Lake Fork Data Analysis Unit E-25
Elk Management Plan

April 26, 2017

Colorado Parks & Wildlife

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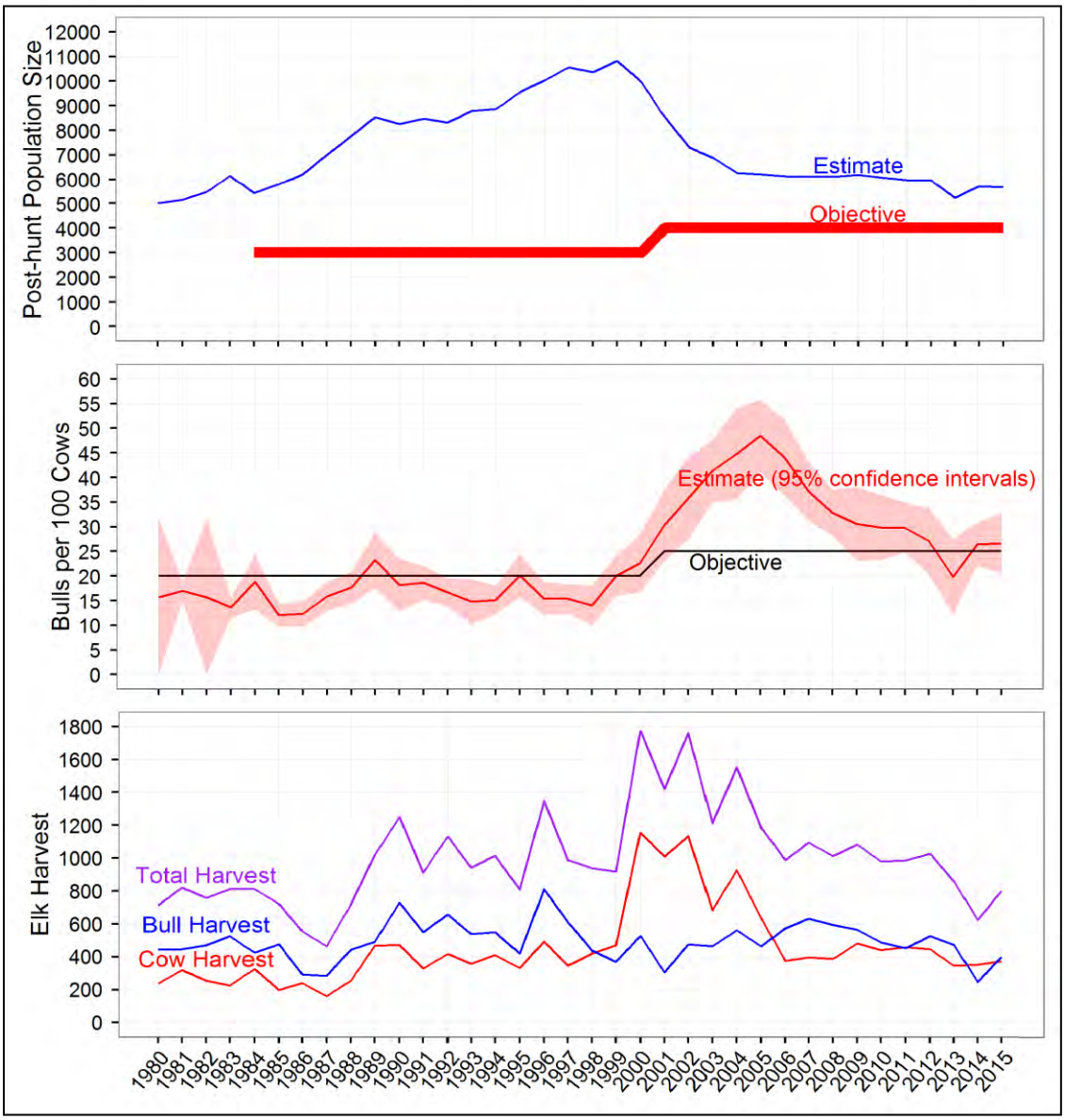
Executive Summary – Lake Fork Herd – E25

Game Management Units: 66 & 67	**Landownership:** 18% private & 82% Public
Post-hunt population size (2015): 5650 elk	**Post-hunt sex ratio (bulls:100 cow)**: 26.6 (modeled)
2001 DAU plan objectives: 4000 elk, 25 bulls:100 cows	
2017 (Current) DAU plan objectives: 6000 – 7000 elk, 23 – 28 bulls:100 cows, gradual change in license allocations	



The E25 elk population will continue to be managed under the limited licensing strategy with the purpose of providing ample hunting opportunity with low hunter crowding. The management alternatives selected in this plan will be used for setting annual license allocations. Formation of primary alternatives (population size) are made considering E25's limited licensing purpose, public input, carrying capacity history, and the influence of secondary alternatives (bull ratio). Formation of secondary (bull ratios) and tertiary alternatives (license allocation strategy details) should consider the

population size alternatives. Bull ratio alternatives were formed considering the over-arching E25 strategy to manage for low hunter crowding. License allocation strategy was formed based on public input and potential impacts on bull ratios.

Objective	Alternatives
Population Size (Primary)	1: 5000 – 6000 elk (*2015 status quo*)
	2. 6000 – 7000 elk (18% increase) *PREFERRED AND APPROVED*
	2: 6500 – 7500 elk (*25% increase*)
	3: 8000 – 9000 elk (*50% increase*)
Bull Ratio (Secondary)	1: 18-23 bulls : 100 cows
	2: 23 – 28 bulls: 100 cows (*status quo*) *PREFERRED AND APPROVED*
	3: 28 – 33 bulls: 100 cows
License Allocation Strategy (Tertiary)	**1: Gradual change in license allocations to meet herd objectives *PREFERED AND APPROVED***
	2: Rapid change in license allocations to meet herd objectives

Desires of hunters were characterized through extensive public input gathering. Two preliminary and three primary surveys with extensive questioning were conducted on hunter opinions. Among the three primary surveys and their respective targeted audiences, few substantial differences in hunter desires exist.

Several issues, outside of hunter desires, influence the carrying capacity of the landscape in E25. Approximately 25% of the total forest canopy (50% of all spruce-fir forest communities) has been impacted by a spruce beetle die-off. It is anticipated that forage availability will increase on elk summer range as a result. Landscape health was poor in the late 1990s and early 2000s following high population sizes of elk, mule deer, and livestock. As a response, CPW decreased elk and mule deer population sizes by 50%. Concerns of degradation to Gunnison Sage-grouse habitat were also present during high ungulate abundance. Current (>2010) surveys indicate that vegetation has likely recovered.

Concerns exist by CPW staff that elk distribution within E25 is changing in response to spruce beetle, non-hunting recreation, vehicle traffic, and private land refuges. While these elk distribution issues may not always be tied directly to carrying capacity, the ability of hunters to encounter elk is likely impacted.

The population size alternative selected is #2: an approximate 18% increase (to 6000-7000 elk) from the 2015 post-hunt status-quo population size. This reflects a collaborative desired population size gathered through extensive polling of survey and meeting participants. The bull ratio selected is #2: 23 – 28 bulls:100 cows (status quo). This alternative is anticipated to strike a balance between hunters who wish to have opportunity (i.e., hunt frequently), and those hunters wanting lower crowding in the field. The license allocation strategy selected is to make a change in population size gradually (alternative #1), rather than rapidly. This also reflects the desires gathered through extensive polling of hunters.

This plan was presented to the CPW commission January 12, 2017 and approved by the CPW commission March 2, 2017.

Introduction and Purpose

Colorado Parks and Wildlife (CPW) manages wildlife for the use, benefit and enjoyment of Colorado's people and visitors. Management of big game populations is conducted with a "Management by Objective" approach, in which big game populations are managed to achieve objectives for each Data Analysis Unit (DAU). DAUs are distinct geographic areas delineated to encompass a herd that has little spatio-temporal overlap with neighboring herds. Ideally, it is where most animals in the herd are born, live, and die. A DAU is often divided into several game management units (GMUs) to distribute hunters and harvest within the DAU.

The primary purpose of a DAU plan is to establish management objectives pertaining to a big game herd. For DAU E25, the DAU plan establishes management objectives in terms of a desired elk population size range (primary) and sex ratio range (secondary). Management objectives established in this plan must abide by statutes and policies set forth by the CPW's Big Game Season Structure, CPW's Strategic Plan, Parks and Wildlife Commission, and the Colorado State Legislature. E25 is currently designated by the Colorado Parks and Wildlife Commission as a totally limited license unit for providing a low-hunter crowding opportunity. DAU plans also identify and carefully consider issues and topics important to big game management. These issues and topics can be categorized broadly into elk population dynamics (pp. 7 – 16), elk habitat carrying capacity and distribution (pp. 17 – 21), and public involvement (pp. 21 – 24); this plan devotes a section to each of those categories.

The alternatives selected in this plan will drive annual elk license setting decisions, which are designed to maintain or modulate the elk population and meet the objectives established in this plan. The plan also describes additional strategies and techniques that will be used to achieve the herd objectives.

Description of DAU

The E25 DAU is located in southwest Colorado in the southern half of the Gunnison Basin, spanning Gunnison, Hinsdale, and Saguache counties. It consists of Game Management Units 66 and 67 (Fig. 1) and spans 1572 square miles. A complete description of the boundary, topography, and climate, can be found in Masden (2001). A description of the current vegetation can be found in the habitat and carrying capacity section below.

Land ownership is dominated (82%) by public lands managed by the Bureau of Land Management (BLM), United States Forest Service (USFS), National Park Service (NPS), and the state of Colorado (Colorado Parks and Wildlife / State Land Board).

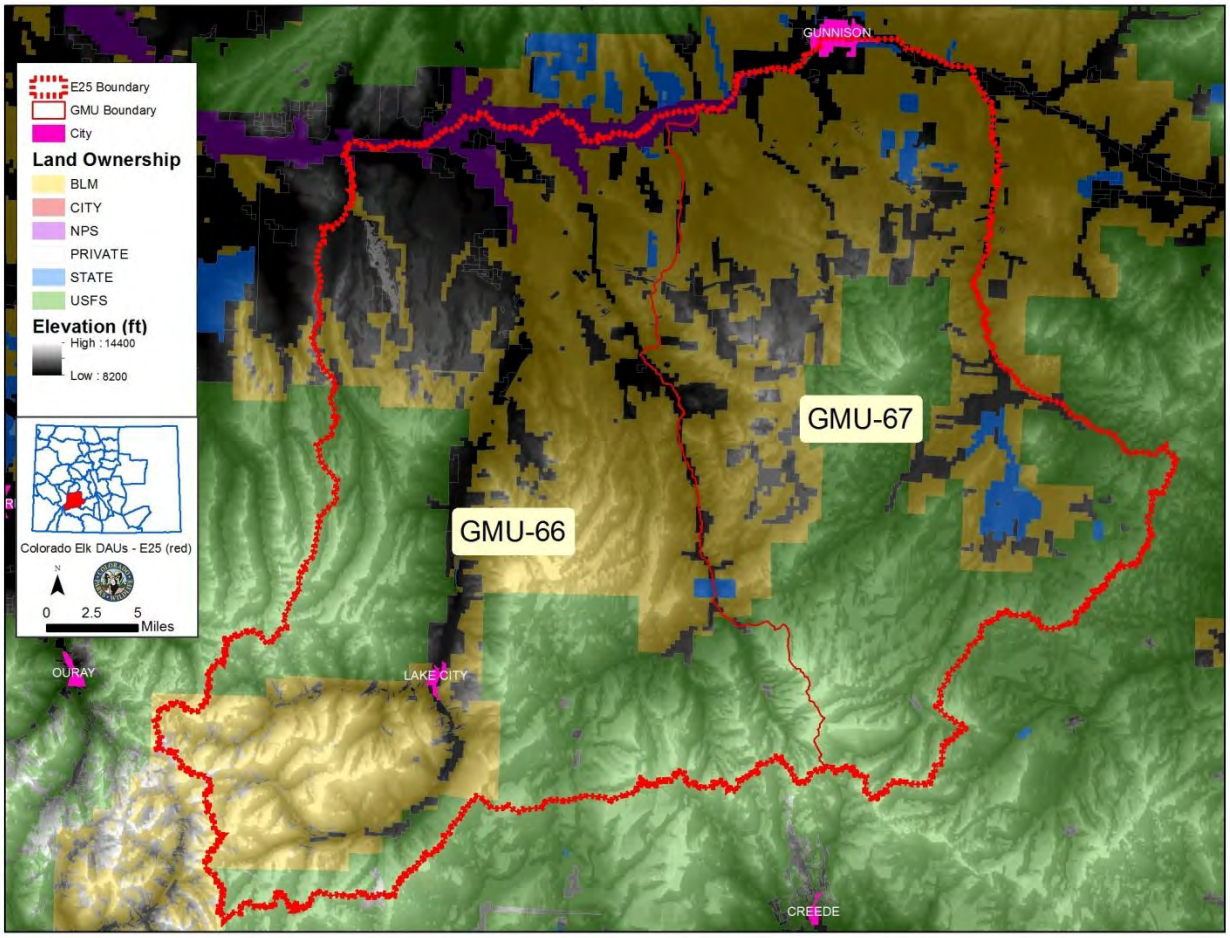


Figure 1. *Location of DAU E25, GMU 66/67 boundaries, public land ownership (shaded), private landownership (un-shaded), cities, and elevation gradient.*

E25 Elk Population Dynamics

Population Estimation Methods

Estimating numbers of wild animals over large geographic areas is a difficult and approximate science. Colorado Parks and Wildlife recognizes the difficulties of estimating the size of big game populations as a challenge in managing populations. The agency utilizes flexible population estimates that incorporate the latest technologies available and complimenting data sources. As additional years of data are added, the accuracy of prior year estimates are improved, thus ultimately improving current estimates.

Population estimates are derived from computer assisted population models that integrate multiple biological factors, such as initial population size, mortality rates, reproductive rates, hunter harvest numbers (Steinert et al. 1994), post-harvest sex ratios, and wounding loss. Annually, a suite of biologically plausible models is constructed and ranked based on a score that minimizes the difference between observed and predicted sex ratios. Initial models of the early 1970s were constructed with ONE POP software. In the early 1980s, POP II software was implemented (Bartholow 2000). Post-1999,

spreadsheet models replaced POP II. In 2009, the spreadsheet model was standardized based on newer mathematical models (White and Lubow 2002). This continual process of updating the model: 1) allows past and current estimates of population size to be more accurate, 2) dampens annual variation that reflects sampling variability, 3) provides a better representation of population trend (long term relative changes in population size). In addition to annual updates to the model, a revision to the model is made when a DAU plan is updated; an expanded suite of models is constructed and the best model is selected.

Actual counts or extrapolation-based sampling of elk population size are not conducted in E25. Instead multiple sources of information are gathered during: 1) aerial elk age/sex classification surveys and 2) elk harvest mortality surveys. The elk age/sex classification surveys provide an estimate of the number of males and number of young of the year per 100 females. Bulls:100 cows ratios include bulls $\geq$ 1 year of age. Current aerial survey methodologies underestimate the bulls:100 cows ratio, as larger groups of animals, primarily represented by females and calves, are easier to detect than bull groups. Habitat utilization differences between bulls and cows further complicates the technique. Given that bulls have a lower probability of detection than cows, a sightability factor is incorporated into the model to provide a more realistic representation of the bulls:100 cows. This modeled bull ratio estimate is utilized when making management decisions concerning allocation of licenses.

During the development of population models, the model produces various diagnostic measures. This includes a measure of model parsimony using an information theoretic approach. Model realism is further diagnosed by examining the various biological parameters derived by the model. Appendix 1 provides further justifications of model suitability regarding specific biological parameters and survey techniques used to gather input data.

Finally, anecdotal information gathered from hunter and landowner contacts made by CPW field staff is considered for model evaluation and final license allocations. While field observations are used to help ground-truth the model, it is recognized that using population estimates based entirely on sportsmen's observations has produced severely biased results (Freddy et al. 2004, Appendix 1).

Indexed Population Size Objectives

The population objective range depends on the population estimate derived during formation of the DAU plan. However, population modeling is an evolving process whereby modeled estimates can change over time based on additional data or improved modeling methodology. CPW managers have conducted two major revisions in the E25 population models since the 2001 plan. These changes ultimately improved the model, but also resulted in a dramatic increase of estimated population size at two points in time (post-hunt 2004 and 2010) (Fig 2). No actions were taken concerning elk license allocations when these changes in population estimation methods occurred; an actual population change was superficial. An index can be calculated by examining the difference observed in the published population estimate for the 2001 DAU plan and the retrospective estimates of the size of the 2001 elk population derived with the most recent population model (July 2016). To account for uncertainty in this disparity, we computed the average difference in annual population size estimates originating from the two models during 1999-2003. The retrospective estimates of population size were on average a factor of 1.67 times higher than what was generated and published on an annual basis. If the 2001 established population

objective of 4000 elk was adjusted retrospectively in accordance with this 67.7% difference, an indexed objective of ~6700 elk would be realized (Fig 2). Given this information, the 2015 E25 population is just under the population objective desired in the 2001 E25 DAU plan.

Population indexing is a concept that has been extensively discussed, but never officially implemented by CPW. In situations where population models are updated with new data (as done annually in E25) or with new parameters that result in more accurate population estimates, an existing DAU Plan could be modified with a simple amendment. As demonstrated in the 2001 – 2016 example expressed above, indexing could be conducted by examining the change in population size of a new population model compared to the existing model. If functional changes to the model in the future result in changes in the population estimate, but not changes in management, the population objective can be modified with a short DAU plan amendment.

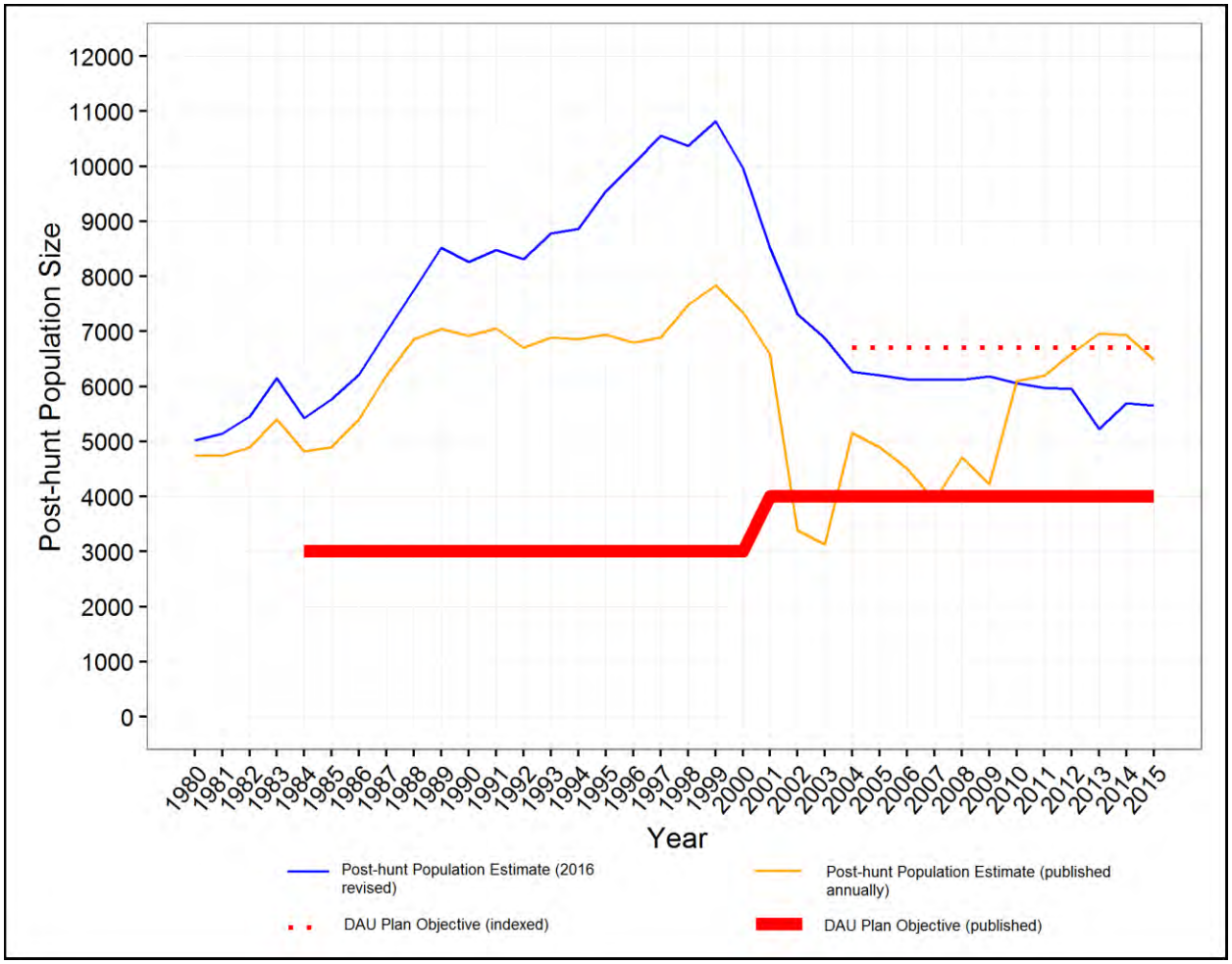


Figure 2. *Population size trend estimates and corresponding herd management objectives. Current best estimates (blue) have smoother estimates over estimates published annually (yellow), and are thus more realistic. DAU plan objectives (solid red lines) of pre- and post-2001. Indexed objective (dotted red line) is*

2001 DAU plan objective scaled with a factor of 1.667 reflecting retrospective population estimate updates.

Post-hunt Population Size History

Examining the E25 herd retrospectively with the most current population model indicates that E25 experienced three major population trajectories since 1980:

1) 1980 – 1999. During this period, the population slowly grew, more than doubling the initial 1980 estimate. An average of 337 cow elk were harvested annually, representing approximately 8% annual harvest of the population's cow segment (pre-harvest annual estimates)

2) 2000 – 2005. During the late 1990's, E25, like elk populations statewide, was over-objective and considered over-abundant from a landscape health and rangeland conflict standpoint. In 2001, management of E25 changed in three ways. The first was to intentionally decrease the elk population size. The second was to raise the population objective size by 25% (3000 to 4000 elk). The third was the implementation of totally limited elk licenses to decrease hunter crowding. Given the published 1999 estimate of 7800 elk, the population objective (4000 elk) of the 2001 DAU plan was implemented to decrease the population size by nearly 50%. From 2000 to 2005, high harvest pressure was placed on cows. The primary method used to reduce the population was with a large allocation of either-sex licenses. Approximately 922 cow elk were harvested annually, representing a 21.7% annual harvest of the population's cow segment (pre-harvest annual estimates).

3) 2006 – 2015. In 2006, either-sex licenses were reduced to only archery season. Based on the published post-hunt population estimates and the corresponding DAU plan objectives, the reductions of the prior period had been met. Retrospectively, with the revised E25 population model provided in this plan, along with indexed objectives, it is further confirmed that the 2001 DAU plan population objective was reached. Population size was considered steady relative to the 1980–1999 and 2000–2005 periods. It is uncertain whether current model projections of population size, given the recent license allocation strategy, is indicating a growing or decreasing population. Approximately 407 cow elk were harvested annually, representing 12.8% of the population's cow segment.

Post-hunt Herd Composition History

Bull ratios (bulls per 100 cows) experienced a sharp increase followed by a sharp decline since 1997 (Fig. 3). This change in bull ratio was driven by a dramatic shift in the harvest proportion of cows and bulls starting in 1997 (Fig. 4). While other factors were likely influential between 1997 and 1999, a large number of limited either-sex licenses were used to bring the E25 population down the following 6 years. This decrease was largely attributed to the high proportion of cows harvested during the 2000 - 2005 period (Fig. 4). Manager manipulations to cow harvest is an efficient means of making dramatic population size changes, with the least influence on total license allocation numbers. Either-sex licensing strategies allow a higher success rate, as it allows hunters to be less selective. Total license numbers are

important to consider when balancing population objectives and maintaining the low hunter crowding status in E25.

During the management period of intentional population decline, the number of bulls encountered for every cow encountered was likely high for hunters, despite a declining overall elk population size (Fig. 2). The response of bull ratios to changes in cow harvest proportion appeared to lag ~4 years (Fig. 4).

In more recent history, the bull ratio may have leveled off (2012-2015). Alternatives posed in this plan assume that this 4-year stasis will continue under status quo license allocations.

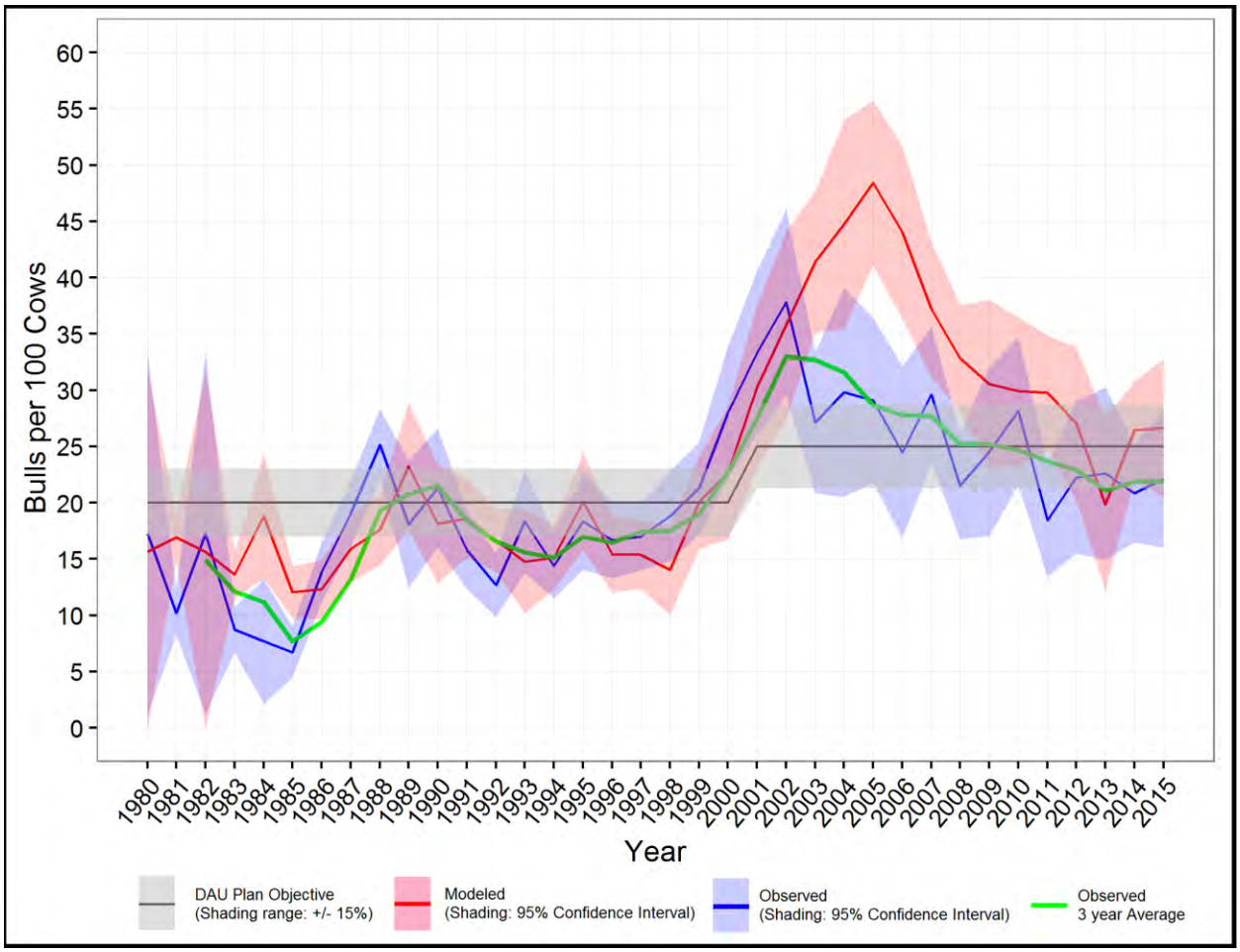


Figure 3: *Modeled (red) and observed (blue) bull ratio estimates (bulls:100 cows) and corresponding 95% confidence intervals (blue and red shading). Previous DAU plan objectives (gray) were not published as ranges, but as a single mid-point objective. Objective range is projected retrospectively corresponding to +/- 15% of the mid-point. Annual management decisions consider the modeled bull ratio and running three-year average observed (green) bull ratio.*

Calves per 100 cows measured post-hunting season are a measure of reproductive performance. Calf ratios have exhibited a gradual decline in E25 since 1980 (Fig. 5). The source of this decline is currently unknown, but may be from disease, predation, climate, and habitat changes. This decline is also

observed in many other Colorado elk DAUs, with the steepest declines in the more southerly latitudes. The current five-year average calf ratios for statewide and E25 (39.06 and 40.9 calves:100 cows) are nearly equivalent.

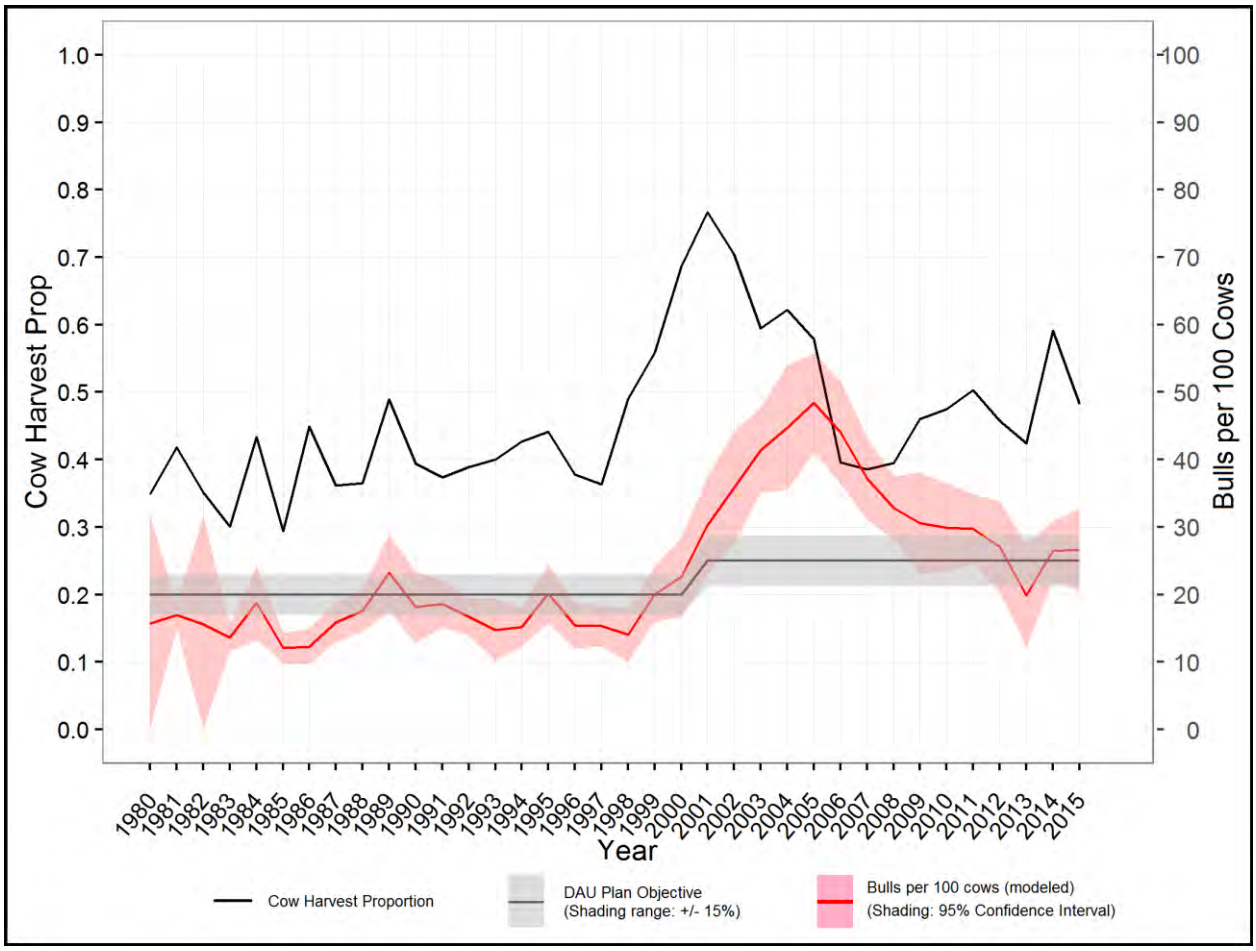


Figure 4. *Proportion of harvest composed of cows (black line) and the respective modeled post-hunt bull ratios (red) and 95% confidence intervals (red shading). Previous DAU plan objectives (gray) were not published as ranges, but as a single mid-point objective. Objective range (gray shading) is projected retrospectively corresponding to +/- 15% of the mid-point.*

Hunting History

Hunter success rates can be measured in two ways: harvest numbers per hunters afield and harvest numbers per licenses available (Fig. 6). The number of harvests per the total hunters afield is the metric published annually by CPW, and is most important to a hunter's experience in terms of hunter crowding levels. However, annual license allocations must consider hunters that drew a license, but did not go to the field. Therefore, the number of harvests per licenses available is the metric most influential in determining the appropriate license allocations.

Harvest success measures vary annually with response to weather and survey error. However, licensing strategies and elk population sizes also have an impact. From 1980 to 1999, during a period of over-the-

counter (OTC) licensing and a growing elk population, harvest success averaged 19.5% (Fig. 6). From 1999 to 2005, during a period of limited either-sex licensing and a declining population, harvest success averaged 33.4% (Fig. 6). From 2006 to 2015, during a period of sex-specific licensing and a stable

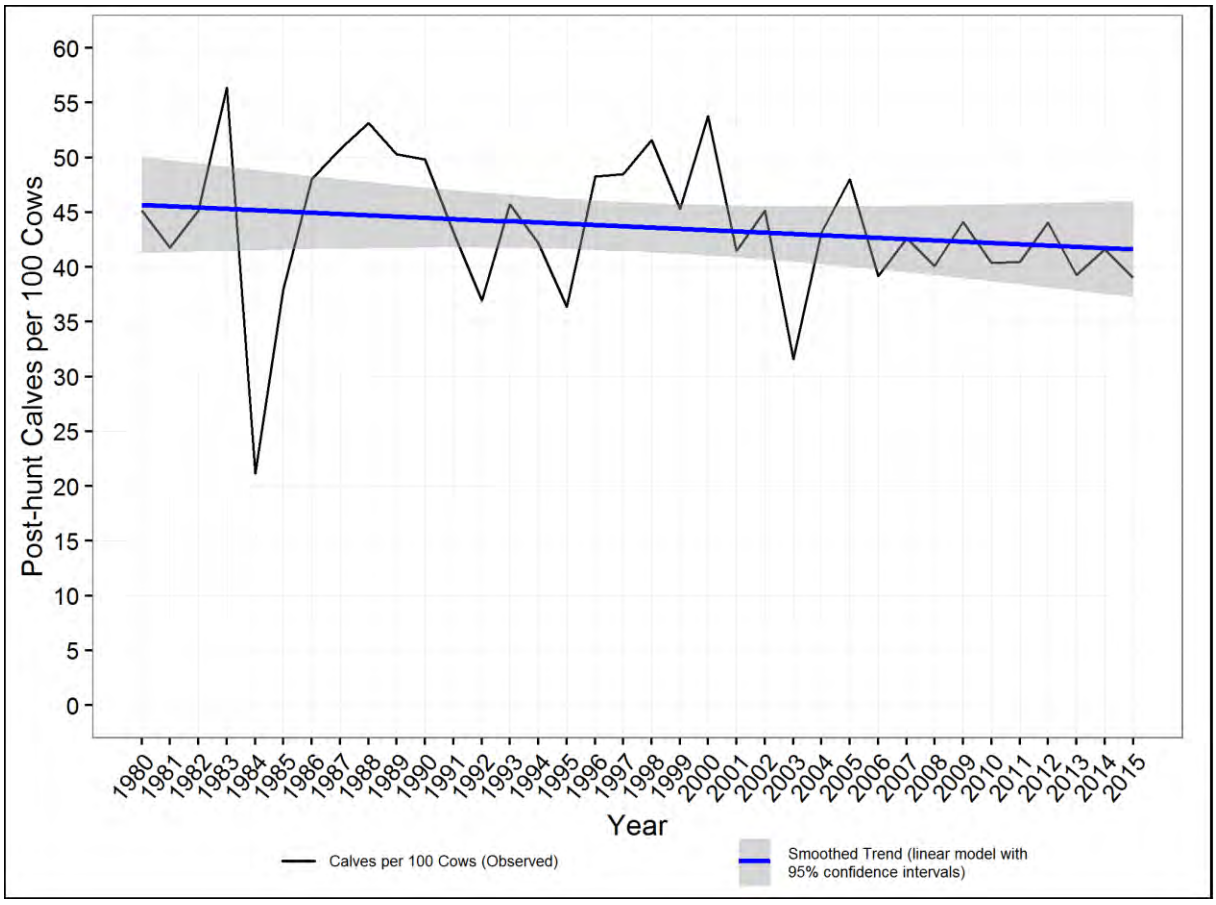


Figure 5. *E25 observed calf ratios (post-hunt calves per 100 cows) 1980 – 2016.*

population, harvest success averaged 27.9% (Fig. 6). This period also appears associated with increased hunter satisfaction.

License Allocations and Demand

The number of licenses allocated for archery, muzzleloader, and rifle declined from 2006 – 2016 (Fig. 7). Corresponding to this decline, the number of first-choice applicants also declined for both rifle and muzzleloader (Fig. 7). Prior (1999 – 2005) to this period, either-sex licenses were primarily available for all methods of take, rather than the current sex-specific licensing strategy. Demand for licenses can be examined by the number of applications per license allocated (Fig. 8). Application demand rates have increased for archery licenses, but have decreased for muzzleloader licenses (Fig. 8). Rifle license demand rates have remained relatively steady (Fig. 8). Comparing E25 license demand to the average demand rate for all Colorado limited license units managed completely for low-hunter crowding (E17, E18, E22, E25, E28, E38, E39, E9), indicates similar trends. E25 archery and muzzleloader licenses have higher demand rate relative to this comparison group, but lower rifle license demand rates (Fig 8).

Reasons for the declining first choice application numbers in the rifle seasons appear to be driven by a variety of factors. Of the 237 respondents characterized in a randomized opinion survey representing hunters from 2006 - 2014, 19.4% (45 respondents) were part of a subset indicating they no longer hunted in E25 (Appendix 2, Section 5, Question 6). When the subset was asked reasons for leaving E25, the highest number of response of any answer choice indicated it was because insufficient numbers of elk were encountered (26.9%). However, a majority (the remaining 73.1%) indicated other reasons such as hunter crowding (13.5%), required days-afield (13.5%), moving residency further away (10.6%), difficulty accessing [age/health/public land access] (10.6%), unable to draw a license (9.6%), saving preference points (8.7%), crowding from non-hunting recreation activities (3.8%), and insufficient encounters of large bulls (2.9%). See appendices (Appendix 2, Section 5, Question 7) for full results of randomized public opinion survey.

Statistics regarding minimum number of preference points required are not discussed here, as point requirements are highly associated with the demand rate measure anyway. Demand rates (first choice applicants per license allocated) provide a more sensitive continuous measure rather than the discrete measure concerned with preference points.

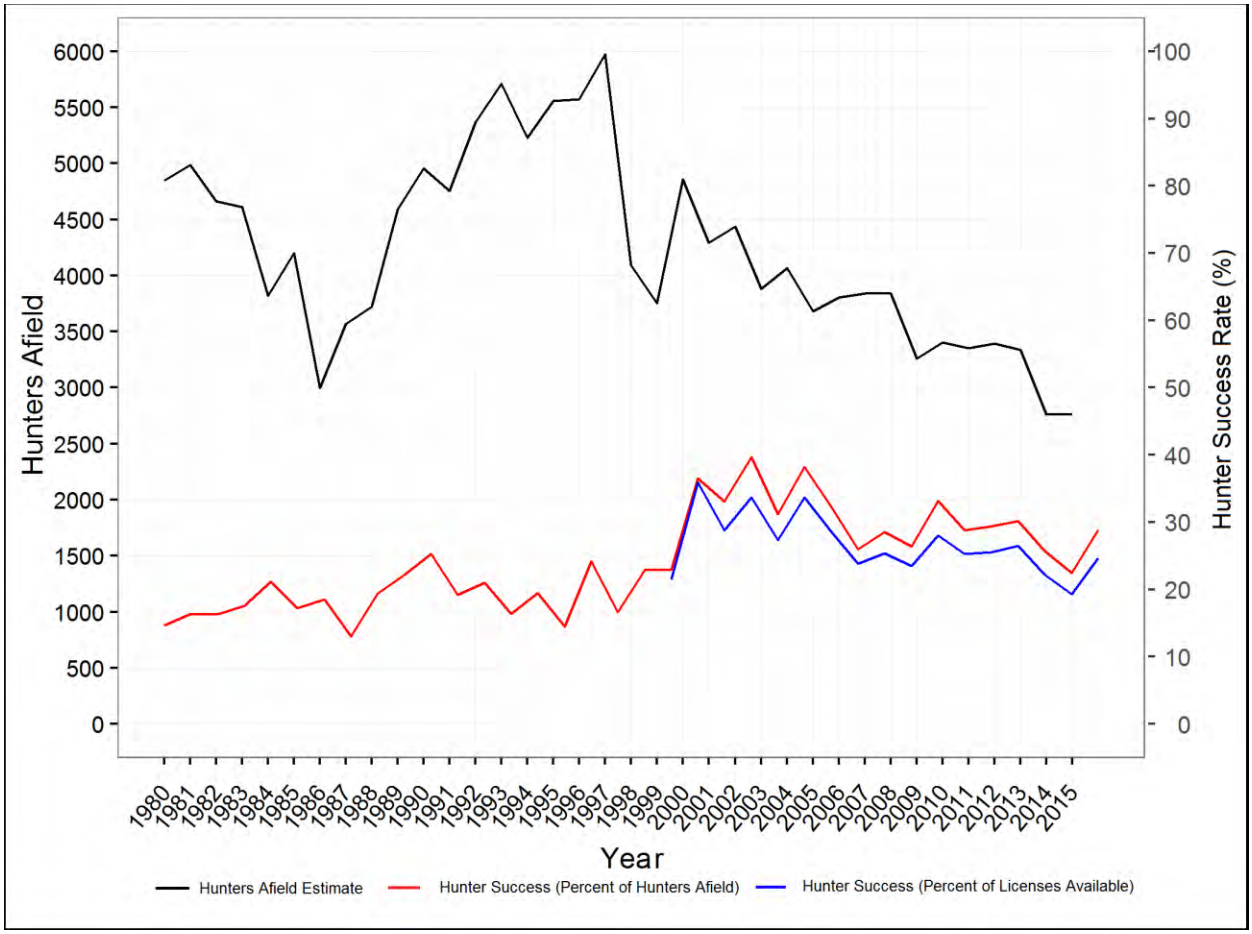


Figure 6. *E25 estimated number of hunters (black) and hunter success rates by the percentage of hunters afield (red) and the percentage of licenses available (blue) 1980-2015.*

Hunter Crowding

Hunter crowding is a function of the total number of hunters afield, DAU area size, elk distribution, and accessibility. Limited licensing structure, relative to OTC licensing, generally allows for fewer hunters to maintain the population size, but increasing the quality of the hunting experience per individual. Comparing hunting success between pre-1999 and post-1999 (when limited licensing was put in place), hunter success (per hunters afield) increased from an average of 19.4% to 30.2% (Fig. 6). This increase in hunter success can translate to fewer hunters being needed in the field to maintain or manipulate the elk population.

A tradeoff is made between hunter crowding and hunting opportunity, in which limited licensing strategy has some control over. Public input surveys indicate mixed results when asking hunters their opinions on hunter crowding versus hunting opportunity. In a survey of the public scoping meeting participants, it appears that hunting every year (having high opportunity) was more important than hunter crowding (Appendix 2: Section 3, Question 5.). When surveying a random selection of hunters, hunting every year was more important than hunter crowding (Appendix 2: Section 5, Question 11). However, the general comment and survey form indicated that hunter crowding was more important than having higher opportunity (Appendix 2: Section 4, Question 11 and Question 13). Additionally, when surveying a random selection of hunters of why they no longer hunted in E25, hunter crowding was slightly more important than not being able to draw a tag (Appendix 2: Section 5, Question 7). When directly asking hunters what sort of elk hunting opportunity, in terms of frequency of hunting, would be preferred, 48% indicated they would like to hunt every year, 29% every two years, 21% every 3-5 years, and 0% every 6-10 years (Appendix 2, Section 5, Question 7).

Hunter crowding likely influences elk distribution on the landscape. Various studies indicate that elk movement rates increase with response to hunting pressure (Johnson et al. 2002, Rumble et al. 2005, Cleveland et al. 2012). Speculations are also made that elk may decrease home range sizes during hunting seasons, thus requiring hunters to traverse more area before encountering an elk. However, decreases in home range size during the hunting season may contradict the effect of increased elk movement rates on hunter-elk encounterability.

Hunter crowding from the elk hunter's perspective can also be influenced by other factors outside of the control of this plan. Hunter numbers afield during concurrent seasons for other big game (mule deer, bear, bighorn sheep) using similar fall habitats in E25 should be considered when developing management plans for those species. Non-hunting recreation activities concurrent with the elk hunting seasons likely have some unknown level of impact on hunter crowding. However, public input surveys indicate only a minority of hunters are concerned with the level of non-hunting recreationists (Appendix 2, Section 5, Question 13 and Appendix 2, Section 3, Question 8). Comments given by some members of the public have indicated concerns for hunter crowding near roadways and access points.

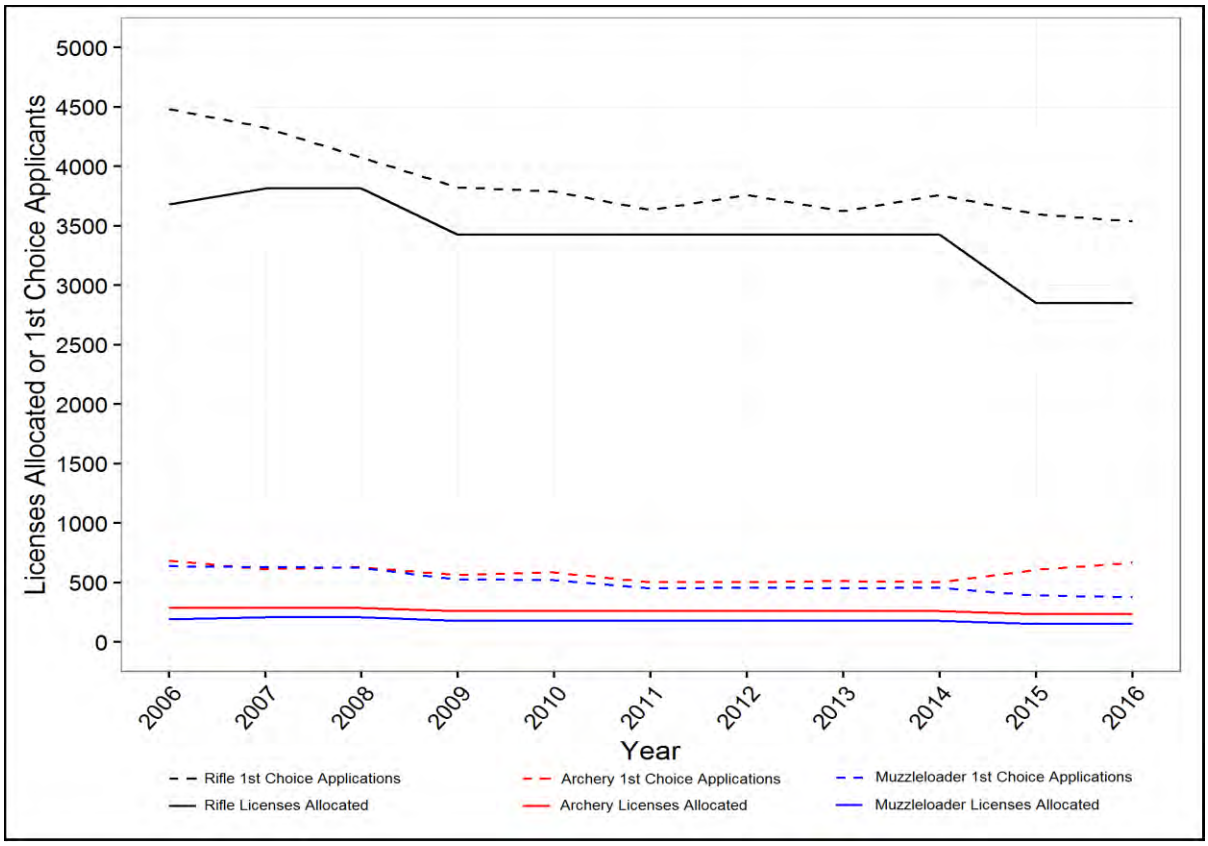


Figure 7. *Number of licenses allocated (solid lines) and corresponding number of first choice applications (dashed lines) for E25 (2006 – 2016) characterized by method of take (rifle, archery, and muzzleloader).*

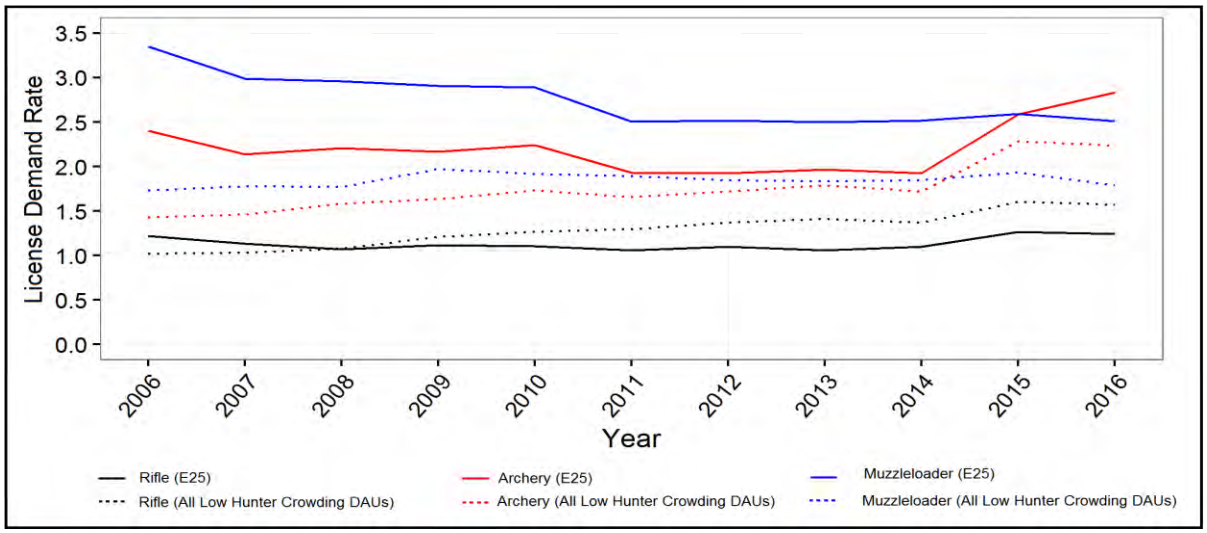


Figure 8. *License demand rate (first choice applications per license allocated) for E25 (solid lines) and the average rate for all DAUs managed for low hunter crowding (dotted lines) for 2006 – 2016, characterized by method of take (rifle, archery, and muzzleloader).*

Non-hunting Influences on Elk Population Growth

A variety of mortality factors, other than hunter harvest, can influence population growth rates. Cow and calf mortality rates quantified in 2000 – 2001 in E25 with VHF telemetry found that annual and over-winter survival rates were comparable to other studied populations (Freddy 2002). Given the 98% annual survival rate and 84% calf survival rate, only a small number of mortalities were found and investigated. Considering the larger Gunnison Basin-wide study area for the Freddy (2002) elk study, the proximate cause of death for 21 collared calves included predation (53%), malnutrition (24%), and other sources (23%). Given the high elk population size at that time, predation and malnutrition were likely compensatory mortality factors with each other.

The effects of wild predators are not always clear. Whether predators are severely limiting elk depends on how close the elk population is to carrying capacity. At relatively high elk population sizes (closer to carrying capacity), predation likely has little effect. Predation could be more concerning if the elk population size is low (well below carrying capacity). Carrying capacity can change depending on rapidly changing ecological conditions (i.e., extreme winter or drought). Prior to concluding that high predation rates have an impact on elk population growth, it should be determined whether predation is the ultimate or proximate cause of death. Ultimate causes of death, such as from the contraction of a fatal disease, must be considered prior to predation. In other cases, non-fatal diseases and poor body condition must also be considered, as these conditions will make elk more prone to predation.

The status of disease (CWD, adenovirus, EHD or blue-tongue) presence is likely low or insignificant in E25. However, CWD and adenovirus have been detected in wild ungulates of neighboring GMUs. EHD has been detected in wild ungulates inhabiting E25. CWD, if ever established at high prevalence, can ultimately decrease population growth rates. Given that aggregations of elk on the landscape can increase transmission rates of diseases like CWD, management activities promoting unnatural aggregations should be limited.

Elk Habitat Carrying Capacity and Distribution

Elk Distribution

Throughout the year, elk can potentially occupy any locality within E25. However, the spatial distribution changes throughout the annual cycle. No quantifiable data has been collected on the spatial-temporal heterogeneity in E25 elk density. It does appear that elk follow a typical seasonal migration pattern in E25, with the utilization of higher elevations in the summer, and lower elevations in the winter. Currently, knowledge of elk distribution is limited to expert opinion maps of elk winter range, critical winter range, and severe winter range (Figure 9).

A sample of VHF collared elk comprised of cows and calves were tracked seasonally from 2000-2002 (Freddy 2002). This sample of elk represented the population using E25 winter range. Examination of the coarse spatio-temporal data indicates that $\geq$ 54% of the elk sampled conducted seasonal migrations to summer range outside of E25. Unfortunately, it is difficult to ascertain whether these collared elk migrated back to E25 winter range before, after, or during hunting seasons. These migrations out of E25

can be difficult to account for when estimating population size if the migrant individuals are not available for hunter harvest in E25.

Elk Habitat Utilization and Movements

Elk utilize a range of habitats, depending on the season and conditions. Elk movement and subsequent habitat utilization patterns are influenced by many factors, such as weather, vegetation (Lyon and Jenson 1980, Hurley and Sargeant 1991, Sawyer et al. 2007), and wild predators (Hebblewhite et al. 2005). A growing body of information also supports that elk habitat utilization is influenced by several anthropogenic factors, including: non-hunting recreation (Phillips and Alldredge 2000, Kloppers et al. 2005), hunting recreation (Walsh et al. 1991, Conner et al. 2001, Johnson et al. 2002, Viera et al. 2003, Sunde et al. 2009, Cleveland et al. 2011, Rumble et al. 2005), off-highway vehicle traffic (Preisler et al. 2006, Wisdom et al. 2005), road traffic (Perry and Overly 1977, Lyon 1979, Rost and Bailey 1979, Witmer and deCalesta 1985, Preisler et al. 2006, Sawyer et al. 2007, Montgomery et al. 2013), resort/residential development (Picton et al. 1980, Morrison et al. 1995, Wait and McNally 2004, Shively et al. 2005), and mineral extraction (Kuck et al. 1985, Webb et al. 2011). It appears that combinations of these anthropogenic and or natural factors produce a nonlinear habitat utilization response in elk (Frair et al. 2008)

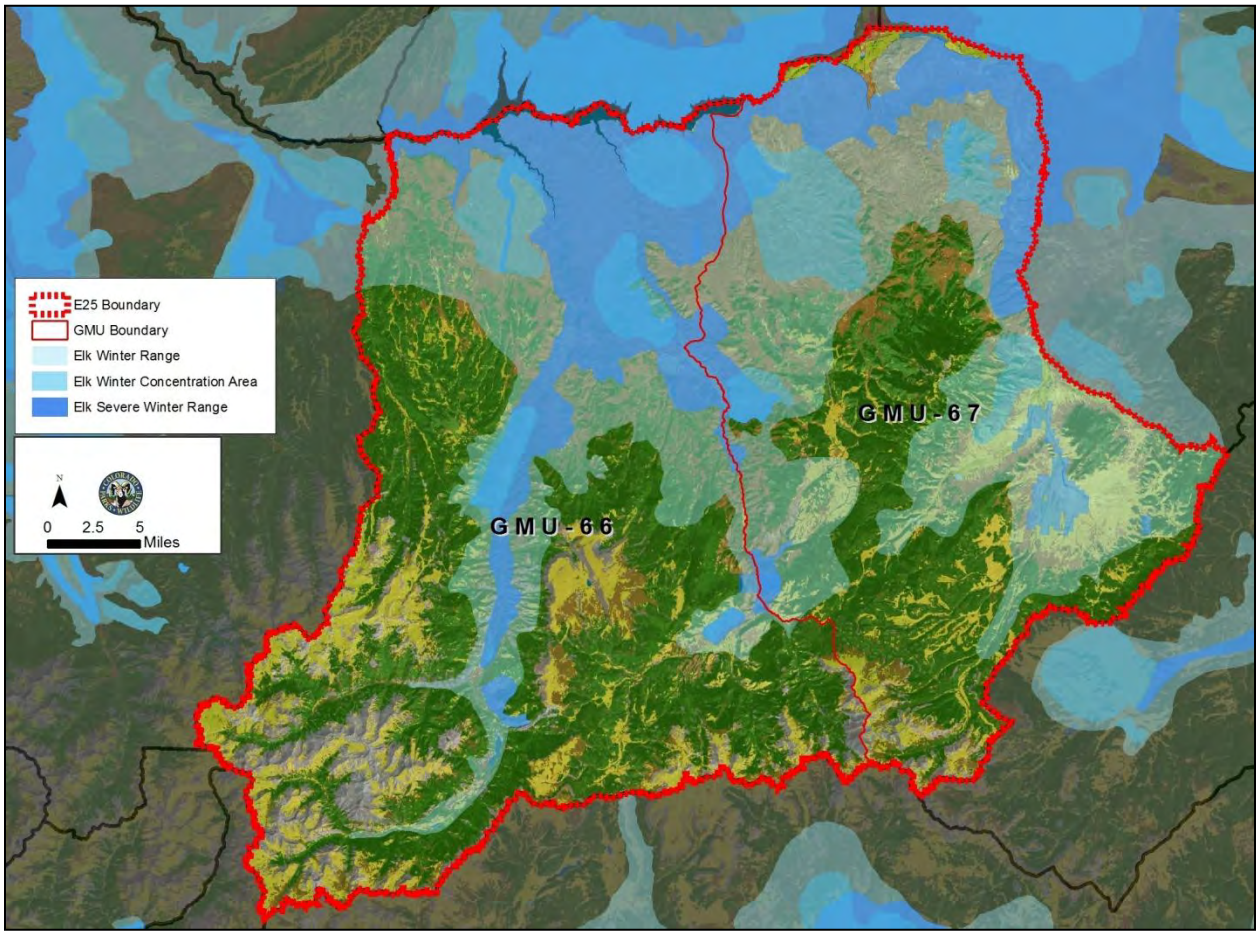


Figure 9. *Polygon range maps derived by CPW staff depicting elk winter range, elk winter concentration areas, and elk severe winter range.*

Vegetation Composition

E25 is composed of three major vegetation cover types (grassland and barren: 14.2%, shrub-land: 27.2%, forest: 58.6%) and a variety of communities within each type (LANDFIRE 2013) (Fig. 10).

Grasslands are found either in high elevation alpine, dispersed throughout the DAU in forest and shrub-land types, or found existing as agricultural conversions. Alpine grasslands, along with adjacent barren ground, cover ~9.4% of E25. Approximately 1% of E25 is considered non-native grasslands maintained via irrigation and haying for crop production.

Shrubland communities, comprising almost one third of E25, exist as: Rocky Mountain Lower Montane Foothill Shrubland, Inter-mountain Basin Montane Sagebrush Steppe, Gambel Oak Shrubland Alliance, Big Sage Brush Shrubland Alliance and Intermountain Big Sagebrush Shrublands. Sagebrush species, found primarily below 9000 ft, dominate these shrubland communities.

Forest communities dominate the mid to high elevations in E25. Rocky Mountain Subalpine Spruce Fir Forest and Woodlands, comprising ~27.5% of E25, are the dominate forest community. Forest communities containing significant Quaking Aspen (Inter-mountain Basin Aspen Mixed Conifer Forest and Woodland or Rocky Mountain Aspen Forest and Woodland) comprise ~18.7% of E25. The remaining forests are comprised of Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodlands (7.9%), Ponderosa Pine based communities (<2%), Lodgepole Pine (<2%), and Juniper based communities (<1%).

Conifer forests of E25 are currently undergoing a spruce beetle epidemic. Aerial survey data indicates that approximately 220 square miles of forest have been affected by spruce beetle in E25 between 2010 and 2015 (Fig.11). This impacted area is approximately 25% of all forest types mapped and 50% of all Rocky Mountain Subalpine Spruce Fir Forest and Woodlands in E25. It appears that beetle impacted areas continue to grow.

Habitat Capability and Condition

Several factors influence how many animals can be supported on a landscape. Habitat or biological carrying capacity is a landscape's ability to provide food and shelter for a particular species. Social carrying capacity is also important, as it is the number of animals that human society may allow or desire on the landscape. Social carrying capacity does not have any intrinsic effects on elk population size, such as the way biological carrying capacity would. Biological carrying capacity is an important variable when recognizing density dependent population responses. Given a finite level of food and cover resources, an ungulate population can become self-limiting under certain conditions; rates of survival and reproduction will decline as population density reaches habitat carrying capacity. Definitive estimates of carrying capacity are not available in E25; capacity can vary spatially and temporally in response to weather, site history, and inter-specific competition. For a long-lived species, such as elk,

fluctuations in weather patterns from year to year make it difficult to manage toward the higher carrying capacities afforded in years of good forage availability and fair weather.

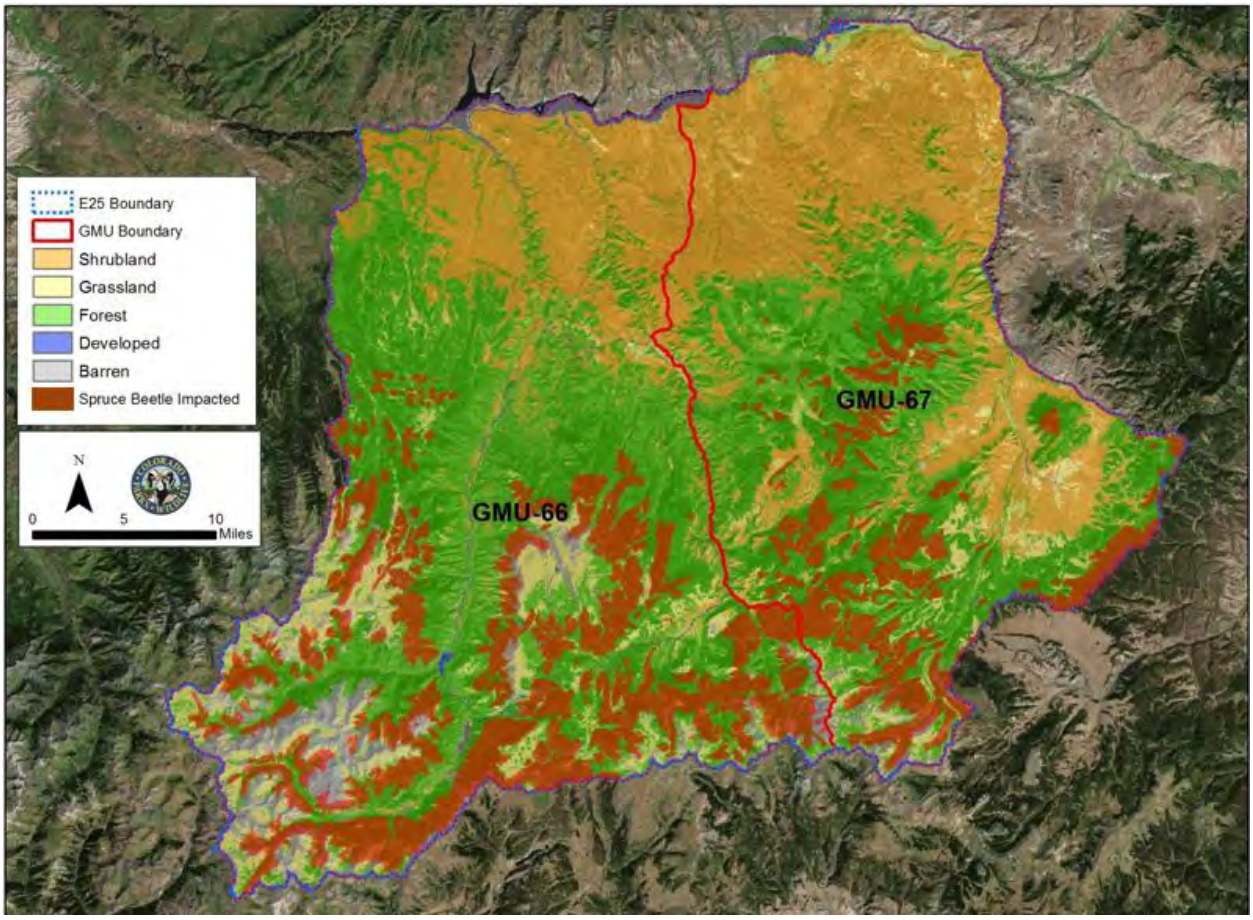


Figure 10. *E25 vegetation map overlaid on aerial imagery. Spruce beetle affected areas (brown) overlaid on forest.*

Very little quantitative information is available to help determine the overall wild and domestic animal carrying capacity in E25. However, three quantitative pieces of information can be co-examined to better understand carrying capacity limitations in this elk population:

1) Examining the elk population history provided in the previous section, elk numbers peaked in 1999 at approximately 10,800 elk. In the subsequent 6 years, the population was intentionally reduced in half.

2) In the late 1990's, winter range condition assessments in the Gunnison Basin determined that winter range forage resources were not in good condition, suggesting that the big game populations had exceeded winter range carrying capacity (Roath et al. 1999). These assessments indicated that the health and productivity of sagebrush species was low, in which little annual growth and new leaders occurred. Additionally, bitterbrush and mountain mahogany showed excessive usage by ungulates.

3) In 2001 – 2006, BLM conducted repeat visits to survey plots in shrub communities measuring average degree of hedging, plant volume, and percent dead. Focus was placed on serviceberry, mountain mahogany, and antelope bitterbrush. Over the five-year period, the degree of hedging increased, plant volume decreased, and the percent dead increased in shrubs (United State Department of Interior 2006). Shrub health in this study was likely influenced by a combination of ungulate usage and a drought spanning 2000 – 2004.

Land health assessments conducted by BLM in the past five years indicate that mountain shrub community health has improved since the early 2000's. Sagebrush communities have likely recovered (see "sage-grouse" sub-section below). It is undocumented whether a full recovery in all shrub species (serviceberry, mountain mahogany, and antelope bitterbrush) has occurred.

It is recognized that managing a wild population to a size that is well below carrying capacity of the habitat results in the highest reproductive rates. Managing a population toward high elk population size objectives can occur in fair weather years with good forage. However, years of extreme winter weather or extended drought may result in an abnormally low carrying capacity for all ungulates (wild and domestic). These temporary, but extreme, weather events can negate managers' efforts to maintain high elk population sizes.

The degree of range overlap among all ungulate species must also be considered for understanding carrying capacity. A detailed discussion of ungulate habitat carrying capacity, with particular reference to mule deer, can be found in Diamond (2013).

Conflicts with Agriculture

Agricultural activities consist of rangeland grazing by cattle and sheep, hay production (grass and alfalfa), and hobby livestock interests. It is estimated that ~1% areal coverage of E25 is croplands consisting of irrigated hay meadows and terraces planted with annually harvested non-native forage. Public lands administered by the BLM and USFS have various grazing allotments assigned to approximately 10-20 individual ranching entities. Most agricultural interests in E25 are based on cow-calf operations that utilizing the federal grazing allotments during the summer. Since 2001, four elk damage claims, totaling $3,571 have been paid by CPW to private landowning ag-producers in E25. Other claims have been mitigated with preventative efforts such as fencing, hazing, etc. The Gunnison Basin HPP committee has provided financial assistance to ranchers for the construction of stack yards.

Ungulate Impacts on Gunnison Sage-Grouse

Thus far, no research has been conducted to examine direct impacts of elk populations on the Gunnison sage-grouse, a recently listed federal threatened species. Speculation has existed that impacts to vegetation in and around grouse nests can occur in areas heavily used by ungulates. Recent research studies conducted specifically in the Gunnison Basin, during a period when vegetation characteristics were within the optimal range, indicate that changes within that optimal range were not strongly indicative of sage-grouse nest success (Stanley et al. 2015, Davis et al. 2015). However, any extreme deviations in vegetation height outside the optimal range should be cautioned against (Davis et al. 2015). Managers should be cognizant of any ungulate mediated decreases in sage brush cover below

10% (at the 1-2 acre scale), as this appears to influence Gunnison sage-grouse nest site selection (Oyler McCance et al. 2001, Aldridge et al. 2012). Recent vegetation characterizations of ecological types most utilized by Gunnison sage-grouse in the Gunnison Basin (Dry Mountain Loam and Mountain Loam) are currently meeting habitat guidelines (breeding, summer, and fall) (Williams and Hill 2012).

Residential and Anthropogenic Development Patterns

Elk have been shown to be negatively influenced by residential development (Wait and McNally 2004). Exurban (1.7 – 40 acres per housing unit) and suburban housing densities (>1.7 acres per housing unit) have a combined 1.06% areal proportion of the E25 land area (Bierwagen et al. 2010). Rural developed private lands (>40 acres per housing unit) cover approximately 7.9% of E25. Population census data of E25, by Census Block, indicate a 2010 human population size of 2963 and a housing unit count of 2720 (US Census Bureau). A 49% increase in total population size has occurred in the counties of Gunnison, Hinsdale, and Saguache from 1980 (15,032 people) to 2010 (22,351 people) (US Census Bureau). Specific to E25, this growth has been accompanied by a 231% increase in land area characterized as exurban and suburban development in E25 between 1980 and 2010 (Bierwagen et al. 2010).

In E25, only 46% of the housing units in 2010 were occupied, with 48% indicated as used for seasonal living (US Census Bureau). These occupancy rates are highly reflective of the tourist based economy. During the summer, the actual human population size inhabiting E25 is much higher than the 2,963 counted in the 2010 census.

Despite E25 having a low human density, housing developments are clustered. The historic human settlement patterns and public land configuration (Fig. 1) result in this spatial clustering of residential areas to occur primarily in long linear patterns along roadways and drainage bottoms (Fig. 11). Most housing developments have occurred on elk winter range (Fig. 11). It is possible that areas of rural density will be converted to exurban, and exurban converted to suburban densities. If housing densities increase in the areas already characterized as rural development, winter range will likely become more fragmented, inhibiting the ability of elk to move across larger expanses of winter range.

A variety of elk studies have indicated that elk distribution, movements, and behavior are influenced by vehicle traffic. Various studies indicate elk respond to vehicle traffic (OHV and highway vehicles) at distances up to up to 1000 m away (Rost and Baily 1979, Preisler et al. 2006). However, the influence of roads on elk is conditional upon several factors, such as vegetation composition (Lyon 1979, Rost and Bailey 1979) and road type (Montgomery et al. 2013).

Highway vehicle traffic volumes have likely increased since 1980 because of the human population growth. Off-highway vehicle utilization has likely increased given that CPW's statewide off-highway registration sales have increased by ~115% from 2001 to 2015. Recently implemented travel management plans by the USFS and BLM will likely redistribute human recreation activities away from certain areas, but possibly concentrate the human activity in others. It is uncertain how this redistribution of roads and traffic influences elk movements and hunter access.

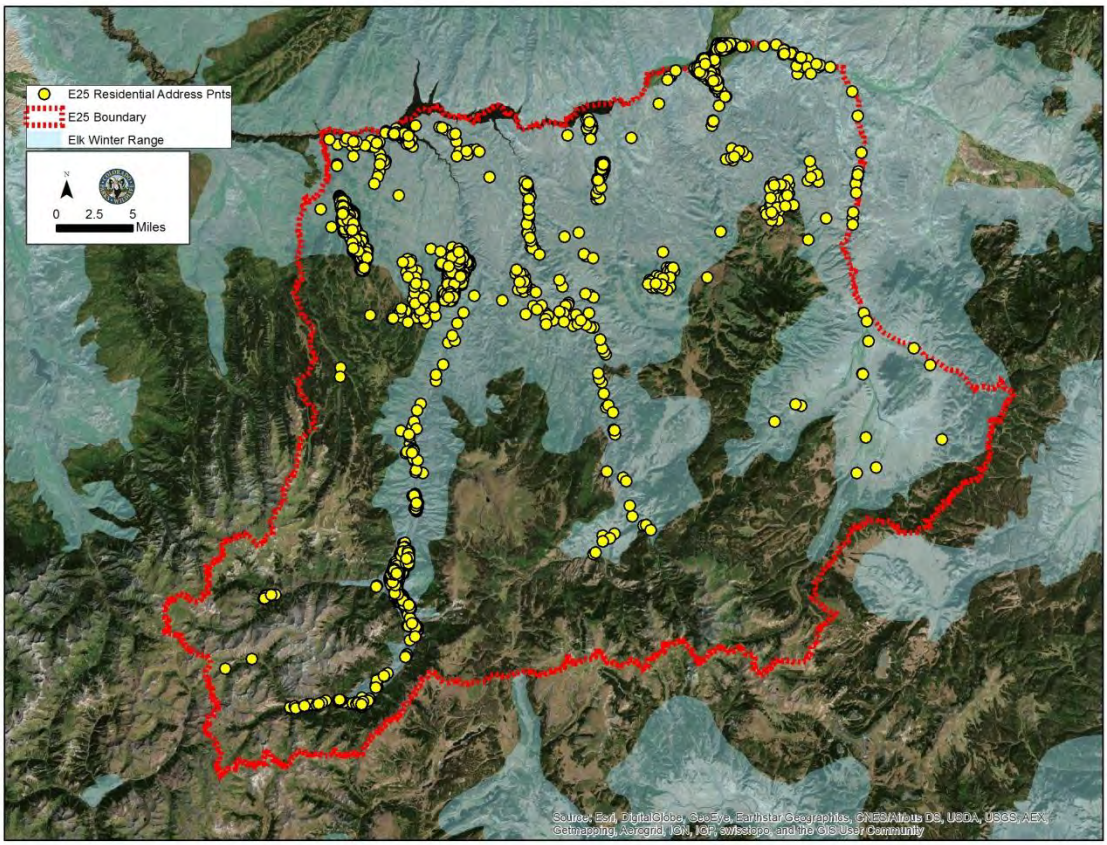


Figure 11. *Address points derived by Gunnison County (www.gunnisoncounty.org) for E25 overlaid on elk winter range.*

Public Involvement

Public Input Surveys

CPW staff considered results from a suite of five public input surveys for the development of this plan. Additionally, meetings were held with the Colorado Parks and Wildlife Commission (May 2016), Hinsdale County Commissioners, Gunnison County Commissioners, USFS, and BLM prior to initiating drafts of this plan. Details of the public survey methods and results for each survey can be found in Appendix 2.

These five public input surveys were conducted:

> ***Survey #1)*** The first survey was an initial effort to gather input from hunters afield during the Fall 2015 hunting season. Satisfaction regarding hunter crowding and relative number of elk seen were collected via in-person contacts between CPW field staff and hunters. The survey was completed by 80 hunters from the wider Gunnison Basin. Comments on issues relevant to their hunting experience were also collected and considered in developing future surveys.
>
> ***Survey #2)*** The second public input survey was conducted to poll hunters attending the Spring (March) 2016 license setting open house in Gunnison, about the actual process of gathering

public input in the near future. This effort helped to determine that surveying past elk hunters via internet would be the preferred method for gathering public input. Seventeen people responded to the survey, and general written comments were also accepted at this meeting.

Survey #3) The third public input survey was conducted in conjunction with public scoping meetings held in Gunnison and Lake City (July 2016). Following an informational presentation on elk population dynamics and elk distribution, attendees at the public informational meeting were questioned via live audience polling. A summary of the results was displayed to the attendees after each session. General written comments were also accepted at this meeting. Combining respondents attending both meetings, a total of 107 people participated in the polling.

Survey #4) A survey and comment form was made available to the general public in August 2016. An online version was made available (Survey Monkey, Inc, Palo Alto, CA, USA). The survey was advertised in local media outlets and allowed anyone with access to the internet to participate. This survey characterized past E25 hunting experiences and future desires for the E25 herd. General written comments were also accepted. A total of 233 people responded to the survey.

Survey #5) A randomly drawn set of hunters (from past E25 elk seasons: 2006, 2010, 2012, 2014) were invited to partake in an internet/paper based survey in August 2016. Online versions served as the primary mechanism (Survey Monkey, Inc, Palo Alto, CA, USA). This survey characterized hunters' past E25 hunting experiences and future desires for the E25 herd. A total of 237 hunters responded to the survey.

While surveys #1 and #2 provided important input for questions asked in further public involvement components, the small sample of participants (relative to latter surveys) rendered further quantitative analysis less useful. Thus, emphasis for drawing inferences on public desires was placed on Survey #3, #4, and #5. Survey #4 was conducted in a less rigorous manner than Survey #3 or Survey #5, and thus receives less consideration.

A majority of hunters surveyed felt that the elk population size is either slowly or rapidly decreasing over the past 5-10 years (Appendix 2, Sections 4, Question 12 and Appendix 2, Section 5, Question 5).

Hunters are generally satisfied concerning their elk hunting experience in E25 the last 5 years. Removing the respondents that did not hunt in E25 (Option F) the remaining responses were pooled by whether they were unsatisfied to some degree or satisfied to some degree. 29.4%, 32.2% and 27% indicated they were generally unsatisfied, while 61.2%, 60.9%, and 61.7% indicated they were generally satisfied in Survey #3 (Appendix 2, Section 3, Question 4), Survey #4 (Appendix 2, Section 3, Question 4), and Survey #5 respectively (Appendix 2, Section 5, Section 12). The remainder of the respondents indicated they were neither satisfied nor unsatisfied (Option C: 9.4%, 6.8%, and 11.3%).

Despite differences in methodological rigorousness between the survey methods, the inferences gathered from the three surveys were relatively similar for desired elk population size. Participants in all

three surveys were given a choice between having a future elk population size change of -50%, -25%, 0%, +25%, and +50%, which corresponds to a population size of ~2800, 4200, 5600, 7000, and 8500 assuming the current modeled population size of 5651. Given that relative differences were equal among the incremental population size choices in the provided scenarios, an average desired population size could be calculated. Surveys #3, #4, and #5 resulted in average desired elk population sizes of 6231, 6834, and 6457 respectively. When asking respondents whether they would prefer to see management changes made in elk population size be made gradually or rapidly, a majority (65.1%, 64.2%, and 74.9%) would rather see gradual changes.

Comment Letters

A total of 19 letters were submitted by members of the public prior to and during development of this plan. These letters represented a range of opinions and attitudes.

Open Comment Period on Draft Plan

A 30-day open commenting period occurred from October 25, 2016 through November 25, 2016. Comments were received from the Gunnison Basin Habitat Partnership Program committee and the Gunnison County Stockgrowers Association that can be found in Appendix 3. Two additional letters were received from individual members of the public.

Management Alternatives and Preferred Objectives

The primary focus of this plan is placed on developing management alternatives for population size. Historically, bull:cow ratios in E25 are heavily influenced by management strategies aimed at manipulating overall population size. In addition, the techniques used to estimate bull:cow ratios are imprecise and biased to some degree. The long-term population and sex ratio objectives for this herd should be managed as ranges, rather than point values. Objective ranges better reflect the uncertainty inherent in wildlife population estimates. Also, having the flexibility to manage this elk herd within a range is more fitting to annual variability in ecological conditions.

References to status quo in these alternatives are based on the 2015 post-hunt estimates (Figure 2 & Figure 3). Unless otherwise noted, the described expectations for each alternative are assuming all other factors (i.e., population vitality, hunter success, and license demand) are status quo.

Population Objective Alternatives

Population Objective Alternative 1: 0% change; 5000 – 6000 elk post-season (Status Quo)

> Assuming status quo bull ratios, population vitality measures, hunter success, and license demand measures, maintaining the status quo population size will likely result in no changes to hunter crowding, hunting opportunity, or preference point requirements.

Population Objective Alternative 2: 18% increase; 6000 – 7000 elk post season (PREFERRED ALTERNATVE)

This alternative represents the collaborative objective population size derived from extensive hunter input. Assuming status quo bull ratios, and constant population vitality measures, hunter success, and license demand measures, increasing the population size by 18% (from status quo) to the mid-point of this objective range will likely:

- Immediately decrease hunting opportunity and hunter crowding, and increase license demand rates.
- In the long-term, increase hunting opportunity and hunter crowding, and decrease license demand rates.
- Compared to the current state, this may result in higher potential for degradation of mountain shrub communities during extreme winter or drought years.

Population Objective Alternative 3: 25% increase; 6500– 7500 elk post season

Assuming status quo bull ratios, and constant population vitality measures, hunter success, and license demand measures, increasing the population size by 25% (from status quo) to the mid-point of this objective range will likely:

- Immediately decrease hunting opportunity and hunter crowding, and increase license demand rates longer than Population Objective Alternative 2, but shorter than Alternative 4.
- In the long-term, increase hunting opportunity and hunter crowding, and decrease license demand rates.
- Result in higher potential for degradation of mountain shrub communities during extreme winter or drought years.

Population Objective Alternative 4: 50% increase; 8000 – 9000 elk post season

Assuming status quo bull ratios, and constant population vitality measures, hunter success, and license demand measures, increasing the population size by 50% (from status quo) to the mid-point of this objective range will likely:

- Immediately decrease hunting opportunity and hunter crowding and increase license demand rates for a period longer than experienced under Population Objective Alternative 2 or 3.
- In the long-term, increase hunting opportunity and hunter crowding, and decrease license demand rates.
- Result in higher potential for degradation of mountain shrub communities during extreme winter or drought years.

Bull Ratio Alternatives

Bull ratio alternatives considered the tradeoffs between hunting opportunity (the ability to draw a license) and hunter crowding (the number of hunters required in the field). Bull ratio alternatives must be considered in context of a population size because it is a proportion of an absolute number; the same bull ratio of a smaller population results in a smaller number of bulls, whereas the same ratio of a large population results in a higher number of bulls that must be managed.

Bull Ratio Objective Alternative 1: Range of 18-23 (midpoint = 21.5) bulls:100 cows

Assuming the population size is status quo (population size alternative 1), reducing the proportion of bulls will likely:

- Require increasing the number of bull hunters afield (increase hunter crowding).
- Increase the opportunity to hunt bull.
- Decrease demand for bull licenses.

Assuming an overall elk population increase (population size alternatives 2, 3, or 4), reducing the proportion of bulls will likely further:

- Require increasing the number of bull hunters afield.
- Increase bull hunting opportunity.
- Decrease the demand for bull licenses.

Bull Ratio Objective Alternative 2 (status quo): Range of 23-28 (midpoint = 25.5) bulls:100 cows (PREFERRED ALTERNATVE)

Assuming the population size is status quo (population size alternative 1), maintaining the bull ratio to status quo will likely result in little changes to hunter crowding, hunter opportunity, and preference points required.

Assuming an overall elk population increase (population size alternatives 2, 3, or 4), maintaining the proportion of bulls will potentially:

- Immediately result in a slight decline in the bull ratio as overall population is increasing, assuming bull license allocations are held at status quo. If bull license allocations are decreased, the ratio will be maintained.
- Immediately result in no to little change in the opportunity to hunt bulls (assuming bull license allocations are held steady during period of population building).
- In the long-term, increase the opportunity to hunt bulls.

Bull Ratio Objective Alternative 3: Range of 28-33 (midpoint = 30.5) bulls:100 cows

Assuming the population size is status quo (population size alternative 1), increasing the proportion of bulls will likely:

- Immediately decrease the opportunity to hunt bulls.
- In the long-term, decrease the opportunity to hunt bulls.
- In the long-term, potentially increase the proportion of mature bulls harvested and thus potentially increase demand for bull licenses.
- Result in a slight decrease of the elk population's cow segment, and thus result in a lower population growth rate. Fewer cow licenses will be allocated than status quo. Hunter opportunity to harvest cows will not be as great as under bull ratio alternatives 1 and 2.

Assuming an overall elk population increase (population size alternatives 2, 3, or 4), increasing the proportion of bulls will potentially:

- Immediately result in a slight decline in the bull ratio as overall population is increasing (because fewer cows are being harvested).
- Immediately result in no to little change in the opportunity to hunt bulls.
- Result in no long term change in the opportunity to hunt bulls under population size alternative2.
- Result in small to moderate increase in the opportunity to hunt bulls under population size alternatives 3 and 4.
- Potentially increase the proportion of mature bulls harvested, and thus potentially increase demand for bull licenses.

License Allocation Rate Strategy Alternatives

License Allocation Alternative 1: Gradual changes in licensing (*(PREFERRED ALTERNATVE)*

If a change in population size or bull ratios is made, changes will be made gradually (smaller incremental changes over a longer period of time with attempts to achieve objectives in 3-5 years).

- This will result in no change to overall hunting opportunity (licenses allocated) over the next 10 years.
- Relative to the competing allocation method of license allocation alternative #2, a loss in annual hunting opportunity will influence a smaller proportion of hunters, but for a longer period of time (i.e., 3-5 years).

- Gradual changes in license allocations targeted for increasing population size (through reduced cow licenses) will temporarily result in less noticeable lower bull ratios temporarily (relative to the competing alternative).

License Allocation Alternative 2: **Rapid changes in licensing**

If any changes in population size or bull ratios are made, changes will be made rapidly (larger incremental change in license numbers over a shorter period of time with attempts to achieve objectives in 1-3 years).

- Relative to the competing allocation method proposed in alternative #1, the loss in annual hunting opportunity will influence a larger proportion of hunters, but for a shorter period of time (i.e., 1-3 years).

- Rapid changes in license allocations targeted for increasing population size (through reduced cow licenses) will temporarily result in noticeable lower bull ratios (relative to the competing alternative).

New Objectives

<u>New Population Objective:</u>

The selected population objective is alternative 2 (6000-7000 elk) which represents an 18% increase over status quo (2015 post-hunt estimates). Alternative 2 is preferred over other alternatives as it:

1) Reflects the average desired population size of the E25 hunting public;

2) Strikes a balance between hunters' opportunity to draw licenses in the short-term and hunter crowding in the long-term;

3) Strikes a balance between **A)** factions of the public who desire even higher numbers of elk and **B**) concerns with rangeland degradation during extreme weather/climatic conditions (i.e., drought, hard winters).

<u>New Bull Ratio Alternative:</u>

The selected bull ratio objective is alternative 2 (23-28 bulls:100 cows), which is status quo. This is preferred over other alternatives as increases in bull ratios (Alternative 3) would reduce hunter opportunity of getting a license, while a decrease in bull ratios (Alternative 1) would increase hunter crowding. When polling hunters, license drawing opportunity and hunter crowding were issues more important than having the opportunity to harvest mature or trophy bulls.

<u>New License Allocation Alternative:</u>

The selected method of making changes to license allocations would be alternative 1, which would indicate that CPW staff makes license changes during a period of intentional population change

gradually over time (i.e., 3-5 years). This is preferred over the competing alternative given these reasons:

1) A gradual change in license allocations was the method desired by hunters polled in extensive surveys

2) Given that manipulations of the number of cow licenses are the primary means for adjusting total elk population size, it is recognized that gradual changes in the proportion of cow licenses are less likely to unintentionally change bull ratios.

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Appendix 1: An Evaluation of E25 Population Model

Colorado Parks and Wildlife staff recognizes that estimating populations of wild animals provides inexact measures of abundance. The mathematical model currently used to estimate population size of elk in E25 incorporates measures from three surveys (annual hunter harvest Survey, aerial age classification ratios, and aerial sex classification ratios). Survival rates of cows (annual) and calves (over-winter) are derived with mathematical formulas concurrent to estimating post-hunt population size.

Are Survival Rates Derived by the Population Model Reasonable?

The model is currently estimating an annual adult survival rate of 98% and an over-winter calf survival rate of 73% (30 yr. average) and 84% (10 yr. average). Cow survival can be compared to two local studies in southwest Colorado, and an ongoing study in the Gunnison Basin:

1. 1993 – 2000: VHF collar monitoring of GMU 42 cow elk detected a 97% annual survival rate (Freddy et al. 2001)

2. 2000 – 2001: VHF collar monitoring of Gunnison Basin cow elk detected a 97% annual survival rate (Freddy et al. 2001)

3. 2013 – 2015: GPS collar monitoring of Northern Gunnison Basin (GMU 54 and 55) is detecting a preliminary 96.9% cow survival rate (*CPW: unpublished data*).

Calf survival studies in GMU 42 and the Gunnison Basin indicate over-winter calf survival rate of 89 and 86% respectively. Thus, estimates derived by the model appear to approximate those measured in actual studies.

Are the Annual Hunter Harvest Survey Results Reasonable?

In 1991, a study was conducted in E3 (GMUs 6, 16, 161, 17, 171) to assess the response biases of harvest estimates obtained from telephone surveys of hunters post-season (Steinert et al. 1994).

> Method 1: Mandatory hunter traffic check stations were conducted in North Park in a manner that would intercept most traffic, by placing check stations on Cameron Pass, Willow Creek Pass, and the Stateline (east, northeast, and south). Road checks intercepted and interviewed approximately 12% of mule deer hunters and 13% of elk hunters, checking a total of 2,628 hunters
>
> Method 2: Interviewed 1,970 hunters by telephone survey with an annual big game harvest survey.
>
> Results: Hunter traffic check station and telephone surveys provided very similar estimates in the percentage of deer and elk hunters reporting a successful hunt. Check stations and telephone surveys indicated a 13.6% and 13.2% (respectively) hunter success rate for elk.

Are the Total Population Size Estimates Derived in the Model Reasonable?

In 2001, a study (Freddy et al. 2004) was conducted in D-6 (GMU 10) to assess whether estimates of population size derived from CPWs mathematical models, was in line with those made by a local sportsmen group, and that of a more rigorous (and more expensive) helicopter quadrat survey method commonly used by Idaho Fish and Game. The rigorous helicopter quadrat survey method revealed 6782 – 11042 deer. Sportsmen's opinions of deer population size (1750 deer) underestimated that given by the more rigorous method by >74%. Population size estimates derived with the CPW mathematical population model approximated the more rigorous count method with 7000 – 7300 deer, and thus underestimated deer population size by only 3 – 37%.

Appendix 2: Public Input Results

Section 1 - Fall 2015 Hunter Field Satisfaction Survey

This first survey was an initial effort to gather input from hunters afield during the Fall 2015 hunting season. Satisfaction regarding hunter crowding and relative number of elk seen were collected via contacts between CPW field staff and hunters via a survey card (Fig A2.1). A majority (97.5%) of the respondents in this survey were acquired from hunters with rifle season licenses. Comments on issues relevant to their hunting experience were also collected and considered in developing future surveys.

Elk Management Plan Hunter Input Card (2015 Season)

(This does not substitute for annual telephone/online harvest surveys for which you may be contacted)

GMU: 54 55 551 66 67 Tag Season: 1st 2nd 3rd 4th

Tag Sex: Cow Bull Either

Satisfaction with crowding/hunter density: *Overcrowded* 1 2 *Acceptable* 3 4 5 *Least crowded*

Satisfaction with number of elk seen: *Little to none seen* 1 2 *Acceptable* 3 4 5 *Abundant*

How many times have you hunted elk in this unit:
1st time 2-3rd time More than 3 times

Tag currently filled: Yes No

Hunting Location/camp (drainage/mountain):_____

Number of hunters in your party:___

Number of total days planned on hunting (nearest half day):_____

Number of days hunted so far (nearest half day):_____

Home zip code:_____ Date:_____

OID (optional):_____

Comments:

Figure A2.1. *Print-out of actual card handed to hunters by CPW personnel*

38 of 80 respondents were from hunters in E25 (GMU 66 & 67), with the remaining from DAU E41(GMU 54) and E43 (GMU 55 & 551). On average, the satisfaction level in terms of elk numbers seen and hunter crowding were higher in E25 than in E41 and E43 (see table A2.1). An average satisfaction level of 3 would indicate that satisfaction is generally acceptable; values below 3 would indicate lower satisfaction while values above 3 would indicate higher satisfaction.

DAU	Average Elk Seen Satisfaction	Average Hunter Crowding Satisfaction
E25	2.69	3.59
E41	2.31	3.38
E43	2.24	3.14

Table A2.1*. Average satisfaction level (1 = least satisfied, 3 = acceptable, 5 = most satisfied) for average elk seen and hunter crowding, by DAU in Gunnison Basin.*

Section 2 - License Setting Open House (2016)

The second public input survey was conducted in order to poll hunters attending the Spring (March 29) 2016 license setting open house in Gunnison. Hunters attending the open house were asked to fill out a survey with three questions regarding the development of Gunnison Basin DAU plans. This effort assisted development of the public input gathering process to be used for near-future DAU plans.

On the single page survey form, respondents circled the DAU(s) of interest to them. Surveys from 17 respondents were collected. Given the small sample size, results were pooled for all DAUs.

The first question asked respondents to rank their interest level (scale 1 – 5, 1 being least interested and 5 being most interested) in several issues regarding elk management in the Gunnison Basin. Interest levels were averaged, and then ranked for comparison among issues. The highest ranked issue (by average interest level) was elk population size (4.0), followed by recreation impacts (3.95), bull ratios (3.68), hunter crowding (3.53), wildlife watching opportunity (3.39), elk changes in habitat usage/distribution (3.21), impacts of elk hunting on local economy (3.16), license drawing opportunity (3.11), vehicle/elk collisions (3.16), and then finally agricultural damages from elk (1.79).

The second question asked respondents to rank (scale 1 – 5, 1 being least interested and 5 being most interested) methods for gathering public input for Gunnison Basin elk DAU plans. The highest ranked method (by average interest level was to conduct internet surveys of past elk hunters (4.32), conduct internet/mail/phone survey of local communities within DAU (4.00), conduct mail/phone surveys of past elk hunters (3.95), form focus groups representing stakeholders (3.95), and conducting public meetings with voting (3.79).

Section 3 - Public Scoping Meeting

The third public input survey was conducted during public scoping meetings held at Lake City (July 28, 2016) and Gunnison (July 29, 2016). Following an informational presentation on elk population dynamics and elk distribution, attendees at the public informational meeting were questioned via live audience polling. A summary of the results were displayed to the attendees after each session. General written comments were also accepted at this meeting. Combining results from both meetings, a total of 107 people participated in the polling. Two arbitrary practice questions were posed in order to accustom respondents with the handheld electronic polling device.

The following questions were provided. The percent of respondents answering are provided following each answer choice.

1. Choose the top three that best represent your interests in GMUs 66 and/or 67?

   A: Business owner (5.9%), **B:** Agricultural operator (3.8%), **C:** Landowner (9.8%), **D:** Hunting guide service industry (3.8%), **E:** Hunting elk for meat (30.7%), **F:** Hunting mature bull elk (26.8%), **G:** Wildlife watcher/non-harvesting recreationist (19.2%)

2. Choose the top three areas where you have hunted elk the most?

   A: GMU 66 (30.8%), **B:** GMU 67 (23.1%), **C:** Northern Gunnison Basin (GMUs 54, 55, 551) (20.2%), **D:** Colorado GMUs outside Gunnison Basin (17.8%), **E:** Outside Colorado (5.7%), **F:** I do not hunt (2.4%)

3. Which season do you prefer to hunt elk the most in GMUs 66 and/or 67?

   A: Archery (30.1%), **B:** Muzzleloader (6.8%), **C:** 1st Rifle (12.6%), **D:** 2nd Rifle (11.7%), **E:** 3rd Rifle (19.4%), **F:** 4th rifle (9.7%) **G:** I do not hunt 66/67 (9.7%)

4. How satisfied were you with your overall hunting experience for elk in GMUs 66 and/or 67 the past 5 years?

   A: Very satisfied (26.4%), **B:** Somewhat satisfied (22.6%), **C:** Neither satisfied nor unsatisfied (7.5%), **D:** Somewhat unsatisfied (13.2%), **E:** Very unsatisfied (10.4%), **F:** I did not hunt 66/67 (19.8%)

5. Rank the top 3 items most important to you when hunting elk in GMUs 66 and/or 67, with 1 being the most important:

Answer Choice	Count of Respondents				Overall Score Weighted by Rank (1 = 1 pnts, 2 = 2 pnts, 3 = 3 pnts)
	Rank 1	Rank 2	Rank 3	Any Ranking	
Hunting for meat	13	23	26	62	137 (23.4%)
Hunting Every Year	9	14	30	53	127 (21.7%)
Chance of harvesting any elk	20	16	13	49	91 (15.5%)
Chance of harvesting a mature bull	17	13	15	45	88 (15.0%)
Hunting with fewer other hunters (low hunter crowding)	7	13	8	28	57 (9.7%)
Overall experience (camping, socializing, chance to see elk, being outdoors, etc)	18	10	2	30	44 (7.5%)
Chance of harvesting a trophy bull	7	10	5	22	42 (7.2%)

6. How important is it to you for youth to have the opportunity to hunt elk in GMUs 66 and/or 67?

   A: Not important (8.6%), **B:** Somewhat important (18.1%), **C:** Very important (73.3%)

7. Please tell us what sort of hunting opportunity you would prefer for elk in GMUs 66 and/or 67:

   A: Hunt every year (48.0%), **B:** Hunt every 2 years (29.0%), **C:** hunt every 3-5 years (21.0%), **D:** hunt every 6-10 years (0.0%), **E:** I am not sure (2.0%)

8. Rank the top 3 items most concerning to you in GMUS 66 and/or 67, with 1 being the most important:

Answer Choice	Count of Respondents				Overall Score Weighted by Rank (1 = 1 pnts, 2 = 2 pnts, 3 = 3 pnts)
	Rank 1	Rank 2	Rank 3	Any Ranking	
Spruce Beetle Impacts on elk	20	23	11	54	135 (23.6%)
Ample opportunity to hunt elk	17	22	28	67	127 (22.2%)
Predator impacts on elk	8	19	14	41	103 (18.0%)

Elk populations too low	8	9	31	48	53 (9.3%)
Motorized travel impacts on elk distribution	13	8	15	36	53 (9.3%)
Protected lands (refuges)	9	8	4	21	49 (8.6%)
Non-hunting recreation impacts	6	6	0	12	36 (6.3%)
Disease	5	2	1	8	15 (2.6%)

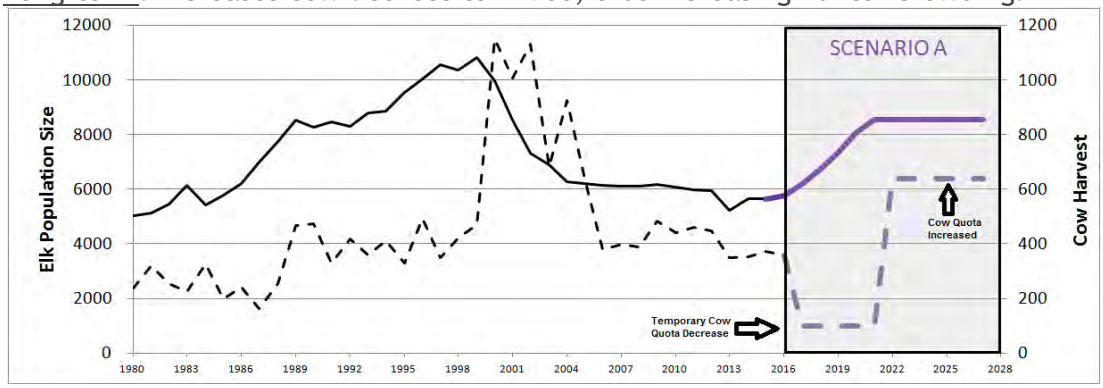
9. According to the current #25 population model, there are ~5650 (+/- 500) elk , and appears to be relatively steady. For planning purposes assume this estimate is correct. This DAU plan will set the objective population for the following 10 years. During these next 10 years, how do you want the elk population size to be managed? *[audience was given various slides indicating anticipated outcomes on a short-term and long-term basis for cow license allocations required, hunter crowding, and rangeland degradation. Outcomes assumed hunter success rates and elk biological variables did not change]*

   Currently, E25 has approximately 5650 (+/- 500) elk. The historic trend of the elk population size for E25 is shown with the black line of the chart below. Manipulating the elk population size influences the availability of cow licenses in the short and long term. Currently, a quota of 1,345 cow hunting licenses is required to maintain this elk population at 5650.

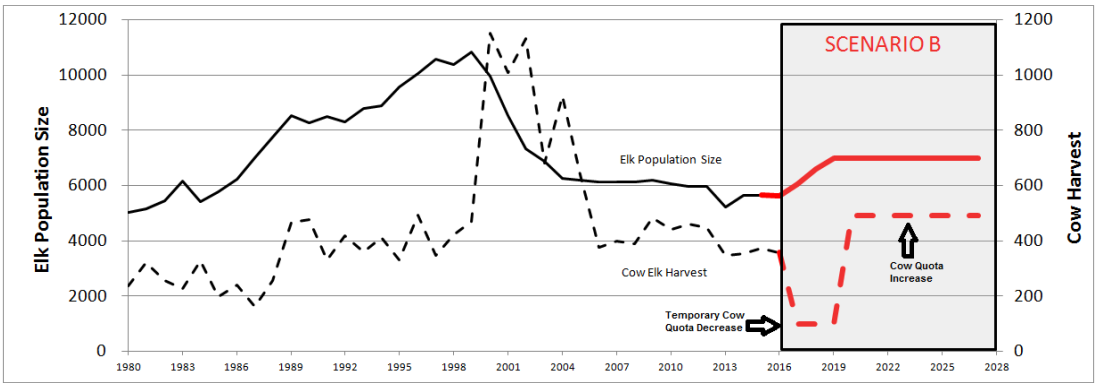
   Manipulating population size can have several anticipated outcomes. Manipulating the population size will have temporary effects on hunters (i.e., hunter crowding, license drawing opportunity) that are opposite of the long-term effects on hunters.

   During the next 10 years, how do you want the E25 elk population size to be managed?

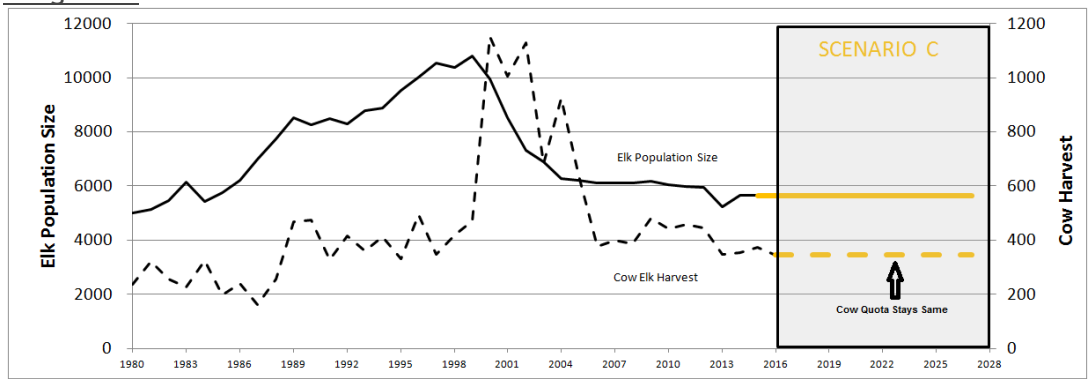
   Scenario A: Increase population size by 50% (to ~8500 elk)
   Anticipated outcomes:
   Temporarily: Cow license decrease to ~400 for ~5 years, reduces hunter crowding.
   Long-term: Increases cow licenses to ~2900, thus increasing hunter crowding.



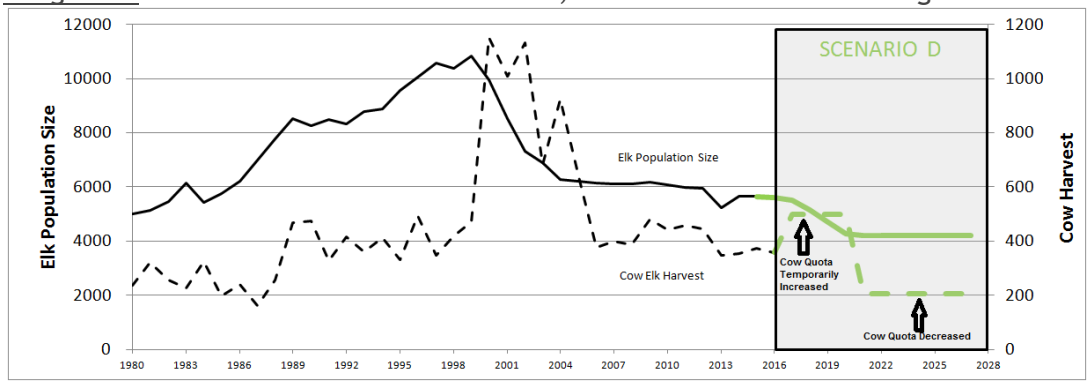
   Scenario B: Increases population size by 25% (to ~7000 elk)
   Anticipated outcomes:
   Temporarily: Cow license decreases to ~400 for ~3 years, reduces hunter crowding.
   Long-term: Cow licenses increase to ~2200, increases hunter crowding.



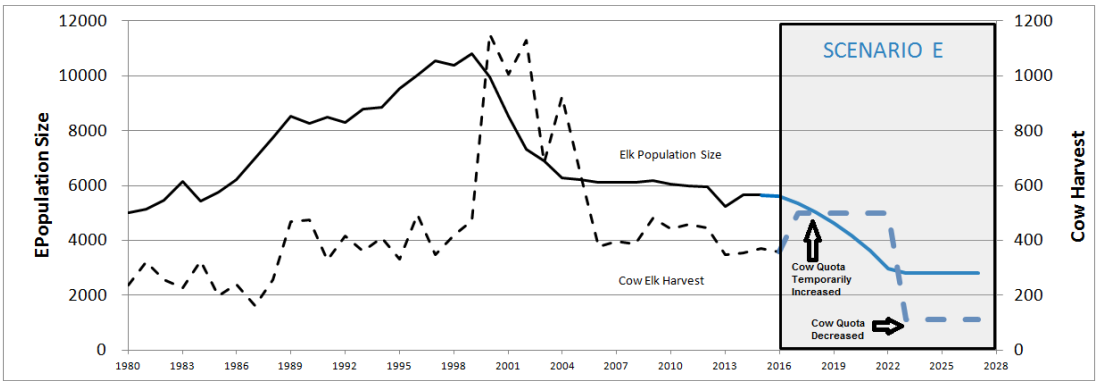
Scenario C: Do not change population size(keep at ~5600 elk)
Anticipated outcomes:
Temporarily: None
Long-term: None



Scenario D: Decrease population size by 25% (to ~4200 elk)
Anticipated outcomes:
Temporarily: Cow license increase to 2300 for ~3 years, increases hunter crowding.
Long-term: Cow licenses decrease to ~950, decreases hunter crowding.



Scenario E: Increases population size by 50% (to ~2800 elk)
Anticipated outcomes:
Temporarily: Cow license increase from 1345 to 2300 for ~5 years, increases hunter crowding.
Long-term: Cow licenses decrease to ~400, decreases hunter crowding.



Answer choices by percentage of respondents:

A: 50% increase resulting in 8500 elk (11.2%), **B:** 25% increase resulting in 7000 elk (45.9%), **C:** 0% change, resulting in the status quo of 5600 elk (39.8%), **D:** 25% decrease resulting in 4200 elk (3.1%), **E:** 50% decrease resulting in 2800 elk (0%)

Descriptive statistical summary (Average, 95% lower and upper confidence limit):

6,231 (5999 – 6462) elk

10. Another important factor for changing the population - HOW to make the change, if a change is made, would you prefer that CPW makes changes:

    A: Rapidly with a dramatic increase/decrease in license availability and population response (34.9%), **B:** Gradually with an incremental increase/decrease in license availability and slower population response (65.1%)

Section 4 - General Comment and Survey Form

The fourth survey was an internet based survey opened up to the general public in August 2016. All attendees of the public scoping meeting had an opportunity to fill out a paper version. An online version was made available (Survey Monkey, Inc, Palo Alto, CA, USA). The survey was advertised in local media outlets and allowed anyone with internet access to participate. Online versions of this survey characterized past E25 hunting experiences and future desires for the E25 herd. General written comments were also accepted. A total of 233 people responded to the survey. Results from this survey were considered less rigorous, as it may not be representative of all interests or the proportionally representative of different stakeholders.

The following questions were provided. The percent of respondents answering are provided following each answer choice.

1. Are you male or female?

    A: Female (8.8%), **B:** Male (91.2%)

2. In what year were you born? (Please indicate the 4-digit year.)

Average Birth Year: 1965.5 (50.5 years of age)

3. Out of the past five years, how many did you hunt for elk in GMUs 66 and/or 67?

A: 0 year (40.0%), **B:** 1 year (11.2%), **C:** 2 year (16.7%), **D:** 3 year (9.3%), **E:** 4 years (6.0%), **F:** 5 years (16.7%)

4. Which of the follow areas best represent your interests in GMUs 66 and/or 67, please rank your top 3, with 1 being the most important? [Summarized by ranked scores]

A: Hunter (587 pnts), **B:** Wildlife Viewer (221 pnts), **C:** Other (95 pnts), **D:** Landowner (80 pnts), **E:** Agricultural operator (41 pnts), **F:** Business Interest (40 pnts) **G:** Hunting Guide Industry (37 pnts) **H:** No answer (18)

5. Have you ever used a voucher from a landowner to hunt elk in GMUs 66 and/or 67?

A: No (77.5%), **B:** Yes (22.5%)

6. Did you pay a guide or outfitter during any of your elk hunts in 66 and/or 67 between 2010 and 2015?

A. No (96.6%), **B:** Yes (3.4%)

7. Did you act as a paid or unpaid guide or outfitter for elk hunting in GMUs 66 and/or 67 between 2010 and 2015?

A: No (92.7%), **B:** Yes (7.3%)

8. Please check the box next to the method of take that you most prefer to hunt elk in GMUs 66 and/or 67. (Please check one.)

A: Archery (26.7%), **B:** Muzzleloader (10.3%), **C:** 1st Rifle (23.7%), **D:** 2nd Rifle (13.8%), **E:** 3rd Rifle (9.1%), **F:** 4th Rifle (9.5%), **G:** I don't hunt in Colorado or hunt at all (6.9%)

9. From the following list, please check the top three areas where you have hunted elk the most..

A: GMU 66 (26.2%), **B:** GMU 67 (17.6%), **C:** Northern Gunnison GMUs (18.8%), **D:** Non-Gunnison GMUs (26.4%), **E:** Non-Colorado (8.8%), **F:** Non-hunter (2.2%)

10. How important is it to you for youth to have the opportunity to hunt elk in GMUs 66 and/or 67?

A: Not important (13.1%), **B:** Somewhat important (34.1%), **C:** Very important (52.8%)

11. Please rank the following items to tell us which is most important you in terms of your elk hunting opportunity in GMUs 66 and/or 67. Rank the items from 1 to 5, where 1 is most important to you and 5 is least important to you.

Answer Choice	Count of Respondents						Overall Score Weighted by Rank (1=5 pnts, 3=3 pnts, 5=1 pnt)
	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Any Rank	
Be able to harvest an animal for meat	52	35	47	33	17	184	624 (21.8%)
Hunt in an area with fewer hunters	49	48	27	37	23	184	615 (21.5%)
Have the chance to harvest a mature animal	40	42	37	28	47	184	582 (20.3%)
Hunt every year	49	27	21	23	61	181	523 (18.2%)
Hunt in area with high success rate	20	39	53	45	18	175	523 (18.2%)

12. Which of the following best characterizes your view of the number of elk in GMUs 66 & 67 over the past 5-10 years? (please check one.)

A: Rapidly increasing (0.5%), **B:** Slowly increasing (6.7%), **C:** No increase or decrease (38.6%), **D:** Slowly decreasing (36.7%), **E:** Rapidly decreasing (17.6%)

13. How satisfied were you with your overall hunting experience for elk in GMUs 66 and/or 67 the past 5 years? (Please check one).

A: Very unsatisfied (13.1%), **B:** Somewhat unsatisfied (8.9%), **C:** Neither satisfied, nor unsatisfied (4.7%), **D:** Somewhat satisfied (24.3%), **E:** Very satisfied (17.3%), **F:** I did not hunt elk in GMU 66/67 (31.8%)

14. Please tell us how important the following items were, in general, to your elk hunting experience in GMUs 66 and/or 67 between 2010 and 2015.

Answer Choice	Unimportant	Neither Important or Unimportant	Important	Overall Score Weighted by Rank (Unimportant=1 pnts, Neither important/unimportant=2 pnts, Important = 3)
Access to public hunting land	2	10	181	565 (10.2%)
Number of animals I saw	4	19	162	528 (9.5%)
Ability to obtain game meat to eat	23	35	131	486 (8.8%)
Ability to hunt in the same unit/area most years	24	50	116	472 (8.5%)

Length of hunting season	15	75	101	468 (8.5%)
Ability to hunt every year	42	43	103	437 (7.9%)
Ability to obtain a license to harvest a male	31	75	83	430 (7.8%)
Price of hunting licenses	46	57	89	427 (7.7%)
Number of trophy animals I saw	44	63	79	407 (7.4%)
Ability to hunt in trophy units	54	63	72	396 (7.2%)
Ability to purchase an over-the-counter license	90	40	55	335 (6.1%)
Access to private hunting land	93	56	39	322 (5.8%)
Availability of guides/outfitters in the area	131	34	20	259 (4.7%)

15. From the list below, please check the 3 issues related to elk hunting in GMUs 66 and/or 67 about which you are most concerned. (Please check no more than 3.)

> **A:** Elk population size (19.4%), **B:** Hunter Crowding (18.6%), **C:** Preference point requirements (16.3%), **D:** Bull ratios (9.9%), **E:** Non-hunting recreation impacts (9.2%), **F:** Predator impacts (6.1%), **G:** Spruce Beetle impacts (5.7%), **H:** Elk distribution changes (4.2%), **I:** Economic impacts of elk hunting (3.6%), **J:** Days afield required (2.8%), **K:** Wildlife viewing opportunities (2.4%), **L:** Agricultural damages (1.0%), **M**: Vehicle/elk collisions (0.8%).

16. If you were to NOT draw an elk license in GMUs 66 and/or 67, please check the 3 things you may do as a result? (Please check no more than 3.)

> **A:** Apply again next year (27.4%), **B:** Hunt Colorado Over the counter GMU (20.9%), **C:** Hunt neighboring GMU (16.5%), **D:** Hunt other Colorado limited unit (11.7%), **E:** Hunt outside Colorado (10.9%), **F:** Acquire landowner voucher (6.5%), **G:** discontinue elk hunting (3.6%), **H:** Other (2.5%).

17. If you have hunted elk in GMUs 66 and/or 67 in the past, but are no longer interested in hunting in these units, please choose the top 3 reasons of why? (Please check no more than 3.)

> **A:** Insufficient elk (23.2%), **B:** Other (13.3%), **C:** Insufficient large bulls (11.6%), **D:** hunter crowding (11.6%), **E:** Saving preference points (11.6%), **F:** Too many preference points required (11.0%), **G:** Difficulty accessing (8.8%), **H:** Non-hunting recreation crowding (5.5%), **I:** Days afield (3.3%)

18. Given the below scenarios and description of anticipated outcomes: During the next 10 years, how do you want the E25 elk population size to be managed?

[In order to put answer choices into context regarding license opportunity and hunter crowding, respondents were given the same background information prior to answering this question as that given during the public scoping meeting. See the Scoping meeting section of this appendix (Appendix 2, Section 3)]

Answer choices by percentage of respondents:

A: 50% increase resulting in 8500 elk (25.5%), **B:** 25% increase resulting in 7000 elk (37.9%), **C:** 0% change, resulting in the status quo of 5600 elk (34.8%), **D:** 25% decrease resulting in 4200 elk (1.2%), **E:** 50% decrease resulting in 2800 elk (0.6%)

Descriptive statistical summary (Average, 95% lower and upper confidence limit):

6,834 (6649 – 7020) elk

19. If a change is made, would you prefer that CPW makes changes:

A: Rapidly with a dramatic increase/decrease in license availability and population response (35.8%), **B:** Gradually with an incremental increase/decrease in license availability and slower population response (64.2%)

Section 5 - Randomized Hunter Survey

For the fifth survey, a randomly drawn set of hunters (from past E25 elk seasons: 2006, 2010, 2012, 2014) were invited to partake in an internet/paper based survey in August 2016. While online versions served as the primary media (Survey Monkey, Inc, Palo Alto, CA, USA), respondents without internet access were given the opportunity to fill out a paper version. This survey characterized hunters past E25 hunting experiences and future desires for the E25 herd. Out of the 1500 solicitations sent via post-card, a total of 237 randomly drawn hunters responded to the survey. Methods were established during survey development to ensure that unique responses were obtained (i.e., hunter could only complete survey once).

1. Respondents by license year sampled from:

A: 2006 (27.0%), **B:** 2010 (30.0%), **C:** 2012 (23.6%), **D:** 2014 (19.3%)

2. Proportion of respondents by residency:

A: Non-resident (36.9%), **B:** Resident (63.1%)

3. Which unit have you hunted the most?

A: GMU 66 (53.0%), **B:** GMU 67 (47.0%)

4. How many years have you hunted GMU 66 and/or 67 (for any animal)?

A: 1 (6.8%), **B:** 2-3 (8.1%), **C:**3-4 (14.0%), **D:** 5-10 (20.9%), **E:** 10+ (50.2%)

5. Which of the following best characterizes your view of the number of elk in GMU 66 and/or 67 over the past 5-10 years?

A: Rapidly increasing (0%), **B:** Slowly increasing (10.2%), **C:** No increase or decrease (37.3%), **D:** Slowly decreasing (33.1%), **E:** Rapidly decreasing (19.3%)

6. Which best characterizes your hunting history of elk in GMU 66 and/or 67:

A: I hunted elk there in the past and anticipate continuing hunting there in the future (80.5%), **B:** I hunted elk there in the past, but no longer (19.5%)

7. If you have hunted elk in GMU 66 & 67 in the past, but no longer do so, please tell us why. Only the top three items ranked will be considered.

Answer choice	Respondent count by ranking			Overall Score Weighted by Rank (1=3 pnts, 2=2 pnts, 3 = 3 pnts)
	1st	2nd	3rd	
Insufficient elk	17	3	1	58 (33.0%)
Hunter crowding	3	4	4	21 (11.9%)
Moved residency further away	4	3	2	20 (11.4%)
Difficult accessing	4	3	2	20 (11.4%)
Saving preference points	3	3	3	18 (10.2%)
Days afield required	0	7	4	18 (10.2%)
Did not draw a tag	3	2	2	15 (8.5%)
Non-hunting recreation crowding	0	1	2	4 (2.3%)
Insufficient large bulls	0	0	2	2 (1.1%)

8. Have you ever used a landowner voucher to hunt elk in GMU 66 and/or 67?

A: No (85.8%), **B:** Yes (14.2%)

9. Have you ever used a guide to hunt?

A: No (88.8%), **B:** Yes (11.2%)

10. Which method of take do you most prefer to hunt elk in GMUs 66 and/or 67?

A: Archery (9.0%), B: Muzzleloader (6.9%), **C:** 1st rifle (21.9%), **D:** 2nd rifle (24.0%), **E:** 3rd rifle (27.5%), **F:** 4th rifle (10.7%)

11. Which of these items are most important to you when hunting elk in GMUs 66 and/or 67? Please rank your top 3 choices.

Answer choice	Respondent Count by Ranking			Overall Score Weighted by Rank (1=3 pnts, 2=2 pnts, 3 = 3 pnts)
	1st	2nd	3rd	
Hunt Every year	58	20	21	256 (20.4%)
Harvesting any elk	27	34	40	229 (18.3%)
Hunting meat	26	35	29	206 (16.4%)
Hunter crowding	27	34	28	205 (16.4%)
Harvesting mature bull	22	30	15	156 (12.5%)
Overall outdoor experience	16	18	20	124 (9.9%)
Harvest trophy bull	11	7	15	77 (6.1%)

12. How satisfied were you with your overall hunting experience for elk in GMUs 66 and/or 67 the past 5 years? (Choose one)

A: Very unsatisfied (7.0%), **B:** Somewhat unsatisfied (20.0%), **C:** Neither satisfied, nor unsatisfied (11.3%), **D:** Somewhat satisfied (40.0%), **E:** Very satisfied (21.7%)

13. Please choose the most concerning issues for you as a hunter in GMUs 66 and/or 67. Please rank your top 3 choices.

Answer choice	Respondent Count			Overall Score Weighted by Rank (1=3 pnts, 2=2 pnts, 3 = 3 pnts)
	1st	2nd	3rd	
Ample hunting opportunity	53	36	23	254 (22.8%)
Insufficient elk population size	49	34	22	237 (21.3%)

Hunter crowding	21	36	31	166 (14.9%)
Private land refuges	28	20	25	149 (13.4%)
Spruce beetle impacts	17	18	21	108 (9.7%)
Motorized traffic	14	14	11	81 (7.3%)
Wild predator impacts	8	6	9	45 (4.0%)
Elk disease	1	10	19	42 (3.8%)
Non-hunting recreation impacts	3	4	13	30 (2.7%)

14. Given the above scenarios and description of anticipated outcomes: During the next 10 years, how do you want the E25 elk population size to be managed? *[In order to put answer choices into context regarding license opportunity and hunter crowding, respondents were given the same background information prior to answering this question as that given during the public scoping meeting. See the Scoping meeting section of this appendix]*

A: 50% increase resulting in 8500 elk (14.2%), **B:** 25% increase resulting in 7000 elk (37.6%), **C:** 0% change, resulting in the status quo of 5600 elk (44.2%), **D:** 25% decrease resulting in 4200 elk (2.2%), **E:** 50% decrease resulting in 2800 elk (1.8%)

Descriptive statistical summary (Average, 95% lower and upper confidence limit):

6,456 (6303 – 6610) elk

15. IF a change is made, would you prefer that CPW makes changes:

A: Rapidly with a dramatic increase/decrease in license availability and population response (25.1%), **B:** Gradually with an incremental increase/decrease in license availability and slower population response (74.9%)

16. What is your zip-code (please enter 5-digit zip)

A: Local (21.2%), **B:** Non-local (78.8%

17. In what year were you born?

Average year: 1959 (Average age: 56.9)

Appendix 3: Public letters acquired during 30-day comment period

Letters from individual parties are not displayed to protect the individual's identity.

11/16/2016

Colorado Parks & Wildlife

State Wildlife Commission

My name is Burt Guerrieri, current President of the Gunnison County Stockgrowers Association. We are the oldest stockgrower organization in Colorado, and we continue to be one of the most active. Thank you for accepting our comments concerning your upcoming decision on elk numbers in DAU E25.

Although we do not have any specific recommendations for elk numbers in Units 66 and 67, we do have concern regarding the process for determining elk numbers for herd objective.

It is essential the elk populations be based first and foremost on the available land resources. We insist the Commission work closely with the USFS and BLM and affected landowners to determine the appropriate carrying capacity of elk, within the available resources. Then, and only then, consider hunter opportunity within that carrying capacity.

I have yet to meet a hunter who wanted less "hunter opportunity". Elk populations should not be based on hunters wanting more elk.

Burt Guerrieri

Please don't hesitate to contact me if you wish.

970-596-2878

Burt@MillCreekRanches.com

Gunnison Basin Habitat Partnership Program Committee

November 16, 2016

Kevin Blecha, Terrestrial Biologist
Colorado Parks & Wildlife
300 W. New York Ave.
Gunnison, CO 81230

RE: Gunnison Basin HPP Committee comments on Elk DAU 25 plan

Dear Mr. Blecha,

This letter is in response to your request for formal comment regarding the Colorado Parks & Wildlife DAU E25 herd management draft plan. The Habitat Partnership Program (HPP) was created to help resolve wildlife conflicts, particularly those associated with fence and forage issues; and to assist CPW in achieving game management objectives. The Gunnison Basin HPP Committee held a special meeting on November 3rd to discuss elk population objectives for E25, and review the herd management plan alternatives. After careful consideration, the committee will offer the following recommendations:

- The committee agrees that the current elk population objective should be increased according to the collaborative objective (Alternative #2). This represents an 18% increase, resulting in a post-season population objective between 6000 - 7000 elk, with a midpoint of 6500 elk. The committee feels that this increase is modest enough that the proposed population objective will be sustainable, as well as well-received by the public. Additionally, the committee supports a gradual population increase to achieve this objective over a period of years, such that near-current levels of hunting opportunity, hunter crowding, and license demand will be maintained.

- The committee supports managing the E25 bull ratio according to the status quo objective (Alternative #2). This represents an objective of 23-28 bulls per 100 cows, with a midpoint of 25.5 bulls. The committee recognizes that it is difficult to increase bull ratios at the same time as population objectives are increasing. Additionally, the committee does not want to see a reduction in hunter opportunity or increased hunter crowding, which could result from respectively increasing or decreasing the bull ratio.

- The committee prefers a gradual change to the license allocation (Alternative #1). The proposed population increase is modest enough that small, incremental changes should be effective in achieving both population and bull ratio objectives, while only minimally (if at all) affecting hunter opportunity and crowding. Current hunting access and pressure helps to keep elk appropriately distributed throughout the area, and the committee feels that significant changes in hunting pressure may result in increased agricultural conflicts. The committee also believes that gradual changes to license allocations allow CPW to manage elk more steadily over the long-term, instead of attempting to respond to short-term or yearly changes which may be less effective in achieving and maintaining plan objectives.

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

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

Sincerely,

Nick Gallowich
Gunnison Basin HPP Chairman