

Red Hill Elk Management Plan

2020-2022



Approved by the Boulder County Commissioners

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FINAL



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Introduction

This document provides management direction for the Red Hill elk (sub-herd of the St. Vrain elk herd) that uses Boulder County Parks & Open Space (BCPOS) properties near U.S. Highway 36 (US 36). This plan highlights historic behaviors of the herd and recent changes in their movement and space-use patterns, specifically documenting the recent population increase of a segment of the herd that has stopped migrating. The impacts of these behavioral changes are outlined, including an increase in elk-human conflicts with agricultural properties, threats to highway safety along US 36 and Nelson Road, and potential threats to native biodiversity. Finally, it presents recommendations for management of the herd in both the short and long term. Short-term strategies are aimed at alleviating immediate negative elk impacts and minimizing the growing non-migratory population segment. Long-term strategies are outlined to maintain a sustainable elk population, improve habitat, and alleviate barriers to safe movement.

Background

Red Hill Elk Herd

The Red Hill elk is a sub-herd of the St. Vrain elk herd residing in northern Boulder and southern Larimer counties. This Red Hill herd was studied by Colorado Parks and Wildlife (CPW) and BCPOS from 1997-2005, around the time of purchase and opening of Heil Valley Ranch open space. The study helped identify important habitats in both summer and winter range, movement corridors, and the timing of migration. The lower elevations of Heil Valley Ranch (and Red Hill) are the primary winter range of the entire sub-herd. The study showed a migratory pattern for all but a few elk, with the majority of the herd migrating west of the Peak-to-Peak Highway to calve and summer. The high elevation meadows and wetlands between Niwot Ridge and St. Vrain Mountain provide the rich habitat to birth and rear calves. That segment returns to the lower elevations in late summer (September/October) for the rut.

As Heil Valley Ranch transitioned from a working ranch and quarrying area to open space with trails, the study was able to monitor those impacts and changes in the elk distribution. Elk changed their use areas to avoid the areas open to visitation. Elk began to use more of the significant acreage closed to the public on the hogback adjacent to US 36, where Red Hill is situated, and areas west of the Wapiti/Ponderosa Loop Trails. More recently, use areas were bisected by the establishment of the Picture Rock Trail. Overall use areas along the hogback extend far to the north toward the Loukonen stone quarry in Lyons and south into areas adjacent to the Lake of the Pines/Foothills Ranch/Mountain Ridge subdivision area (4.5 miles long; approximately 2,800 acres).

Portions of this general area, along the hogback, were acquired by BCPOS over the last 15 years to create an area in relatively natural condition owned and managed exclusively by BCPOS and virtually devoid of people (see Appendix A). However, with the acquisition of these properties (and Heil Valley Ranch), a substantial area (more than 5,000 acres) was removed from hunting. Open areas east of US 36 were used as winter range after heavy snowfall and as spring range during green-up before migration. Telemetry and observations identified a few key crossing points along US 36.

In conjunction with the Rabbit Mountain elk herd study, a new study began in 2017 at Red Hill to identify changes and verify use patterns. One new development confirmed by the study was

the establishment of a resident elk herd in the area and substantial use areas south of Nelson Road east of US 36. In the 1997-2005 study, none of the telemetered animals used this Table Mountain area. Recent observations and counts revealed winter group sizes of more than 200 animals south of Nelson Road. BCPOS and CPW also began to track summer use of areas around Red Hill and east of US 36 and discovered a sub-herd of elk that did not migrate (as those elk had done in the previous study; Figure 1).

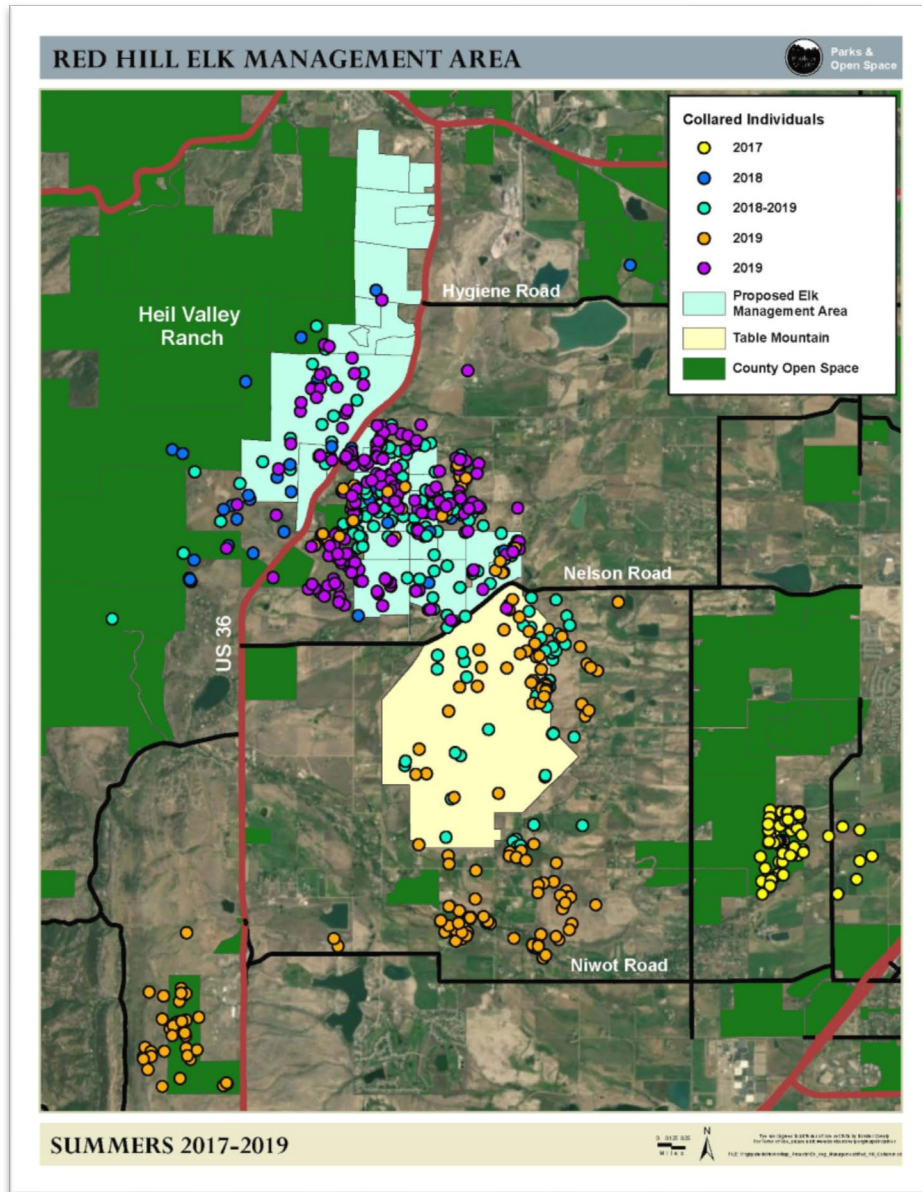


Figure 1. Elk management area showing use by collared individuals from summer 2017-2019.

Cows and calves were observed and counted over the summer of 2018 and 2019, revealing a growing year-round, resident population of more than 100 individuals in June of 2019. In July 2018, staff counted approximately 48 elk. Just on year later in June 2019, staff counted 108 elk. This growth in number represented recruitment of calves (2018 and 2019) and was large enough

to imply immigration of adult elk from the migratory herd (Figure 2). This sub-herd of the Red Hill population has the potential to continue to grow in number.

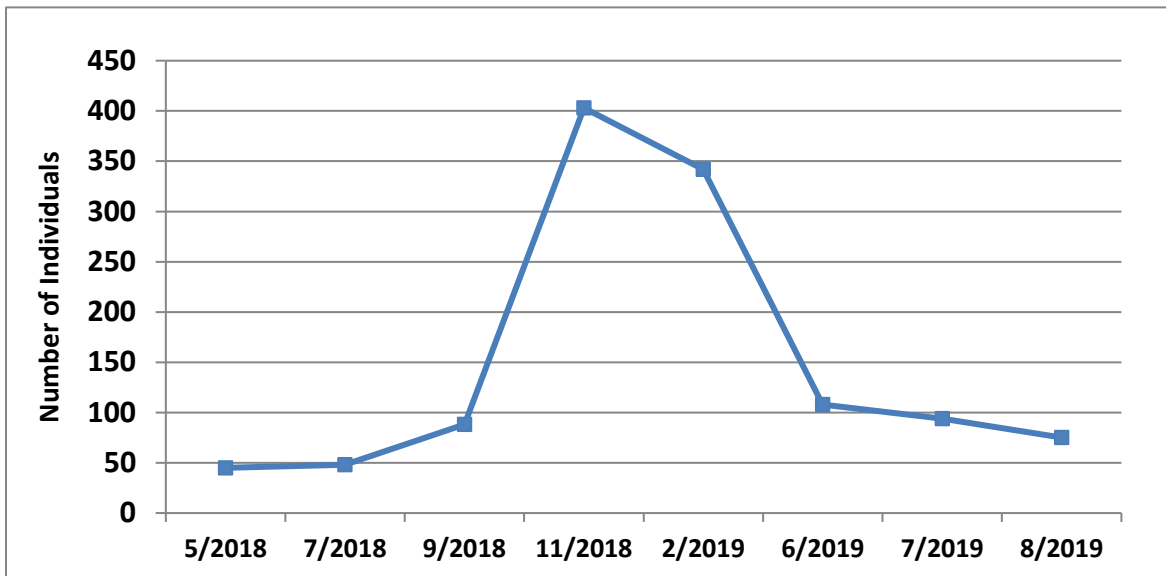


Figure 2. The Red Hill elk herd minimum counts from summer 2018 through summer 2019.

Land Use/Cover

The areas east of US 36 north of Nelson Road are a mixture of development, irrigated fields, and (mostly) native shortgrass prairie. The area, bounded by Nelson Road (south), US 36 (west), 51st and 49th St. (east), and St. Vrain Road (north) comprises about 2,250 acres. It is loosely ringed by scattered homes and ranches with a core area devoid of roads and little human activity. BCPOS manages about 1,130 acres in this area. About half of that area has been acquired by BCPOS with the Loukonen Dairy (606 acres) and Trevarton (740 acres) in the past 10 years (see Appendix A). There are about 215 additional acres of native prairie open space managed by City of Boulder Open Space and Mountain Parks. The native prairie/riparian area of Lykins Gulch and Red Hill shrublands provides shade, cover, and forage for the elk when they are east of US 36 and are proximate to the irrigated areas.

The area south of Nelson Road is dominated by the Department of Commerce Table Mountain research facility. It is approximately 1,700 acres of shortgrass prairie with restricted access, few roads, isolated small research buildings, and the two large radio telescopes. The areas surrounding the facility are almost exclusively private residences, ranches, and farms on larger-acreage lots. Some of these contain irrigated fields for hay or vegetables/market farms. Elk use in the area is facilitated by the relative quiet of the research facility, its grasslands, and some of the irrigated operations ringing the mesa. There are no POS properties contiguous to Table Mountain, with only the small (71 acres) Brewbaker-Sorensson parcel along Lefthand Creek, south of the mountain. Three OSMP parcels are proximate to Table Mountain, totaling 246 acres.

Colorado Natural Heritage Program (CNHP) inventoried Boulder County in 2007 and 2008 to assess the county's biodiversity. This survey identified areas with the highest biodiversity significance based on rare, threatened, and endangered species and habitats:

“The foothills of Boulder County harbor the highest concentration of globally rare biodiversity elements. There are two foothills areas with outstanding biodiversity significance (B1), Rabbit Mountain and Red Hill south of Lyons, which achieve B1 ranks due to their concentration of four or more globally critically imperiled to globally imperiled (G1-G2) element occurrences that are in excellent or good (A- or B-ranked) condition. These elements include foothills natural communities, several mountain mahogany shrublands, and two Piedmont grassland communities. Additionally, embedded within these areas are shale outcrops with globally imperiled Bell's twinpod (etc.). Rabbit Mountain and Red Hill South of Lyons are the only areas in Boulder County where foothill shrublands contribute significantly to the vegetation mosaic on the landscape” (CNHP 2009).

Table Mountain and the Lykins Gulch area (east of US 36) are CNHP B2 areas (Very High Biodiversity Significance; CNHP 2009). Table Mountain is primarily a U.S. Department of Commerce facility with restricted access, south of Nelson Road. It is a shortgrass prairie mesa of approximately 1700 acres with a few roads and a handful of isolated small research buildings. Portions of those areas east of US 36 are irrigated and intensively farmed for hay and alfalfa (and mostly private property). These areas are largely Boulder County Parks and Open Space lands. Additionally, there are several small vegetable/specialty farming operations both north and south of Nelson Road.

Elk-Human Conflicts

Highway Safety

The Colorado Department of Transportation (CDOT) has identified the corridor of US 36 between Boulder and Lyons as an area of concern for wildlife-vehicle collisions. Since 2005, there have been 256 incidents involving vehicles hitting deer or elk along this corridor. Of those accidents, 35 percent (89) involved elk. The average property damage cost of a wildlife-vehicle collision is estimated at approximately \$3,000.

Within the last five years, road strikes have increased. Frequent crossings by the Red Hill elk herd within a 10-mile crossing zone (mile markers 22-33) have resulted in at least 40 elk strikes (Figure 3). BCPOS staff have identified three areas where elk frequently cross in the four-mile stretch north of Nelson Road: 1) near the Foothills Baptist Church, south of the Boulder Feeder Canal crossing; 2) just south of St. Vrain Road and 3) about half mile north of Nelson Road.



Figure 3. At left, elk damaged sustained to a vehicle owned and operated by Boulder County staff. At right, elk crossing through right-of-way fence along US 36.

Mitigation measures have been introduced with little success. Yellow wildlife crossing caution signs and a series of reflectors meant to scare elk were installed. Additionally, the stretch of US 36 between mile markers 25 and 33 was designated as a Wildlife Crossing Zone in 2010 by House Bill 10-1238. It was selected for enforcement of a nighttime speed reduction from 60 to 55 miles per hour from October through June. However, enforcement was minimal, and at the end of the pilot program in 2012 the original speed limit was reinstated (Figure 4).



Figure 4. At left, speed limit signs highlighting the nighttime speed reduction from 2010-2012. At right, an example of one of two wildlife crossing caution signs along US 36.

Videos of crossings by the elk have recently been featured on local newscasts (KDVR-TV, KUSA-TV) and on community pages (Lyons Facebook page). With continued population growth resulting in increases in annual daily traffic along US 36, the number of wildlife-vehicle collisions is expected to increase (Figure 5).

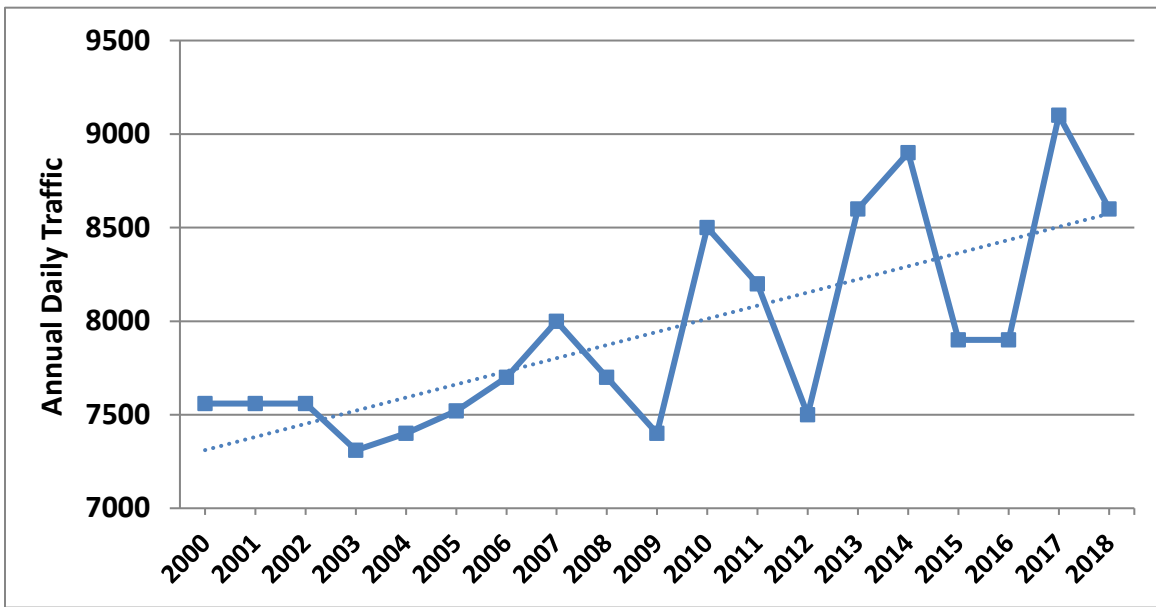


Figure 5. Average annual daily traffic along US 36 between Boulder and Lyons from 2000-2018. Data provided by CDOT.

Agricultural Damage

Changes in the herd’s overall distribution have caused considerable damage to agricultural producers both north and south of Nelson Road. The concentration of several small specialty vegetable and farming operations in the area attracts elk with novel and unfenced forage. The elk herd has caused damage to growing crops, stored crops, ornamental trees and shrubs, and fences. CPW is liable for damage by elk to agricultural products under cultivation and fences (C.R.S. 33-3-103 and 33-3-104).

Game damage hunting licenses have been issued by CPW to private landowners that share a property boundary with either BCPOS property or Table Mountain. In 2019, 32 game damage licenses were issued to adjacent landowners. Of those 32 issued, only three elk have been harvested to date.

CPW has counseled eight total landowners with either agricultural or ornamental damage to provide remediation through stockyard fencing or reimbursement through game damage claims. However, five of the eight landowners own and operate small, organic farms, and the remaining three landowners are experiencing ornamental damage, losses that are sometimes not eligible for reimbursement under state damage laws. CPW has paid one claim totaling \$4,500. The landowner has been experiencing damage for the past three years.

CPW and BCPOS worked to provide relief from elk impacts to BCPOS tenant-occupied properties in 2019, including the Imel property. Because BCPOS does not allow firearms or hazing wildlife on county-owned property, BCPOS Director approval was required before administering noise makers/pyrotechnics by Resource Protection staff to haze animals off property. In one instance, CPW and BCPOS staff coordinated a closure of N. 63rd St. to haze approximately 100 animals west. The group returned shortly thereafter.

Following the initial hazing event, the area was routinely monitored, and animals were hazed by Resource Protection staff. But to provide continuous and immediate relief, BCPOS gave the tenant permission to haze when needed and CPW provided cracker shells, fuse rope, and M80s. More recently, the elk herd accessed the tenant's hay barn overnight.

Potential Impacts to Natural Resources

As highlighted earlier, CNHP inventoried Boulder County in 2007 and 2008 to assess the county's biodiversity. This survey identified areas with the highest biodiversity significance based on rare, threatened, and endangered species and habitats. Red Hill was awarded a B1 ranking due to its concentration of four or more globally critically imperiled to globally imperiled element occurrences that are in excellent or good condition. Red Hill is one of three areas in Boulder County that holds a B1 ranking. Additionally, Table Mountain and the Lykins Gulch area (east of US 36) are CNHP B2 areas (Very High Biodiversity Significance; CNHP 2009).

Having experienced natural resource damage on Ron Stewart Preserve at Rabbit Mountain by an overabundant, resident herd, the growing resident herd at Red Hill therefore warrants immediate action. While the area surrounding Red Hill and the current distribution of the elk herd differs from conditions at Ron Stewart Preserve, preventive management of the Red Hill herd will benefit the otherwise irreplaceable resources inventoried at Red Hill and the surrounding area.

Actions Taken to Address Elk Impacts

- As described above, CPW has provided counsel, remediation, and game damage fees to numerous landowners adjacent to the elk management area. To help address problem elk and redistribute animals, CPW has also distributed 32 game damage tags.
- In 2010, CDOT enforced a nighttime speed reduction from 60 to 55 miles per hour from September through April. Enforcement was minimal, and at the end of the pilot program, the original speed limit was reinstated.
- Prior to 2010, large yellow wildlife crossing warning signs were placed at both ends of the areas where elk frequently cross in attempt to influence driver behavior. An attempt to alter the physical environment and crossing conditions in the form of reflectors meant to frighten elk were also installed in a half-mile portion of the crossing zone just north of Nelson Road.
- In fall of 2019 (for 2020 hunting season), CPW extended the boundaries of the special elk hunting subunit around Ron Stewart Preserve to encompass the Red Hill elk management area.
- Similar to the creation of the Rabbit Mountain subunit in 2015, the subunit increase to encompass the Red Hill elk management area will serve to intensify hunting pressure and enable harvest on private land surrounding open space.
- CPW, with assistance from BCPOS, captured six elk from the Red Hill elk herd (for GPS collars) in March and April of 2017; four elk in February and March of 2018; and three elk in March of 2019. As of February 2020, four collars are in operation. An additional

11 collars total will be deployed between the Red Hill and Rabbit Mountain elk herds in 2020.

- BCPOS and CPW highlighted the issue of growing elk conflicts during a presentation to the Boulder County Commissioners (BOCC) on April 25, 2019, and to the Boulder County Parks and Open Space Advisory Council (POSAC) on November 21, 2019.

Plan Goal and Objectives

Goal:

Manage a sustainable, migrating elk population on open space properties surrounding US 36 through adaptive management to protect areas of high biodiversity and reduce elk-human conflicts.

Objectives:

1. Prevent impacts to areas of high biodiversity, including grassland sites, shrub stands, and forested areas in the Heil Valley Ranch/Red Hill area and natural lands east of US 36.
2. Maintain a migrating elk herd, with no more than 25 summering individuals.
3. Continue to work with agricultural tenants, farmers, and landowners to minimize elk-human conflicts and elk damage.
4. Facilitate highway safety along US 36 and Nelson Road by reducing elk-highway interactions and establishing partnerships with local, state, and federal agencies.

Management Options Considered

Status Quo

If no management action occurs to limit growth of the summer population and encourage redistribution, the non-migratory segment of the Red Hill elk herd will likely continue to increase with the recruitment of calves, as well as immigration of individuals from the remaining migratory segment. As summering elk numbers increase, impacts to natural resources and damage to crops and private property are expected to increase. This increase also has the potential to affect public safety year-round, not just during peak migration.

As private landowners employ deterrent methods to protect crops and as harvest pressure increases on private land within the subunit, these factors may further concentrate elk on open space and BCPOS tenant-occupied properties (which are not currently open to hunting). This condition may potentially intensify elk-human conflicts and promote resource damage on open space property, if no management occurs. Utilizing open space as refuge, the Red Hill elk herd can potentially cause resource damage by browsing, grazing, and trampling. CPW and BCPOS agree that management action is needed.

Fertility Control

Fertility control is not a proven, nor approved means of controlling wild elk populations. The Environmental Protection Agency (EPA) has regulatory authority over fertility control agents for

use in free-ranging wildlife under the Federal Insecticide, Fungicide and Rodenticide Act (1947). Although two fertility control agents have been approved for use in feral horses (PZP and GonaCon) and one in white-tailed deer (GonaCon), the EPA has not approved any fertility control agent for use in free-ranging elk populations. As a result, there is no legally available fertility control agent that could be considered for management of elk using the Red Hill/Table Mountain area.

Because the herd is a mix of migratory and non-migratory elk – and other techniques could lead to encouraged migration – there is a likelihood of ending up treating migrants with fertility control agents, which would be redundant. It would also then not likely be efficacious in keeping the summering population small. Since the population is not isolated from the migrants, fertility control would not do anything to reduce immigration from the migratory elk. And fertility control does not remove any animals from the population that are currently causing the summer damage. For the above reasons BCPOS has decided against Fertility Control as a management option. See Appendix B for more information about fertility control.

Trap and Transplant

Chronic wasting disease (CWD) occurs in both elk and deer in the Red Hill area and within the St. Vrain Elk herd. CWD, along with the potential transmission of other diseases, is the primary reason for not transplanting elk from Red Hill to areas far enough away to ensure elk will not return. Moving them within the migratory segment is not an option, because they still have the ability to not migrate the following season. In addition, most Colorado elk herds are near or above population objectives, so finding a suitable release location is problematic especially for elk habituated to feeding on agricultural crops. Cost and logistics are also restrictive for such an extensive capture operation. For these reasons, CPW and BCPOS conclude trap and transplant is not a viable option.

Professional Culling

Culling is the lethal removal of animals from a population in an organized fashion. It is controversial because of the immediacy and negative connotations associated with removing large segments of (often visible) populations. Some citizens object to lethal removals of any kind (hunting, trapping, or culling). Most culling is done at night with suppressed weapons by professional sharpshooters in an efficient, condensed time period. That method of culling may or may not be the case with this elk population.

Although this method can potentially be effective at reducing ungulate populations, it is in opposition to state statute 33-1-101 (4) C.R.S., which states that hunting will be the primary method of effecting necessary wildlife harvests. Agency and professional culling is also counter to the North American Model of Wildlife Conservation (Organ et al. 2012). However, ungulate culling, primarily deer, has become a common practice throughout the United States over the last 20 years.

Past CPW experience involving agency culling for CWD management and a public survey of Evergreen residents regarding elk management options (Chase et al. 2002) indicate that the public prefers public harvest over professional culling in Colorado. In BCPOS' online survey of public input on the Ron Stewart Preserve at Rabbit Mountain plan, of 353 respondents, only seven – less than 2 percent – suggested professional culling.

Culling is costly to implement. Estimates range from \$900 (White Buffalo personal communication; best case scenario) to \$4,700 per animal (Powers et al. 2016). The number of animals to be removed (50-70) is reasonable for this technique and might be achievable in a relatively short period of time with minimal effort, if conditions are favorable. However, there are unknowns about how well culling might work, harvesting in the summer and early fall when baiting is not an option.

These unknowns and constraints would likely drive costs higher (White Buffalo, pers comm 2020). The operation would likely be undertaken as a job/hourly contract because of the unknowns, which could very well lead to not meeting harvest goals or require excessive costs. The total cost estimates would likely range from \$75,000-200,000 for 50 animals with good success. That cost could go nearly as high as \$350,000 for 70 animals at the high cost end of the spectrum. The per-animal cost could end up being very high if the contract is hourly and the success rate is low because of constraints and unfavorable conditions. Additionally, periodic lethal removal would be required in the long-term to maintain objectives.

There is currently no procedure in Colorado for applying and implementing a contracted culling plan. Additionally, there are concerns about animals dispersing across roads (Nelson Road and/or US 36) at night when visibility is diminished as a result of this type of operation. The cost and effort, unknowns, safety concerns, tenant/livestock concerns, and reticence of the state toward this option have led us to conclude that culling is not an option for this issue on POS lands. See Appendix C for more information.

Public Harvest

Harvest of elk and deer for food is firmly rooted in local history, dating back to Native Americans over 10,000 years ago. Private property within the Red Hill elk management area permitted public harvest for decades prior to acquisition by BCPOS. Through acquisition, BCPOS helped eliminate this local-scale management of elk populations, ultimately fostering landscape-scale changes through the promotion of safe refuge for the elk.

Hunting has proven to be highly effective and expedient in managing wildlife populations and their distribution (Organ et al, 2012). Public harvest has therefore been utilized as a game management method by multiple municipalities along the Front Range, including BCPOS. When BCPOS first published the Ron Stewart Preserve at Rabbit Mountain draft elk management plan online with proposed limited public hunting, 66 percent supported the plan, 7 percent supported the plan with modifications, and 27 percent did not support the plan. The largest number of comments (17 percent) supported the plan because of concern for the natural resources adversely affected by too many elk. The largest objection to the plan was opposition to hunting on county open space (9 percent).

Fencing

Temporary, limited fencing can be an effective tool to aid in native plant recovery in areas overgrazed and trampled by elk when employed in conjunction with population reduction and distribution management options. BCPOS used this strategy in the Ron Stewart Preserve at Rabbit Mountain Elk and Vegetation Management Plan. Two important bedding areas inside the core use area for elk were fenced off to deny shade and make the area less attractive to elk. A single, small riparian area east of US 36 has been identified as one that might warrant fencing

because of degradation by heavy elk use. It might also deny elk a place for calving/calf-rearing. No areas west of US 36 (grassland, shrubland, or riparian) have been identified as degraded by elk use. This condition is likely a result of the vast amount of suitable, quality habitat available – in sharp contrast to Ron Stewart Preserve at Rabbit Mountain.

All fencing would be built to be wildlife friendly (allow movement of other species). However, monitoring would need to prevent other unfenced areas from damage as the elk are excluded from the fenced area. Fencing costs can be expensive, depending upon the fence type and size of the area(s) to be fenced. Standard 8-foot game fencing on wood posts is likely to cost between \$15-30/meter. Electric fence for elk has also been used with high efficacy (high tensile and braided hotwire). The high tensile 5-7-strand fence costs \$10-12/meter. Electric braid fencing costs \$10-12/meter as well. BCPOS would determine the best alternative to fence any highly impacted locations on open space.

Fencing high-value private lands (vegetable production areas) is an option. These areas on the outskirts of the Table Mountain are suited to fencing as they do not represent barriers to animal movement and are of sufficiently small size to be cost-effective over the long-term. Even short visits by limited numbers of elk can have a severe impact on an operation. Fencing of the few hot spots in the area would be a deterrent, resulting in greatly decreased resources available to elk over the summer and fall. Whether CPW could help defray any fencing costs on private lands would need to be determined. CPW has a series of game damage amelioration strategies, but fencing is far down the hierarchy of preferred choices. This strategy protects specific properties over the long term and should decrease game damage payments. If a concurrent population reduction program is not implemented, then elk will visit other attractive private lands more frequently.

Hazing

Hazing can cause elk to move, at least temporarily, but the literature and experience show it is labor intensive and elk eventually habituate over time (Walter et al. 2010). In addition, hazing does not result in direct population reduction of overabundant elk. CPW may be liable for damage to real and personal property by elk while being moved by CPW (C.R.S 33-3-104(b)).

BCPOS tested hazing on Ron Stewart Preserve during the fall and winter of 2015-2016. BCPOS staff visited the southern portion of Ron Stewart Preserve more than 20 times from July 2015 through March 2016. The elk always chose to move away from the staff. In nearly all cases, elk ran away as a large group. Staff was able to influence the direction of travel in most cases. Radio-collared animals returned to Ron Stewart Preserve in usually one to three days (as long as six days). But they always returned.

In hazing exercises from 2018 and 2019 at Ron Stewart Preserve at Rabbit Mountain, elk resisted longer movements and needed to be pushed and pursued more intensively to get the same movement. Elk were also less likely to cross the road and the mine, remaining on Rabbit Mountain, seemingly becoming more tolerant of hazers. Noisemakers and cracker shells have been used on the Red Hill herd on the BCPOS Imel property. The current agricultural tenant reports that although methods worked the first few times, they are already ineffective at moving these elk.

Because of the safety risk of sending the herd across US 36 and lack of sustained response within the Rabbit Mountain herd, we have concluded that hazing has been ineffective at producing real behavior change in elk herds. Hazing will therefore be used in limited instances to reduce immediate crop damage on BCPOS agricultural lands and to encourage spring migration.

Wildlife Movement Facilitation

With BCPOS properties comprising the bulk of the elk winter range, with the Heil Valley Ranch complex to the west, and the Loukonen Dairy Farm, Pierce, Wolf Run, Platt, and Centennial Ranch properties east of the highway, elk crossings are frequent. Public safety and wildlife migration are priorities for the State of Colorado. It is estimated that 4,000 wildlife-vehicle crashes are reported state-wide each year, representing an estimated \$80 million in damages. Several sites along US 36 in the Red Hill area have been identified as places to facilitate safe wildlife crossings.

Acknowledging the continued growth of Colorado's population and increasing pressure on wildlife migration and threats to public safety, several working groups and funding sources have been made available.

Partnerships

- Colorado Wildlife and Transportation Alliance was created in 2018 to ensure safe and successful migration of big game species.
- Partners of the Alliance include CDOT, CPW, the Bureau of Land Management, U.S. Fish and Wildlife Service, Department of Transportation, the National Wildlife Federation, U.S. Forest Service, Great Outdoors Colorado, Rocky Mountain Elk Foundation and the Mule Deer Foundation.

Funding Sources/Initiatives

- In 2018, the allocation of state resources for addressing state-wide issues were bolstered by federal funding opportunities made available through a U.S. Department of the Interior Secretarial Order 2018-3362.
- In 2019, Colorado Governor Jared Polis signed an Executive Order (D-2019-011) to conserve Colorado's big game winter range and migration corridors.

For example, the State Highway 9 (SH 9) Colorado River South Wildlife and Safety Improvement Project in Grand County was completed in 2015. The overpass and underpass system was extensive and involved the construction of two wildlife overpass structures, five wildlife underpasses, nine pedestrian walk-throughs, 10.4 miles of eight-foot-high wildlife exclusion fencing, 62 wildlife escape ramps, and 29 wildlife guards to reduce wildlife-vehicle collisions throughout an 11-mile stretch south of Kremmling. The system resulted in a 90 percent reduction in wildlife-vehicle collisions in the first year.

Feasibility and available funds for larger projects, such as an overpass or underpass, will depend on transportation improvement programs and a CDOT Prioritization Study, similar to the study that was completed on the Western Slope prior to initiation, funding, and construction of the SH 9 mitigation network (see CDOT Western Slope Wildlife Prioritization Study). The following are examples of partnerships and funding sources from the SH 9 system construction.

SH 9 Funding Sources

- CDOT/RAMP
- CPW
- Blue Valley Ranch
- Muley Fanatic Foundation
- Rocky Mountain Elk Foundation
- Woodcock Foundation

Wildlife movement can be facilitated, and wildlife-vehicle collisions reduced by affecting either driver behavior or the physical environment in areas where wildlife cross roadways. However, while an overpass or underpass would reduce road strikes, it will not reduce the growth of the newly formed resident elk herd or reduce human-elk conflicts on private property.

See Appendix D for examples of high-cost, high-technology and low-cost, low-technology options viable for enabling local movement and reducing wildlife-vehicle collisions.

Public Input and Opinion

Staff presented the issues related to the Red Hill elk herd during the November 21, 2019, POSAC meeting and at an open house on Feb. 5, 2020. At the POSAC meeting, the committee heard these comments from the public: 1) neighbors concerned with the increasing elk damage on their private property; 2) neighbors concerned with the potential safety issue of hunting open space adjacent to their residences; 3) public support for elk management because it has proven to be effective at Ron Stewart Preserve at Rabbit Mountain; 4) public opposition to hunting elk on open space. These opinions were confirmed at our open house.

Public comment was also accepted online for one week after the open house. Of the 39 respondents, 37 (95 percent) agreed that the herd needed to be managed. Sixteen (41 percent) of respondents indicated that they were directly affected by the herd, whether they were an adjacent neighbor in the area, farmer or agricultural producer in the vicinity of the area, or a local commuter. Among the top concerns were impacts to local natural resources, highway safety, and damage to crops. Proposed management methods included public harvest, culling, the establishment of a wildlife overpass over US 36, and investigating effective and accessible programs for those with agricultural losses.

After the management plan was drafted and posted online, written public comment was accepted online until March 27. Of the 43 individuals that submitted comments, 36 (69 percent) were opposed to the plan. Twenty-five identified themselves as a farmer or agricultural producer in the management area or an adjacent neighbor. Top comments included concerns about human and livestock safety, being disrupted by gunfire, trespassing, damage to private property, and that hunting on open space property would exacerbate game damage issues on private land. Top suggestions included soliciting peer review, hiring sharpshooters to manage the herd, and establishing a highway crossing across US 36.

BCPOS Management Recommendations

BCPOS proposes to use a combination of approaches, both in the short and long term. Short-term methods will help mitigate impacts to natural resources, local agriculture, and summer highway safety by managing the growing segment of non-migratory elk. In the long term, we

recommend managing for a small summer elk population, exploring ways to improve habitat, and alleviating barriers to safe movement.

The mix of management techniques will be adjusted within the planning cycle depending upon the conditions, herd size, success rates from various control methods, other factors, partner contributions, and actions taken by others. Proposed harvest will be managed by timing, area, number of hunters, access, and length of season. All recommendations will employ routine monitoring, data collection and analysis to measure progress toward objectives, which will serve to improve the elk management program.

Short-term

- Limited public harvest program
- Targeted hazing during peak migratory periods
- Coordinated hunting with adjacent landowners (private and BCPOS tenant)

Long-term

- Limited public harvest program
- BCPOS tenant assistance
- Habitat assessments to inform where habitat improvement projects could be prioritized
- Facilitation of elk movement between habitats east and west of US 36 through the construction of a wildlife overpass, underpass, or other highway crossing method

Short-Term

Public Harvest

To target the rapid growth of the resident sub-herd, mitigate elk-human conflicts, and elk damage to agricultural properties, BCPOS recommends a controlled, antlerless-only public harvest program. Building on the success of the public harvest program at Ron Stewart Preserve at Rabbit Mountain as an effective management tool and a model of safe hunting on open space property, strict adherence to established safety measures will be enforced in managing the Red Hill elk herd. Staff will work to address safety concerns noted by residents adjacent to the Red Hill elk management area.

This option has proven successful and requires minimal cost to BCPOS. Participants would be required to purchase an elk hunting license, provide their own equipment, and volunteer their time. All harvested animals will be properly field-dressed, and all edible parts will be removed from the property as legally required. The mechanisms for licensure allowing animal harvest already exists via established CPW processes. A public harvest program would be in compliance with state statute 33-1-101(4) C.R.S. that articulates the state will use hunting as the primary method of effecting wildlife harvest and is compatible with the North America Model of Wildlife Conservation (Organ et al. 2012).

2020 Plan Implementation

Following is the plan for a safe public harvest program for the Red Hill elk herd. Public hearings will be held annually with POSAC and the Board of County Commissioners to provide updates, solicit feedback from the public, and to make any changes to this approach. If the herd

population objective is met before the end of the approved two-year term of the program, all hunting will cease.

What: Limited Antlerless-Only Elk Harvest Program.

Who: GMU 20 subunit (Hunt Code E-F-020-L3-R) antlerless rifle license holders. Up to four hunters per week, each with one companion and one vehicle (only on access road). In future years, the number of hunters may decrease depending on effectiveness. All hunters will be required to pass a shooting proficiency test for their method of take, and attend an on-site orientation.

How: Solicitation of subunit license-holders for declaration of interest in hunting Ron Stewart Preserve at Rabbit Mountain or Red Hill followed by lottery type-access system, both administered by BCPOS.

Short-range weapons, i.e., archery, muzzleloader, and shotgun slug only (effective range for short-range weapons is approximately 100 yards); foot and/or pack animal access only. Muzzleloader and shotgun slug will be permitted throughout the elk management area. Archery will be restricted to areas west of US 36. Non-lead ammunition only.

Method of take could be modified to include centerfire rifle should harvest success not meet objectives, and pending approval and safety assessment.

When: Aug. 15, 2020 – Oct. 31, 2020.

- Six days per week from Monday-Saturday. This weekly duration could be modified depending on hunting success and elk movements in future years.
- Variable message signage will be incorporated along US 36 and Nelson Road as feasible to alert commuters of the potential for more frequent movements by the elk herd.

Where: Red Hill elk management area (see Figure 6 on page 18).

- No hunting within a 100-150 yard safety buffer around property edges adjacent to private property identified in the elk management area.
- In high-density residential areas, extra safety measures will be implemented.
- Hunting will be confined to areas currently closed to the public. Hunting boundaries adjoining Heil Valley Ranch will be drawn to maintain a minimum distance of one-quarter of a mile from public trails (Picture Rock Trail).

General Safety Rules and Regulations:

- CPW and BCPOS rules and regulations (Appendix E for additional safety measures, orientation and training topics)
- Mandatory site orientation and shooting proficiency test
- Management by hunt coordinator, CPW District Wildlife Manager, and BCPOS Resource Protection staff

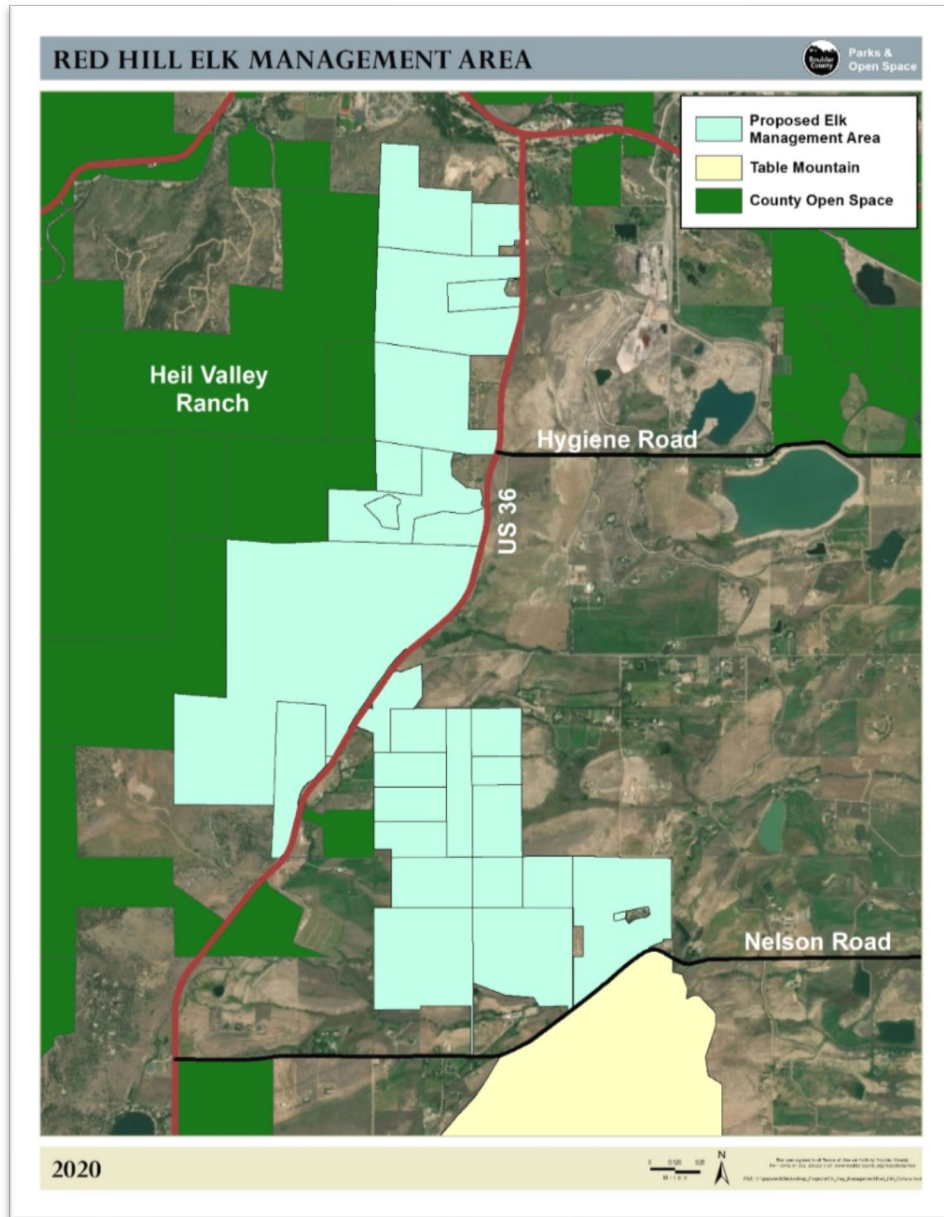


Figure 6. Proposed Red Hill elk management hunting area. Proposed access points and safety buffers not included.

Proposed Access:

Areas west of US 36

- Inside gate at Dan Thompson
- Driveway of Loukonen Outlots
- Inside gate/old road bed at North Pointe
- Inside gate/old road bed at Trevarton

Areas east of US 36

- Inside gate at Centennial Ranch

USFS adjacent land near Hall 2 (all applicable hunting licenses)

- Promote legal access through BCPOS to USFS land immediately west of Heil Valley Ranch (historic trespass access) on the northwest corner of Hall 2 off Highway 7 near mile marker 31

Hazing

Hazing in the Red Hill and Table Mountain area will be complex. Major roads (US 36 and Nelson Road) have high volumes of traffic at all hours. Hazing animals out of the BCPOS properties east of US 36 could force them to cross these busy roads, contrary to our goal of improving highway safety and reducing the potential for collisions.

The one partial option that could still function would be targeted hazing in the spring around the time elk choose to migrate to higher elevations (late April-early May). Hazing elk away and west from US 36 on the BCPOS properties in the Red Hill area could achieve some success. It would discourage animals from being in areas adjacent to US 36 and encourage them to be in areas farther to the west. However, there is so much habitat west of US 36 that it would be difficult to get elk to move in any coordinated direction. If we could get animals to actually move westward or stay west of US 36, they would have a better chance to associate with the migratory segment of the herd and migrate with them in mid-to-late May. This hazing could restore some of the activity that occurred on these lands prior to purchase by POS, which may have led to lower elk use. If this hazing is coupled with an active hunting program, it is possible that the combined human disturbance of the two activities will be synergistic and create uncertainty about the habitat quality and disturbance level elk have become accustomed to. It may help to encourage some of the non-migrants to join the migratory segment.

The results of the hazing will be difficult to quantify because of the lack of control of many factors. But the metrics to be looked at would include any changes in movement or distribution of the radio-collared segment and the summer count numbers.

Hunter Exchange with Landowners Program (HELP)

To provide an additional resource to private landowners experiencing elk damage in the vicinity of the Red Hill elk management area and to maximize harvest within the subunit, staff proposes creating an online portal managed by BCPOS for pairing private property owners with local subunit hunters.

This recommendation is in response to the large pool of hunters that contacted BCPOS looking for hunting opportunities adjacent to Ron Stewart Preserve and within the subunit. Previously, an informal list of available hunters was developed each hunting season, with little success in pairing hunters with local landowners. This recommendation attempts to curtail the repeated number of hunters approaching landowners that either have their own hunting protocols or who do not want hunting on their property. It also attempts to identify private landowners that seek options and create success in facilitating connections.

Who: GMU 20 subunit (Hunt Code E-F-020-L3-R) antlerless rifle license holders.

Private landowners experiencing damage from either the Rabbit Mountain or Red Hill sub-herds.

How: Local hunters would submit contact details, availability, and level of experience via the online portal, expressing interest in hunting on local private land. Hunters would be required to grant permission to release contact information to local landowners, if drawn. The portal would be advertised during BCPOS draw notifications.

Local landowners would submit contact details. As local landowners submit details, a local hunter will be randomly drawn from the list to be placed in contact with the landowner. The portal would be advertised during public meetings and via BCPOS social media.

When: Duration of subunit license season (Aug. 15, 2020 – Jan. 31, 2021).

Where: Private land within the GMU 20 subunit (Hunt Code E-F-020-L3-R).

Wildlife Issues on BCPOS Tenant Property

BCPOS agricultural leases currently prohibit tenants from any form of control of wildlife, whether through non-lethal methods such as hazing or through lethal methods such as hunting. Firearms are prohibited on open space; therefore, tenants cannot use damage tags administered by CPW and are not allowed to solicit assistance from local hunters. Tenants may also be ineligible for game damage compensation via CPW for failing to meet specific criteria. In order for tenants to qualify, CPW requires that landowners do not unreasonably restrict hunting for the problem species on the property, restrict public land access, or lease hunting rights.

Due to these restrictions, tenants often suffer significant economic impact under BCPOS management policies, and requests for compensation for documented losses are often paid by BCPOS. Payments can present a considerable drain to BCPOS operating budgets and resources and can create a strain on BCPOS-tenant relationships.

In 2019, 32 game damage licenses were provided to private landowners within the Red Hill elk management area. Damage licenses are a common method for addressing conflict animals. Therefore, to address elk and other wildlife conflicts on tenant lands adjacent to the Red Hill elk management area, such as the Imel property, BCPOS tenants experiencing elk-specific game damage will be eligible for lethal removal assistance. Tenants with sustained game damage can file a complaint with BCPOS, who will then work with CPW to provide appropriate tags and to solicit subunit hunter assistance. Only hunters who have successfully completed the CPW/BCPOS hunter proficiency and orientation will be eligible.

Who: GMU 20 subunit (Hunt Code E-F-020-L3-R) antlerless rifle license holders who have passed a shooting proficiency test administered by CPW (through Red Hill elk or Ron Stewart Preserve elk management program).

BCPOS tenants experiencing damage from the Red Hill sub-herd.

How: Tenants with sustained game damage can file a complaint with BCPOS, who will work with CPW to secure appropriate licenses and hunters. CPW and BCPOS will determine appropriate methods to maintain safety conditions for adjacent property owners.

When: Aug. 15 – Feb. 15 annually.

Where: BCPOS tenant property within and adjacent to the Red Hill management area.

Long-Term

Public Harvest

Herd management in some capacity will need to continue in the long term to address summer refuge on BCPOS property. The initial two-year period will serve to impact the growing resident population and encourage redistribution. Periodic or routine hunting pressure thereafter is expected to maintain population objectives and help cultivate long-term behavioral changes. Maintenance need not be as robust as the initial harvest period and would be tailored to meet the needs to the herd, habitat, local landowners, and threats to public safety. POSAC and BOCC approval would be solicited. Public harvest is necessary to maintain populations as habitat improvement projects and projects aimed at facilitating movement are considered.

BCPOS Tenant Assistance

As BCPOS agricultural leases currently prohibit tenants from any form of control of wildlife, to address elk and other wildlife conflicts in the long term, staff recommends developing a Standard Operating Procedure for year-round, non-lethal control of wildlife on tenant properties. Developing a working group comprised of the Wildlife, Resource Protection, and Agriculture departments at BCPOS, the group will identify and/or outline the following:

1. Wildlife species, tenant properties, and agricultural products of concern
2. Critical timing/windows for planting or harvesting of agricultural products
3. Parameters for tenant management of nuisance species including hazing techniques (i.e., cracker shells) and pre-emptive measures (i.e., pallets, fencing)
4. Protocols for notifying BCPOS and CPW and streamlined routing for approval

Habitat Evaluation

Significant impact to our natural resources has not yet been seen in native areas west of US 36. A single riparian area east of US 36 that has apparent elk damage is under consideration for fencing. A combination of fencing, weed control, and fewer animals over shorter periods of time should restore this small habitat. BCPOS staff will periodically check the Red Hill area west of US 36 for indicators of heavy use, such as trailing and damage to shrub and tree stands.

Habitat Improvement

The flood of 2013 destroyed a ditch takeout on two open space properties west of US 36 and eliminated a former water source. As a result, the trees and shrubs along the ditch and the ponds that it fed have all begun to deteriorate and die. The cost of the repairs and the number of ditch share owners make repairing this water source unlikely.

The other major land use change that affected elk use and distribution was the construction of the Picture Rock Trail. This trail has served to direct elk use to the hogback area, up away from the trail west of Red Hill. In order to mitigate this impact, BCPOS implemented a closure designation associated with the Red Hill Conservation area and Critical Wildlife Habitats (#71, #84). The commitment to retain these areas as closures is an important component of maintaining quality habitat west of US 36.

The other improvement for this area would be the removal of boundary and internal fences from areas of the newer purchases to facilitate elk movement. The area currently has many elk jumps along these fence lines, but complete removal (and the commitment to not utilize the lands in a grazing capacity) would be even more beneficial. BCPOS has been actively removing interior fences on our foothills properties for over 15 years and will continue to do so in this area.

There are several stock ponds on the Trevarton and North Pointe properties that collect rain and snowmelt runoff. Most are in good condition, but it may be possible to improve their water holding capability to improve more habitat areas west of US 36, again contingent on Colorado water law.

Highway Crossing Methods

To begin to address issues related to wildlife movement and wildlife-vehicle collisions, staff have partnered with Rocky Mountain Wild to conduct a fragmentation analysis of Boulder County and with Defenders of Wildlife to raise awareness about habitat connectivity and the landscape-level needs of wildlife. Staff also continue to work with CDOT to discuss mitigation options and monitor trends in wildlife-vehicle collisions along US 36 using CDOT roadkill reports. Finally, staff have identified three specific areas where elk frequently cross in the four-mile stretch north of Nelson Road: 1) near the Foothills Baptist Church, south of the Boulder Feeder Canal crossing; 2) just south of St. Vrain Road; and 3) about half-mile north of Nelson Road. These areas are suitable for wildlife crossing technologies.

To move the needle further, staff recommends and strongly supports the exploration of potential partnership options and funding sources for larger, long-term projects. As stated above, feasibility and availability of funds for larger projects will depend transportation improvement programs and on a CDOT Prioritization Study, similar to the study completed on the Western Slope prior to initiation, funding, and construction of the SH 9 mitigation network.

Monitoring

Data will be collected and analyzed to understand how management actions affect elk use of the greater Red Hill elk management area. Results will inform managers about changes that should be made to improve the program. This data includes the means and methods to monitor elk use (elk numbers, movements, seasonal migration, concentration areas, and shifting habitat use), as

well as changes in the parameters of the elk population related to hunting seasons and the public harvest program.

The monitoring efforts will include collecting information on elk use within the greater Red Hill elk management area, elk distribution (through GPS collars), and the effects of hazing, tenant and private land hunting, and the public harvest program on elk use of the area. As of February 2020, four GPS collars are in operation within the Red Hill elk herd. An additional 11 collars total will be deployed between the Red Hill and Rabbit Mountain elk herds in 2020.

Elk Use of the Management and Surrounding Area

Coordinated ground surveys will be conducted in the greater Red Hill management area to monitor changes in overall population. Coordinated surveys will be conducted at dawn or dusk by a team of observers spread throughout the management area to maximize the detection of elk. Surveys will attempt to collect information on all groups of elk which have radio-collared elk and are within the greater management area.

Distribution and Movement

GPS collars on elk will be used to monitor elk distribution and movements as affected by:

- Hunting seasons
- Public harvest program on BCPOS properties
- Agriculture production (monitoring what crops elk are damaging via game damage claims)
- Season of year
- Elk life history (e.g., calving and the rut)
- Hazing (number of days of hazing, methods used, staff resources, movements of the elk, length of time elk stayed out of the core area)

Hunting and Public Harvest Management Program Effects on Elk Use

Mandatory reporting from hunters participating in the public harvest program will also be collected to provide information on elk use as related to the harvest program. The information collected will provide information on:

- Hunting effort on BCPOS properties (number of hunters and days hunted)
- Harvest success/number of elk harvested
- Harvest location
- Elk distribution related to hunting effort
- Behavior of elk

Partnerships

CPW

Colorado Parks and Wildlife is the state agency charged with managing wildlife populations. All proposed actions in this plan have been discussed with CPW and meets CPW regulations. The District Wildlife Manager will be a key partner in the implementation of any action taken in this

area. This person works directly with any private landowner on game damage, depredation tags, hunting infractions, and public relations.

Table Mountain

The situation for the Department of Commerce is a unique one. The department has the ability to control access to a very large acreage used by the elk herd. It also has some highly valuable equipment and studies occurring on its facility. Staff from the Department of Commerce are engaged in the elk herd discussion with CPW and are working on potential solutions that could contribute to the overall management of the herd.

City of Boulder

As mentioned, the City of Boulder owns more than 200 acres of open space in the general area. The city will be brought into the management discussion, as there is the potential for its open space to also play a role in refuging.

CDOT

Our partnership with CDOT will be critical for addressing the long-term issues concerning public safety along US 36. Staff will continue to partner with CDOT to monitor areas of concern and determine appropriate remediation methods and available funding sources. The timing and funding of any project will be dictated by the priorities set by transportation improvement programs and prioritization studies.

Communications

BOCC Updates

Platforms: PMIs and annual public meetings

1. Periodic updates at PMIs on public feedback and adaptations to elk management
2. Weekly email updates to BOCC on progress during the hunting season including monthly elk counts.
3. POSAC and BOCC public meetings update reporting on first year in May 2021 and annually thereafter for the two-year term of this plan.

Plan Duration

This two-year, short-term plan is to manage the Red Hill elk herd. Staff will update the plan with lessons learned and modifications for the future. The updates will be open to public comment, reviewed by POSAC, and approved by BOCC.

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Appendices

Frequently Asked Questions

Is public harvesting just Colorado Parks and Wildlife attempting to generate revenue?

No. In Colorado, big game populations are managed for specific population size objectives, which are approved in a public process by the Parks and Wildlife Commission. The number of licenses issued is determined by size of the population relative to the objective. If the population is above the objective, more licenses are issued. If the population is below the objective, fewer licenses are issued. Finally, it is likely that the implementation of a public harvest program will result in fewer licenses issued than are currently issued after the refuge situation is removed and the elk population reductions are realized. The subunit hunt area is designed to be a locals hunt because of the extremely high percentage of private lands in the unit. The cost of an in-state elk license is less than \$55. And the subunit tag is a cow tag. Bull or either-sex tags (that allow bull harvest) are \$661.75. None of these licenses would be issued for this hunt.

Do other municipalities use public harvest to manage wildlife?

Yes, several open spaces and municipalities have public harvest programs to help manage wildlife populations. Below is a list of some programs on the Front Range, including the three-year public harvest program on Ron Stewart Preserve at Rabbit Mountain within Boulder County:

- Boulder County Parks and Open Space Ron Stewart Preserve at Rabbit Mountain Elk and Vegetation Management Plan for elk (<https://www.bouldercounty.org/open-space/management/rabbit-mountain-elk-management-plan/>)
- Jefferson County's Centennial Cone for deer and elk (<http://jeffco.us/open-space/parks/centennial-cone-park>)
- Larimer County's Red Mountain Open Space for elk, deer and pronghorn (http://larimer.org/parks/red_mountain_hunting.htm)
- Larimer County's Eagle's Nest Open Space for deer and elk (<https://www.larimer.org/naturalresources/parks/eagles-nest>)
- The Green Ranch at Golden Gate State Park for elk (<http://cpw.state.co.us/placestogo/parks/GoldenGateCanyon/pages/huntinggreenranch.aspx>)

Appendix A: BCPOS Acquisitions and Land Use Changes (1990-2019)

Transaction Name	Property	Closing Date	Parcel Name	Parcel Acres
CEMEX-Silica Quarry	CEMEX-Silica Quarry	8/10/2001	1	115.273
Centennial Ranch	Centennial Ranch	2/20/1996	1	146.593
Etter	Etter	7/17/2001	ALL	35
Hansen	Hansen	8/24/2000	ALL	80
Heil Valley Ranch 1	Heil Valley Ranch 1	1/5/1996	3	1240
Heil Valley Ranch 1	Heil Valley Ranch 1	1/6/1995	1 (TNC-County)	2374
Heil Valley Ranch 1	Heil Valley Ranch 1	1/6/1995	Parcel 2	1240
Heil Valley Ranch 1	Heil Valley Ranch 1	1/6/1994	Section 31	80
Heil Valley Ranch 1 Total				4934
Heil Valley Ranch 2	Heil Valley Ranch 2	10/29/2012	1	209
Loukonen-Dairy Farm	Loukonen-Dairy Farm	9/24/2019	J	65.89
Loukonen-Dairy Farm	Loukonen-Dairy Farm	9/18/2018	I	40.42
Loukonen-Dairy Farm	Loukonen-Dairy Farm	9/21/2017	H	40.5839
Loukonen-Dairy Farm	Loukonen-Dairy Farm	9/8/2016	G	39.99
Loukonen-Dairy Farm	Loukonen-Dairy Farm	9/9/2015	F	40
Loukonen-Dairy Farm	Loukonen-Dairy Farm	9/1/2014	E	40
Loukonen-Dairy Farm	Loukonen-Dairy Farm	10/16/2013	D	40
Loukonen-Dairy Farm	Loukonen-Dairy Farm	9/1/2012	C	40
Loukonen-Dairy Farm	Loukonen-Dairy Farm	4/6/2011	B	120
Loukonen-Dairy Farm	Loukonen-Dairy Farm	10/15/2010	A-3	0.7783
Loukonen-Dairy Farm	Loukonen-Dairy Farm	10/15/2010	A-4	76.4012
Loukonen-Dairy Farm	Loukonen-Dairy Farm	10/15/2010	A-5	39.5812
Loukonen-Dairy Farm	Loukonen-Dairy Farm	10/15/2010	A-6	22.3825
Loukonen-Dairy Farm Total				606.0271
Loukonen-Outlots	Loukonen-Outlots	10/10/2005	F	181.909
Loukonen-Outlots	Loukonen-Outlots	10/10/2005	1	29.954
Loukonen-Outlots Total				211.863
North Pointe	North Pointe	7/31/2007	Lot 7A	13.58
North Pointe	North Pointe	7/31/2007	OUT A	63.15
North Pointe	North Pointe	7/31/2007	OUT A	36.63
North Pointe Total				113.36
Pierce	Pierce	2/7/1998	Parcel 2	44.84
Pierce	Pierce	12/23/1997	Parcel 1	85.838
Pierce Total				130.678
Platt	Platt	2/20/1996	1	173.459
Thompson (Dan)	Thompson (Dan)	7/19/2007	A	38.304
Trevarton	Trevarton	1/22/1993	A-4	171.86
Trevarton	Trevarton	2/14/1992	A-3	200
Trevarton	Trevarton	2/15/1991	A-2	40
Trevarton	Trevarton	5/2/1990	A-1	80

Trevarton Total				491.86
Trevarton (Dorothy Ellen) Fee	Trevarton (Dorothy Ellen)	9/1/2017	All	716.5
Wolf Run	Wolf Run	5/16/1999	2	89.082
Wolf Run	Wolf Run	5/16/1999	1	72.066
Wolf Run Total				161.148
Grand Total				8163.0651

Appendix B: Efficacy of Fertility Control for Managing Red Hill Elk

Even if a fertility control agent, such as GonaCon, was legally available for use in elk, it would require capture and treatment of a large portion of the breeding-age female elk population at least every other year. Under the most favorable conditions, fertility control would prevent population growth, but not reduce the herd size. Based on experience capturing female elk from the Red Hill elk herd, capture and treatment logistics are an insurmountable barrier to fertility control. These elk are wary and cannot be approached within dart gun range, and bait is not as effective as in normal circumstances because of the lack of persistent snow cover and the abundance of alternate food sources. In addition, human infrastructure and high velocity winter winds preclude effective helicopter capture of such a large number of elk.

Elk are long lived, with female life spans of 15-20 years. As a result, it would require a decade or more before fertility control to result in any population reduction to the non-migratory sub-population. This still won't account for immigration from the migratory sub-population, which can't be controlled. Also, fertility control agents would not promote greater movement of the elk herd or a return to seasonal migration. In addition, there is no evidence in the literature to indicate that fertility control techniques can be effectively applied on a scale enough large to limit population growth rates of open populations of free-ranging elk (Walter et al. 2010, Powers et al. 2014, Powers and Moresco 2015).

There are also ecological, behavioral and natural selection concerns, both known and unknown, associated with fertility control agents in free-ranging wildlife to be considered. Female ungulates treated with PZP experience multiple estrus cycles (which is not a common occurrence under natural circumstances), prolonging the breeding seasons and stress on treated and untreated animals (Powers and Moresco 2015). Fertility control may affect timing of mating and birthing seasons, and longevity of treated animals (Powers et al. 2014, Powers and Moresco 2015).

Frequently Asked Questions

What fertility control agents are approved for use in free-ranging elk populations?

Fertility control agents must first be approved by the Environmental Protection Agency (EPA) and then by individual states before application in management situations. No agents have been approved for elk by the EPA or any states.

Have fertility control agents been tested in elk?

Porcine zona pellucida (PZP) and GonaCon have been tested in captive and in free-ranging elk. Both agents are effective in reducing pregnancy rates, although they are less effective in free-ranging elk than in captive elk. To date, neither fertility control agent is used or has proven to be effective at managing population size in free-ranging elk.

What free-ranging animals are PZP and GonaCon approved for?

PZP is approved for use in feral horses. GonaCon is approved for use in feral horses and white-tailed deer.

What are the health or behavioral effects in treated animals?

Females treated with PZP continue to have estrus cycles, but most often fail to become pregnant. As a result, the breeding season may be extended in members of the deer family from a few weeks to several months. The presence of PZP-treated female elk may result in bull elk

continuing to bugle, tend harems and fight other males past the normal September-October breeding season. The extended breeding behavior could result in social stress and reduced body condition for animals within the herd. For these reasons, PZP is not the preferred fertility control agent for members of the deer family. In contrast, females vaccinated with GonaCon showed a decrease in sexual activity and breeding behavior, although they were maintained as part of the harem. Behavioral effects of any type of fertility control have not been well studied in free-ranging elk.

What is the treatment method for GonaCon in white-tailed deer?

GonaCon must be hand injected in deer. At this time, it is not approved for use in elk. At the time of approval, an appropriate treatment method would be determined.

How often would female elk need to be treated if GonaCon was approved?

A study in Rocky Mountain National Park indicated that GonaCon was effective at reducing pregnancy rates in female elk for one to two years post treatment (Powers et al. 2014). Thus, female elk would need to be treated, at a minimum, every other year. It is unknown if after multiple treatments, female elk would be permanently infertile or maintain infertility for an extended period.

Are there ecological effects of fertility control agents in elk? Potentially. Changes to natural selection, effects on social structure and behavior, timing of mating and birthing season, changes to longevity, impacts to migration, all need to be studied before use as a management tool in free-ranging native populations (Powers et al. 2014, Powers and Moresco, 2016).

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Appendix C: Culling vs. Hunting

Rocky Mountain National Park Elk & Vegetation Management Plan Fact Sheet

https://www.nps.gov/romo/learn/management/elkveg_fact_sheet.htm

- A variety of conservation tools are used in (the RMNP) plan implementation, including fencing, vegetation restoration, and culling. Culling is the primary conservation tool used for lethal reduction of the herd. In future years, the park, using adaptive management principles, could reevaluate opportunities to use elk redistribution, wolves, or fertility control as additional tools.
- The actual number of animals the National Park Service (NPS) may cull, as well as the costs, will vary each year based on annual population surveys and hunter success outside the park. The level of management action taken to control the population size is adjusted annually based on the current population size estimates. Based on adaptive management, actions to control the population will be taken to manage for a population size within the range specified in the ROD (600-800 elk in the park subpopulation and 1,000 to 1,300 elk in the Estes Park subpopulation) and to meet vegetation objectives.
- NPS personnel are responsible for culling operations. To augment NPS personnel, authorized agents assist in culling operations under the direct supervision of NPS personnel. Cost, efficiency, and effectiveness are the factors that determine when additional personnel are needed. For purposes of this plan, "authorized agents" can include professional staff from other federal, state, or local agencies, Indian tribes, or qualified volunteers. NPS selects and supervises all personnel, including qualified volunteers. Short-term park closures can be implemented while culling activity is occurring.
- Cullers, including NPS personnel and authorized agents, are certified in firearms training, specially trained in wildlife culling, and are required to pass a proficiency test in order to qualify and participate in culling activities. Cullers are expected to work in teams under the supervision of an NPS team leader to insure humane dispatch and quality meat recovery.
- Culling activity has occurred during the winter months, early in the morning, to minimize impacts on park operations, visitors, private inholdings, and neighbors.
- What is the difference between hunting and culling?
Hunting is not allowed in Rocky Mountain National Park and is not a part of the elk management plan. Hunting is a recreational activity that includes elements of fair chase and personal take of the meat. Hunting is administered by the State Fish and Game Agency.

Culling is used as a conservation tool to reduce animal populations that have exceeded the carrying capacity of their habitat. Culling is done under very controlled circumstances in order to minimize impacts on park operations, visitors, private inholdings, and neighbors. Culling is an efficient and humane way to reduce herds of animals that are habituated to the presence of humans.

- Why was public hunting considered but dismissed as an alternative?
Hunting is prohibited in the park by law. In 1929, Congress prohibited hunting within the limits of Rocky Mountain National Park. Public hunting within the park raises several issues:
 1. It would significantly change the visitor experience in the park. Visitors expect to come to Rocky Mountain National Park and not encounter hunters.
 2. It would require changing the law that has been in place in the park since 1929.
 3. It would significantly displace the existing recreational use of park visitors and would compromise visitor safety.

- Park managers selected culling of elk, using specially trained park staff and authorized agents, to reduce the elk herd and minimize the impacts on park operations, visitors, private inholdings, and neighbors. For over 90 years, visitors have expected that recreational activities can take place in Rocky Mountain National Park without interference from hunting. Hiking, horseback riding, snowshoeing, and skiing in the backcountry are very popular activities, along with sightseeing and wildlife viewing along the park's roadways.

- The NPS recognizes that public hunting is an important recreational activity and wildlife management tool in Colorado. Currently, hunting is permitted on approximately 98 percent of the federal lands in Colorado, including lands managed by the U.S.D.A. Forest Service (Forest Service), the Bureau of Land Management, and numerous national wildlife refuges throughout the state. Further, the NPS recognizes and supports Colorado Parks and Wildlife's (CPW) use of hunting for management of wildlife in areas outside and adjacent to the park.

_____End of RMNP Fact Sheet_____

What were the resources necessary to carry out this culling program?

RMNP had volunteer sharpshooters who passed a proficiency test work alongside parks and CPW staff to take out the elk. Two teams of four people each carried out the culling; additional volunteers and staff retrieved the animals, field dressed them and transported them. CPW distributed the meat through a lottery system. Volunteer sharpshooters were not eligible for the lottery. The estimated cost was \$4,700/elk.

How many elk did they cull?

RMNP management plan estimated up to 200 elk could be culled. In the three years of implementation, 53 elk were culled.

Appendix D: Highway Crossing Methods

The following are examples of high-cost, high-technology and low-cost, low-technology options viable for enabling local movement and reducing wildlife-vehicle collisions.

Low-Cost/Low-Technology

Seasonal nighttime reduction in speed limits imposed in 2010 was one such attempt to modify driver behavior, though the original speed limit was reinstated after the end of the two-year pilot program. Large yellow warning signs were also placed at both ends of the areas where elk have crossed for many years, in another attempt to influence driver behavior. Additionally, reflectors meant to frighten elk were installed in a half-mile portion of the crossing zone just north of Nelson Road. However, reflectors have proved ineffective at reducing wildlife crossing and wildlife-vehicle collisions. Many reflectors are not in working order (broken, missing, out of alignment).

Low-cost, low-technology strategies, including seasonal, variable message signs in specific areas, have been effective at reducing speeds and collisions. Novitiate drivers pay attention to these signs, while habitual and repeated drivers may tend to ignore them over time. But drivers do notice when the signs are removed; hence they recognize the seasonal importance. However, this passive technology does nothing to affect elk or where they cross the roadway.

Rumble strips, chevrons, and pavement striping, in concert with signs (or the variable message signs), can affect driver behavior and speed for short distances but would likely be ineffective at reducing speeds over the entire stretch from Nelson Road to St. Vrain Road. Any of these strategies could be accompanied by fencing to direct elk to cross the highway at a specific point(s). Game-proof highway fencing costs \$12,000-15,000 per mile, not counting routine maintenance and monitoring.

High-Cost/High-Technology

Three higher-cost, high-technology options involve informing drivers that elk are in the area adjacent to the highway or have entered the highway right-of-way.

1. Radio-collars on elk that trigger flashing warning lights and signs when elk are present. This option requires instrumentation of a significant portion of the herd (at least 10 percent), along with an array of radio receivers and warning signs.
2. Trip-beam sensors or cameras that detect elk in or near the road right-of-way and activate warning lights and signs.
3. Electromagnetic field cable that triggers warning lights and signs when large animals cross the cable, placed parallel to the road right-of-way in a crossing zone.

All of these technologies are more effective and less expensive if they are focused at single sites. They are not cost-effective over long stretches of highway. These strategies are labor and maintenance intensive and can sometimes result in false-positives – elk are present, but not

crossing the highway. They also suffer from false-negatives, where either technology failure or uninstrumented animals don't set off warnings, yet still cross the highway.

An additional strategy that could be adopted is exclusionary fencing along the entire four-mile stretch west of the highway, attempting to prevent elk from crossing the roadway at all. It would effectively remove the east side acreage from the winter range. Smaller species will still be able to pass under the roadway at several box culverts and pipe culverts. However, landowners in the Nelson Road area may object to this visual impediment.

The highest cost and most effective strategies are those that remove wildlife from the road surface, either by going over or under it. Constructed overpasses cost in excess of \$1,000,000 due to the extensive earth-moving and engineering of the bridge portions. Overpasses usually include directional fencing and have the largest footprint of any strategy. They are three-dimensional and have elevated, constructed approaches that exceed the width of the highway right-of-way.

Underpasses can be constructed at places along a roadway where there is suitable headroom to accommodate some form of tunnel. Constructed underpasses can be tailored to the animal species that gains by crossing the roadway. Culvert underpasses for desert tortoise, lynx, or Florida panther need not be large and can be fitted into most highway situations (\$10,000-60,000). Crossings for large ungulates usually require much larger openings and sightlines to allow passage and comfortable entry. As such, these underpasses cost considerably more (\$200,000-600,000). SH 9 underpass structure total cost was \$728,135. Large arch culverts are the preferred pipe structure, sized at least 12' x 24' wide, but as large as 18' x 60' wide to be accepted by elk. These can be either corrugated metal pipe or prefabricated concrete pieces. Underpasses often require significant excavation and shoring, but do not usually exceed the width of the road right-of-way.

New span bridges are an option that provides the openness and sightlines favored by large ungulates and may be used by all wildlife species. These costs are usually in excess of \$1,000,000. SH 9 overpass structure cost totaled \$1,260,012. Bridges can actually be constructed over excavated lands to put safe crossings at existing at-grade crossing points. But usually, existing bridges and culverts are retrofitted into wildlife underpasses at existing drainages. This can substantially reduce costs, especially if road maintenance or re-surfacing were going to update or replace the existing drainage structure. Roadways can be raised slightly or culvert size enlarged, adding little cost to existing plans. But this nuance is more appropriate for smaller, non-ungulate crossings.

Appendix E: Public Harvest Program Requirements and Training Topics

Mandatory Shooting Proficiency Testing

Participants will be given instructions on the shooting proficiency test and directions to the range. Shooters will be instructed to sight-in their weapon(s) of choice prior to coming to the test.

Mandatory Elk Management Area Orientation

Participants will be given detailed maps and will be advised on the following. As part of their training, an on-the-ground tour will also be required prior to participation.

- Open space boundaries
- Access points
- Eagle closure boundaries/dates
- Parking lots and trailheads
- Roads and trails
- Residential areas

Contacts

Participants will be given a list of contacts including staff from BCPOS and CPW, as well as numbers for the Boulder County Sheriff's Department and Colorado State Patrol.

Ethics

Participants will be instructed on expectations regarding ethics, such as the discreet removal of harvested elk, what to do if they encounter someone (including surrounding landowners) while participating in the harvest program, proper treatment and care of habitat on the open space, etc.

Participants will be advised that participation in the Red Hill elk management program is a privilege, not a right, and that permits for participation may be revoked at the discretion of Boulder County and/or Colorado Parks and Wildlife staff.

CPW Rules, Regulations and Laws

Instructors (BCPOS and CPW) will go over rules. Instructors will also cover laws and regulations, such as license/tagging requirements, manner of take, legal hunting hours, proof of sex, requirements to pursue wounded game and provide harvested animals for human consumption, safety laws, etc.

Participants will be required to comply with all rules, laws and regulations, including but not limited to those of Boulder County, Colorado Parks and Wildlife and the State of Colorado. Violation of any rule, regulation or law may result in the immediate revocation of the participants in the Public Harvest Permit Program. In order to participate, participants will sign an agreement to report any violation of rules, regulations or laws immediately, whether they are intentional or accidental (e.g., participant shoots spike bull elk thinking it was a cow).

Special BCPOS Regulations and Guidelines

1. All hunters must participate in an onsite orientation program and proficiency test prior to their designated access dates.
2. Access permits are valid only for the days indicated on permit.
3. All hunters must be 18 years of age or older.
4. Hunting is for antlerless elk only.
5. Hunters may enter the property one hour before sunrise and remain onsite until one hour after sunset.
6. Hunters must check-in and out via the hunt voicemail whenever accessing or leaving Boulder County property.
7. Weapons must be unloaded when in the designated safety zone and may only be used within the designated safety zone to dispatch an injured animal.
8. Hunters are required to carry their hunting access permit at all times while hunting the Red Hill elk management area and adjacent Boulder County Parks and Open Space properties.
9. Each permitted hunter may be accompanied by one guest. Guests may not hunt or carry a firearm.
10. Parking is in designated locations only. Only one vehicle per hunting party is permitted. Parked vehicles must display a valid Boulder County Parks and Open Space parking placard.
11. Posting of photos taken during the Red Hill elk management program to social media sites is highly discouraged.
12. Elk must be field-dressed prior to removal from the hunting area. Gut piles must be at least 100 feet away from all trails or roadways.
13. Leave no trace. Hunters are required to pack out all of their waste.
14. All hunters will be required to complete an online post-hunt survey.
15. No motorized vehicles are allowed. Elk retrieval is by foot or horse only. Hunters may use designated fire roads for retrieval when appropriate. Wheeled game carts are allowed.
16. No smoking.
17. No drones or UAS may be used.
18. No collared elk may be taken.
19. No pets are allowed.

Checking-In, Checking-Out, Notifications

Participants will be given instruction on how to check-in prior to entering the open space, how to check-out when they are ready to leave, and how to report hunting activities (number of days/hours hunted, harvest success, etc.), both of which will be required.

Hunters must notify the hunting coordinator via voicemail or text message when they enter or exit the hunting area.

Hunters are required to report all unrecovered animals, injured animals that travel onto private property, regulation infractions, and unauthorized access/use of the Red Hill elk management area and the surrounding hunting areas.

Private Property and Safety

Instructors will give a thorough safety review, including rules/regulations related to safety and unique aspects of the public harvest program (e.g., neighboring lands). Participants will be provided with instructions on what to do if they wound an elk that then runs onto private property. Permission from the owner of the private property **MUST** be obtained prior to pursuing the elk on said property.

Media

Participants will be given instruction on how to handle contacts with the media should they encounter or be contacted by media personnel. There will be no posting of news photos or stories relating to participation in the program on ANY social media outlets.

Liability Release

Participants will be required to review and sign a liability release prior to participating in the program.

Open Space Resources

Participants will be given notice that collecting items such as shed antlers, artifacts, plants, rocks, etc. from the open space is strictly prohibited and will be punished to the full extent of the law.

Mandatory Qualifications for Participation in the Red Hill Public Harvest Program

1. Must be at least 18-years-old
2. Must have passed an accredited hunter education program
3. Must have a valid, unfilled GMU 20, Hunt Code E-F-020-L3-R, cow elk license
4. Must be capable of passing a shooting proficiency test
5. Must use non-lead ammunition
6. Must have the knowledge and ability to field dress an elk
7. Must have the knowledge and ability to pack out edible portions of an elk distances up to one mile without the use of a vehicle
8. Must attend mandatory training and mandatory orientation field trip
9. Must check-in prior to entering the open space and check-out when done
10. Must complete hunting report to include information on hunting activity and harvest success
11. Must remain in full compliance with all rules, laws and regulations, including but not limited to those of Boulder County, Colorado Parks and Wildlife and the State of Colorado. Violation of any rule, regulation or law may result in the immediate revocation of the Red Hill Public Harvest Program Permit.