CPW – ACUC Project Plan

Assessing Distribution and Improving Inventory Efforts to Better Manage the Clear Creek Elk Herd (E-38)

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Background

The Clear Creek elk herd, Data Analysis Unit (DAU) E-38, is located on the central Front Range of Colorado, just northwest of Colorado's largest human population center (Figure 1). It is composed of game management units (GMUs) 29 and 38. GMU 29 is managed for quality elk hunting, while GMU 38 is managed for opportunity elk hunting. The DAU is approximately 896 mi^2, 54% of which is private, 21% USFS, 18% City and County, 2% CPW, <1% USFWS, <1% BLM, <1% State Land Board and 2% other. The majority of public land open to hunting, which is USFS land, occurs in the western portion of the DAU. Reliable basic demographic and spatial information on the herd is lacking. Most elk in the herd use the foothills of the eastern portion of the DAU during the winter. Some elk migrate to the higher elevations in the western portion of the DAU during the summer, but it is believed that a growing proportion of elk have stopped migrating and are using the foothills and plains throughout the year. The current population objective range is 1,000 to 1,400 elk, with a bull: cow ratio objective of 35 – 40 bull: 100 cows (Huwer 2005). It is not certain if the herd is within the population objective range because population models, and the observed data used to construct those models, are deficient. It is thought that bull: cow ratio is close to objective in GMU 29, but below objective in GMU 38. There is believed to be significant elk movement between the Clear Creek elk herd and the Mount Evans elk herd (DAU E-39) in the southeastern portion of the DAU. Elk in GMU 391 move into GMU 38, and possibly vice versa, often during the time-frame when classification surveys are conducted in February.

Need

For many years, area staff and partnering land management agencies have requested several different elk distribution projects on numerous occasions within this elk herd. The requests for those projects arose from a variety of needs including collaboration on land management and land use, elk-vehicle collisions and roadway design, refuging behavior (elk use of areas absent of hunting that often result in resident herds), disease, basic knowledge of elk distribution, and basic population information and mitigating elk conflicts.

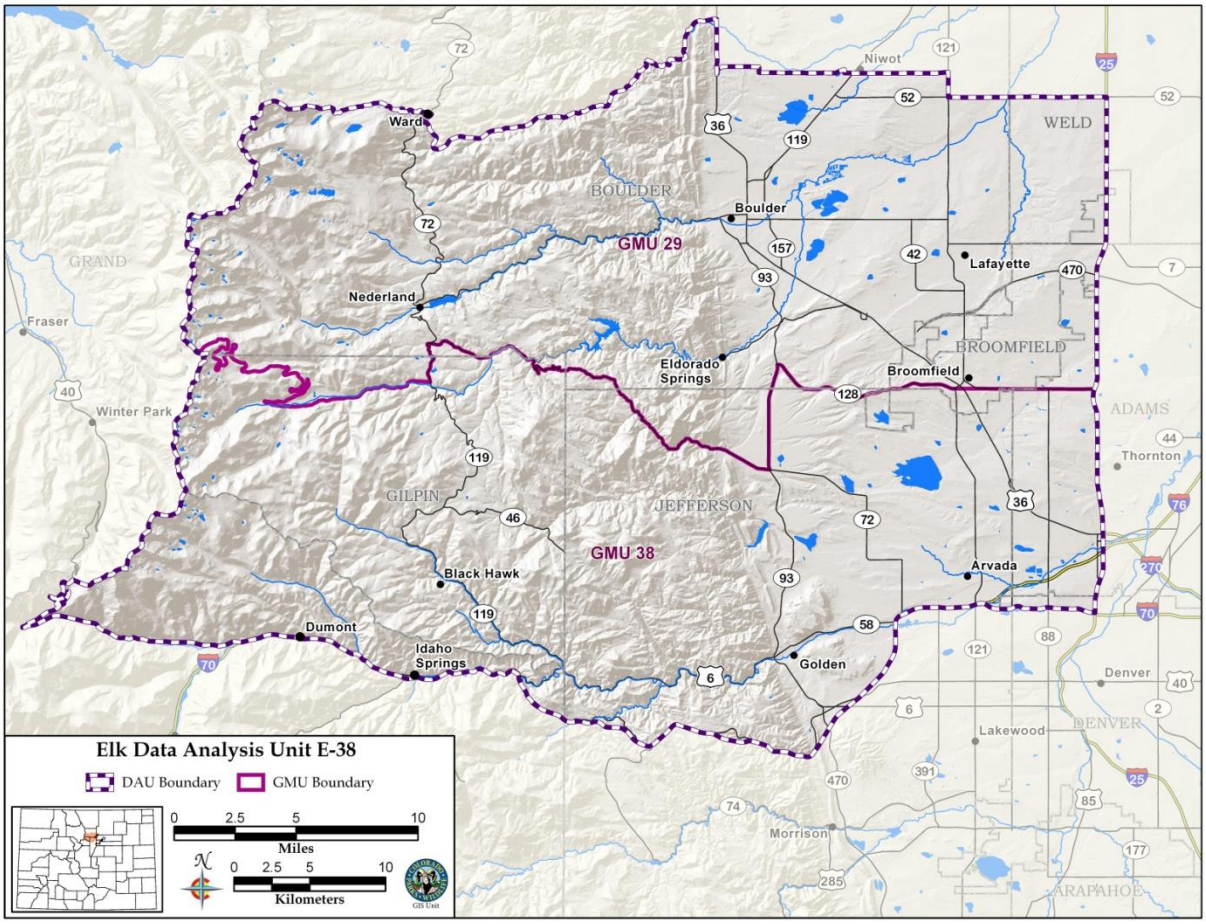

Figure 1. Elk data analysis unit (DAU) E-38, composed of game management units (GMUs) 29 and 38.

Herd objectives and observed population information (estimated from classification data) are used to manage ungulate populations. Vital rates vary based upon density, climate, habitat conditions (including anthropogenic influences) and predation. Like much of the Front Range, aerial classification surveys are not conducted in E-38. As a substitute, Terrestrial and Area 1, 2 and 5 staff conduct coordinated ground classification surveys each year. While

considerable staff time and effort is expended, sample size, representativeness of the sample and the overall usefulness of the data leave much to be desired. However, as evidenced from a similar project in the St. Vrain elk herd DAU E-9 (Kraft, unpublished data) the application of GPS collars has the potential to greatly improve sample size (Table 1) and the representativeness of sample to estimate young: female ratios, yearling male: female ratios and minimum subherd size from coordinated ground surveys with Area staff. In E-9, this resulted in more informative data collected on the herd, which better informed population models, while significantly reducing the staff time required to complete those surveys. We propose a similar framework in the Clear Creek elk herd to better understand herd composition and minimum subherd sizes.

Table 1. Number of elk observed during annual coordinated ground surveys in elk DAU E-9. Years with * denote surveys in which GPS collars were not deployed.

Year	Elk Observed
2012*	654
2013	1770
2014	1920
2015	1864
2016*	891
2017	1383
2018	1558

In addition, the distribution of elk within the Clear Creek elk herd is thought to have changed because human recreation, land management and land use, development and habitat conditions are changing at a rapid rate in the area. Colorado Parks and Wildlife is working with several agencies, which have requested information that would provide baseline and/or monitoring information relative to proposed projects and management programs. Stakeholders and programs seeking elk distribution information include: the USFWS at Rocky Flats, Boulder County at Walker Ranch, Reynolds Ranches and the Toll Trail System, Jefferson County on several foothills properties, the City of Golden at golf courses and within the city limits to mitigate conflicts, and Boulder County and the USFS at the Magnolia trails complex. A challenge for the collaborators involved in those projects is a lack of basic information regarding how elk use the landscape. The above collaborators have requested that CPW initiate elk distribution projects or have proposed their own respective studies of elk distribution. Because of the advancement of innovative technology, many land managers are now requesting spatial data based upon GPS technology to make better management

decisions. As previoulsy mentioned, a similar effort in the St. Vrain elk herd has helped to inform management activities relative to elk distribution (Kraft unpublished data; for example, elk at Rabbit Mountain on Boulder County Open Space).

This project proposes to gain a better understanding of elk distribution to better inform managers regarding several projects and issues related to elk. Land management actions, such as habitat projects on SWAs, seasonal closures, road and trail construction, trail use management, public harvest programs and forestry projects, would be better informed by such information and provide a means to monitor elk responses to those actions. GPS collars distributed representatively across the DAU can provide the needed information that is pertinent to current management issues. This project will provide a better understanding of elk distribution and movement corridors, which will also be used to update CPW Species Activity Maps.

Objectives

Project Goals

1) **Understand the distribution and movements of the Clear Creek elk herd**
2) **Improve abundance and herd composition estimates of the Clear Creek elk herd**
3) **Support partnering agencies on land and elk programs and projects**

Project Objectives

1) Use GPS collars to estimate herd space use parameters such as home ranges, seasonal ranges, and movement corridors.
2) Use GPS collars to locate groups of elk to estimate young: female and yearling male: female ratios during annual coordinated ground surveys.
3) Use GPS collars to survey elk group size during coordinated ground survey in order to provide a baseline for CPW population models.
4) Collaborate with other government agencies to produce movement and abundance information and products related to specific projects, including subherd size,

recreation and trails design and impacts, elk conflicts, highway construction and harvest programs.

5) Support the development of large mammal monitoring programs with other agencies by providing baseline distribution and abundance information.

Expected Results and Benefits

This project is intended to produce information and products to managers specific to E-38. Products generated from this project include reliable survey data to better inform CPW population models, basic information regarding elk distribution, recommendations for mitigating conflict and elk damage, information to inform harvest programs and incorporating elk needs into recreation and land management projects. This project will 1) improve the overall license setting and population modeling processes (White and Lubow 2002) by increasing survey sample size, coverage and efficieny of coordinated ground surveys 2) help CPW gain an understanding of elk space use of the landscape, as it relates to proposed land use changes (including mapping seasonal ranges and migration corridors), 3) help to mitigate and evaluate the impacts of proposed trails projects and existing trail and visitor management, 4) help to implement public harvest programs on open space to reduce habitat damage and elk conflicts and finally, 5) inform open space operations. This project will also help to inform upcoming Herd Management Plan updates (Huwer 2007, Huwer 2005) and will help to aid in evaluating existing DAU alignment. This project will be the first collar study at the DAU scale in the herd. To date, there have been very limited studies of elk distribution in the DAU (Hallock 2016). There has only been one small-scale elk telemetry study in the DAU (Hallock 1991). The study was conducted over 25 years ago and in a very small area relative to the DAU.

With regards to CPW's strategic plan, this project will provide information to improve knowledge and management of the herd, which will better enable management towards the objectives defined in the herd management plan. Because aerial surveys are not possible, the proposed project design is currently the most efficient monitoring framework available given survey constraints and expected costs. This project will also provides information to identify priority areas to ensure the needs of the elk herd are addressed in the many land

management decisions currently being evaulated. This project also has the potential to inform future hunting programs and increase hunting opportunity.

If this project is not conducted, there will be a loss in CPW's effectiveness during collaboration with the many land managers on the Front Range, including the USFWS, Boulder County, Jefferson County, the City of Golden and the USFS on several projects. In addition, CPW and other managers will remain uninformed regarding elk and land use issues across the DAU. Finally, CPW will be less informed during the population estimation and license setting processes.

Approach

Methods

Captures

Captures will be conducted in compliance with CPW Administrative Directive W-23 and by methods approved by ACUC (Elk ACUC 06-2015) and recommended by CPW's veterinary staff. All captures will be managed and conducted by CPW staff and CPW contractors that have appropriate capture experience and training. Seasonal technicians and partner agency staff will be receive capture training prior to assisting with capture.

Female elk ≥ 2 years old will be captured. Captures will be conducted primarily from February 1st to April 15th, but may also occur between August 15th to January 31st to capture those elk not available during the primary capture period, or to target elk using specific seasonal ranges at particular times of the year. The proposed primary capture period was selected to minimize interference with gestation, parturition, neonate survival and hunting seasons. If all collars are not deployed during the initial project year, capture efforts will continue. Collars may also be redeployed after mortalities.

The majority of elk will be captured by helicopter net-capture with a contracted helicopter capture vendor. Helicopter net-gun capture is preferred, but helicopter darting is another capture technique that may be employed due to time of year, weather conditions, vegetation and topography. We will work with Terrestrial's veterinarian to determine which of the above capture techniques is most appropriate. Ground capture via projectile chemical

immobilization and clover trapping with anesthesia, will also be used to capture elk in specific areas. We estimate that it may be necessary to ground capture up to 15 individual elk from the proposed subherds (see *Capture Locations* below). Ground captures are necessary because a large portion of the elk herd uses urban areas, where helicopter capture is not an option. Upon capture, GPS/VHF radio-collars and individually identifiable ear tags (with drug withdrawal information) will be attached. After processing, elk will be immediately evaluated for injury and monitored for 14 days. If an elk is critically injured during capture or is terminally ill, it will be euthanized. Euthanasia will be conducted onsite by CPW veterinarian and ACUC (CPW – Terrestrial and Research Guidelines for Euthanasia; Wolfe et al. 2018, Elk ACUC 06-2015) approved procedures including captive bolt, gunshot, or potassium chloride injection. Collars will remain on elk, even after collar failure, as collars will continue to be utilized during coordinated ground surveys.

Capture Locations

Collars will be deployed in the following subherds during the initial project year. The following deployment itinerary is based upon the current limited knowledge of subherd numbers and distribution within the DAU.

GMU 29

Tolland – 5

Magnolia - 5

Caribou – 5

Peewink/Sugarloaf – 4

GMU 38

Centennial Cone - 3

Golden – 4 (ground captures)

Rocky Flats – 5 (ground captures) ***This subherd is also thought to use GMU 29 also**

Young's Property- 3

Goultra's Property – 2

Lookout Mountain/Blue Mountain – 5 (ground captures)

Total – 41

Monitoring Collars

Collars will be monitored via software through a satellite uplink. Mortality signals will be investigated as soon as practical to estimate cause of death, but this project is not designed for a thorough mortality investigation. Returned collars will be redeployed. Collars will be honed to and visually located at least once per year during classification surveys in February and March.

Analysis and Data Assimilation

Population Modeling

During annual coordinated ground surveys in February and March, collars will be honed to classify groups of elk. The composition and number of elk observed will be used to construct new population models of the herd (White and Lubow 2002). Ground surveys will also provide information on the minimum number of elk in specific subherds including Golden, Lookout Mountain, Rocky Flats and Magnolia.

Space Use Metrics

Location data will be used to update CPW's Species Activity Maps. In addition, several space use metrics will be estimated on the various herd segments. Those metrics used will depend on the collaborative effort between the project collaborators, but will likely include home range estimation such as, minimum convex polygons (Mohr 1947), kernel density estimates (Worton 1989, Horne and Garton 2006) and Brownian bridges (Horne et al. 2007) and time-spent analyses. The analyses will be completed by CPW field staff and collaborating land manager(s).

Schedule

Based upon expected battery life of available GPS collars, this project will run for five years, including the initial capture year. Field work for this project will begin in February 2020. Coordinated annual ground surveys, focusing on collar locations, will continue as long as collars remain affixed to elk.

Budget

Budget (Year 1)			
Description	**Cost**	**Quantity**	**Total**
Personnel			
GOCO Intern	$16.94/hr @ $14/hr pay	1, 6 month term	17075.52
Temporary	$19.36/hr @ $16/hr pay	1, 4 month term	13009.92
Equipment and Supplies			
GPS Collars (2 locations/day)	750	41	30750.00
Activation Fees	40	41	1640.00
Subscription Fees	300	41	12300.00
Immobilization Drugs	265	3	795.00
Helicopter Capture	700	35	24500.00
Field Supplies	1000		1000.00
			$101,070.44

Budget (Years 2 & 5)			
Description	**Cost**	**Quantity**	**Total**
Personnel			
GOCO Intern	$16.94/hr @ $14/hr pay	1, 6 month term	17075.52
Temporary	$19.36/hr @ $16/hr pay	1, 4 month term	13009.92
Equipment and Supplies			
GPS Collars (2 locs/day)	0	41	0.00
Activation Fees	0	41	0.00
Subscription Fees	300	41	12300.00
Immobilization Drugs	265	2	530.00
Helicopter Capture	700	0	0.00
Field Supplies	1000		1000.00
			$43,915.44

Budget (Years 3 & 4)			
Description	**Cost**	**Quantity**	**Total**
Personnel			
GOCO Intern	0	0	0.00
Temporary	0	0	0.00
Equipment and Supplies			
GPS Collars (2 locs/day)	0	41	0.00
Activation Fees	0	41	0.00
Subscription Fees	300	41	12300.00
Immobilization Drugs	265	2	530.00
Helicopter Capture	700	0	0.00
Field Supplies	1000		1000.00
			$13,830.00

Grants to Date

Rocky Mountain Elk Foundation – Grant # CO190174, Spring 2019, $26,000

Colorado Parks and Wildlife, Auction and Raffle Grant – Spring 2019, $50,000

Literature Cited

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Appendix A – Capture Form

Capture Form Species_____

Date:_____Personnel:_____

Time	**Drug**	**Lot**	**mg/ml**	**Dose (ml)**	**Method**	**Location**
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

Time Immobilized:_____Time Recovered:_____

Time	**Temperature**	**Pulse**	**Respiration**
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Age:_____Mo Yr (Estimated or Actual) Dependent Young? Y N Unknown

Weight:_____lb kg (Actual or Estimated) Sex - Male Female Unknown

Recapture? Y N If yes, previous mark(s):_____

Capture Location and UTMs (NAD83):_____

Zone_____UTME_____UTMN_____

Weather Conditions:_____Ambient Temperature_____(F C)

Animal Condition: Excellent Good Fair Poor BCS:_____

Blood Collected: Y N Ear Snip Collected: Y N Rectal Biopsy: Y N

Collar Color & Mark:_____Collar Freq & SN:_____

Ear Tag Color and #:_____Do Not Consume Date:_____

Removed Collar Magnet? Y N Removed Dart(s)? Y N Collected All Dart(s)? Y N

Comments: