along the Front Range during winter.

Deer numbers increased during the 1970s through 1980s, peaking in the late 1980s (Vieira and George 2002). Since 1988, population models indicate that the post-hunt population went through three declines (Figure 7). Substantial declines occurred in the late 1980s and early 2000s, while a less significant decline occurred in the late 2000s. The late 1980s and early 2000s declines were followed by increases in the herd size, while the late 2000s decline was followed by a stable population trend. The herd declined in the late 1980s and late 2000s due to increased harvest. The herd declined in the early 2000s when liberal licensing and targeted culling were implemented as management for CWD to reduce deer density. Quadrat population estimates were conducted in 2004 and 2014. The 2014 estimate changed the population trajectory from decreasing to increasing.

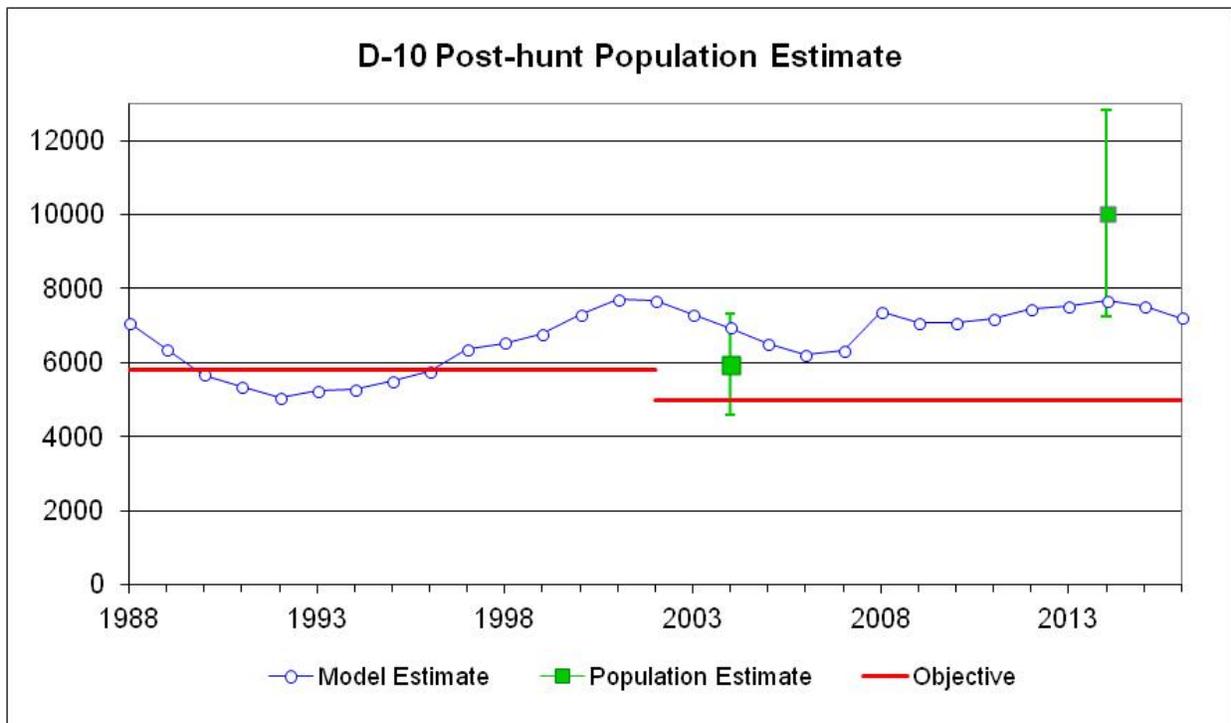


Figure 7: Post-hunt modeled population estimate, quadrat population estimates and objective population size of the Big Thompson deer herd, Data Analysis Unit (DAU) D-10, composed of Game Management Unit 20.

Post-hunt Herd Composition

Buck: Doe Ratio

The buck: doe ratio, expressed as the number of bucks per 100 does, is used as a measure of male hunting opportunity, male age-structure and potential productivity of the population. In general, lower buck: doe ratios result in fewer and younger-aged bucks in the population, but more opportunity for hunters to obtain a buck license. In contrast, higher buck: doe ratios produce more and older large-antlered bucks, but less opportunity for hunters to obtain a license. Herds with lower buck: doe ratios have higher reproductive potential due to proportionally more females in the population.

Prior to the late 1990s, the Big Thompson deer herd was managed as an area of intermediate buck hunting opportunity. Most hunters were able to obtain a license and some hunters harvested mature bucks. During the 1990s, a significant shift in the landscape began. City and counties began to acquire significant tracts of land and the larger ranches and farms continued to subdivide into subdivisions. More deer began to concentrate on those areas because of hunting restrictions and lack of hunting offtake. Deer refuging on those areas resulted in high deer densities and high buck: doe ratios. This led to increased buck: doe ratios throughout the herd, regardless of the number of buck licenses issued, because harvest was lost on those refuge areas (Figure 8).

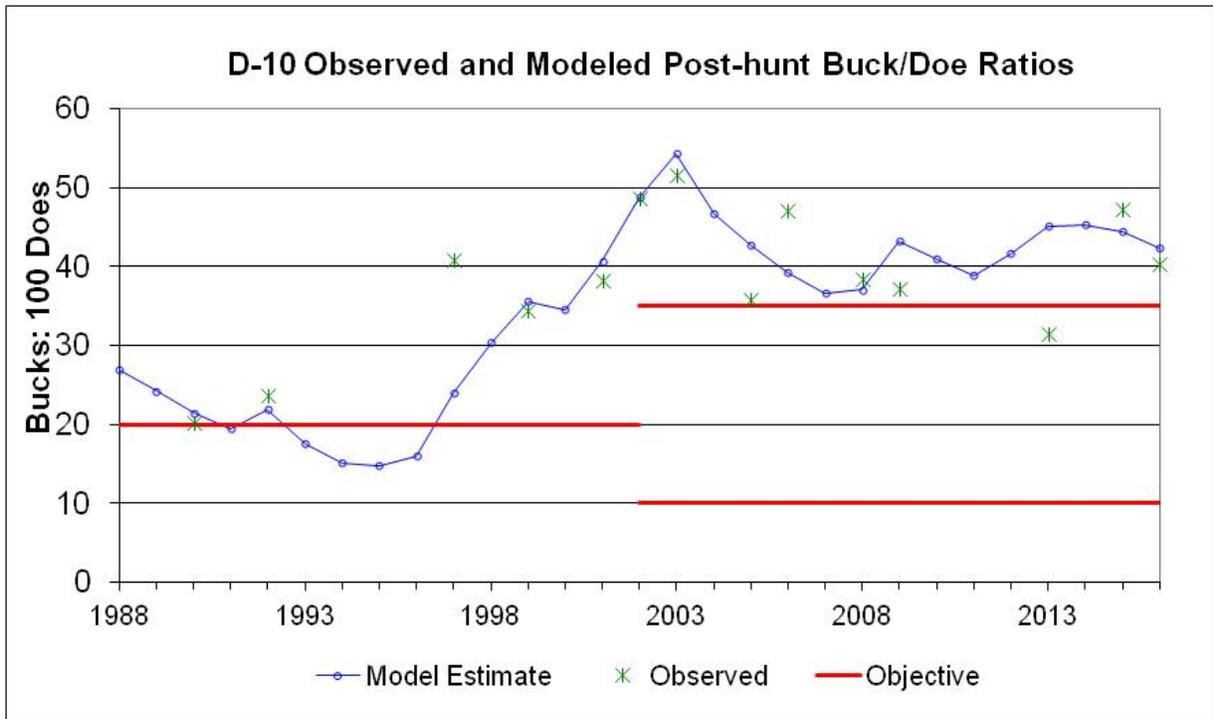


Figure 8: Modeled, observed, & objective sex ratio of the Big Thompson deer herd, Data Analysis Unit (DAU) D-10, composed of Game Management Unit (GMU) 20.

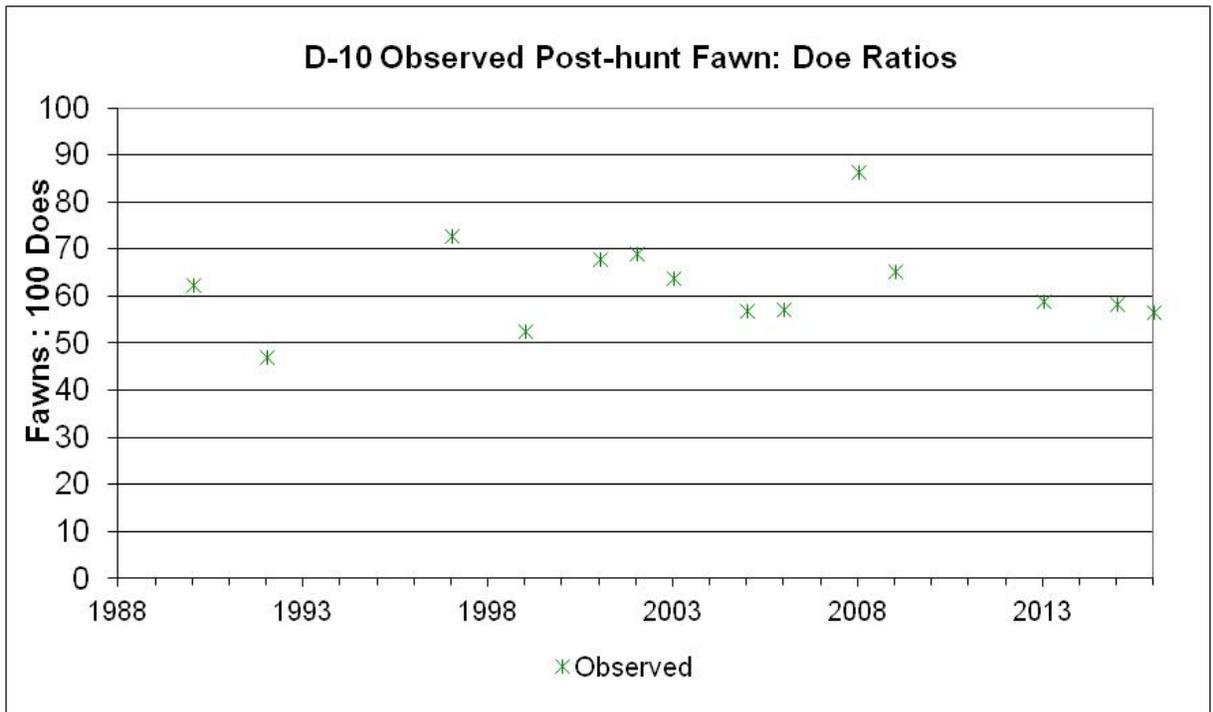


Figure 9: Observed age ratios of the Big Thompson deer herd, Data Analysis Unit (DAU) D-10, composed of Game Management Unit (GMU) 20.

Fawn: Doe Ratio

The post-hunt fawn: doe ratio, expressed as the number of fawns per 100 does, is used as metric of herd productivity. The measure roughly reflects the combined summer natality and summer-to-early-winter survival rate of fawns relative to does. Concurrent with the observed sex ratio, there are 14 years of observed post-hunt age ratio data between 1988 and 2016 (Figure 9).

Licensing and Harvest

Since 1988, seasons and license numbers have varied substantially. Hunting seasons in D-10 have included archery, muzzleloader, general rifle, and private-land-only (PLO) seasons. In 1988, the seasons consisted of one over-the-counter (OTC) either-sex archery, statewide antlered and antlerless muzzleloader seasons, two OTC antlered-only rifle, one statewide antlered-only rifle, one limited antlerless rifle and one limited PLO rifle season. In 1992, the limited antlerless public season was removed. In 1995, the limited PLO antlerless season was removed. In 1997, two limited general antlerless rifle seasons specific to GMU 20 were implemented. In 1999, all licenses became limited in quota and specific to the DAU. In addition, all antlerless hunt codes were removed and the archery season became antlered-only. In 2001, antlerless muzzleloader, either-sex archery and three PLO antlerless seasons were implemented. In 2002, the three PLO antlerless seasons were combined and three general rifle antlerless hunt codes were implemented. In 2001 and 2002, two-for-one antlerless licenses were issued for rifle seasons. In 2005, an antlered PLO hunt code was implemented. Since 2005, seasons have consisted of archery either-sex, antlered and antlerless muzzleloader, three general rifle antlerless seasons, three general antlered seasons and antlered and antlerless PLO seasons; all of which are limited in quota.

The number of estimated hunters afield has also varied since 1988 (Figure 10). The number of licenses issued is the main determinant of hunters afield, which is the main determinant of harvest. Harvest is estimated with surveys based upon the principles of survey sampling. The trend in harvest mirrors the trend in the hunters afield (Figure 10). In general, as hunters afield increase, harvest increases and the population declines and vice versa. Since 1988, harvest has varied from 1,544 to 234, with a mean of 670 (Figure 11).

Harvest success rate, calculated here as total harvest divided by the total number of hunters afield, varies annually. Since 1988, the average annual success rate is 37%, with a high of 44% and a low of 26% (this excludes 2001 and 2002, which were two-for-one doe license years, and 2013, which was a year greatly impacted by flooding). The PLO seasons have higher success rates than the regular rifle, archery and muzzleloader seasons. Harvest success has an inverse relationship with the number of licenses issued and hunters afield.

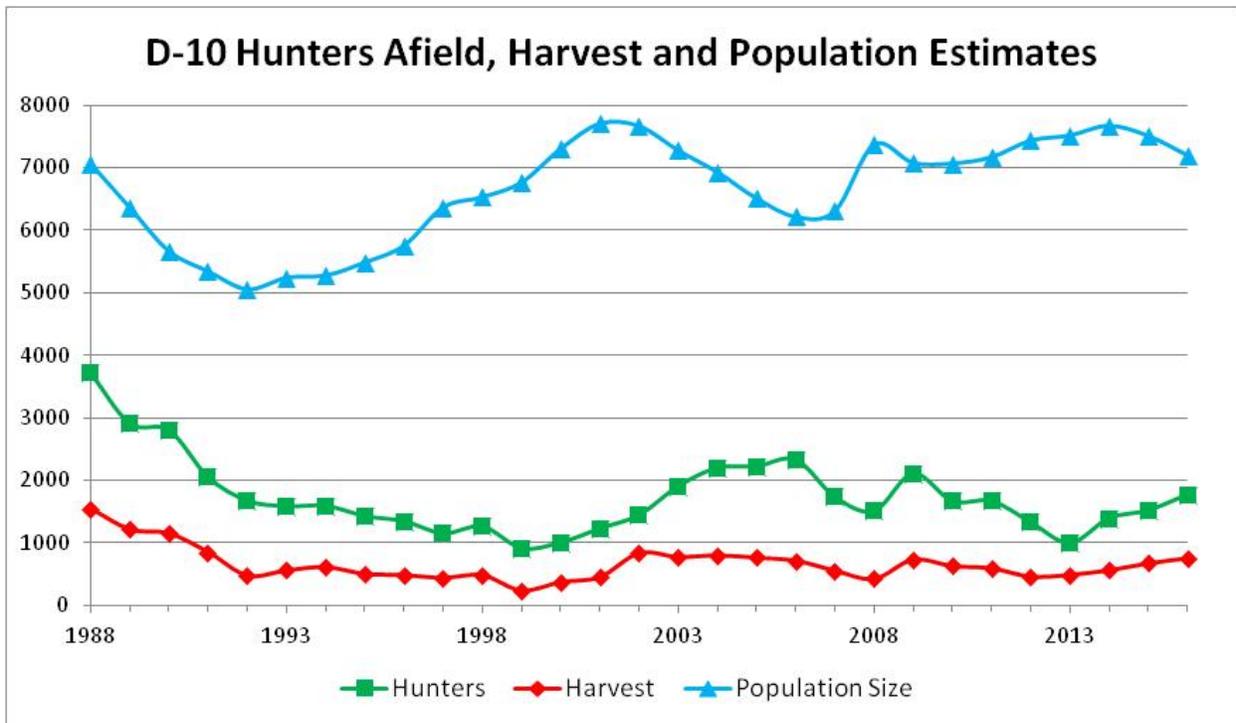


Figure 10: Estimated hunters, harvest and population size in the Big Thompson deer herd, Data Analysis Unit (DAU) D-10, composed of Game Management Unit (GMU) 20.

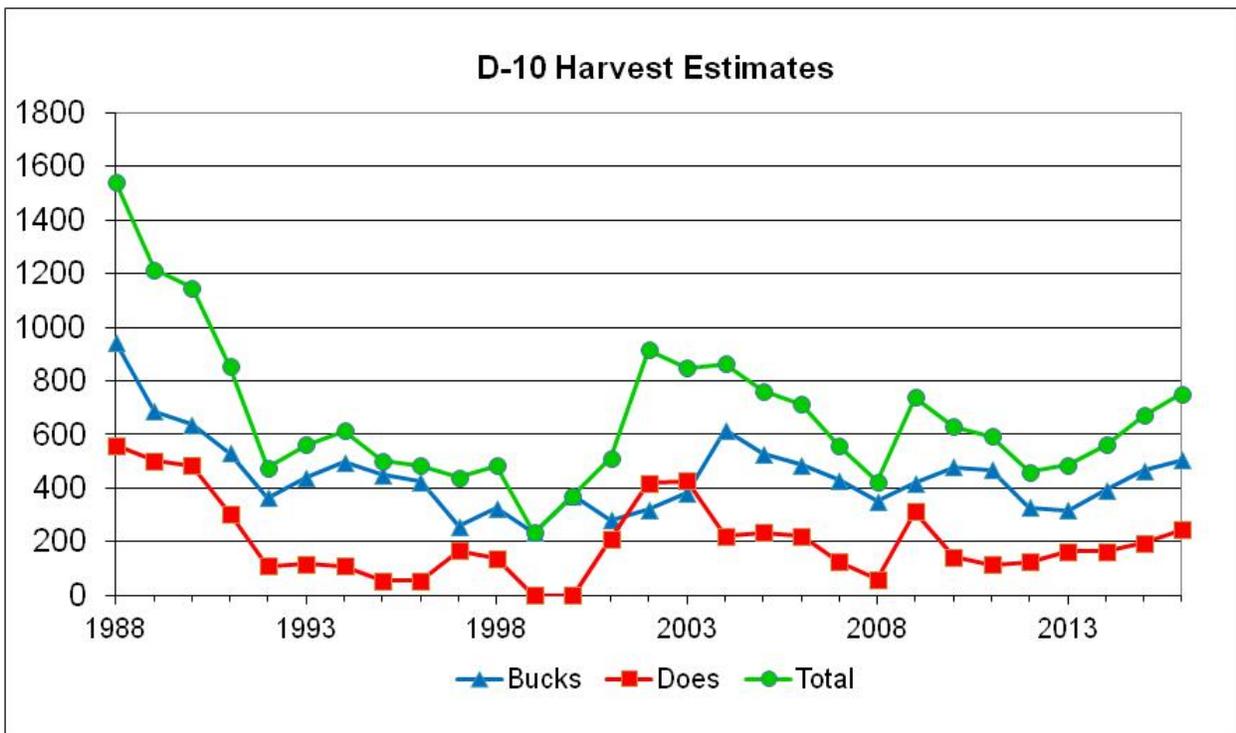


Figure 11: Estimated harvest of the Big Thompson deer herd, Data Analysis Unit (DAU) D-10, composed of Game Management Unit (GMU) 20.

Chronic Wasting Disease

Chronic wasting disease, a transmissible spongiform encephalopathy, affects deer native to Colorado. It is characterized by slowly developing behavioral changes and progressive loss of body condition leading to death (Williams and Young 1992). There are no known treatments for CWD. Chronic wasting disease has been known to occur in both deer and elk in D-10 since 1981, but was likely present prior to its initial detection. The estimated annual CWD prevalence rates in males in D-10, which are based upon hunter harvest submissions, are among the highest in the state (Figure 12). In 2017, mandatory testing for bucks harvested in the rifle seasons resulted in a prevalence estimate of 12% for adult male mule deer. As mentioned above, CPW used liberal hunter harvest and targeted hotspot culling to reduce deer density and/or male abundance and age structure in an effort to reduce CWD prevalence. It is not apparent if either density reduction or depressing the male: female ratio reduces CWD prevalence. However, at this point in time, the best management practice in herds with high CWD prevalence is to avoid an abundant older-age structure of males within the population. This is because older males have the highest CWD prevalence rates (Miller and Conner 2005).

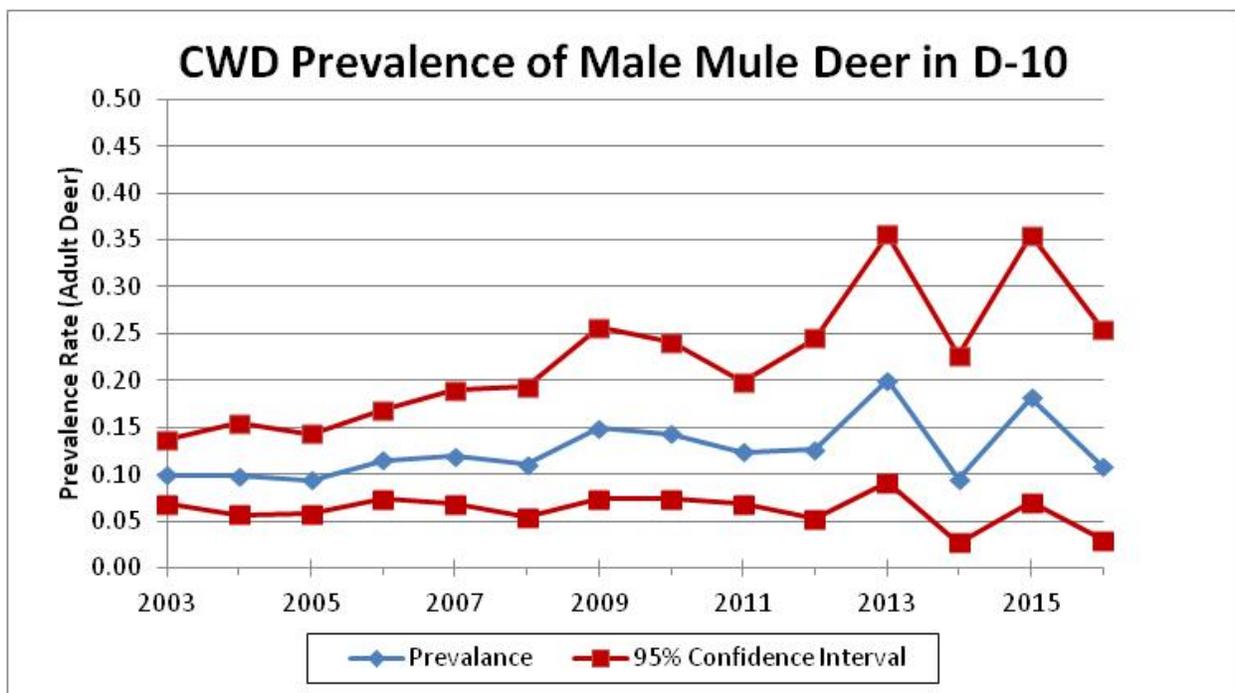


Figure 12: Annual chronic wasting disease (CWD) prevalence estimates of male mule deer in the Big Thompson deer herd, Data Analysis Unit (DAU) D-10. Prevalence estimates are based upon hunter submitted deer and agency collected deer, which are ≥ 2 years old. D-10 is composed of Game Management Unit (GMU) 20.

Demand and Preference Points Required

General rifle licenses sell out at first choice. Preference points are not generally required to hunt deer in GMU 20. Recently, preference points were required to hunt

does in the general rifle seasons, however, no preference points were required in 2016.

Economic Contribution

Hunters provide monies to local economies through the use of lodging, guiding and outfitting services and the purchase of goods and services. However, deer are also an economic cost through landscaping and agriculture damage, along with vehicle collisions.

Past Management Strategies

Population and Herd Composition Ranges

Previous Post-hunt Objectives (Pre 2002)

Population Size - 5,800

Sex Ratio - 20 bucks: 100 does

Previous Post-hunt Objectives (2002 to 2017)

Population Size - < 5,000

Sex Ratio - 10 - 35 bucks: 100 does

Current Post-hunt Population Estimates (2016)

Population Size (Modeled) - 7,200

Sex Ratio (Modeled) - 43 bucks: 100 does

Proposed Objectives (2018)

Population Size Range - 8,000 - 10,000

Sex Ratio Range - 25 - 30 bucks: 100 does, with 10% CWD prevalence trigger

Historically, the Big Thompson deer herd was managed for hunting opportunity. Many licenses were issued, resulting in smaller herd size and buck: doe ratio. By the mid 1990s, management focus shifted and the number of licenses issued was reduced. This allowed both the deer herd and the buck: doe ratio to increase. Another important factor that contributed to the increase in herd size and buck: doe ratio was the transition of many foothills properties to city and county open spaces or subdivision developments. Because hunting was often restricted in those areas, city and county open spaces and developments created refuges from harvest. By the early 2000s, the deer herd had been on an increasing trend for approximately a decade. Then in 2001, another substantial shift in management occurred. The herd began to be managed under a suppression strategy in an effort to stop the spread of CWD and reduce prevalence. Hunter harvest along with targeted culling was used to reduce deer density and to survey CWD prevalence. Those efforts reduced the size of the herd.

During the last ten years, management has focused on finding a balance between managing to control CWD with deer distribution. Significant harvest and hunting pressure resulted in hunters complaining of few or no deer on public land open to

hunting, while often too many deer occurred in refuge areas. In an effort to maintain deer on public land open to hunting, PLO licenses were utilized as the primary harvest tool, while general rifle licenses were reduced substantially.

CURRENT MANAGEMENT ISSUES AND STRATEGIES

Refuges and deer distribution, CWD and human population growth remain the most important issues to this herd. A trend on the Front Range is city and county open space programs purchasing private lands, where hunting historically occurred, and restricting hunting on those lands. Development of private land has also eliminated hunting in areas where hunting historically occurred. Hunting restrictions on city and county open space and some private land have created refuges for deer and elk.

Refuges are a major concern because harvest cannot be used to manage distribution or meet herd objectives. A relatively large proportion of the core winter range in the DAU is open space, parks and unincorporated subdivisions. Most of which have become refuges from harvest. Refuges concentrate animals and often short-stop migration, creating nonmigratory-resident herds. Refuges also directly and indirectly reduce the proportion of animals using other public lands, such as USFS. Directly, animals are attracted to refuges where human disturbance, such as hunting pressure and recreation, occurs less frequently than on the surrounding lands. Indirectly, in order to move the herd towards the population objective, more licenses must be issued, which results in greater harvest of animals that use huntable public land, while animals using refuges experience little harvest. Because animal densities on public land open to hunting are reduced to meet overall herd objectives, harvest success declines and more licenses are needed to harvest the same number of animals. Ironically, hunters complain about the scarcity of deer on public land open to hunting (e.g. USFS), while residents near open space or in unincorporated subdivisions complain of too many deer. Colorado Parks and Wildlife must continue to explore opportunities to manage deer distribution.

Refuges also compound the CWD issue. Chronic wasting disease prevalence in D-10 is among the highest state. As previously mentioned, refuges not only concentrate deer, which is not desirable for CWD management, but also allow males in the population to grow old. This is a concern because older-aged male deer have higher CWD prevalence than any other age and sex class of deer (Miller and Conner 2005). Best management practices for CWD management suggest managing for a population with a relatively low sex ratio and young age structure in the male segment of the population. As mentioned above, harvesting deer, including older-aged males, is not possible on refuges. For this reason, the herd has not achieved the sex ratio objective for a considerable time. Colorado Parks and Wildlife must continue to explore opportunities to harvest male deer on refuges to manage CWD. There are plans for more frequent and comprehensive CWD surveillance in the herd. Also, an adaptive harvest strategy will be developed based upon CWD prevalence (see Proposed Alternative and Objectives below).

High density and rapid growth of the human population, and resultant development, continue to cause habitat loss, fragmentation and degradation. Because of the high value of land in the DAU, there is great financial incentive for landowners to develop land. With only a small percentage of deer and elk winter range on private land that is protected with conservation easements, the need for conserving the remaining habitat on both private and public lands is vital.

Another impact of an increasing human population is the increase in outdoor recreation. Outdoor recreation including hiking, dog-walking, skiing, mountain biking, ATV riding, jeep touring and dirt-biking have increased tremendously. Recreation occurs during all times of the year on all seasonal ranges, particularly on winter and transitional ranges and during critical periods of winter and fawning. The heightened level of human activity on the landscape is an important disturbance to deer and other wildlife, which can ultimately lead to reduced survival and reproduction. Dogs both on- and off-leash also contribute to the harassment and mortality of wildlife (e.g., Miller et al. 2001). These behavioral stressors and additional mortality sources can reduce recruitment of young into the population directly by limiting young-of-the-year survival, as well as indirectly by displacing animals from preferred feeding and bedding areas.

PUBLIC INPUT PROCESS

Public input was solicited through three open houses, a public survey and comment period on a draft of the HMP. The open houses were announced through various media outlets, press releases and the CPW website. The open houses were held in Estes Park, Loveland and Longmont on August 19th, 20th and September 2nd 2015, respectively. The format of the open houses was to disseminate information on the herd, answer questions from the public and give attendees the opportunity to complete the public survey regarding the future management of the herd. No one attended the open houses.

The public survey was also available on the CPW website from September 1st to September 30th, 2015. The survey's availability and background information on the herd was advertised with a press release and announced on CPW's website. In addition, 1000 postcard announcements were mailed to a random sample of hunters that had applied for a deer license in GMU 20 during 2012 to 2014. In total, 123 respondents completed the survey.

Public input from the survey was then incorporated into a draft HMP that was posted on the CPW website and sent to local governments and land management agencies for comment. Individuals, land management agencies, and local governments were then invited to submit comments on the draft HMP during a 30-day comment period, which was held in October and November. One government agency and one citizen provided comments on the draft plan (Appendix D).

Summary of Public Input

Survey Results

The herd management information packet, public survey and results are located Appendices B and C. Most survey respondents live in Colorado (96%) and well over one-half (57%) live in the DAU. Most of the respondents that reside in D-10 have done so for a long time (mean = 24 years). The majority of survey respondents defined their interest in the herd as hunter (81%) or landowner (11%). The majority of respondents have hunted in D-10 (96%). All respondents enjoy seeing deer (100%). Over half of the respondents (54%) are at least moderately interested in viewing or photographing deer in the area. Of the three choices available, 1) being able to see large-antlered deer was most important, followed by 2) being able to easily find deer and then 3) being able to see large groups of deer.

The majority of respondents (56%) would like to see an increase in the herd size. Only 7% support a decrease. Thirty-three percent of respondents would like to see an increase in the sex ratio, 33% do not want a change, while 22% want a decrease.

The majority of respondents have not experienced deer-related conflicts (80%), but some respondents have been involved in deer-vehicle collisions (5%), or have had property damage to homes, businesses and agriculture (9%). Respondents are concerned about habitat loss due to development, revenue generated from tourism related to deer and deer-vehicles collisions. The survey showed that 55% of respondent are satisfied with CPW's management of the herd and that 62% of respondents support CWD management actions, even reduction management similar to what occurred in the early 2000s.

Hunters rated additional access to areas where deer occur and harvesting a deer as the most important factors that would improve their hunting experience. The ability to hunt females every year and hunter crowding ranked as the least important factors. The following survey responses were based upon a scale of excellent, good, fair or poor. The majority of respondents that have hunted in D-10, rate the overall hunting experience as good. They also rated the opportunity to harvest a deer for meat as good and the opportunity to harvest a large-antlered buck as fair.

Issue Identification

Several common issues emerged from general comments in the survey along with discussions. Common themes were:

- Desire for more deer in the herd, especially on public land
- CPW should work to improve hunter access on open space and private land
- CPW should not cull again to manage for CWD
- CPW should manage to mitigate CWD
- CPW should not manage to mitigate CWD
- Manage for quality buck deer hunting
- Do not manage for quality buck deer hunting
- Other forms of recreation causing conflicts with or interfering with hunting

Comments on the Draft Plan during the 30 Day Comment Period

One letter was received from the City of Fort Collins, Natural Areas Department. In the letter, the Natural Areas Department stated it would continue to work with CPW regarding deer and elk management and defined how hunting and other management activities are evaluated on Natural Areas (Appendix D). One letter was received from a private citizen during the 30-day comment period. In the letter, the individual mentioned concerns about the deer population being down and refuges from hunting.

ALTERNATIVE OBJECTIVES

When revising an HMP, the development of the alternative objectives relies heavily on the model estimates. Population estimation is an evolving process, whereby modeled estimates can change over time because of additional data or improved modeling methodology. Therefore, when modeled estimates change regardless of an actual change in the population, it is reasonable to adjust or index population objectives relative to the new modeled estimates. The basis of harvest-based population management is to increase female harvest when a population exceeds objective, decrease female harvest when a population is below objective and maintain female harvest when a population is at objective. Concurrently, male and female harvest is adjusted to achieve the sex ratio objective. Because herd objectives are only meaningful in the relative context of the model estimates available at the time the objectives were established, indexing maintains the integrity of the objectives based on the fundamental criteria of whether there are too many, too few or the desired number of animals in the population. Therefore, as modeled population estimates improve, it is important to adjust or index the population objectives, but not necessarily harvest objectives. Currently, when an HMP is revised a new suite of models is run and the best model(s) are selected, which frequently results in some degree of indexing.

Population Alternative Objectives

Population objectives are ranges, in recognition of the complexity of precisely estimating and managing populations and the variation inherent in carrying capacity due to changes in climate, land management, disease and habitat (e.g., fires, winter weather events, droughts, land swaps, forest management and development). The intention is to manage for a target within the selected objective range. The previous population objective was < 5,000 deer. From 2001 to 2014, the population was managed to suppress the population size for CWD management.

Alternative 1: 7,000 - 9,000 deer post-hunt

This alternative range is 40% to 80% greater than the previous population objective. The current post-hunt population estimate (7,200 deer) is within this alternative range. This alternative may be the most effective strategy to reduce deer impacts to habitat and human-deer conflicts. However, of the three alternatives, this alternative will provide the least harvest, hunting opportunity and viewing opportunity. This alternative will result in licensing most similar to what currently

exists. Under this alternative, it is advisable to pursue more hunting opportunities in the eastern area of the DAU on private land and open space to manage deer distribution and refuges, CWD and human-deer conflicts.

Alternative 2: 8,000 - 10,000 deer post-hunt

This alternative range is a 60% to 100% increase from the previous population objective and a 25% increase from the current population estimate to the middle of the alternative range. According to the public input process, this alternative is most desirable by the public. This alternative will result in intermediate levels of hunting, harvest, viewing opportunity and human-deer conflicts relative to the other population objective alternatives. This alternative will result in fewer antlerless licenses available in the short-term, but once the population objective range is achieved, more antlered and antlerless licenses will be available in the long-term. Under this alternative, it is advisable to pursue more hunting opportunities in the eastern area of the DAU on private land and parks and open space to manage deer distribution and refuges, CWD and human-deer conflicts.

Alternative 3: 9,000 - 11,000 deer post-hunt

This alternative range is 80% to 120% higher than the previous population objective. This alternative will provide the greatest harvest, hunting opportunity and viewing opportunity. However, this alternative would likely result in the greatest number of human-deer conflicts and has the greatest potential to negatively impact habitat through overutilization. This alternative will result in fewer licenses available in the short-term, but more licenses available in the long-term. Under this alternative, it is advisable to pursue more hunting opportunities in the eastern area of the DAU on private land and parks and open space to manage deer distribution and refuges, CWD and human-deer conflicts.

Herd Composition (Sex Ratio) Alternative Objectives

Similar to the population objective, the sex ratio objective is a range in recognition of the difficulties of precisely estimating and managing populations. The intention is to manage for a target within the selected objective range, while allowing some flexibility to respond to the variation inherent in carrying capacity due to changes in climate patterns, land management, disease and habitat (e.g., fires, winter weather events, droughts, land swaps, forest management, and development).

An adaptive harvest management approach is proposed to manage herd composition and CWD prevalence in the herd. Because older males are more likely to have the disease (Miller and Conner 2005), manipulating the sex ratio and associated male age structure may affect CWD prevalence in the herd. The premise is based upon the assumption that fewer males and a younger age structure of males will result in lower CWD prevalence (e.g., a deer herd with a sex ratio of 20 bucks: 100 does would likely have lower prevalence rate than one with 40 bucks: 100 does). By monitoring prevalence of a herd, licensing and harvest can be adjusted to increase or decrease the sex ratio based upon estimated prevalence, presumably allowing manipulation of CWD prevalence within the herd. Therefore, if CWD prevalence exceeds triggers

specified in the Colorado Chronic Wasting Disease Response Plan, appropriate adaptive management actions listed in that plan will be implemented.

We also propose a threshold or trigger of 10% prevalence in adult male deer (which roughly equates to 5% prevalence in adult females; Mike Miller personal communication). This threshold is thought to be at a level where increasing prevalence starts to negatively affect population growth. If this threshold is met or exceeded, the sex ratio is managed at the lower end of the objective range (e.g., if the sex ratio objective is 25 - 30 bucks: 100 does and prevalence remains below the threshold, then the herd is managed for 30 bucks: 100 does; if the threshold is met or exceeded, then the population is managed for 25 bucks: 100 does). In addition, other management strategies to reduce CWD prevalence will continue to be implemented including shifting buck harvest later in the year and using disease management licensing in localized areas of high CWD prevalence (e.g. hotspots). Due to costs, we propose obtaining adequate hunter harvest samples every 3 - 5 years. This allows a balance between cost and obtaining adequate information to trigger management in a meaningful time frame. All sex ratio alternatives proposed in this plan recommend the CWD prevalence threshold or trigger to adaptively adjust the target objective within the sex ratio objective range.

Alternative 1: 20 - 25 Bucks: 100 Does Post-hunt

This alternative range is up to a 20% reduction from the previous target objective of 25 bucks: 100 does. This alternative will result in the most male hunting opportunity, but will cause the greatest decrease in both male harvest success and number of males on the landscape. Hunters would experience more hunter-crowding, see fewer bucks, and harvest younger and smaller bucks compared to Alternatives 2 and 3. It is likely that this alternative will be the most effective at reducing CWD prevalence. This alternative will result in the most productive deer herd because a larger proportion of the population will be females. Achieving this alternative range will be very difficult due to refuges from hunting.

Alternative 2: 25 - 30 Bucks: 100 Does Post-hunt

This alternative range is up to a 20% increase from the previous target objective of 25 bucks: 100 does. Compared to the other alternatives, this alternative will result in intermediate levels of male hunting opportunity, male harvest success, viewing opportunity, number of males on the landscape and CWD management. Achieving this alternative range will be difficult due to refuges from hunting.

Alternative 3: 30 - 35 Bucks: 100 Does Post-hunt

This alternative range is a 20% to 40% increase from the previous target objective of 25 bucks: 100 does. It is likely that this alternative range is least effective at reducing CWD prevalence in the herd. This alternative will produce more males and more older males on the landscape. For a given population size, this alternative will result in the fewest male licenses available in the future, but will increase male harvest success. It will take longer to draw a male license, but hunters could expect

to see more males and fewer hunters afield compared to the previous two alternatives. Achieving this alternative range will be difficult due to refuges.

Preferred Alternative Objectives

The following alternative objectives were developed through consideration of habitat, carrying capacity, potential for human-deer conflicts, CWD and results from the public input process. The public input process indicated that the public would like more deer, and more buck deer, on public land open to hunting.

Population Alternative: 8,000 - 10,000 deer:

This alternative was selected because it aligns with the findings of the public input process. This alternative is likely within the biological carrying capacity and it is probable that social factors may limit a population increase above this alternative range. As previously mentioned, it is advisable to pursue more hunting opportunities in the eastern area of the DAU on private land and open space to manage deer distribution (reduce harvest pressure on public land) and refuges, CWD and human-deer conflicts.

Herd Composition Alternative: 25 - 30 bucks: 100 does:

This alternative was selected to reduce CWD prevalence in the herd. The public input process indicated that the public desire for more older-aged males, but also support active management for CWD. This alternative is the best compromise between those opposing management strategies. This alternative range provides intermediate levels of male hunting opportunity and number of males on the landscape. If CWD prevalence exceeds triggers specified in the Colorado Chronic Wasting Disease Response Plan, appropriate adaptive management actions listed in that plan will be implemented. Additionally, a $\geq 10\%$ CWD prevalence estimate in adult male deer will trigger the shift from managing for 30 bucks: 100 does to 25 bucks: 100 does in an attempt to reduce CWD prevalence in the herd. Additional harvest strategies, such as shifting buck harvest into the later seasons and special hunting licenses in identified CWD hotspots, may be employed. An effort will be made to better distribute harvest across the landscape, rather than concentrating harvest on public land open to hunting, to avoid reducing deer densities to undesirable levels on public land.

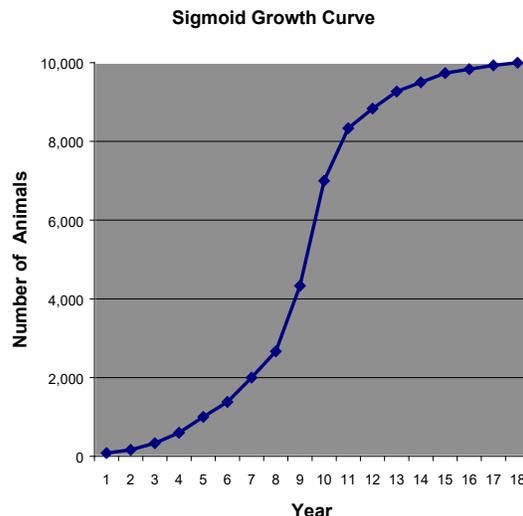
In addition to the above overall objective ranges for the herd, private-land-only licenses will be used to reduce deer densities and conflicts in the eastern half of the DAU. In order to improve hunting success on public land, proportionally more deer licenses and harvest will need to occur on private land and other landownership types, besides USFS. Collaboration with city and county open space departments is necessary to meet herd objectives, manage CWD, reduce conflicts and eliminate refuges. Colorado Parks and Wildlife will also work with the USFS to address habitat issues.

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APPENDIX A: POPULATION DYNAMICS, MAXIMUM SUSTAINED YIELD & DENSITY DEPENDENCE

Numerous studies of animal populations, including such species as bacteria, mice, rabbits, and white-tailed deer have shown that the populations grow in a mathematical relationship referred to as the "sigmoid growth curve" (right). There are three distinct phases to this cycle. The first phase occurs while the population level is still very low and is characterized by a slow growth rate and a high mortality rate. This occurs because the populations may have too few animals and the loss of even a few to predation or accidents can significantly affect population growth.



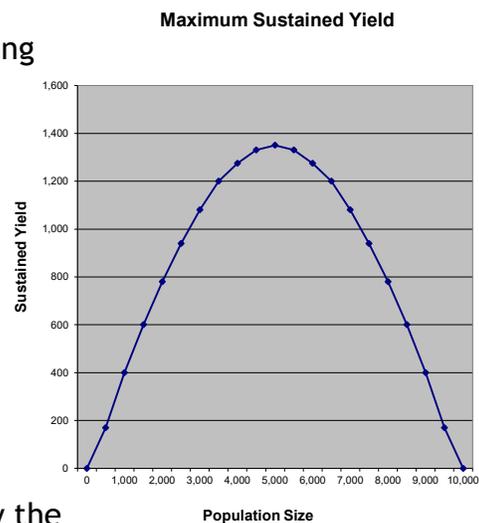
The second phase occurs when the population number is at a moderate level. This phase is characterized by high reproductive and survival rates. During this phase, food, cover, water and space are not a limiting factor. During this phase, animals such as white-tailed deer have been known to successfully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

The final or third phase occurs when the habitat becomes too crowded or habitat conditions become less favorable. During this phase the quantity and quality of food, water, cover and space become scarce due to the competition with other members of the population. These types of factors that increasingly limit productivity and survival at higher population densities are known as density-dependent effects. During this phase, for example, white-tailed deer fawns can no longer find enough food to grow to achieve a critical minimum weight that allows them to reproduce; adult does will usually only produce 1-3 fawns; and survival of all deer (bucks, does and fawns) will decrease. During severe winters, large die-offs can occur due to the crowding and lack of food. The first to die during these situations are fawns, then bucks, followed by adult does. Severe winters affect future buck: doe ratios by favoring more does and fewer bucks in the population. Also, because the quality of a buck's antlers is somewhat dependent upon the quantity and quality of his diet, antlers

development may be diminished. If the population continues to grow, it will eventually reach a point called "K" or the maximum carrying capacity. At this point, the population reaches an "equilibrium" with the habitat. The number of births each year equals the number of deaths; therefore, to maintain the population at this level would not allow for any "hunnable surplus." The animals in the population would be in relatively poor body condition, habitat condition would be degraded from over-use, and when a severe winter or other catastrophic event occurs, a large die-off is inevitable.

What does all this mean to the management of Colorado's big game herds? It means that if we attempt to manage for healthy big game herds that are being limited by density-dependent effects, we should attempt to hold the populations more towards the middle of the "sigmoid growth curve." Biologists call this point of inflection of the sigmoid growth curve the point of "MSY" or "maximum sustained yield." In the example below, MSY, which is approximately half the maximum population size or "K", would be 5,000 animals. At this level, the population should provide the maximum production, survival, and available surplus animals for hunter harvest. Also, at this level, range habitat condition should be good to excellent and range trend should be stable to improving. Game damage problems should be lower and economic return to the local and state economy should be higher. This population level should produce a "win - win" situation to balance sportsmen and private landowner concerns.

A graph of a hypothetical deer population showing sustained yield (harvest) potential vs. population size is shown (right). Notice that as the population increases from 0 to 5,000 deer, the harvest also increases. However, when the population reaches 5,000 or "MSY", food, water and cover becomes scarce and the harvest potential decreases. Finally, when the population reaches the maximum carrying capacity or "K" (10,000 deer in this example), the harvest potential will be reduced to zero.



Also, notice that it is possible to harvest exactly the same number of deer each year with 3,000 or 7,000 deer in the population. This phenomenon occurs because the population of 3,000 deer has a much higher survival and reproductive rate compared to the population of 7,000 deer. However, at the 3,000 deer level, there will be less game damage and resource degradation, but lower watchable wildlife values.

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

Research in several studies in Colorado has shown that density-dependent winter fawn survival is the mechanism that limits mule deer population size because winter forage is limiting (Bartmann et al. 1992, Bishop et al. 2009). Adult doe survival and reproduction remain high, but winter fawn survival is lower at higher population sizes relative to what the winter habitat can support. The intuition to restrict, or even eliminate, female harvest in populations where productivity is low and when populations are below HMP objectives is counterproductive and creates a management paradox. In that, for populations limited by density dependent processes, this “hands-off” type of management simply exacerbates and perpetuates the problem of the population being resource limited, and countermands the goals and objectives of the HMP. As Bartmann et al. (1992) suggest, because of density-dependent processes, it would be counterproductive to reduce female harvest when juvenile survival is low and increase harvest when survival is high. Instead, a moderate level of female harvest helps to maintain the population below habitat carrying capacity and should result in improved survival and recruitment of fawns. Increased fawn recruitment allows for more buck hunting opportunity and a more resilient population.

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

Literature Cited

- Bartmann, R.M., G.C. White, L.H. Carpenter. 1992. Compensatory mortality in a Colorado mule deer population. *Wildlife Monographs* No. 121. 39 pp.
- Bishop, C.J., G.C. White, D.J. Freddy, B.E. Watkins, and T.R. Stephenson. 2009. Effect of enhanced nutrition on mule deer population rate of change. *Wildlife Monographs* No. 172. 28 pp.

APPENDIX B: INFORMATION PACKET FOR SURVEY



The Big Thompson Deer Herd

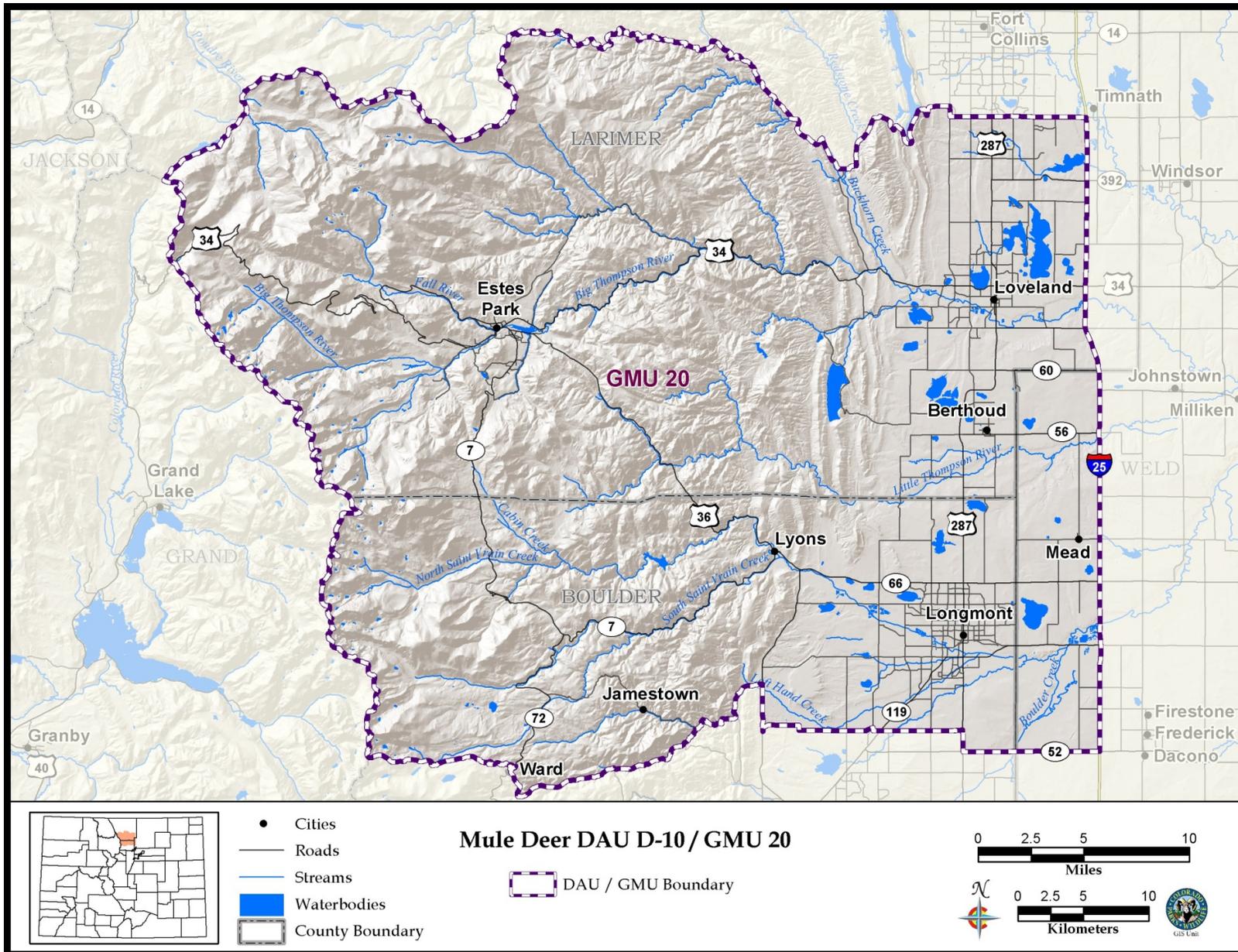
**Data Analysis Unit D-10
Game Management Unit 20**

In Colorado, big game species are managed at the herd level. The management of each herd is guided by a herd management plan. Herd management plans describe herd population and management histories, population objectives, and management strategies for at least the next 10 years. The planning process to develop herd management plans incorporates the desire and concerns of the public along with the habitat and biological capabilities of big game herds. Public input is a very important part of the herd management planning process.

Colorado Parks and Wildlife (CPW) is seeking your input on the future management of the Big Thompson deer herd. The Big Thompson deer herd, Data Analysis Unit (DAU) D-10, is composed of Game Management Unit (GMU) 20, which occurs in southern Larimer and northern Boulder counties. The area is bounded on the north by Larimer County Roads 44H (Buckhorn), 27, 38E, 19, and Harmony Road; on the east by Interstate 25; on the south by Colorado Highway 52, U.S. Highway 287, Boulder County Road 34 (Niwot/Neva roads), U.S. Highway 36, Boulder County Roads 94, 81, 106, and 95 (Lefthand Canyon Drive), 102 (Brainard Lake Road), and the ridge line from Brainard Lake west to Pawnee Peak; on the west by the Continental Divide, Rocky Mountain National Park Boundary, and Pennock Creek-Elk Creek divide. The Big Thompson, Little Thompson, and St. Vrain are major drainages. Municipalities include Berthoud, Estes Park, Fort Collins, Longmont, Loveland, and Lyons. The information you provide will help CPW develop objectives and management strategies for the future of the herd.

This document is a supplement to the 2015 Big Thompson deer herd survey. The survey closes September 30th and can be found at the Herd Management Plans webpage on the CPW website at:

<http://cpw.state.co.us/thingstodo/Pages/HerdManagementPlans.aspx>



Objectives

Colorado Parks and Wildlife manages big game herds to provide the public with hunting and viewing opportunities, while minimizing conflicts and damage caused by the herd. In order to accomplish those goals, the total number of animals in the herd and the proportion of males in the herd are considered. Therefore, herd management plans define **1) a population objective** and **2) a male to female ratio objective**.

Population Objective: Colorado Parks and Wildlife strives to manage big game populations within both the biological and social carrying capacity of the herd. The biological carrying capacity is the number of animals that can be supported by the available habitat. The social carrying capacity is the number of animals tolerated by the people affected by the herd. When big game populations are at optimal levels, habitat damage is not a consideration, people are able to enjoy viewing, photographing, and hunting big game, and big game-human conflicts are minimized. If big game numbers are too low, it is difficult for viewers and hunters to find big game. If big game numbers are too high, herd productivity declines, habitat damage occurs, and conflicts may rise to intolerable levels.

In order to increase big game populations, fewer licenses will be available in the short-term, but generally more licenses will become available each year in the long term. In order to decrease big game populations, more licenses will be available short-term, but fewer licenses will be available each year in the long-term.

Male to Female Ratio Objective: For a specific population size, there is a tradeoff between the number of male licenses available to hunters vs. the size of males available to harvest. Big game herds can be managed to maximize 1) the opportunity to draw a male license, 2) male size (i.e., more males and older, larger males), or 2) some compromise between male hunting opportunity and male size. For that specific population size, if the herd is managed to maximize male hunting opportunity, more male licenses are available and hunters are able to obtain male licenses more easily. This management strategy results in fewer males and fewer larger males in the herd along with decrease hunter success. If the herd is managed to maximize the antler/body size of the males, fewer male licenses are issued each year and harvest success increases. As a result, the average body/antler size of males harvested is greater and hunters will see more males while hunting, however, hunters may not be able to draw male licenses as frequently and preference points may be required to draw a license. Currently, the Big Thompson herd is managed to maximize the opportunity to hunt males.

Population Estimation

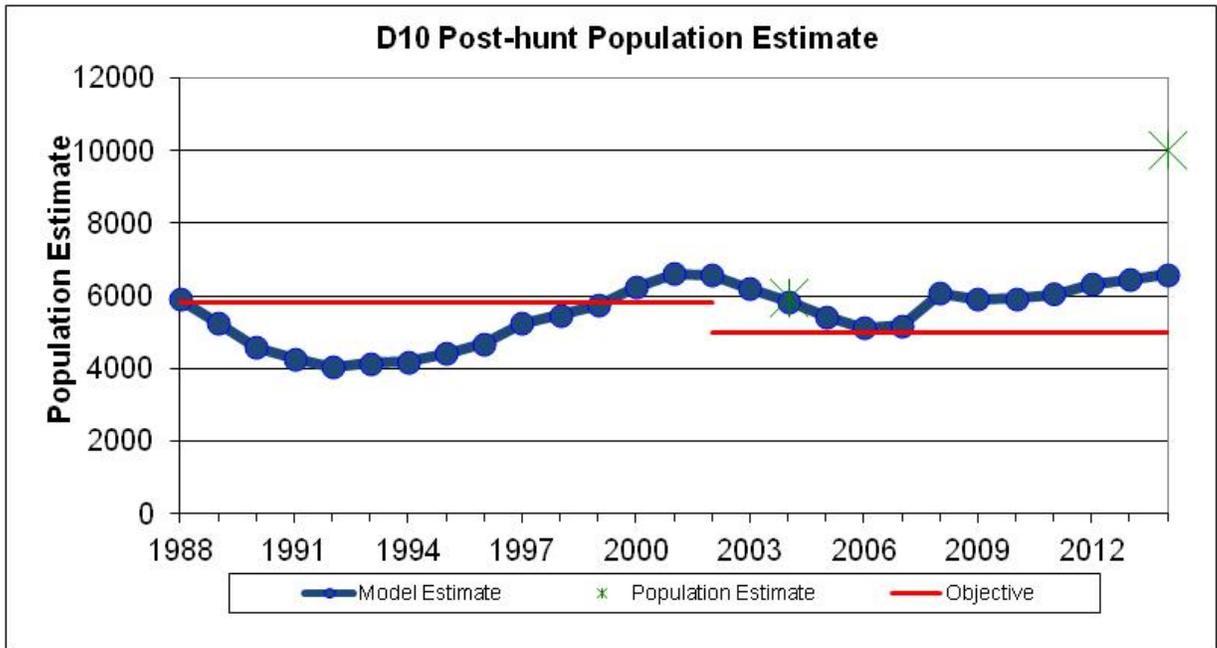
Estimating numbers of wild animals over large geographic areas is a difficult and approximate science. Numerous attempts have been made to accurately count known numbers of wild animals in large fenced areas. All of these efforts have failed to count 100% of the animals. CPW recognizes the difficulties of estimating the size of big game populations as a challenge in managing populations and the agency continually attempts to maximize the accuracy of these estimates by using the latest technology and inventory methodology available. As better information and techniques becomes available (e.g., new estimates of survival/mortality, wounding loss, sex ratios, density, or new modeling techniques and software), they are evaluated and used where appropriate.

Population estimates are derived from population models created with the help of computers. This approach integrates multiple biological factors, including mortality rates, initial population size, sex ratio at birth, observed sex and age ratios, hunter harvest, and wounding loss. The models are aligned on post-hunt sex ratios observed during winter classification, and for some herds abundance estimates are derived from line transect or quadrat surveys.

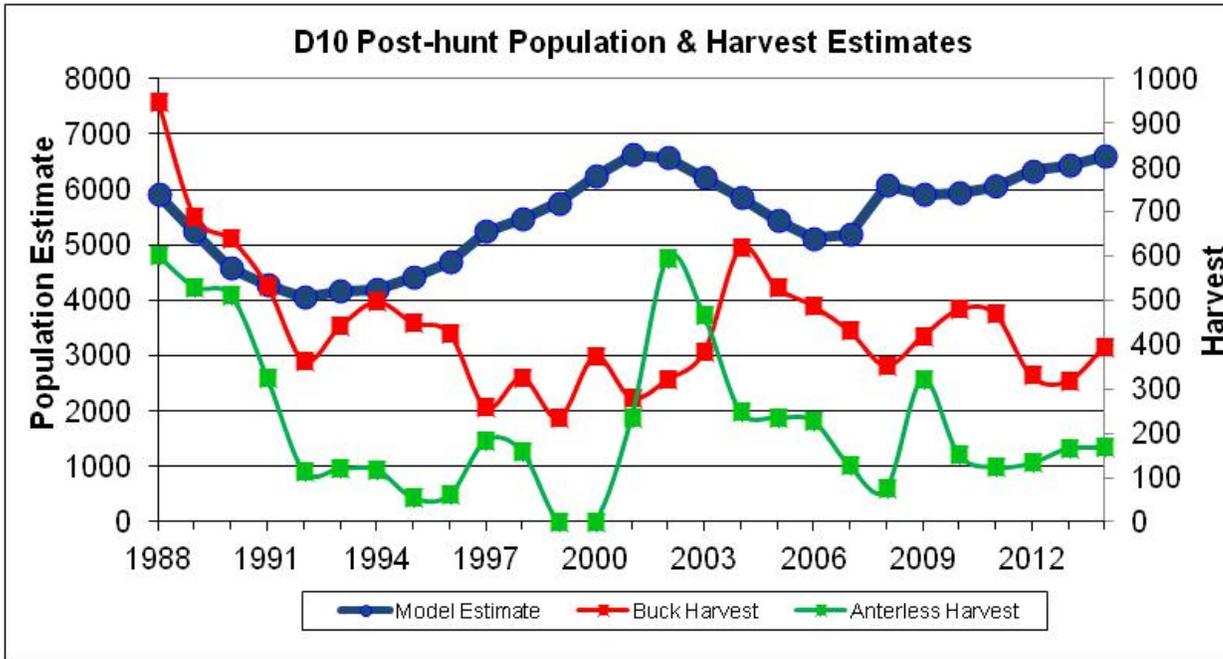
When herd management plans are revised, a suite of population models is constructed and the best model(s) are selected. During the population modeling process, new models may fit better than old models and

provide new and different population and sex ratio estimates. The process of altering population estimates when new and better models and/or data become available is termed indexing and adjustments to the population objectives and estimates may become necessary without changes to licensing. The population estimates presented in this document should, therefore, not be considered a completely accurate enumeration of the animals in the DAU. **The population estimates presented below are based upon the population model used to manage the herd for the last 12 years. A different model, or suite of models, may be utilized for the new herd management plan.**

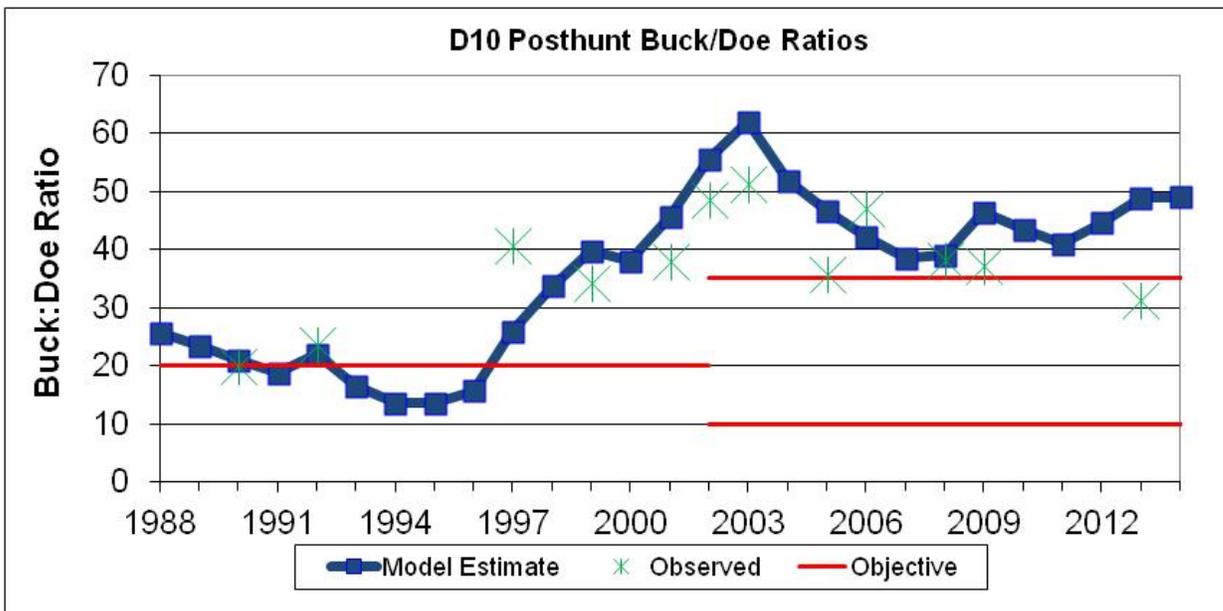
Deer Herd: D-10 Game Management Unit: 20
Post-hunt Population: Current Objective - 5,000
 2014 Modeled Estimate - 6,600 2014 Population Estimate 10,000 (7,250 - 12,800)
Post-hunt Sex Ratio: Current Objective 25 bucks:100 does
 2013 Observed 31 bucks:100 does 2014 Model Estimate 49 bucks:100 does



D-10 modeled and objective post-hunt population from 1988 to 2014.

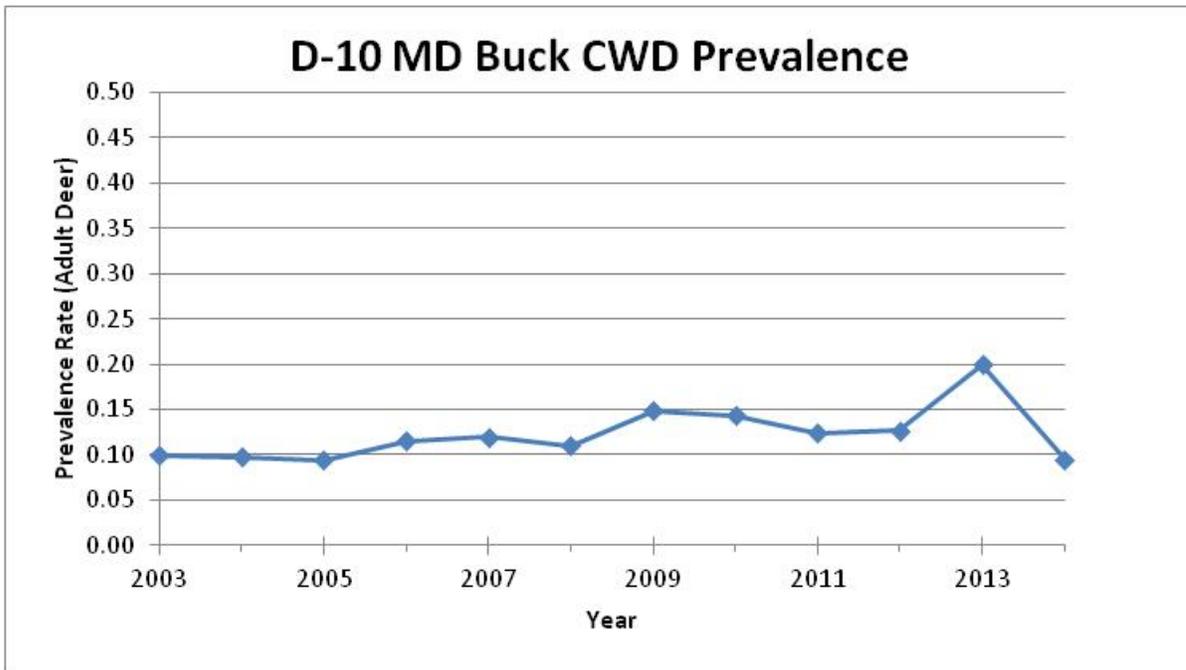
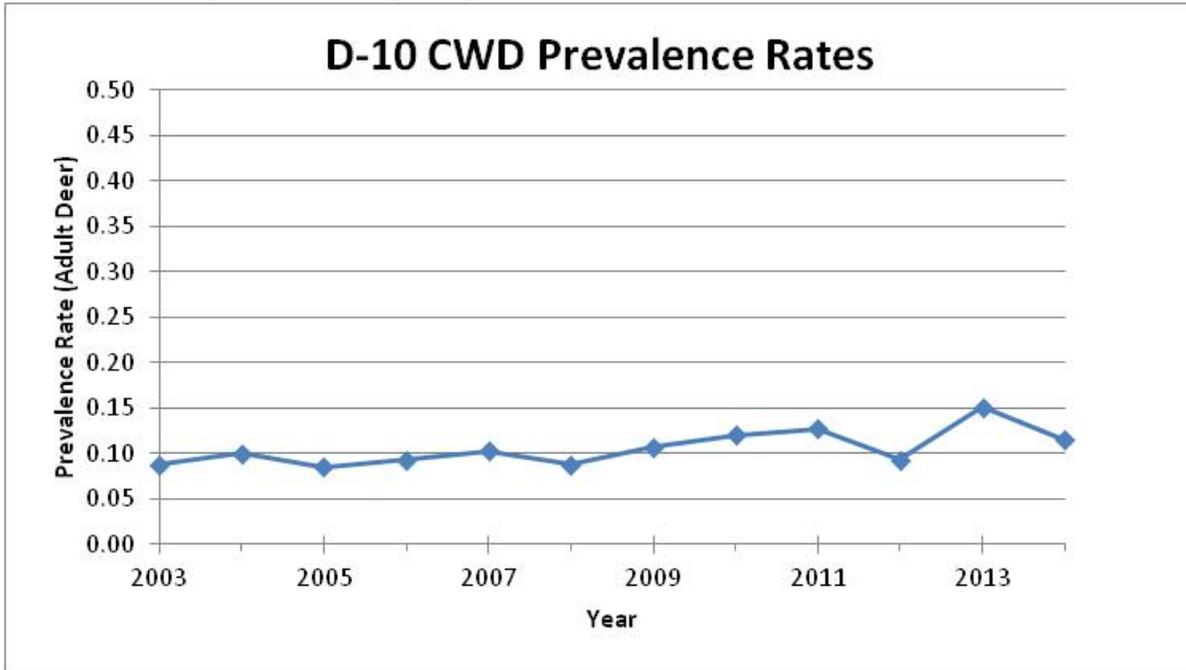


D-10 modeled population, buck and doe harvest estimates from 1988 to 2014.



D-10 modeled, observed and objective post-hunt sex ratios from 1988 to 2014.

Chronic Wasting Disease - Highest prevalence in the state



Preference Points

Minimum number of preference points for residents to draw a license for 2015.

Season	Hunt Code	Preference Points
Arch Either	DE020O1A	0
Muzzle Doe	DF020O1M	0
Rifle Doe 2	DF020O2R	1
Rifle Doe 3	DF020O3R	1
Rifle Doe 4	DF020O4R	1
PLO Doe	DF020P5R	0
Muzzle Buck	DM020O1M	0
Rifle Buck 2	DM020O2R	0
Rifle Buck 3	DM020O3R	0
Rifle Buck 4	DM020O4R	0
PLO Buck	DM020P5R	0

Current Seasons

D-10 Data													
Season	Hunt Code	Licenses											
		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Arch Either	DE020O1A	400	400	400	300	300	400	400	400	300	300	300	300
Muzzle Doe	DF020O1M	100	100	100	75	20	100	50	50	50	50	50	50
Rifle Doe 2	DF020O2R	200	200	200	100	30	30	30	30	30	30	30	30
Rifle Doe 3	DF020O3R												
Rifle Doe 4	DF020O4R												
PLO Doe	DF020P5R	1000	1000	1000	300	225	600	300	300	270	325	325	500
Muzzle Buck	DM020O1M	150	150	150	150	150	175	175	175	125	125	125	125
Rifle Buck 2	DM020O2R	1500	1500	1000	550	450	550	450	450	350	370	370	370
Rifle Buck 3	DM020O3R	"	"	"	"	"	"	"	"	"	"	"	"
Rifle Buck 4	DM020O4R	700	700	700	400	225	300	225	225	125	125	125	125
PLO Buck	DM020P5R		300	500	500	475	550	550	575	480	500	500	500

Arch – Archery, Muzzle – Muzzleloader, PLO – Private Land Only

APPENDIX C: PUBLIC SURVEY



SOLICITATION FOR PUBLIC COMMENT ON DEER MANAGEMENT The Big Thompson Deer Herd (D-10) (Game Management Unit 20)

In Colorado, big game species are managed at the herd level. The management of each herd is guided by a herd management plan. Herd management plans describe herd population and management histories, population objectives, and management strategies for at least the next 10 years. The planning process to develop herd management plans incorporates the desire and concerns of the public along with the habitat and biological capabilities of big game herds. Public input is a very important part of the herd management planning process.

Colorado Parks and Wildlife (CPW) is seeking your input on the future management of the Big Thompson deer herd. The Big Thompson deer herd, Data Analysis Unit (DAU) D-10, is composed of Game Management Unit (GMU) 20, which occurs in southern Larimer and northern Boulder counties. The area is bounded on the north by Larimer County Roads 44H (Buckhorn), 27, 38E, 19, and Harmony Road; on the east by Interstate 25; on the south by Colorado Highway 52, U.S. Highway 287, Boulder County Road 34 (Niwoot/Neva roads), U.S. Highway 36, Boulder County Roads 94, 81, 106, and 95 (Lefthand Canyon Drive), 102 (Brainard Lake Road), and the ridge line from Brainard Lake west to Pawnee Peak; on the west by the Continental Divide, Rocky Mountain National Park Boundary, and Pennock Creek-Elk Creek divide. The Big Thompson, Little Thompson, and St. Vrain are major drainages. Municipalities include Berthoud, Estes Park, Fort Collins, Longmont, Loveland, and Lyons.

The information you provide will help CPW develop objectives and management strategies for the future of the herd. Additional background information on the Big Thompson Deer Herd can be found at <http://wildlife.state.co.us/Hunting/BigGame/HerdManagementDAUPlans/Pages/HerdManagementDAUPlans.aspx>

Please complete the online survey, available at <http://wildlife.state.co.us/Hunting/BigGame/HerdManagementDAUPlans/Pages/HerdManagementDAUPlans.aspx>

or mail this completed survey to:

Colorado Parks and Wildlife
Attn: Ben Kraft
4207 West County Road 16E
Loveland, CO 80537

Online surveys must be completed by September 30th, 2015
Paper surveys must be mailed by September 30th, 2015

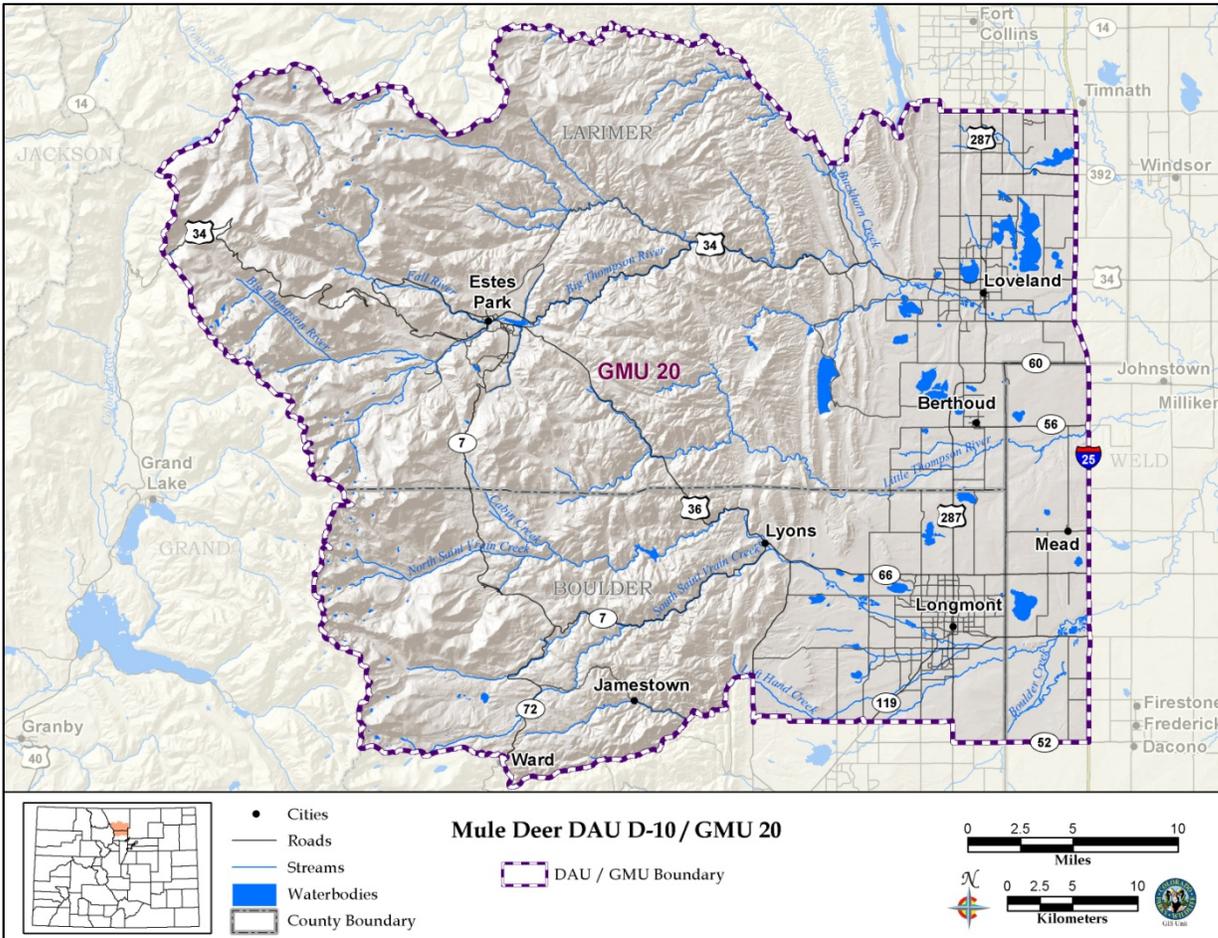


Figure 1. Geographic location of the Big Thompson deer herd management area (Data Analysis Unit D-10, composed of Game Management Unit 20) located in southern Larimer and northern Boulder counties.

TELL US ABOUT YOURSELF

Q1 Where do you live? (See map.)

Answered: 120 Skipped: 3

Answer Choices	Responses
Within the area of the Big Thompson deer herd	57.50% 69
In Colorado, but outside the area of the Big Thompson deer herd	39.17% 47
Outside of Colorado	3.33% 4
Total	120

Q2 If you live within the area of the Big Thompson deer herd, how many years have you resided in the area?

Answered: 72 Skipped: 51

Answer Choices	Average Number	Total Number	Responses
Years	24	1,749	72
Total Respondents: 72			

Q3 Which of the following best represents your interest in the Big Thompson deer herd? (Please select one.)

Answered: 121 Skipped: 2

Answer Choices	Responses
Hunter	80.99% 98
Guide/Hunting outfitter	0.00% 0
Outdoor Recreation, not related to hunting. For example, fishing, hiking, off-road vehicle use, backpacking, camping	1.65% 2
Conservation/Environmental Non-Government Organization	0.00% 0
Natural Resources or Land Management Agency Personnel	0.00% 0
Rancher or Agriculture Producer	0.00% 0
Local Landowner (1-35 acres)	5.79% 7
Local Landowner (35-100 acres)	5.79% 7
Local Landowner (>100 acres)	1.65% 2
Resident of the Area	1.65% 2
Vacation to the Area	0.00% 0
Other (please specify)	2.48% 3
Total	121

#	Other (please specify)	Date
1	close friend with residents that reside and own large areas of land/hunter	9/16/2015 12:53 PM
2	As a resident of area 20, I feel I should do my part to help manage the big game population to keep deer and elk at a sustainable level by hunting.	9/11/2015 9:29 PM
3	extended family of land owner 100arces+,hunter,conservation	9/10/2015 8:16 PM

ATTITUDES TOWARDS DEER AND DEER MANAGEMENT

Q4 What is your attitude toward the Big Thompson deer herd?

Answered: 120 Skipped: 3

Answer Choices	Responses	
Enjoy seeing deer	100.00%	120
Do not enjoy seeing deer	0.00%	0
Total		120

Q5 How interested are you in viewing or photographing the Big Thompson deer herd?

Answered: 120 Skipped: 3

Answer Choices	Responses	
Not at all interested	6.67%	8
Slightly interested	16.67%	20
Somewhat interested	22.50%	27
Moderately interested	21.67%	26
Very interested	32.50%	39
Total		120

Q6 Please rank the following in terms of which is the most important to your wildlife viewing experience. Give them most important item a 1 and the least important item a 3. Do not use any number more than once.

Answered: 120 Skipped: 3

	1	2	3	Total	Score
Being able to see large groups of deer	18.63% 19	28.43% 29	52.94% 54	102	1.66
Being able to easily find deer	37.38% 40	42.99% 46	19.63% 21	107	2.18
Being able to see large-antlered buck deer	48.70% 56	27.83% 32	23.48% 27	115	2.25

Q6 What, if any, conflicts have you personally experienced with the Big Thompson deer herd? (Select all that apply.)

Answered: 117 Skipped: 6

Answer Choices		Responses
Vehicle collisions		5.13% 6
Agricultural/Ranch conflicts		1.71% 2
Property damage at home, including trees, gardens, fences or landscaping		7.69% 9
No conflicts		80.34% 94
Other conflict (please specify)		5.13% 6
Total		117

#	Other conflict (please specify)	Date
1	private property	9/27/2015 1:12 PM
2	Vehicle Collisions. property damage. garden damage	9/18/2015 8:15 AM
3	to many motorcycles/partiers in the national forest during hunting season.	9/14/2015 8:32 PM
4	NF access	9/10/2015 9:52 PM
5	no concern from your department for my herd	9/10/2015 8:19 PM
6	would not let me select all....vehicles, ranch conflicts, property damage. we don't mind any of that though! we enjoy the deer.	9/10/2015 1:18 PM

Q8 How concerned are you about the following topics related to the Big Thompson deer herd?

Answered: 120 Skipped: 3

	Very concerned	Somewhat concerned	Not at all concerned	I am not sure.	Total
Deer-vehicle collisions	11.97% 14	45.30% 53	39.32% 46	3.42% 4	117
Damage to agricultural/ranch products such as crops and fences	0.85% 1	38.98% 46	54.24% 64	5.93% 7	118
Damage to your home, including trees, gardens, fences, or landscaping	2.54% 3	17.80% 21	77.97% 92	1.69% 2	118
Loss of deer habitat due to human development	59.66% 71	29.41% 35	10.08% 12	0.84% 1	119
Revenue generated from deer-related tourism to local economies, including hunting	27.73% 33	45.38% 54	25.21% 30	1.68% 2	119

Q9 Are you satisfied with where deer occur within GMU 20?

Answered: 120 Skipped: 3

Answer Choices	Responses	
Yes	72.50%	87
No	27.50%	33
Total		120

Q10 If you are not satisfied with where deer currently occur, why?

Answered: 34 Skipped: 89

Q11 How satisfied are you with CPW's management of the Big Thompson deer herd? Please consider deer watching, deer conflicts, how well CPW provides for and limits deer hunting, and chronic wasting disease, etc.

Answered: 120 Skipped: 3

Answer Choices	Responses	
Very satisfied	10.83%	13
Satisfied	44.17%	53
Neutral	23.33%	28
Dissatisfied	10.83%	13
Very dissatisfied	5.83%	7
I am not sure.	5.00%	6
Total		120

HERD OBJECTIVES

Chronic Wasting Disease: Chronic wasting disease (CWD) is a disease of deer and elk that causes behavioral changes and progressive loss of body condition, eventually leading to death. There is no known treatment of the disease. The Big Thompson deer herd consistently has the highest CWD prevalence rate among deer herds in the state. Currently, it is estimated that around 10% of the deer in the Big Thompson deer herd are infected with CWD.

It is thought that high deer densities and a higher proportion of males a population leads to higher disease prevalence rates. Our CWD surveillance monitoring has shown that mature male deer have higher prevalence rates than female and young deer (generally two times higher). It may be that maintaining a low density younger herd with fewer males would result in lower CWD rates in a population.

Q12 The previous herd management plan for the Big Thompson deer herd considered chronic wasting disease (CWD) as an important factor determining both the herd size objective and the male: female ratio objective. An attempt was made to manage the herd at a reduced population size and low male: female ratio in order to decrease CWD prevalence in the herd. Do you support a similar CWD management strategy for the future management plan?

Answered: 120 Skipped: 3

Answer Choices	Responses	
Yes	62.50%	75
No	37.50%	45
Total		120

Colorado

Parks and Wildlife manages big game herds to provide the public with hunting and viewing opportunities, while minimizing conflicts and damage caused by herds. In order to accomplish those goals, the total number of animals in the herd and the proportion of males in the herd are considered. Therefore, herd management plans define **1) a population objective** and **2) the ratio of males to females objective**.

The Population Objective: Colorado Parks and Wildlife strives to manage big game populations within both the biological and social carrying capacity of the area. The biological carrying capacity is the number of animals that can be supported by the available habitat. The social carrying capacity is the number of animals tolerated by the people affected by the herd. When big game populations are at optimal levels, habitat damage is not a consideration, people are able to enjoy viewing, photographing, and hunting big game, and conflicts are minimized. If big game numbers are too low, it is difficult for viewers and hunters to find big game. If big game numbers are too high, habitat damage occurs, herd health and productivity declines due to density-dependent effects, and conflicts may rise to intolerable levels. Density-dependent effects act on populations because there is a limited amount of habitat resources (for example, food and winter range) available to the population. As the population increases, the amount of habitat resources available to each individual declines and therefore herd productivity declines.

In order to increase big game populations, fewer licenses will be available in the short-term, but more licenses will become available each year in the long term (given that the population size is below density-

dependent thresholds). In order to decrease big game populations, more licenses will be available short-term, but fewer licenses will be available each year in the long-term (given that the population size is below density-dependent thresholds).

Q13 How should the Big Thompson deer herd population size be managed in the future? (Select one.)

Answered: 119 Skipped: 4

Answer Choices	Responses	
Increase greatly (More than 25%)	24.37%	29
Increase somewhat (10%)	32.77%	39
No change from previous objective	26.05%	31
Decrease somewhat (10%)	3.36%	4
Decrease greatly (More than 25%)	3.36%	4
I am not sure.	10.08%	12
Total		119

The Male to

Female Ratio Objective: The male: female ratio objective and the number of male licenses available each year are also related to the population objective. Smaller populations generally provide fewer male licenses, while larger populations generally provide more male licenses. However, populations that are so large that they are near the total number of animals that the habitat is able to support generally provide fewer male licenses because of density-dependent effects.

For a specific population size, there is a tradeoff between the number of male licenses available to hunters vs. the size/quality of males available for hunters to harvest. Big game herds can be managed to 1) maximize the opportunity to hunt males, 2) maximize male antler and body size (i.e., more males and older-larger males), or 3) some compromise between male hunting opportunity and male quality. For a specific population size, if the herd is managed to maximize the opportunity to hunt males, more male licenses are available and hunters are able to more easily obtain male licenses. This management strategy results in the fewest number of males in the population and the fewest older and larger males in the herd, along with the lowest hunter success rates. If the herd is managed to maximize the body size and antler size of the males, fewer male licenses are issued each year. As a result, the average body/antler size of males harvested is greater and hunters will see more males while hunting, however, hunters will not be able to draw male licenses as frequently (it may take several years, and preference points, to draw a male

Q14 How should the Big Thompson deer herd male to female ratio be managed? (Select one)

license).

Answered: 118 Skipped: 5

Answer Choices	Responses
No change from previous objective	33.05% 39
Increase in the number and size of males (i.e. harder to draw a license, but higher harvest success)	33.05% 39
Increase the opportunities to hunt males (i.e. easier to draw a license, but lower harvest success)	22.03% 26
I am not sure.	11.86% 14
Total	118

HUNTING

Q15 Have you ever hunted in the Big Thompson deer herd (GMU 20)?

Answered: 119 Skipped: 4

Answer Choices	Responses
Yes	95.80% 114
No	4.20% 5
Total	119

Q16 In GMU 20, what type of land do you hunt most frequently?

Answered: 114 Skipped: 9

Answer Choices	Responses
Public land	50.88% 58
Private land	35.96% 41
Both, equally	13.16% 15
Total	114

Q17 In GMU 20, what sex of deer do you hunt most frequently?

Answered: 114 Skipped: 9

Answer Choices	Responses
Male	60.53% 69
Female	18.42% 21
Both, equally	21.05% 24
Total	114

Q18 How do you rate your hunting experiences with the Big Thompson deer herd?

Answered: 113 Skipped: 10

Answer Choices	Responses	
Excellent	15.93%	18
Good	46.90%	53
Fair	24.78%	28
Poor	12.39%	14
Total		113

Q19 How do you rate your opportunity to harvest deer for meat in the Big Thompson deer herd?

Answered: 112 Skipped: 11

Answer Choices	Responses	
Excellent	15.18%	17
Good	52.68%	59
Fair	19.64%	22
Poor	12.50%	14
Total		112

Q20 How do you rate your opportunity to harvest large-antlered males in the Big Thompson deer herd?

Answered: 111 Skipped: 12

Answer Choices	Responses	
Excellent	5.41%	6
Good	19.82%	22
Fair	45.05%	50
Poor	29.73%	33
Total		111

Q21 How do you describe the level of hunter crowding you experience while hunting the Big Thompson deer herd?

Answered: 113 Skipped: 10

Answer Choices	Responses	
Very crowded	2.65%	3
Moderately crowded	22.12%	25
Slightly crowded	35.40%	40
Not at all crowded	39.82%	45
Total		113

Q22 Please rank the following items from 1 to 7 in the order of what would most likely improve your deer hunting experience in the Big Thompson deer herd. Give the item most likely to improve your experience a 1 and the item least likely to improve your experience a 7. Do not use any number more than once.

Answered: 111 Skipped: 12

	1	2	3	4	5	6	7	Score
Less hunter crowding	1.92%	10.58%	14.42%	12.50%	14.42%	19.23%	26.92%	
	2	11	15	13	15	20	28	3.08
Harvesting a deer	24.04%	17.31%	15.38%	19.23%	17.31%	5.77%	0.96%	
	25	18	16	20	18	6	1	4.90
Harvest a large-antlered buck deer	25.00%	22.12%	7.69%	10.58%	12.50%	10.58%	11.54%	
	26	23	8	11	13	11	12	4.59
Seeing more deer	12.15%	11.21%	28.04%	14.95%	15.89%	12.15%	5.61%	
	13	12	30	16	17	13	6	4.30
Drawing a buck deer license more frequently	6.54%	10.28%	15.89%	14.02%	22.43%	24.30%	6.54%	
	7	11	17	15	24	26	7	3.65
Drawing a doe deer license more frequently	0.94%	7.55%	7.55%	20.75%	7.55%	18.87%	36.79%	
	1	8	8	22	8	20	39	2.70
Additional access to areas where deer occur	30.28%	22.02%	10.09%	7.34%	9.17%	8.26%	12.84%	
	33	24	11	8	10	9	14	4.81

Q23 Please provide additional comments regarding the future management of the Big Thompson deer herd below.

Answered: 69 Skipped: 54

APPENDIX D: COMMENT LETTERS



Natural Areas Department
1745 Hoffman Mill Road
PO Box 580

Fort Collins, CO 80522

970.416-2815

970.416-2211 - fax

fcgov.com/naturalareas
naturalareas@fcgov.com

November 21, 2017

Mr. Ben Kraft

Colorado Parks and Wildlife
4207 West County Road
16E Loveland, CO 80537

Dear Mr. Kraft,

This letter is in response to the Colorado Parks and Wildlife “Big Thompson Deer Herd Management Plan.” The City of Fort Collins Natural Areas Department manages several natural areas within the boundaries of this Data Analysis Unit (D-10), including Bobcat Ridge, Coyote Ridge, Cathy Fromme Prairie, and Fossil Creek Reservoir natural areas, with all natural areas in this unit totaling 8,134 acres.

Natural areas are managed for a variety of natural resources and recreational opportunities congruent with the Department’s mission. In the D-10 deer herd management plan it is stressed that city and county acquisition of land for open space presents issues to management of healthy deer populations. Specifically, that these areas are not open to hunting and serve as refuges that concentrate deer and cause uneven distribution of deer across the landscape.

Hunting on a natural area is considered, in cooperation with Colorado Parks and Wildlife (CPW), on a site-by-site and case-by-case basis, and is evaluated based on wildlife population objectives, the maintenance of habitat quality, public safety, and the opportunity to provide a sustainable high-quality experience in nature (The Natural Areas Department Wildlife Conservation Guidelines, 2017). Site-specific management plans address hunting more specifically (Bobcat Ridge and Soapstone Prairie

management plans). Currently, the Natural Areas Department is working in cooperation with CPW on gathering data to better understand the elk population at Bobcat Ridge Natural Area and may consider a limited elk hunt for this natural area. While CWD-infected deer have not been documented at Bobcat Ridge Natural Area, the Natural Areas Department will continue to coordinate with CPW in monitoring deer and elk for wildlife disease. Additionally, the Natural Areas Department allows a limited hunt for pronghorn on Soapstone Prairie Natural Area.

While the Natural Areas Department considers hunting on a case-by-case basis, it must be carefully addressed within a spectrum of other conservation and recreational resources. Natural areas provide refuge from urban and exurban development for a wide variety of wildlife and plant species. Likewise, many of these areas are small, fragmented properties surrounded by development and may not be appropriate for hunting. The City of Fort Collins continues to acquire natural areas properties, and future acquisitions may provide more hunting opportunities, particularly as it relates to managing healthy resources (e.g., mitigating for over-browsing) and maintaining healthy wildlife populations.

Thank you for the opportunity to comment on the revised Big Thompson Deer Herd Management Plan. We appreciate our partnership with CPW and the continued collaboration and consultation on a multitude of wildlife conservation issues.

Sincerely,



Jennifer Roberts

Cc: J. Stokes, R. Bachand, D. Figgs, R. Steeves, A. Meyer



Thanks for taking the time to actually look into the issues impacting the mule deer in area 20.

I had a great hunt this year resulting in a nice 4x4 buck. That being said it really seemed like the numbers were down.

I covered a lot of country and hiked into a lot of areas that most hunters wouldn't. I don't know what the biggest impact is on the herd right now.

I did see a lot of lion tracks but I don't think that is the main problem. As you stated the amount of private land and government land that we cannot use seems to really harbor a lot of animals. I wish they would open up select open space land to a limited draw tag. We need to have good conservation of these animals.

I would truly like to learn more about mule deer in area 20 and mule deer in general. If you have any recommendations on literature or if we could talk about it sometime I would really be grateful. I would be interested in volunteering for some mule deer projects also if you ever need help.

My number is XXX-XXX-XXXX if we could chat sometime I would appreciate it.

Thank you