UNITED STATES

DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

ENVIRONMENTAL ASSESSMENT

RANGE CREEK WILD HORSE HERD MANAGEMENT AREA GATHER PLAN

DOI-BLM-UT-G020-2018-0024-EA

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1.0 INTRODUCTION

This Environmental Assessment (EA) has been prepared to disclose and analyze the environmental consequences of the Range Creek Wild Horse Herd Management Area Gather Plan as proposed by Bureau of Land Management (BLM) Price Field Office (PFO). The EA is a site-specific analysis of potential impacts that could result with the implementation of a proposed action or alternatives to the proposed action. The EA assists the BLM in project planning and ensuring compliance with the National Environmental Policy Act (NEPA), and in making a determination as to whether any "significant" impacts could result from the analyzed actions. "Significance" is defined by NEPA and is found in regulation 40 Code of Federal Regulation (CFR) 1508.27. An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a statement of "Finding of No Significant Impact" (FONSI). If the decision maker determines that this project has "significant" impacts following the analysis in the EA, then an EIS would be prepared for the project. If not, a Decision Record (DR) may be signed for the EA approving the selected alternative, whether the proposed action or another alternative. A DR, including a FONSI statement, documents the reasons why implementation of the selected alternative would not result in "significant" environmental impacts (effects) beyond those already addressed in the Price Field Office Resource Management Plan (PRMP)/Final EIS (*10, 31, 2008*).

BACKGROUND

Since the passage of the Wild Free-Roaming Horses and Burros Act (WFRHBA) of 1971, BLM has refined its understanding of how to manage wild horse population levels. By law, BLM is required to control any overpopulation, by removing excess animals, once a determination has been made that excess animals are present and removal is necessary. Program goals have always been to establish and maintain a "thriving natural ecological balance," which requires identifying the Appropriate Management Level (AML) for individual herds. In the past two decades, goals have also explicitly included conducting gathers and applying contraceptive treatments to achieve and maintain wild horse populations within the established AML, so as to manage for healthy wild horse populations and healthy rangelands. The use of fertility controls help reduce total wild horse population growth rates in the short term, and increases gather intervals and reduces the number of excess horses that must be removed from the range. Other management efforts include improving the accuracy of population inventories and collecting genetic baseline data to support genetic health assessments. Decreasing the numbers of excess wild horses on the range is consistent with findings and recommendations from the National Academy of Sciences (NAS), American Horse protection Association (AHPA), the American Association of Equine Practitioners (AAEP), Humane Society of the United States (HSUS), Government Accountability Office (GAO), Office of Inspector General (OIG) and

current BLM policy. BLM's management of wild horses must also be consistent with Standards and Guidelines for Rangeland Health.

Since 1992, approximately 546 wild horses have been gathered and removed from within and near the Range Creek HMA. In 1994, 1997, 2002, and 2006 AML gathers were conducted in the HMA. A removal of 92 horses occurred in 2018 from private lands outside the HMA, utilizing bait and water techniques.

APPROPRIATE MANAGEMENT LEVEL

The Appropriate Management Level (AML) is defined as the number of wild horses that can be sustained within a designated HMA, which achieves and maintains a thriving natural ecological balance in keeping with the multiple-use management concept for the area. The AML was originally established for the Range Creek HMA as a population range of (75-125) wild horses in the Price River Management Framework Plan (MFP, 1983).

The Range Creek HMA currently does have a Herd Management Area Plan (HMAP) signed in 1994. The HMA is managed in accordance with the HMAP, current policies and regulations for wild horses, with management objectives specific to the HMA. The Range Creek HMAP will be updated as part of the gather plan due to changes in planning, regulations, effectiveness of alternatives that were previously dismissed, and new management options that were not adequately analyzed. The 2008 Price Field Office RMP further defined the Range Creek HMA (WHB-1, 2, 3, 4, 7, 8, 12, & 13, PRMP, P.87).

The estimated population of wild horses within the Range Creek HMA as of March 01,2019 is 282 horses. This figure was calculated utilizing the April 2017 aerial population survey that was completed using the simultaneous-double count method[1] , and adding a 20% increase for the 2017 and 2018 foal crop, as well as subtracting the 92 horses removed from private lands in 2018.

The 2017 inventory was proceeded in 2013 by a Photographic Mark-resight aerial survey of the Range Creek HMA. Six separate transects were flown at that time with every group encountered counted, GPS'd, and photographed each time they were encountered. Three transects were flown per day, with 32 groups of horses identified. Within that, 32 groups 142 individuals were identified with an estimated population of 152 horses.

The last gather of the Range Creek HMA occurred in July of 2018. At that time 92 wild horses were gathered and removed from adjacent private lands. Based on the most recent population inventory and the 2013 Photo-Mark-resight inventory, the 2017 population estimation was accurate. An inventory flight was completed in March 2019, with 124 horses counted. It was anticipated at the time that a 25+ percent miss rate occurred, due to horses being off in country they normally don't go into. Normally the horses will hang on the tops of the ridges down to the first cliff line. Horses were

[1] Estimated population at time of inventory was 261 horses. Estimate only includes horses a year of age or older, does not include foals born at the time of inventory or after. The simultaneous-double count survey method is a form of mark-resight; three observers in an aircraft independently observe and record groups of wild horses. Sighting rates are estimated by comparing sighting records of the three observers. Those animals seen by one observer are the "marked" group; those that are also seen by the other observers are "resighted". The HMA was flown once with transects approximately one (1) mile or less apart. Photos of each band were not taken. The data has been statistically analyzed to estimate the number of wild horses (Appendix C).

found down to the third cliff line, during the flight. On ground sightings since the flight have pushed the miss rate up to at least 38% with an anticipated 45% miss.

Additional horses may occur in the herd area for several other reasons that include, but are not limited to the following: (1) wild horses may have been captured illegally by members of the public in other wild horse area and moved into this area (this illegal activity has been suspected in past years) and (2) domestic or estray horses may have been released into the HMA. For several years now the private landowner has reported a sorrel mare within the Range Creek HMA that he believes is a domestic mare. She is inquisitive about humans and will let you approach, however the stud in her band is very protective and will insert himself between the person and the mare and drives her away. This is only one case within the Price Field Office where domestic horses or burros have been released onto public lands.

Table 1, Herd Management Area, Acres, AML, Estimated Population

HMA	Total Acres	Appropriate Management Level	Estimated Population	% of AML	Removal**
Range Creek HMA (March 01, 2019)	55,023	75-125	282	225 - 376	157-207
Range Creek HMA (Summer 2019)	55,023	75-125	338	270 – 450	213 - 263

*This population estimate is based on the April 2017 population survey (261 adults) adding 20% foal increase for 2017 (51 animals) & 2018 (62 animals), minus the 92 horses gathered off of private lands in 2018.

** Removal numbers calculated by using the estimated population and subtracting the low and high end AML. (282-75=207)

Based upon all the information available at this time, the BLM has determined that 263 excess wild horses exist (above high AML) within and adjacent to the HMA and need to be removed beginning in Summer of 2019, This assessment is based on the following factors including, but not limited to, the following:

- A population inventory of wild horses in April 2017 showed the Range Creek HMA to have 338 wild horses (263 excess (*includes foals born at time of flight, and those born since) minus the 92 horses removed from private lands in July 2018) above the high AML by summer 2019.
- By Summer 2019 the use by wild horses would exceed the forage allocated for wild horses in the Range Creek HMA by nearly 338%.

By comparison, over the last 10 years livestock use has averaged 15% of that authorized.

PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to remove excess wild horses from within and outside the HMA, to manage wild horses to achieve and maintain established AML ranges for the HMA and to reduce the wild horse population growth rate in order to prevent undue or unnecessary degradation of the public lands by protecting rangeland resources from deterioration associated with an overpopulation excess wild horses within and outside the HMA, and to restore a thriving natural ecological balance and multiple use relationship on the public lands consistent with the provisions of Section 1333 (a) of the *Wild Free-Roaming Horses and Burros Act of 1971.*

The need is derived through management objectives established in FLPMA, the Price RMP, and the Wild Horse and Burro Act of 1971. Which in conjunction establish that rangeland resources should be protected to prevent undue degradation of public lands associated with excess populations of wild horses within the HMA and the use of rangeland resources by horses outside the HMA boundaries.

CONFORMANCE WITH BLM LAND USE PLAN(S)

Plan Conformance: The proposed action and alternatives have been reviewed and found to be in conformance with one or more of the following BLM Land Use Plans and the associated decision(s):

Price Resource Management Plan (RMP) October 2008, which contains the following decisions that specifically apply to management of the Range Creek HMA:

- WHB-1; Manage populations for appropriate age and sex ratios, genetic viability, adaptability, and adoptability as well as to maintain AMLs on established HMAs
- WHB-2; Allow wild horse and burro research as long as other wild horse and burro program goals are met.
- WHB-3; HMA boundaries have been adjusted on the Range Creek, Muddy Creek and Sinbad HMAs to match the natural and manmade barriers that existed when the Wild Free-Roaming Horse and Burro Act was passed in 1971 that separate or restrict wild horse and burro movement.
- WHB-4; Wild horses and burros will be managed in three HMAs – Range Creek (horses), Muddy Creek (horses), and Sinbad (burros).
- WHB-7; The AML will be periodically evaluated and subject to adjustment in HMA plans and Environmental Assessments for gathers based on monitoring data and best science methods.
- WHB-8; Range Creek HMA; 55,000 Acres; 75-125 (horses)
- WHB-12; 3,000 animal unit months (AUMS) will be allocated for wild horses and 420 AUMs will be allocated for wild burros.
- WHB-13; Increase or decrease in available forage will be adjusted on a case-by-case basis to support Standards for Rangeland Health.

The proposed action and alternatives are also consistent with the *Range Valley Mountain Habitat Management Plan* (RVMHMP), approved in 1991. This plan analyzed the habitat overlaps and impacts of increasing elk and wild horses (appendix 6 of the RVMHMP).

The Range Creek Wild Horse Herd Management Area Plan (HMAP), approved June 1994, established, through vegetative studies, the AML of "100 wild horses". It also stated: "only the number of adult animals will be used in the calculations of the AML", and "the total population would range from a

low of 75 to a high of 125 animals". This established the AML and forage allocation, through population and vegetative studies, as estimated and recommended in the Price River Management Framework Plan (PRMFP).

The proposed action and alternatives are in conformance with the Fundamentals of Rangeland Health (43 Code of Federal Regulations (CFR) 4180) and Utah's Standards for Rangeland Health and Guidelines for Grazing Management which addresses watersheds, ecological conditions, water quality, and habitat for special status species.

RELATIONSHIP TO STATUTES, REGULATIONS, OR OTHER PLANS

In conformance with the policy developed by the BLM's Utah State Director and approved by the Secretary of Interior, the Proposed Action Alternative would comply with the following:

Gathering excess wild horses complies with Public Law 92-195 (WFRHBA) as amended by Public Law 94-579; Federal Land Policy and Management Act (FLPMA), and Public Law 95-514 (Public Rangelands Improvement Act [PRIA] of 1978). WFRHBA, as amended, requires the protection, management, and control of wild free-roaming horses and burros on public lands. In addition, the preparation and transport of wild horses would be conducted in conformance with all applicable state statutes.

The Proposed Action is in conformance with all applicable regulations at 43 CFR 4700 and policies. The following are excerpts from 43 CFR relating to the protection, management, and control of wild horses under the administration of the BLM.

- **43 CFR 4700.0-2 Objectives**

Management of wild horses and burros as an integral part of the natural ecosystem of the public lands under the principle of multiple use.

- **43 CFR 4700.0-6(a-c) Policy**

Requires that BLM manage wild horses "…as self-sustaining populations of healthy animals in balance with other uses and the productive capacity of their habitat … consider comparably with other resource values …" while at the same time "…maintaining free-roaming behavior."

- **43 CFR 4700.06(e) Policy**

Healthy excess wild horses for which an adoption demand by qualified individuals exists shall be made available at adoption centers for private maintenance and care.

- **43 CFR 4710.3-1 Herd management areas.**

Herd management areas shall be established for the maintenance of wild horse and burro herds. In delineating each herd management area, the authorized officer shall consider the appropriate management level for the herd, the habitat requirements of the animals, the relationships with other uses of the public and adjacent private lands, and the constraints contained in 4710.4. The authorized officer shall prepare a herd management area plan, which may cover one or more herd management areas.

- **43 CFR 4710.4 Constraints on management.**

Management of wild horses and burros shall be undertaken with limiting the animals' distribution to herd areas. Management shall be at the minimum feasible level necessary to attain the objectives identified in approved land use plans and herd management area plans.

- **43 CFR 4720.1 Removal of excess animals from public lands.**

Upon examination of current information and a determination by the authorized officer that an excess of wild horses or burros exists, the authorized officer shall remove the excess animals immediately.

- **43 CFR 4740.1 Use of motor vehicles or aircraft.**

(a) Motor vehicles and aircraft may be used by the authorized officer in all phases of the administration of the Act, except that no motor vehicle or aircraft, other than helicopters, shall be used for the purpose of herding or chasing wild horses or burros for capture or destruction. All such use shall be conducted in a humane manner.

(b) Before using helicopters or motor vehicles in the management of wild horses or burros, the authorized officer shall conduct a public hearing in the area where such use is to be made.

Section 106 of the National Historic Preservation Act requires federal agencies to determine the possible effects of their actions on historic properties (those archaeological or historic sites eligible for or listed on the National Register of Historic Places). See 36 CFR 800 for a description of this process.

The Proposed Action and alternatives are in conformance with Decision Records and Finding of No Significant Impacts for the 1994 (EA#UT-066-94-10) Range Creek Herd Management Area Plan (HMAP), 1997 (AD#UT-066-97-19), 2002 (EA#UT-070-2002-29), and 2006 (EA# UT-070-2006-001) Range Creek Wild Horse Gathers.

The proposed action and alternatives are in conformance with the Fundamentals of Rangeland Health (43 CFR 4180) and Utah's Standards for Rangeland Health and Guidelines for Grazing Management which addresses watersheds, ecological conditions, water quality and habitat for special status species.

The proposed action and alternatives are consistent with the Carbon County Master Plan, signed, October 1, 1997; which generally supports multiple use-sustained yield concepts.

All federal actions must be reviewed to determine their probable effect on threatened and endangered plants and animals (the Endangered Species Act (ESA)).

Executive Order 13212 directs the BLM to consider the President's National Energy Policy and adverse impacts the alternatives may have on energy development.

The proposed action complies with the BLM Utah Riparian Management Policy (Instruction Memorandum [IM] UT-93-93, March 1993). This policy states that riparian areas will be maintained in or improved to "Proper Functioning Condition." In addition, the Proposed Action and No Action Alternative would comply with the following laws and agency regulations, other plans and are consistent with federal, state and local laws, regulations, and plans to the maximum extent possible.

- Taylor Grazing Act (TGA) of 1934
- FLPMA of 1976 (43 U.S.C. 1701 et seq.) as amended
- PRIA of 1978
- ESA of 1973, as amended
- Bald and Golden Eagle Protection Act of 1962
- BLM Manual 6840 – Special Status Species Management
- Migratory Bird Treaty Act
- Utah Comprehensive Wildlife Conservation Strategy (CWCS)
- Utah Partners in Flight Avian Conservation Strategy Version 2.0
- Birds of Conservation Concern 2002
- Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds
- IM 2008-50, Migratory Bird Treaty Act – Interim Management Guidance
- Protection, Management, and Control of Wild Free-Roaming Horses and Burros, Title 43 CFR 4700
- Standards of Quality for Waters of the State, R317-2-6, Utah Administrative Code, December, 1997.
- Utah BLM Riparian Management Policy (IM UT-93-93) of 1993
- National Environmental Policy Act of 1969, as amended
- American Indian Religious Freedom Act of 1979
- Archaeological Resource Protection Act of 1979
- National Historic Preservation Act of 1966, as amended
- Appropriations Act, 2001 (114 Stat. 1009) (66 Fed. Reg.753, January 4, 2001
- State of Utah Resource Management Plan, January 02, 2018

DECISION TO BE MADE

Based on the analysis presented in the EA, the authorized officer will select an alternative that meets the Purpose and Need for the Proposed Action. The BLM's authorized officer will decide whether to implement all, part, or none of the proposed action as described in section 2.2.1 to manage wild horses within the HMA. The authorized officer's decision would not adjust livestock use within the HMA, as this was set through previous decisions. The authorized officer's decision may set or adjust AML; select goals and objectives for management of wild horses within the Range Creek HMA. As well as select gather methods, timeframes of actions, and numbers of horses gathered, treated and released depending on the alternative or parts of any alternative chosen.

IDENTIFICATION OF ISSUES

Identification of issues for this assessment was accomplished by considering the resources that could be affected by implementation of one of the alternatives, through involvement with the public and input from the BLM interdisciplinary team.

The proposed action was reviewed by an interdisciplinary team composed of resource specialists from the PFO. This team identified resources within the Range Creek HMA, which might be affected and considered potential impacts using current office records and geographic information system (GIS) data. The result of the review is contained in the Interdisciplinary Team Checklist, Appendix A.

Consultation and coordination with BLM, State Historic Preservation Office (SHPO), the Utah Division of Wildlife Resources (UDWR), US Fish & Wildlife Service (USFWS), Native American Indian tribes and routine business contacts with livestock operators and others, have underscored the need for the BLM to maintain wild horse and burro populations within the AML.

Public involvement was initiated on this Proposed Action on January 5, 2018 by posting on the ePlanning web page. Refer to section 5.0, Public Participation and Appendix L to see comments and interest from the public and organizations.

Resources within the project area that may be affected must be discussed. Those resources which are not present, or are not affected by the Proposed Action or alternatives, are included as part of the Interdisciplinary team checklist (Appendix A). Rationale for dismissing specific resources are also contained in Appendix A.

Those resources, which may be affected, by the Proposed Action and/or alternatives are carried forward throughout this analysis, and are discussed briefly as follows.

LIVESTOCK GRAZING

Portions of one (1) grazing allotment (Green River) is part of the HMA. The allotment has livestock grazing privileges designated for cattle. Overlap of areas of use between wild horses and livestock occurs on specific sites on the allotment causing competition for forage and water resources. Yearlong wild horse grazing reduces forage availability for livestock. Grazing by excess wild horses during the critical growing season and during drought conditions can reduce forage production, vigor, reproduction, and availability for several years. Detailed information about the authorized livestock use within the HMA is provided in Term Grazing Permit Renewal EA for the allotment.

VEGETATION

Drought conditions in 2008, 2009, 2012 and 2018 have reduced forage production in some of the key wild horse habitat areas. Although livestock numbers were reduced and/or completely removed from the pastures of the Green River Allotment in the Range Creek HMA during these and other years excess wild horses overgrazed many areas during critical growth periods. This, along with the reduced vigor of the plants because of drought, may cause mortality of key forage species throughout the HMA. Inadequate residual vegetation (forage) and litter remaining on certain key use areas allowed soil loss and erosion. As of April 30, 2019, the Palmer Drought Severity Index placed the entire Price Field Office in a Non-Drought status. General distribution of horses shows heavy concentration and utilization of vegetation in the Cold Springs and Bishop Ridge areas, with moderate to heavy use in the Twin Hollow, Flat Iron and Cedar Ridge. Horses have begun moving into the Cottonwood ridge area, as well as outside the HMA on Bruin Point and Summer House Ridge.

WILD HORSES AND BURROS

Rangeland resources and wild horse health have been and are currently being affected within the Range Creek HMA due to drought and overpopulation. The overpopulation of wild horses has

reduced available water and forage, resulting in increased competition for available resources. The gather and removal of wild horses from the Range Creek HMA would have direct and indirect impacts to individual animals and the social structure of bands in the area.

Most impacts would be short term (under 1 year), but some would be long term (greater than a year). The following issues have been identified and will be discussed within this EA.

1. Sustainability of Healthy Populations of Wild Horses:
    - Adjustment of sex ratio to "natural" percentages
    - Age Distribution
    - Genetic mix
    - Population control
    - Gather and Handling Methods
2. Impacts to individual wild horses and the herd. Measurement indicators for this issue include:
    - Projected population size and annual growth rate (Win Equus population modeling);
    - Expected impacts to individual wild horses from stress due to handling; darting stress
    - Expected impacts to herd social structure;
    - Expected effectiveness of proposed fertility control applications;
    - Potential effects to genetic diversity; and
    - Potential impacts to animal health and condition.

SAGE GROUSE

What habitat overlap exists between the wild horses and greater sage-grouse?

What impact would there be to greater sage-grouse in the HMA from the gather/maintenance activities?

ISSUES CONSIDERED BUT NOT ADDRESSED FURTHER

CULTURAL RESOURCES

Previous review for Cultural Resources within the Range Creek HMA was completed for the 1994 (EA#UT-066-94-10), 1997 (AD#UT-066-97-19), 2002 (EA#UT-070-2002-29), and 2006 (EA# UT-070-2006-001) wild horse gathers with appropriate consultation and NEPA, as well as the Green River Allotment Grazing Permit Renewal (EA# UT-070-2000-025).

Prior to their use, each site (trap location, temporary holding facility, or camp location) would receive a class III cultural clearance. If during the course of the clearance, it is determined that there are cultural resource concerns, an alternate site would be chosen. There are one campsite, three trap locations and one temporary holding facility at present that have previously been cleared for Cultural Resources and used. The temporary holding facility at Nutters Coral would be constructed out of panels within the large paddock on the west side of the facility. The corrals themselves will not be used. If during the course of the gather a new trap location is determined to be needed a class III cultural clearance would be completed prior to use.

SUMMARY

This chapter has presented the purpose and need of the proposed project, as well as the relevant issues, i.e., those elements of the human environment that could be affected by the implementation of the proposed project. In order to meet the purpose and need of the proposed project in a way that resolves the issues, the BLM has considered and/or developed a range of action alternatives. These alternatives are presented in Chapter 2. The potential environmental impacts or consequences resulting from the implementation of each alternative considered in detail are analyzed in Chapter 4 for each of the identified issues.

2.0 DESCRIPTION OF ALTERNATIVES

This chapter describes the alternatives considered by the BLM during preparation of this Environmental Assessment.

INTRODUCTION

This section of the EA describes the Proposed Action and alternatives, including any that were considered but eliminated from detailed analysis. Alternatives analyzed in detail include the following:

Alternative 1: No Action – Continue existing management. No gather and removal.

Alternative 2: Proposed Action –Selective removal of excess horses to within AML range while maintaining a breeding population. Implement population growth suppression including sex ratio adjustment to reduce the annual population growth and maintain the population level at AML, once achieved for a 10-year period.

Alternative 3: Gather and remove excess animals to within AML range without population growth suppression or sex ratio adjustment. Maintain the population level at AML once achieved for a 10-year period.

The Action Alternatives were developed to achieve and maintain the established AML to ensure a thriving natural ecological balance, remove excess wild horses from the range, prevent further deterioration to the range, and ensure the long-term health of wild horses within the HMA. Fertility control treatments and adjustments to the sex ratio would slow population growth. The No Action Alternative would not achieve the identified Purpose and Need; however, it is analyzed in this EA to provide a basis for comparison with the other action alternatives, and to assess the effects of not conducting a gather at this time.

ALTERNATIVE 1 – NO ACTION

Under this Alternative, the HMA would continue to be managed with the objective of maintaining an AML range of 75-125 animals. The HMA would continue to be managed under the objectives of the Price RMP, the Range Creek HMAP and current regulations and policies. No additional objectives specific to the management of wild horses within the Range Creek HMA would be adopted or undertaken. No gather would take place at this time. Management would continue as follows:

- The sex ratio of animals released back to the range following future gathers will continue to be approximately 50% males and 50% females.
- Studies to determine and monitor mortality, age structure, sex ratio, productivity, population growth rate, habits, and movements will be continued
- Existing monitoring including utilization, forage condition, water availability, animal health, and periodic population census and sampling for genetic diversity would continue.
- AML would be adjusted, as needed.

- Fertility control would not be applied to animals released back to the range following future gathers.

ALTERNATIVE 2 – PROPOSED ACTION

The Proposed Action would gather and remove approximately 263 wild horses—includes 2019 foal increase—in the initial gather and return periodically to gather excess wild horses to maintain AML. Administer or booster population control measures to the other gathered horses over a period of ten years from the date of the initial gather operation. After the initial gather, the target removal number would be adjusted accordingly based off population inventories for the HMA and the resulting projection of excess animals over AML. The principal management goal for the HMA would be to retain a core breeding population of 75 wild horses, which is the low end of AML. To help reduce population growth rates, the population would be managed to achieve a 60% male sex ratio and all mares released back to the HMA would be treated with fertility control vaccine (PZP GonaCon, or most current formulation or other approved method (IUD)). Fertility Control and sex ratio adjustment would not be implemented under the proposed action until the HMA is within AML. The combination of these actions should lower the population growth rate within the HMA.

Selective removal procedures would prioritize removal of younger excess wild horses after achieving AML within the HMA, and allow older less adoptable wild horses to be released back to the HMA. At the AML level established for the HMA and based on known seasonal movements of the horses within the HMA, sufficient genetic exchange should occur to maintain the genetic health of the population.

However, if gather efficiencies during the initial gather do not allow for the attainment of the Proposed Action during the initial gather (i.e., not enough horses are successfully captured to reach low AML), the Price Field Office (PFO) would return to the Range Creek HMA to remove excess horses above low AML and would conduct follow-up gathers over a 10 year period to remove any additional wild horses necessary to achieve and maintain the low range of AML as well as to allow BLM to gather a sufficient number of wild horses so as to implement the population control component of the proposed action for wild horses remaining in the HMA.

If gather efficiencies of the initial gather exceed the target removal number of horses necessary to bring the population within the AML range of 75-125 wild horses during the initial gather, this would allow the BLM to begin implementing the population control components (PZP, GonaCon, or most current formulation or other approved method (IUD)) of this alternative with the initial gather. Population inventories and routine resource/habitat monitoring would be completed between gather cycles to document current population levels, growth rates, and areas of continued resource concern (horses concentrations, riparian impacts, over-utilization, etc.) prior to any follow-up gather. The subsequent maintenance gather activities would be conducted in a manner consistent with those described for the initial gather and could be conducted during the period, which provides maximum effectiveness for fertility control application. Funding limitations and competing priorities might affect the timing of maintenance gather and population control components of the Proposed Action.

The PFO also proposes to apply fertility control to select mares through the use of a single dose inoculation and the delivery system using dart guns. This would be done on the Range Creek HMA, through 2028 (or as long as it can be reasonably concluded that no new information and no new circumstances have substantially changed in the area of analysis) in order to help maintain adult wild

horses within the AML range of 75-125 wild horses. If it is determined that a mare or mares cannot be approached within darting range on foot, then baiting would be used to invite the horses to within darting distance for treatment. Baiting would be with water, salt, mineral, or weed free hay in areas that horses utilize in their normal movements throughout the HMA. Horses may need to be trapped at bait stations, which would enable them to be darted and then released.

The expectations for the proposed action includes both short and long-term goals. The short term goal is to bring growth rates to less than seven percent annually and the long-term goal is to reduce the need for gathers and removals, without jeopardizing the genetic health of the population.

Under the Proposed Action, a sufficient number of wild horses would be gathered from heavily concentrated areas within the project area to reduce resource impacts and all wild horses residing in areas adjacent to the HMA (outside-established boundaries) would be gathered and removed. Fertility control (PZP, GonaCon, or most current formulation or other approved method (IUD)) would be applied to all released mares to decrease the future population growth rate. It is anticipated that relatively few mares (10-20) would be treated with the first gather. The procedures to be followed for implementation of fertility control are discussed below and detailed in Appendix F. Stallions would be selected for release to adjust the sex ratio of the population to 60% male sex ratio. Every 4-5 years 1-3 studs or mares from a different HMA (or metapopulation within the HMA), with similar or desired characteristics of the horses within the Range Creek HMA would be released to maintain the genetic health on the HMA. All horses identified to remain in the HMA population would be selected to maintain a diverse age structure, herd characteristics and body type (conformation).

MANAGEMENT ACTIONS FOR ALTERNATIVE 2 (PROPOSED ACTION) – WITH REFERENCE TO POPULATION GROWTH SUPPRESSION.

BLMs Use of Contraception in Wild Horse Management

Expanding the use of population growth suppression to slow population growth rates and reduce the number of animals removed from the range and sent to off-range pastures (ORPs) is a BLM priority. The WFRHBA of 1971 specifically provides for contraception and sterilization (section 3.b.1). No finding of excess animals is required for BLM to pursue contraception in wild horses or wild burros. Contraception has been shown to be a cost-effective and humane treatment to slow increases in wild horse populations or, when used with other techniques, to reduce horse population size (Bartholow 2004, de Seve and Boyles-Griffin 2013). All fertility control methods in wild animals are associated with potential risks and benefits, including effects of handling, frequency of handling, physiological effects, behavioral effects, and reduced population growth rates (Hampton et al. 2015). Contraception by itself does not remove excess horses from an HMA's population, so if a wild horse population is in excess of AML, then contraception alone would result in some continuing environmental effects of horse overpopulation. Successful contraception reduces future reproduction. Limiting future population increases of horses could limit increases in environmental damage from higher densities of horses than currently exist. Horses are long-lived, potentially reaching 20 years of age or more in the wild and, if the population is above AML, treated horses returned to the HMA may continue exerting negative environmental effects, as described in section 3.3.2 throughout their life span. In contrast, if horses above AML are removed when horses are gathered, that leads to an immediate decrease in the severity of ongoing detrimental environmental effects.

Successful contraception would be expected to reduce the frequency of horse gather activities on the environment, as well as wild horse management costs to taxpayers. Bartholow (2007) concluded that the application of 2 or 3-year contraceptives to wild mares could reduce operational costs in a project area by 12-20%, or up to 30% in carefully planned population management programs. He also concluded that contraceptive treatment would likely reduce the number of horses that must be removed in total, with associated cost reductions in the number of adoptions and total holding costs. If applying contraception to horses requires capturing and handling horses, the risks and costs associated with capture and handling of horses may be comparable to those of gathering for removal, but with expectedly lower adoption and long-term holding costs. Population suppression becomes less expensive if fertility control is long-lasting (Hobbs et al. 2000). Selectively applying contraception to older animals and returning them to the HMA could reduce long-term holding costs for such horses, which are difficult to adopt, and could reduce the compensatory reproduction that often follows removals (Kirkpatrick and Turner 1991). On the other hand, selectively applying contraception to younger animals can slow the rate of genetic diversity loss – a process that tends to be slow in a long-lived animal with high levels of genetic diversity – and could reduce growth rates further by delaying the age of first parturition (Gross 2000). Although contraceptive treatments may be associated with a number of potential physiological, behavioral, demographic, and genetic effects, detailed below, those concerns do not generally outweigh the potential benefits of using contraceptive treatments in situations where it is a management goal to reduce population growth rates (Garrott and Oli 2013).

The literature review is intended to summarize what is known and what is not known about potential effects of treating mares with porcine zona pellucida (PZP) vaccine and GonaCon (GnRH). As noted below, some negative consequences of vaccination are possible. Fertility vaccines are administered only to females.

Whether to use, or not use, any particular method to reduce population growth rates in wild horses is a decision that must be made considering known effects as well as the potential effects of inaction, such as continued overpopulation and rangeland health degradation.

Reference in this text to any specific commercial product, process, or service, or the use of any trade, firm or corporation name is for the information and convenience of the public, and does not constitute endorsement, recommendation, or favoring by the Department of the Interior.

Alternative 2 (Proposed Action) incorporates the following actions and management requirements:

- Fertility control treatment would be conducted in accordance with the approved standard operating and post-treatment monitoring procedures. Breeding age mares selected for release back to the range would be treated with approved fertility control vaccines, which would slow reproduction of the treated mares for one to three breeding seasons.
- Any new fertility controls could be used as directed through the most recent direction of the National Wild Horse and Burro Program. The use of any new fertility controls would use the most current best management practices and humane procedures available for the implementation of the new controls.
- PZP mixing procedures would follow those listed in Appendix G. The PZP protocol would be examined annually, in line with any new instructions provided by SCC. The field use of GnRH does not require mixing of the adjuvant.

- Horse Immunocontraception Data Sheets would be prepared and updated as presented in Appendix H. An individual mare's previous records would be reviewed prior to any darting activity.
- Mares would be individually marked and/or be individually recognizable without error. No mares would be treated unless she has been identified for treatment.
- Fertility control would be administered once AML is reached and go through the life of the plan. If monitoring shows successful applications, no negative reactions and reduction in foaling rates, the fertility control treatments would continue beyond the life of the plan as long as it can be reasonably concluded that no new information and no new circumstances arise that need to be considered and those that are analyzed within this document have not substantially changed within the HMA. Fertility control applications would also depend on annual funding and the presence of qualified applicators.
- Each mare would have an identification sheet with pictures, describing any markings, brands, scars, or other distinguishing marks. At the beginning of each year, a list of mares identified for re-treatment would be created. That information would be loaded into a format that is easy to use in the field (book or electronic device).
- New mares (over the age of 18 months) coming into treatment would be given the booster dose no sooner than 30 days after they have received the primer dose. Estimated age would be based on when the horses are observed being new herd foals. For older previously treated horses, it would come from the treatments data sheets. Aging older untreated horses would be based off of photographs or similar documentation provided by volunteers knowledgeable of the herd/bands. For any adult mare that cannot be immediately established, initial treatment would be delayed by one year, to ensure she is older than 18 months by the time of the first treatment.
- Primer inoculations would be administered to mares that are at least 18 months old. Mares that are 2-4 years old would be treated. The 5 year old mares would be taken off the treatment schedule until they have produced at least one foal that lives to be one year old. After a mare produces one foal that survives for a year, she would be put back on fertility control treatments.
- Flexibility in determining which mares are selected for treatment is vital to the success of the fertility control program. Adjustments would be made if it is found that there is a severe reaction by an individual mare, that mare can contribute more to genetic diversity or a mare that might have a negative effect to the genetic diversity of the herd. This information would be documented on the Data Sheet.
- If timing or funding constraints arise, a treatment priority would consider the band or herd composition and priority would be given based on age class.
  Priorities would be established as follows:
  1) 2-4 year old mares,
  2) mares just coming back into treatment , and
  3) older mares that have received several treatments since producing a live foal.
- The annual treatment schedule, database and Data Sheets would be reviewed/approved by the authorized officer with the PFO wild horse specialist and/or darting specialist. An annual monitoring report would be prepared for the authorized officer and filed with the HMA records. This monitoring report would show PZP/GnRH orders placed/ costs, planned treatment schedule/actual treatments (number/dates of mares treated), lost darts, negative reactions/BLM action taken for that mare, number of new/current year foals counted/observed, unique circumstances, off road vehicular use, general rangeland condition/water availability, volunteer efforts, correspondence between/among PFO and the

Science and Conservation Center (SCC) and National Wild Horse and Burro Program (WH&B) Office and other pertinent information.

The field darting treatment protocol would take approximately two to three years after initiation to fully implement. Field darting would be conducted in an opportunistic manner while the specialist is conducting routine monitoring activities as part of normal duties in the field. Ordinarily, field darting activities would be conducted on foot. Access throughout the HMA would be achieved by use of 4X4 vehicles and other off-highway vehicles (OHVs). Vehicles would be utilized on existing roads and trails in the HMA. On a case by case basis, the use of OHVs off existing roads and trails may be allowed for administrative purposes; however such use shall be made only with the approval of the authorized officer.

Personnel authorized for field darting of the Range Creek horses must be trained for this task and certified by the SCC at Zoo Montana in Billings Montana. Additionally, all work would be conducted in accordance with the SOPs (Appendix F) and mixing procedures (Appendix G).

The PFO would work with the National WH&B Office in Reno, Nevada, and the SCC at Zoo Montana to order the PZP vaccine. The SCC then prepares and ships the order to the PFO. Each dose would consist of 100 micrograms of PZP in 0.5cc buffer (a phosphate buffered saline solution). Mixing the vaccine would be accomplished as described in the Wild Horse Contraceptive Training Manuel (mixing procedures in Appendix G). Remote application would be by means of 1.0cc Pneu-dart darts, with either 1.25 or 1.5 inch barbless needles, delivered by either Dan-inject or Pneu-dart CO2 powered or cartridge fired guns.

The PFO would work with the National WH&B Office in Reno, Nevada and the USDA to order the GnRH vaccine. The USDA would then prepare and ship the order to the PFO. Each dose of GonaCon (GnRH) would consist of 2 ml of liquid GonaCon, including 0.032% of mammalian GnRH. No mixing of the vaccine is required. Remote application would be by means of 'Slo-inject' TM Pneu-Dart darts, equipped with 3.81 cm 14 gage Tri-Port needles and a gel collar (McCann et al. 2017), delivered by either Dan-inject or Pneu-dart CO2 powered or cartridge fired guns. An attempt would be made to recover all darts (normally about a 98% recovery is expected).

PFO would be applying adaptive management principles. If policies change or the vaccine effects or effectiveness proves undesirable, then the application of the fertility control measures would be stopped, or reconsidered based on new scientific information. If a specific adjuvant is dropped from BLM use and is replaced by another drug or immunization for fertility control purposes, that method would be applied by the PFO in future treatments.

Horse Identification

The treated mares would be individually marked and/or be individually recognizable without error. During past treatments, mares have been freeze branded on the hip and the neck. These brands would help in the identification of the horses. During any future gathers, new brands would be put on mares released back to the HMA. Color, leg and face markings, and any other unique markings or scars would identify any mares without a brand. Once each horse is positively identified, their information would be compiled into a database along with photographs. Individual identification information (photographs and unique characteristics) would be compiled into books or put onto an electronic device that can be taken to the field. Individual numbers are assigned to each herd/band

member based on these unique characteristics. Unique numbers would be assigned to all mares and documented on the Data Sheets. A filly under 18 months would be tracked on her mother's Data Sheet. A filly over 18 months of age would receive her own number and Data Sheet. Maternal kinship would be tracked or followed through Data Sheet notes.

Record Keeping

All darting, foaling, and health data would be recorded as per the Data Sheet (Appendix H). Data Sheets would be prepared and maintained in the PFO. Initially, copies of the data sheets would be sent to the National WH&B Program Office and to the SCC. Thereafter, only treatment updates or new mare Data Sheets would be sent annually.

Regulatory Authorization

The liquid PZP vaccine, known as ZonaStat-H is federally approved by the EPA registration number 86833–1. Training is required by the SCC to receive and/or administer PZP to wild horses. The PFO wild horse specialist received training in August 2018.

The liquid GonaCon (GnRH) vaccine, known as GonaCon-Equine, is federally approved by the EPA registration number 56228-41. No specific training is required to administer GonaCon to wild horses, though a certified pesticide handler does need to receive shipments of the drug.

ALTERNATIVE 3 – GATHER WITHOUT FERTILITY

Under this Alternative, once BLM has met its objective of removing approximately 263 excess wild horses (including 2019 foal increase) the gather would conclude. Maintenance gathers would be required over the next ten years to keep population within the AML range as the population increases and again exceeds AML. There would be no use of population growth suppression measures taken for the wild horses remaining in the HMA. All wild horses residing outside the Range Creek HMA would be gathered and removed. All the wild horses would be transported to BLM holding facilities where they would be prepared for adoption and/or sale to qualified individuals who can provide them with a good home or to long term pastures or for any other disposition authorized by law. These actions would be the same as in the proposed action.

The Range Creek HMA would continue to be managed in accordance with the Price Resource Management Plan, current policies and regulations.

MANAGEMENT ACTIONS COMMON TO ALTERNATIVES 2 & 3 FOR GATHER AND REMOVAL

- Gather operations would be conducted in accordance with BLM Washington Office Instruction Memorandum (IM) 2015-151 and the Comprehensive Animal Welfare Program (CAWP) described in Appendix D. Previously used and authorized capture techniques include helicopter round up, roping, water and bait trapping, and other methods as approved by BLM Handbook H-4700-1 and the authorized officer, and would include multiple gather sites. Selection of capture techniques would be based on several factors including herd health and season of the year to maximize gather success and minimize herd impacts. Prior to their use, each site would receive a class III cultural clearance. If during the course of the clearance,

it is determined that there are cultural resource concerns, an alternate site would be chosen. To the extent possible, previously used and cleared sites would be selected.

- During capture operations, safety precautions would be taken to protect all personnel, animals, and property involved in the process from injury or damage. Only authorized personnel would be allowed on site during the removal operations. Included in the "capture and removal" operations would be sorting individual horses as to their age, sex, temperament and /or physical condition, and to return selected animals to the range.
- During gather operations, the Lead Contracting Officers Representative (COR), as delegated by the Authorized Officer (AO) prior to the gather, would authorize the release or euthanasia of any wild horse that they believe would not tolerate the handling stress associated with transportation, adoption preparation, or holding. No wild horse should be released or shipped to a preparation or other facility with a preexisting condition that requires immediate euthanasia as an act of mercy. The Incident Commander (IC) or COR should, as an act of mercy and after consultation with the on-site veterinarian, euthanize any animal that meets any of the conditions described in BLM Washington Office IM 2015-070.
- Wild horse herd data which may be collected during the gather operations includes data to determine population characteristics (age/sex/color/etc.), assess herd health (pregnancy/parasite loading/physical condition/etc.), and determine herd history and genetic profile (hair sampling, IM 2009-062).
- Best Management Practices would be followed prior to and during gather operations. All vehicles and equipment should be free of mud and debris prior to entering BLM administered lands, and weed free hay would be used in trap sites and temporary holding facilities located on BLM-administered lands.

- Selective removal procedures would prioritize removal of younger excess wild horses after achieving AML within the HMA, and allow older less adoptable wild horses to be released back to the HMA.

Additional design features are described in Appendix E. Standards from the Comprehensive Animal Welfare Program for wild horse and burro gathers are contained in Appendix D.

Helicopter

If the local conditions require a helicopter drive-trap operation, the BLM would use a contractor or in-house gather team to perform the gather activities in cooperation with BLM and other appropriate staff. The contractor would be required to conduct all helicopter operations in a safe manner and in compliance with Federal Aviation Administration (FAA) regulations 14 CFR § 91.119 and BLM IM No. 2010-164.

Helicopter drive trapping involves use of a helicopter to herd wild horses into a temporary trap. The CAWP (Appendix D) would be implemented to ensure that the gather is conducted in a safe and humane manner, and to minimize potential impacts or injury to the wild horses. Traps would be set in an area with high probability of access by horses using the topography, if possible, to assist with capturing excess wild horses residing within the area. Traps consist of a large catch pen with several connected holding corrals, jute-covered wings and a loading chute. The jute-covered wings are made of material, not wire, to avoid injury to the horses. The wings form an alley way used to guide the horses into the trap. Trap locations are changed during the gather to reduce the distance that the animals must travel. A helicopter is used to locate and herd wild horses to the trap location. The pilot uses a pressure and release system while guiding them to the trap site, allowing them to travel at

their own pace. As the herd approaches the trap the pilot applies pressure and a prada horse is released guiding the wild horses into the trap. Once horses are gathered they are removed from the trap and transported to a temporary holding facility where they are sorted.

If helicopter drive-trapping operations are needed to capture the targeted animals, BLM would assure that an Animal and Plant Health Inspection Service (APHIS) veterinarian or contracted licensed veterinarian is on-site during the gather to examine animals and make recommendations to BLM for care and treatment of wild horses. BLM staff would be present on the gather at all times to observe animal condition, ensure humane treatment of wild horses, and ensure contract requirements are met.

Bait/Water Trapping

Bait and/or water trapping may be used if circumstances require it or best fits the management action to be taken. Bait and/or water trapping generally require a longer window of time for success than helicopter drive trapping. Although the trap would be set in a high probability area for capturing excess wild horses residing within the area, and at the most effective time periods, time is required for the horses to acclimate to the trap and/or decide to access the water/bait.

Trapping involves setting up portable panels around an existing water source or in an active wild horse area, or around a pre-set water or bait source. The portable panels would be set up to allow wild horses to go freely in and out of the corral until they have adjusted to it. When the wild horses fully adapt to the corral, it is fitted with a gate system. The acclimation of the horses creates a low stress trapping method. During this acclimation period the horses would experience some stress due to the panels being setup and perceived access restriction to the water/bait source.

When actively trapping wild horses, the trap would be staffed or checked on a daily basis by either BLM personnel or authorized contractor staff. Horses would be either removed immediately or fed and watered for up to several days prior to transport to a holding facility. Existing roads would be used to access the trap sites.

Gathering excess horses using bait/water trapping could occur at any time of the year and traps would remain in place until the target number of animals are removed. Generally, bait/water trapping is most effective when a specific resource is limited, such as water during the summer months. For example, in some areas, a group of wild horses may congregate at a given watering site during the summer because few perennial water resources are available nearby. Under those circumstances, water trapping could be a useful means of reducing the number of horses at a given location, which can also relieve the resource pressure caused by too many horses. As the proposed bait and/or water trapping in this area is a low stress approach to gathering wild horses, such trapping can continue into the foaling season without harming the mares or foals.

Gather Related Temporary Holding Facilities (Corrals)

Wild horses that are gathered would be transported from the gather sites to a temporary holding corral in goose-neck trailers. At the temporary holding corral, wild horses would be sorted into different pens based on sex. The horses would be aged and provided good quality hay and water. Mares and their un-weaned foals would be kept in pens together. At the temporary holding facility, a veterinarian, when present, would provide recommendations to the BLM regarding care and treatment of the recently captured wild horses. Any animals affected by a chronic or incurable disease, injury, lameness or serious physical defect (such as severe tooth loss or wear, club foot, and

other severe congenital abnormalities) would be humanely euthanized using methods acceptable to the American Veterinary Medical Association (AVMA).

Transport, Off-range Corrals, and Adoption Preparation
All gathered wild horses would be removed and transported to BLM holding facilities where they would be inspected by facility staff and if needed a contract veterinarian to observe health and ensure the animals are being humanely cared for.

Those wild horses that are removed from the range and are identified to not return to the range would be transported to the receiving off-range corrals (ORC, formerly short-term holding facility) in a goose-neck stock trailer or straight-deck semi-tractor trailers. Trucks and trailers used to haul the wild horses would be inspected prior to use to ensure wild horses can be safely transported. Wild horses would be segregated by age and sex when possible and loaded into separate compartments. Mares and their un-weaned foals may be shipped together. Transportation of recently captured wild horses is limited to a maximum of 12 hours.

Upon arrival, recently captured wild horses are off-loaded by compartment and placed in holding pens where they are provided good quality hay and water. Most wild horses begin to eat and drink immediately and adjust rapidly to their new situation. At the off-range corral, a veterinarian provides recommendations to the BLM regarding care, treatment, and if necessary, euthanasia of the recently captured wild horses. Wild horses in very thin condition or animals with injuries are sorted and placed in hospital pens, fed separately and/or treated for their injuries.

After recently captured wild horses have transitioned to their new environment, they are prepared for adoption, sale, or transport to Off-Range pastures. Preparation involves freeze-marking the animals with a unique identification number, vaccination against common diseases, castration, and de-worming. At ORC facilities, a minimum of 700 square feet of space is provided per animal.

Adoption
Adoption applicants are required to have at least a 400 square foot corral with panels that are at least six feet tall. Applicants are required to provide adequate shelter, feed, and water. The BLM retains title to the horse for one year and inspects the horse and facilities during this period. After one year, the applicant may take title to the horse, at which point the horse becomes the property of the applicant. Adoptions are conducted in accordance with 43 CFR Subpart 4750.

Sale with Limitations
Buyers must fill out an application and be pre-approved before they may buy a wild horse. A sale-eligible wild horse is any animal that is more than 10 years old or has been offered unsuccessfully for adoption at least three times. The application also specifies that buyers cannot sell the horse to slaughter buyers or anyone who would sell the animals to a commercial processing plant. Sales of wild horses are conducted in accordance with the 1971 WFRHBA and congressional limitations.

Off-Range Pastures
When shipping wild horses for adoption, sale, or Off-Range Pastures (ORPs) the animals may be transported for up to a maximum of 24 hours. Immediately prior to transportation, and after every 24 hours of transportation, animals are offloaded and provided a minimum of 8 hours on-the-ground rest. During the rest period, each animal is provided access to unlimited amounts of clean water and two pounds of good quality hay per 100 pounds of body weight with adequate space to allow all animals to eat at one time.

Mares and sterilized stallions (geldings) are segregated into separate pastures, except at one facility where geldings and mares coexist. Although the animals are placed in ORP, they remain available for adoption or sale to qualified individuals; and foals born to pregnant mares in ORP are gathered and weaned when they reach about 8-12 months of age and are also made available for adoption. The ORP contracts specify the care that wild horses must receive to ensure they remain healthy and well-cared for. Handling by humans is minimized to the extent possible although regular on-the-ground observation by the ORP contractor and periodic counts of the wild horses to ascertain their well-being and safety are conducted by BLM personnel and/or veterinarians.

Euthanasia or Sale without Limitations
Under the WFRHBA, healthy excess wild horses can be euthanized or sold without limitation if there is no adoption demand for the animals. However, while euthanasia and sale without limitation are allowed under the statute, these activities have not been permitted under current Congressional appropriations limitations. If Congress were to lift the current appropriations restrictions, then it is possible that excess horses removed from the HMA over the next 10 years could potentially be euthanized or sold without limitation consistent with the provisions of the WFRHBA.

Any old, sick or lame horses unable to maintain an acceptable body condition (greater than or equal to a Henneke BCS of 3) or with serious physical defects would be humanely euthanized either before gather activities begin or during the gather operations. Decisions to humanely euthanize animals in field situations would be made in conformance with BLM policy (Washington Office Instruction Memorandum (WO IM) 2015-070 or most current edition). Conditions requiring humane euthanasia occur infrequently and are described in more detail in Washington Office Instruction Memorandum 2009-041.

Public Viewing Opportunities
Opportunities for public observation of the gather activities on public lands would be provided, when and where feasible, and would be consistent with WO IM No. 2013-058 and the Visitation Protocol and Ground Rules for Helicopter WH&B Gathers. This protocol is intended to establish observation locations that reduce safety risks to the public during helicopter gathers. Due to the nature of bait and water trapping operations, public viewing opportunities may only be provided at holding corrals.

ALTERNATIVES CONSIDERED BUT ELIMINATED

Alternatives considered but eliminated from further analysis are included in Appendix J, with discussion as to why each alternative was not carried forward.

3.0 AFFECTED ENVIRONMENT

This chapter presents the potentially affected existing environment (i.e., the physical, biological, social, and economic values and resources) of the impact area as identified in the Interdisciplinary Team Checklist found in Appendix A and presented in Chapter 1 of this assessment. This chapter provides the baseline for comparison of impacts/consequences described in Chapter 4.

GENERAL SETTING

The Range Creek HMA is approximately 55,000 acres of Federal, State and Private lands located 20 miles northeast of Price, Utah *(Map* 1). The general boundary is described as: Dry Canyon and the north rim of Horse Bench on the north; Bruin Point on the West; Bishop Ridge and Flat Canyon on the south and the broken ledges of the Green River on the east. Access is provided to the HMA via Nine Mile Canyon up Cottonwood Canyon, or up water canyon to Bruin point from the town of East Carbon. Annual precipitation is approximately 16 inches, in the higher elevations with an average 9.3 inches coming during the summer (May through September). Precipitation as of May 2019 was 26.70 inches or 107 percent of normal (water-year) at the Timberline weather station, according to data collected since 2007. Temperatures at the Timberline weather station, Utah range from an average monthly high of 74 degrees Fahrenheit in July to 28 degrees in December (NOAA, online, 2019). Of the 55,023 acres in the HMA approximately 43,235 are public land acres and 11,788 acres are state and private lands. The topography of the HMA is typical of the Tavaputs Plateau area, varying from extremely rough to smooth terrain on Sandstone benches. The steep sided mesas and deeply incised drainages throughout the HMA could potentially create problems gathering horses. The wild horses primarily use the open benches and parks, but do use wooded areas occasionally.

The HMA has several undeveloped springs and seeps that are used as water sources by the wild horses, as well as reservoirs and developed springs. Most of the developed water sources are in fair condition, with most in need of repair or general maintenance.

RESOURCES/ISSUES BROUGHT FORWARD FOR ANALYSIS

LIVESTOCK GRAZING

Insert The Green River Allotment encompasses the Range Creek HMA. Livestock grazing use on the affected grazing allotment has been held to less than 15 percent of permitted use for the past six years. Overlap of areas of use between wild horses and livestock does occur on specific sites on the allotment causing competition for forage, water and space. Wild horses, wildlife, and livestock compete directly for the same space, water and forage resources. Yearlong wild horse grazing reduces forage availability for livestock. Grazing by excess wild horses during the critical growing season and during drought conditions can reduce forage production, vigor, reproduction, and availability for several years.

The seasons of use and Animal Units Months (AUMs) for the affected allotment are listed below in Table 2.

Table 2. Green River allotment numbers, season of use, and AUMs					
Pasture	Livestock		Season of Use		AUMs
	No.	Kind	From	To	
Horse Bench	500	Cattle	2/01	4/15	1,156
Flat Iron	150	Cattle	3/16	4/15	131
Twin Hollow	150	Cattle	4/16	5/31	177
Cottonwood	200	Cattle	4/16	5/31	281
Cedar Ridge	200	Cattle	4/16	5/31	266
Lower Steer Ridge	200	Cattle	4/16	5/31	172
	60	Cattle	6/01	10/15	154
Cold Springs	350	Cattle	6/01	10/15	583
Private Land Block	700	Cattle	6/01	10/15	347
TOTAL					3,267

Although voluntary reductions in cattle AUMs have been taken by permittees, horse numbers have remained at or above the upper AML levels.

Table 3. Ten year average grazing use													
Green River Allotment			Grazing use by year										
Pasture	Permitted	2018	17	16	15	14	13	12	11	10	2009	Average	% Ave
Horse Bench	1156	0	0	0	0	0	0	0	0	0	0	0	0
Flat Iron	131	0	0	0	0	0	78	42	42	0	27	19	14
Twin Hollow	177	0	0	0	95	95	45	79	79	0	145	54	30
Cottonwood	281	67	48	23	51	12	66	17	27	45	92	45	16
Cedar Ridge	266	0	0	43	24	42	99	29	53	57	67	41	16
Lower Steer Ridge	326	0	0	0	60	63	0	20	0	55	101	30	9
Cold Spring	583	0	0	0	167	167	183	167	167	0	105	96	16
PLB	347	30	25	29	87	77	61	33	29	136	103	61	18
Sum	**3267**	**97**	**73**	**95**	**484**	**456**	**532**	**387**	**397**	**293**	**640**	**345**	**11**
%	100	3	2	3	15	14	16	12	12	9	20	11	11

Livestock use has averaged 11 percent of the permitted AUMs over the past ten years, with a high of 20 percent of permit and 30 percent by pasture as shown in Table 3.

Wild horses will drive away livestock and wildlife from watering and feeding areas (Miller, 1981). When these resources become depleted, wildlife and wild horses will move to a new location, while livestock must be removed. Overlap between horses and cattle have been shown to increase at higher stocking density. Large numbers of any two species (cattle or horses) increase the negative interactions (Smith 1986).

Livestock in the allotment depend on reservoirs, and springs during the period they are on the allotment. Several small springs and seeps are scattered throughout the allotment and HMA. During normal precipitation years, these small springs and seeps disperse wild horse use throughout the HMA reducing competition between livestock and wild horses. During drought years, these small springs and seeps dry up and wild horses must move to other water sources. This increases competition between wild horses and livestock.

Some fences have been damaged by wild horses in their natural movement and in their search for water. Most of these fences were in place before the passage of the Wild and Free Roaming Horse and Burro Act of 1971. These fences inhibit the natural and free roaming nature of the wild horses but are necessary for livestock management.

VEGETATION

The HMA ranges from 5,600 to 8,700 feet in elevation, and supports vegetation types ranging from aspen/mixed conifer to salt desert shrub, and grasslands. The pinyon-juniper woodland, vegetation type dominates the HMA. Primary forage species are Indian ricegrass, Needle and Thread, mutton grass, winter fat, and fourwing saltbush.

Rangeland Health Studies have been completed on the livestock grazing allotment that encompasses the Range Creek HMA. These studies can be found within the allotment files at the BLM Price Field Office. The methodology of each study was completed using technical reference 1734-6. Vegetation production and vigor has been reduced by drought. Drought is defined as prolonged dry weather generally, when precipitation is less than 75% of average annual amount (Society for Range Management 1974). Precipitation is the most important single factor determining the type and productivity of vegetation in an area. The Range Creek HMA averages less than 16 inches per year. During the period from 2001-2017 the precipitation was near normal for the majority of the time. The water years of 2002, 2008, 2010 and 2018 were below normal; 2001 and 2016 were above normal. The 2019 water year is shaping up to be above normal.

The current drought cycle has had a tremendous influence on rangeland vegetation. As described above, year-long grazing by wild horses has put additional stress on key forage species already affected by drought. Some key forage species have been lost. Recovery could take 5 to 15 years, depending on how severely the drought affected a particular area. Two or more years of drought have far greater impact on vegetation than one year of drought followed by normal or above-normal precipitation.

Rangeland resources are currently being affected within the herd area due to lower than normal precipitation 6 out of the last 10 years, which has reduced vegetative growth and vigor.. Utilization of primary forage species over the majority of the HMA was nearly 90 percent for last year's growth.

Monitoring data collected within the Range Creek HMA indicated the Utah BLM Standards and Guidelines for Healthy Rangelands were not being fully met and that causal factors for non-attainment of Standard 2 and 3 include excessive use by wild horses, historic livestock grazing and climatic conditions (drought).

Utilization studies that have been completed during the past 20 years, along with PFO staff observations, suggest that as wild horse populations increase they contribute to the decrease of forage species. This is especially true in grassland and sagebrush/grassland.

Thirteen trend studies have been set up within the Green River Allotment and Range Creek HMA by the PFO, BLM (6) and UDWR (7). Two of the BLM study locations have been abandoned with conversion to the new monitoring protocol. The Twin Hollow study overlaps the UDWR study, and the Cottonwood study location is not large enough to contain the new study layout. These studies describe the browse and herbaceous communities remaining in a static trend, with several locations showing an increase in Pinyon and Juniper depending on location within the HMA. Several studies have not been established long enough to collect enough data to give a reliable trend, or were established prior to a vegetative treatment, to assist in determining the success of the treatment. These Frequency trend studies suggest the trend is in generally stable or static condition.

Yearlong grazing by wild horses has been one contributing factor to the static trend of the herbaceous communities. Horses, because they are territorial, are grazing the same areas repeatedly throughout the spring during critical growing periods for grasses. High populations of wild horses can reduce the available forage for not only the year the grasses are grazed, but also for years to come. Horses will graze the most desirable forage plants first before grazing on other species. Wild horses are capable of cropping forage much more closely than wild or domestic ruminants, causing a loss of the most desirable forage species and reducing plant diversity.

From 2011 to present, the excess number of wild horses (numbers over AML) within the HMA have reduced the amount of available forage for all grazing animals.

WILD HORSES

As described earlier, the current AML that is set for the area is 100 horses with no less than 75, and no more than 125 horses. There have been 8 gathers conducted in the mid 1980's, 1994, 1997, 2002, 2006 and 2018 on the current Range Creek HMA. Most recent was a private land gather in 2018. Ninety two wild horses were gathered, and removed in 2018. After completion of the 2006 gather Thirty-three horses were released back to the HMA. The released horses were a mix of Range Creek horses and horses from the Buck and Bald complex in Nevada. The Buck and Bald horses were released in 2006 for genetic purposes. The dominant color in the HMA is Bay, followed by Black, with an increasing number of Pintos and Roans. Sorrels, Chestnuts, Browns and Grey's can also be found. All studs released in 2006 were checked for signs of being Chriptorchids prior to release. Several studs from Range Creek that were intended for release were rejected for being Chriptorchids.

The wild horse herd size within the HMA was estimated to be 282 horses as of March 1, 2019. This number is based on an April 2017 aerial population inventory utilizing the Double Observer method, and allowing for population growth between April 2017 and March 1, 2019. A statistical analysis of the aerial survey data provided a 90% confidence interval around that herd size estimate of 261 adult horses on the HMA in April 2017, with a 90% confidence interval between 252-278 adult horses at

that time (Lubow 2017). The HMA has an estimated average 20 percent annual reproductive rate as seen from past inventory and gather reports (BLM, 4700 files). Allowing for 92 horses removed from private lands in 2018 and new foals that are expected to be born in spring and summer 2019, the projected number of horses present in the HMA by fall 2019 will be approximately 338.

BLM is not required by law to manage the herds found in any given HMA as if they were genetically isolated populations. A 2013 report from the National Academies of Sciences' national Research Council (NRC), commissioned by BLM, recommended that BLM consider genetic management of wild horses from the perspective of metapopulations. Under this framework, herds from individual HMAs should not be considered to be genetically isolated populations. Rather, BLM was encouraged to consider the historical and present connections between HMAs. Genetically, BLM was encouraged by NRC (2013) to maintain genetic variation across a number of potentially interconnected herds (i.e., many herds within a given metapopulation); the connections between herds may be maintained by natural emigration and immigration, or by human-assisted translocation. The AML in Range Creek HMA alone is not large enough to maintain genetic diversity, as measured by observed heterozygosity (Ho) without introduction of horses from outside the HMA. Heterozygostiy levels can be maintained and Inbreeding can be avoided through introductions of additional wild horses from other herds. The genetically effective breeding size of a herd, Ne, is a reflection of the number of individuals that are contributing to the maintenance of genetic diversity (reviewed in NRC 2013); this number can be difficult to measure directly, but is related to the numbers of breeding males and females in a herd. If a herd consists of 40 breeding mares and 60 breeding stallions, then a simplified calculation of Ne (Hartl and Clark 2007) would lead to an estimate of 96. However, actual Ne is usually lower than the numbers of breeding animals present would imply, so the BLM Wild Horse and Burro Handbook suggests considering other options for maintaining genetic diversity when herd size must be held at below about 150 animals due to habitat limitations or other considerations (BLM 2010). The handbook (BLM 2010) includes suggestions that can be considered for maintaining genetic diversity in small herds such as this one; these suggestions do not represent a specific, legally-binding, BLM policy. Two suggestions there are to introduce 1-2 mares every 10 years or so, and to increase the sex ratio in favor of males (which should increase the number of harems and the number of effectively breeding males). The preferred alternative includes even more frequent translocations (1-3 animals, every 4-5 years, if needed), which would be expected to reduce inbreeding to an even greater degree. In the past, BLM has translocated wild horses into Range Creek HMA in order to improve genetic diversity there, and the preferred alternative would continue this practice. Increasing sex ratio is expected to increase the number of breeding males because competition between stallions is expected to reduce harem size.

Genetic sampling that is conducted during gathers allows BLM to gauge the genetic health of the herd, which allows BLM to identify whether and how much additional wild horses should be translocated into the HMA. Blood samples for genetic testing were taken in 2002 to create a baseline for the wild horses that occur within the Range Creek HMA. These samples were sent to Dr. Gus Cothran and Texas A&M. At that point in time the Range Creek HMA was tested as two separate units, the Cedar Ridge and Cold Springs herd areas. Genetic analysis from 62 individuals gathered during the 2002 gather showed a very low Observed Heterozygosity (Ho) or individual variability at that time (Cothran, 2003). Doctor Cothran stated in his 2003 report for Cedar Ridge that "Ho and He values were essentially the same, which indicates that the herd is in genetic equilibrium and that there is no evidence of inbreeding seen from the variability data." The Cold Springs 2003 report shows that "He was higher than Ho to a degree that is suggestive of inbreeding."

In 2006, 26 hair samples were submitted to Dr. Cothran for testing. 14 from Cedar Ridge and 12 from Cold Springs. Results from that sample were very similar in nature to the 2002 samples. Dr. Cothran states that the data from both 2002 and 2006 show little exchange of genetic information between the two herd areas (Cothran, 2009). Since the 2003 report, horses from the Buck and Bald HMAs have been introduced as well as horses from each ridge were moved to the other ridge following the 2006 gather to improve the genetic variability of the herd. Genetic monitoring that would take place as a result of any alternative with a gather would allow BLM to determine what the current status of genetic variability is in the herd, and whether additional introductions could be necessary. Hair samples from 50 individuals gathered during the 2018 Private land gather were submitted to Dr. Cothran for analysis.

The AML for the Range Creek HMA was set in the Price River Management Framework Plan (MFP) (1983). The Price River MFP decisions directed the BLM to provide forage on a sustained yield basis through natural regeneration, reverse the downward deterioration of grazing lands and establish monitoring studies to determine proper forage allocation levels for wild horses, livestock and wildlife. This process was culminated through the development and implementation of activity plans for the wild horses, livestock and wildlife programs, which are the Range Creek Wild Horse Management Area Plan (HMAP), the Range Valley Mountain Wildlife Habitat Management Plan (HMP) and the Green River Grazing Allotment Management Plan (AMP). The BLM PFO has attempted since the completion of the HMAP in 1994 to maintain the wild horse population within the AML on the Range Creek HMA. Since 1994, four (4) gathers and removals have been conducted within the HMA in an attempt to keep the horse population within the AML. In 1994, 1997, 2002 and 2006 the population was down near the lower end of the AML. Gathers of wild horses within this HMA have proven difficult due to heavy tree cover, terrain, horse movement and distance. As the population increases, it becomes harder to gather the number of horses needed to reduce the population to within the AML.

Because horses have a cecal digestive system and can cover longer distances than domestic ruminants, wild horses can remain in good health under forage conditions fatal to domestic ruminants (Holechek 1989). In 1997 through 1999, range conditions within the HMA became so bad that even though livestock use was reduced or eliminated on the BLM allotments and several hundred wild horses removed, health of some horses declined to critical conditions. Some horses were lost to starvation and dehydration during those years.

The overriding limiting factor for the carrying capacity of wild horses in the HMA is not the available forage, although this is a concern, but is the supply of reliable water during the summer months. Wild horses in this HMA congregate in portions of the HMA to stay close to available water sources. This concentration increases as drought reduces the available water in and around the HMA. Upland vegetation in proximity to water sources are used heavily by wild horses and wildlife, while vegetation in areas farther from water (i.e., greater than six miles) is used slightly too moderately.

The increased concentration of wild horses at all the reliable water sources in the HMA have reduced vegetation and caused soil compaction. Due to the high population of wild horses within the HMA, it is expected that wild horses will try to leave the HMA and expand into new areas looking for feed and water. This has been noted recently with horses moving out onto private lands near Bruin Point and trying to push out onto portions of Steer Ridge.

It is anticipated that the age structure of the Range Creek HMA wild horses resemble a normal age structure with ages ranging from foals to animals in excess of 20 years of age. The sex ratio is estimated to be approximately 50% mares and 50% stallions with variations 10% below or above these levels.

Population modeling was completed for the Range Creek HMA using Version 1.4 of the WinEquus population model (Jenkins 2002) to analyze how the alternatives would affect the wild horse population (Appendix I). This modeling analyzed removal of excess wild horses with no fertility control, as compared to removal of excess wild horses with fertility control and sex ratio adjustments for released horses. The No Action (no removal) Alternative was also modeled. One objective of the modeling was to identify whether any of the alternatives "crash" the population or cause extremely low population numbers or growth rates. Minimum population levels and growth rates were found to be within reasonable levels and adverse impacts to the population not likely. Graphic and tabular results are also displayed in detail.

SAGE GROUSE

The greater sage-grouse is currently a BLM sensitive species – it had been a candidate for listing under provisions of the ESA; in March 2010 the USFWS determined that listing was warranted but precluded by higher priorities (75 FR 13910). Subsequently a planning effort was completed by the BLM and the US Forest Service, which resulted in the amendment of BLM land use plans, as, is documented in the ARMPA (BLM 2019). On October 2, 2015, the USFWS determined the greater sage-grouse was not warranted for protection under ESA (80 FR 59857). Management of the species is guided by the ARMPA.

The ARMPA delineated sage-grouse habitat into Priority Habitat Management Areas (PHMA). PHMA are lands identified as having the highest value for maintaining sustainable greater sage-grouse populations. There are 16,135 acres (approximately 29 percent) of PHMA within the Range Creek Herd Management Area (HMA), of which 9,275 acres are on BLM lands (see PHMA Map).

In 2017, an interagency effort to prepare maps of seasonal Greater Sage-Grouse habitat in Utah produced three maps of modeled seasonal habitats. These habitat maps were developed using a database of hundreds of lek locations paired with over 20,000 very high frequency (VHF) radio telemetry locations from Greater Sage-Grouse statewide. The resulting models were created using a method where 85 percent of the Greater Sage-Grouse VHF seasonal locations were captured within the habitat management areas, then the habitat conditions associated with those locations were identified throughout the state. It is important to note that these maps only reflect areas with vegetation characteristics similar to areas where the VHF locations were located ; therefore, these models may not reflect every acre of seasonal habitat used by a given population, but they do identify areas of potential seasonal habitats. The Habitat Map shows the modeled seasonal habitat for Greater Sage-Grouse within the HMA.

Approximately 15,295 acres of greater sage-grouse seasonal habitats occur (on all ownerships) within the HMA, with a majority of seasonal habitat overlapping each other. Seasonal habitats within the HMA include nesting/brood-rearing (9,880 acres), late brood-rearing/summer (13,759) and winter (13,674). There are two leks (Bishop Ridge Corral & Bishop Ridge Drift Fence) located within the HMA.

The greater sage-grouse in the HMA are part of the West Tavaputs Plateau Population Area. The West Tavaputs GRSG habitat is characterized by sagebrush stands interspersed with aspen and spruce-fir communities at high elevations, and pinyon-juniper communities at low elevations. The vegetation is generally diverse, with mountain big sagebrush dominant in the upper elevations and Wyoming big sagebrush and black sagebrush occurring at mid-elevations and winter habitats. Generally, the understory vegetation is diverse, with a variety of grasses and forbs. Telemetry data suggest the birds are using most of the mid- to high-elevation sagebrush areas on the plateau to meet breeding, nesting, and brood-rearing habitat needs.

During winters, birds are moving to three primary locations lower on the plateau. There is evidence that GRSG sometimes winter north of Nine Mile Canyon (Cowboy Bench and Wrinkles areas) and mix with wintering Anthro Mountain birds. These long movements (up to 11 miles) are associated with heavy snow years (Castle Country Adaptive Resource Management Local Working Group 2006; Crompton 2012). Additionally, telemetry data documented a bird from the West Tavaputs area crossing east over the Green River onto tribal lands.

From the last 10 years of lek counts (2004 to 2013), the West Tavaputs Plateau population is estimated to range between 56 and 308 birds (14 to 77 males counted on six leks). There are seven known leks in the area, of which three are active each year (B. Crompton, personal communication with Renee Chi, BLM, April 3 and April 23, 2013). The population is found on a rugged plateau northeast of Price, Utah and is the easternmost population in WAFWA MZ III (Stiver et al. 2006). West Tavaputs is a series of broad, discontinuous plateaus incised by deep drainages. The plateau drains north and east to Nine Mile Canyon and the Green River, respectively.

Based on calculating Lambda for lek counts between 2006 and 2013, the only years when the same leks were consistently counted and the same number of leks were counted, the West Tavaputs population is increasing (λ = 1.21). However, 7 years of lek counts are not enough years to establish a trend with substantial confidence.

It is also important to note that although efforts to count leks each year has increased, access to count leks during peak lek attendance may be limited in high snow years, and counting the leks during off-peak male lek attendance can skew lek counts to look like a decline. Current percent disturbance in GRSG habitat in the West Tavaputs area is 0.7 percent, or 0.8 percent if fire history is included.

Historically, there have been low levels of anthropogenic disturbances in the West Tavaputs Plateau area, with minimal oil and gas development. However, recent development is concentrated in the limited GRSG wintering habitats and exceeds densities of 1 well per section on approximately 11 percent of the population. Additional future well development will occur in winter habitat over the next two decades with mitigation emphasis on maintaining GRSG on the landscape. Roads are common on most ridges but receive low levels of use.

GRSG are thought to have been historically distributed in all 29 Utah counties, based on sagebrush distribution, but are now found in 26 counties (UDWR 2009a). They are estimated to occupy only 41 percent of their historic habitats in Utah and are half as abundant as they were prior to 1850 (Beck and Mitchell 1997). GRSG population declines correspond with trends of decreasing habitat quality and quantity that is common throughout the West. The reasons for declines in GRSG habitat quality and quantity vary from site to site but include wildfire, urban expansion, development, agricultural conversion, herbicide treatments, noxious weed/invasive species expansion, conifer encroachment, drought, and improper historic livestock grazing and in some cases improper current livestock

grazing (Manier et al. 2013). In western Utah, GRSG are at highest risk from habitat loss and degradation associated with nonnative annual grass invasion and conifer encroachment and related changes in fire risk, while in eastern Utah they are at highest risk from habitat loss and disturbance associated with energy development.

4.0 ENVIRONMENTAL IMPACTS

This chapter presents the expected effects from implementing the alternatives to the resources of concern. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.

ALTERNATIVE 1 – NO ACTION

The following are the impacts expected from the implementation of the No Action Alternative to the resources of concern.

LIVESTOCK GRAZING

Livestock would not be displaced or disturbed due to gather operations under the No Action Alternative. Direct impacts from not managing horses within the Range Creek HMA would have a negative effect on livestock grazing within the identified grazing allotments. Increased numbers of horses would adversely affect vegetative resources, which horses, livestock and wildlife compete for, as well as an increased competition for water resources and impact upon the springs and streams. This would result in a reduced carrying capacity. As wild horse numbers increase, livestock grazing within the HMA may have to be further reduced in an effort to slow the deterioration of the range to the greatest extent possible or because rangeland conditions do not support the multiple uses for which the public lands are being managed.

MITIGATION MEASURES

No mitigation measures identified for this resource, under this alternative

RESIDUAL IMPACTS

Residual impacts are as disclosed in the analysis above.

VEGETATION

Direct and Indirect impacts would include disturbance of native vegetation immediately around all waters sources, as well as across the entire HMA from an increase in horse use. Impacts would be created by hoof action as the horses travel to and from water as well as disturbance created by the foraging of the horses on individual plants. This is an ongoing impact to vegetation but would be increased exponentially by allowing the horse herd to regulate itself.

MITIGATION MEASURES

No mitigation measures identified for this resource, under this alternative.

RESIDUAL IMPACTS

Residual impacts are as disclosed in the analysis above.

WILD HORSES

The HMA would be managed under the objectives of the Price RMP, the Range Creek HMAP and current regulations and policies with no additional objectives specific to the management of wild horses within the Range Creek HMA.

If the No Action Alternative is taken, excess wild horses would not be removed from within the Range Creek HMA at this time. The animals would not be subject to the individual direct or indirect impacts as a result of a gather operation in Summer 2019. Over the short-term, individuals in the herd would be subject to increased stress and possible death as a result of increased competition for water and forage as the wild horse population continues to grow. The number of areas experiencing severe utilization by wild horses would increase over time. This would be expected to result in increasing damage to rangeland resources throughout the HMA. Trampling and trailing damage by wild horses in/around riparian areas and water sources would also be expected to increase, resulting in larger, more extensive areas of bare ground. Competition for the available water and forage between wild horses, domestic livestock, and native wildlife would increase.

Wild horses are a long-lived species with documented survival rates exceeding 92% for all age classes and do not have the ability to self-regulate their population size. Predation and disease have not substantially regulated wild horse population levels within the Range Creek HMA. Some mountain lion predation may occur, but does not spear to be substantial. Coyotes are not prone to prey on wild horses unless young or extremely weak. Other predators such as wolf, or bear do not exist within the HMA. As a result, there would be a steady increase in wild horse numbers for the foreseeable future, which would continue to exceed the carrying capacity of the range. Individual horses would be at greater risk of death by starvation and lack of water. The population of wild horses would compete for the available water and forage resources, affecting mares and foals most severely. Social stress would increase. Fighting among stud horses would increase as they protect their position at scarce water sources, as well as injuries and death to all age classes of animals.

Substantial loss of the wild horses in the HMA due to starvation or lack of water would have obvious consequences to the long-term viability of the herd. Continued decline of rangeland health and irreparable damage to vegetative, soil and riparian resources, would have obvious impacts to the future of the HMA and all other users of the resources, which depend upon them for survival. As a result, the No Action Alternative would not ensure healthy rangelands, would not allow for the management of a healthy, self-sustaining wild horse population, and would not promote a thriving natural ecological balance.

As populations increase beyond the capacity of the available habitat, more bands of horses would leave the boundaries of the HMA in search of forage and water. This alternative would result in increasing numbers of wild horses in areas not designated for their use, would be contrary to the Wild Free-Roaming Horse and Burro Act and would not achieve the stated objectives for wild horse herd management areas, to “prevent the range from deterioration associated with overpopulation,” and “preserve and maintain a thriving natural ecological balance and multiple use relationship in that area.”

MITIGATION MEASURES

No mitigation measures identified for this resource, under this alternative.

RESIDUAL IMPACTS

Residual impacts are as disclosed in the analysis above.

SAGE GROUSE

The potential disturbance of sage-grouse young due to helicopter trapping would be avoided by the No Action alternative. Otherwise, impacts from this alternative would be expected to be negative, with the continuation of the negative effects resulting from the high population levels of wild horses, including reductions in vegetative cover, plant diversity, forage, biological crusts, and insect prey availability.

MITIGATION MEASURES

No mitigation measures identified for this resource, under this alternative.

RESIDUAL IMPACTS

Residual impacts are as disclosed in the analysis above.

MONITORING AND/OR COMPLIANCE

See monitoring section for the proposed action for monitoring protocols.

ALTERNATIVE 2 – PROPOSED ACTION

The following are the impacts expected from the implementation of the Proposed Action Alternative to the resources of concern.

LIVESTOCK GRAZING

The Proposed Action would not have any direct impacts to livestock grazing. Objectives that identify improvements to forage and water availability would reduce competition for these resources within the HMA, if they are accomplished.

Livestock located near gather activities may be temporarily disturbed or displaced by the helicopter and the increased vehicle traffic during gather operations. If the gather occurs during the permitted grazing period. This displacement would be temporary and the livestock would move back into the area once gather operations move. Past experience has shown that gather operations have little impact on grazing cattle. No adjustments in permitted livestock use, active AUMs, season of use and/or terms and conditions would occur as a result of the Proposed Action. Direct impacts of the gather activities itself would be minor and short-term.

Indirect impacts to livestock grazing would be an increase in forage availability and quality, reduced competition for water and forage, and improved vegetative resources that would lead to a thriving ecological condition over the course of 6 to 10 years. Water sources that are repaired for either livestock or wild horses would also benefit the other user group.

MITIGATION MEASURES

None identified.

RESIDUAL IMPACTS

Residual impacts are as disclosed in the analysis above.

VEGETATION

Wild horse populations above AML compete for forage, water, and cover allocated to wildlife and livestock. Chambers et al. (2017) reviewed some of the impacts that wild horses can have on rangeland ecosystems, including impacts on native wildlife. That review notes that wild horse grazing is associated with a lower overall plant cover, shrub cover, species richness, and biomass, but more unpalatable and grazing-tolerant plant species, that they may spread invasive species such as cheatgrass, and that they may have outsized effects on aquatic ecosystems and riparian communities. Kaweck et al. (2018) found that wild horses can have higher per-capita effects on riparian ecosystems than cattle. There are several recent studies that have documented wild horses excluding native wildlife from water sources (Ostermann-Kelm et al. 2008, Perry et al. 2015, Hall et al. 2016a, Gooch et al. 2017, Hall et al 2018).

Direct impacts to the vegetation would include disturbance of native vegetation immediately in and around temporary trap sites, and holding, sorting and animal handling facilities. Impacts are created by vehicle traffic, and hoof action of penned horses and can be locally severe in the immediate vicinity of the corrals or holding facilities. Generally, these activity sites would be small (less than one half acre) in size. Since most trap sites and holding facilities are re-used during recurring wild horse gather operations, any impacts would remain site specific and isolated in nature. In addition, most trap sites or holding facilities are selected to enable easy access by transportation vehicles and logistical support equipment and would therefore generally be near or on roads, pullouts, water haul sites or other flat spots, which were previously disturbed. Generally, within one to two months of capture operations disturbance within the trap location is not visible. These common practices would minimize the cumulative effects of these impacts.

Indirect impacts would be associated with improvements in range and forage condition and long-term maintenance of habitat quality. A balanced demand for forage would help maintain the vigor of vegetation, allow for seedling establishment, maintain ground cover, and thereby maintain a thriving natural ecological balance. This would avoid range deterioration, particularly in future drought years.

MITIGATION MEASURES

None identified.

RESIDUAL IMPACTS

Residual impacts are as disclosed in the analysis above.

WILD HORSES

Since the passage of the Wild Free-Roaming Horse and Burros Act of 1971 (WFRHBA) over 40 years ago, field observations, herd health monitoring and population inventories have recorded locations in and around the HMA where wild horses have occurred. Horses normally do not move outside the HMA unless the population is above AML and/or there are drought conditions.

As forage within close proximity of water sources is depleted the wild horses will need to range greater distances for forage. The distance the animals must travel over steep rugged terrain can result in rapid physical deterioration of the animals.

Rangeland resources and wild horse health have been and are currently being affected within the Range Creek HMA, due to drought and overpopulation. Excess wild horses above AML have reduced available water and forage, resulting in increased competition for available resources. The gather of wild horses from the Range Creek HMA would have direct and indirect impacts to individual animals and the social structure of bands in the area. Most impacts would be short term (less than 1 year), but some would be long term (greater than one year). These impacts are discussed within this EA.

The Proposed Action would decrease the existing overpopulation of wild horses by approximately 148 wild horses. Each successive gather operation over a period of six to ten years and stallions would be selected for release with the objective of establishing a 60% male ratio within the population of 30-50/45-75 female/male horses on the range. The target population when the objectives of this alternative are reached would result in a total population at approximately low-range AML or 75 horses. Every 4-5 years 1-3 studs or mares from a different HMA, with similar or desired characteristics of the horses within the Range Creek HMA would be released to maintain the genetic health on the HMA. All animals selected to remain in the population would be selected to maintain a diverse age structure, herd characteristics and body type (conformation). The Proposed Action would not reduce all of the associated impacts to the wild horses and rangeland resources. Over the short-term, individuals in the herd would still be subject to increased stress and possible death as a result of continued competition for water and forage. Although lessened the areas experiencing heavy and severe utilization levels by wild horses would continue to be heavily impacted by horses but to a lesser extent, impacts to rangeland resources (concentrated trailing, increased bare ground, etc.) throughout the HMA would be expected to heal slowly once the AML has been reached.

It is a possibility that bands of horses could leave the boundaries of the HMA into areas not designated for their use in search of forage and water. If this should occur, the proposed action may not achieve the stated objectives for the wild horse herd management area, to "prevent the range from deterioration associated with overpopulation", and "preserve and maintain a thriving natural ecological balance and multiple use relationship in that area". Upon identification of horses outside the HMA future gathers would focus on those groups or individuals to ensure the herd stays within the HMA.

Removal of excess wild horses would improve herd health. Decreased competition for forage and water resources would reduce stress and promote healthier animals. This removal of excess animals coupled with anticipated reduced reproduction (population growth rate) as a result of fertility control should result in improved health and condition of mares and foals as the actual population comes into line with the population level that can be sustained with available forage and water resources, and would allow for healthy range conditions (and healthy animals) over the longer-term. Additionally, reduced population growth rates would be expected to extend the time interval

between gathers and reduce disturbance to individual animals as well as to the herd social structure over the foreseeable future.

Bringing the wild horse population back to low range AML by achieving the proposed action would reduce damage to the range from the current overpopulation of wild horses and allow vegetation resources to start recovering, without the need for additional gathers in the interim. As a result, there would be fewer disturbances to individual animals and the herd, and a more stable wild horse social structure would be provided.

Impacts to individual animals may occur as a result of handling stress associated with the gathering, processing, and transportation of animals. The intensity of these impacts varies by individual animal and is indicated by behaviors ranging from nervous agitation to physical distress. Mortality to individual animals from these impacts is infrequent but does occur in 0.5% to 1% of wild horses gathered in a given gather. Other impacts to individual wild horses include separation of members of individual bands of wild horses and removal of animals from the population.

Indirect impacts can occur after the initial stress event, and may include increased social displacement or increased conflict between stallions. These impacts are known to occur intermittently during wild horse gather operations. Traumatic injuries may occur, and typically involve bruises from biting and/or kicking, which do not break the skin.

The gathers would occur frequently making wild horses more difficult to trap. The horses would become very evasive and learn to evade the helicopter by taking cover in treed areas and canyons. Wild horses would also move out of the area when they hear a helicopter, thereby further reducing the overall gather efficiency. Frequent gathers would increase the stress to wild horses, as individuals and as entire herds. It would become increasingly more difficult over time to repeat gathers if the gathers are within two year intervals to successfully treat mares with fertility control.

Stallions selected for release would be released to maintain the post-gather sex ratio at approximately 60% stallions in the remaining herds. Stallions would be selected to maintain a diverse age structure, herd characteristics and body type (conformation). It is expected that releasing additional stallions to reach the targeted sex ratio of 60% males would result in smaller band sizes, larger bachelor groups, and some increased competition for mares. With more stallions involved in breeding it should result in increased genetic exchange and improvement of genetic health within the herd.

Fertility Control

The use of fertility control vaccines is discussed in depth in Appendix K.

Sex Ratio

Population control methods including the adjustment of sex ratios to favor stallions would be expected to have relatively minor impacts to overall population dynamics. Under the Proposed Action impacts of additional stallions in the population could include: decreased band size, increased competition for mares, and increased size and number of bachelor bands. These effects would be slight, as the proposed sex ratio is not an extreme departure from normal sex ratio ranges. Conversely, a selection criterion, which leaves more mares than stallions, would be expected to result in fewer and smaller bachelor bands, increased reproduction on a proportional basis with the herd,

and larger band sizes. With more stallions involved in breeding it should result in increased genetic exchange and improvement of genetic health within the herd.

Water/Bait Trapping

Bait and/or water trapping generally requires a long window of time for success. Although the trap would be set in a high probability area for capturing excess wild horses residing within the area and at the most effective time periods, time is required for the horses to acclimate to the trap and/or decide to access the water/bait.

Trapping involves setting up portable panels around an existing water source or in an active wild horse area, or around a pre-set water or bait source. The portable panels would be set up to allow wild horses to go freely in and out of the corral until they have adjusted to it. When the wild horses fully adapt to the corral, it is fitted with a gate system. The acclimatization of the horses creates a low stress trap. During this acclimation period the horses would experience some stress due to the panels being setup and perceived access restriction to the water/bait source.

When actively trapping wild horses, the trap would be checked on a daily basis. Horses would be either removed immediately or fed and watered for up to several days prior to transport to a holding facility. Existing roads would be used to access the trap sites.

Gathering of the excess horses utilizing bait/water trapping could occur at any time of the year and would extend until the target number of animals are removed to relieve concentrated use by horses in the area, reach AML, to implement population control measures, and to remove animals residing outside HMA boundaries. Generally, bait/water trapping is most effective when a specific resource is limited, such as water during the summer months. For example, in some areas, a group of wild horses may congregate at a given watering site during the summer because few perennial water resources are available nearby. Under those circumstances, water trapping could be a useful means of reducing the number of horses at a given location, which can also relieve the resource pressure caused by too many horses. As the proposed bait and/or water trapping in this area is a low stress approach to gathering of wild horses, such trapping can continue into the foaling season without harming the mares or foals. Conversely, it has been documented that at times water trapping could be stressful to wild horses due to their reluctance related to approaching new, human structures or intrusions. In these situations, wild horses may avoid watering or may travel greater distances in search of other watering sources.

The wild horses that are gathered would be subject to one or more of several outcomes listed below.

Temporary Holding Facilities During Gathers

Wild horses gathered would be transported from the trap sites to a temporary holding corral near the HMA in goose-neck trailers or straight-deck semi-tractor trailers. At the temporary holding corral, the wild horses will be aged and sorted into different pens based on sex. The horses will be provided ample supply of good quality hay and water. Mares and their un-weaned foals will be kept in pens together. All horses identified for retention in the HMA will be penned separately from those animals identified for removal as excess. All mares identified for release will be treated with fertility control vaccine in accordance with the SOPs for Fertility Control Implementation in Appendix F.

At the temporary holding facility, a veterinarian, when present, will provide recommendations to the BLM regarding care, treatment, and if necessary, euthanasia of the recently captured wild horses. Any

animals affected by a chronic or incurable disease, injury, lameness or serious physical defect (such as severe tooth loss or wear, club foot, and other severe congenital abnormalities) would be humanely euthanized using methods acceptable to the American Veterinary Medical Association (AVMA).

Transport, Short Term Holding, and Adoption Preparation

Wild horses removed from the range as excess would be transported to the receiving short-term holding facility in a goose-neck stock trailer or straight-deck semi-tractor trailers. Trucks and trailers used to haul the wild horses will be inspected prior to use to ensure wild horses can be safely transported. Wild horses will be segregated by age and sex when possible and loaded into separate compartments. Mares and their un-weaned foals may be shipped together depending on age and size of foals. Mare and un-weaned foals are not separated for longer than 12 hours. Transportation of recently captured wild horses is limited to a maximum of 8 hours. During transport, potential impacts to individual horses can include stress, as well as slipping, falling, kicking, biting, or being stepped on by another animal. Unless wild horses are in extremely poor condition, it is rare for an animal to die during transport.

Upon arrival, recently captured wild horses are off-loaded by compartment and placed in holding pens where they are fed good quality hay and water. Most wild horses begin to eat and drink immediately and adjust rapidly to their new situation. At the short-term holding facility, a veterinarian provides recommendations to the BLM regarding care, treatment, and if necessary, euthanasia of the recently captured wild horses. Any animals affected by a chronic or incurable disease, injury, lameness or serious physical defect (such as severe tooth loss or wear, club foot, and other severe congenital abnormalities) that was not diagnosed previously at the temporary holding corrals at the gather site would be humanely euthanized using methods acceptable to the AVMA. Wild horses in very thin condition or animals with injuries are sorted and placed in hospital pens, fed separately and/or treated for their injuries. Recently captured wild horses, generally mares, in very thin condition may have difficulty transitioning to feed. A small percentage of animals can die during this transition; however, some of these animals are in such poor condition that it is unlikely they would have survived if left on the range.

After recently captured wild horses have transitioned to their new environment, they are prepared for adoption or sale. Preparation involves freeze-marking the animals with a unique identification number, vaccination against common diseases, castration, and de-worming. During the preparation process, potential impacts to wild horses are similar to those that can occur during transport. Injury or mortality during the preparation process is low, but can occur.

At short-term corral facilities, a minimum of 700 square feet is provided per animal. Mortality at short-term holding facilities averages approximately 5% (GAO-09-77, page 51), and includes animals euthanized due to a pre-existing condition, animals in extremely poor condition, animals that are injured and would not recover, animals which are unable to transition to feed; and animals which die accidentally during sorting, handling, or preparation.

Adoption

Adoption applicants are required to have at least a 400 square foot corral with panels that are at least six feet tall. Applicants are required to provide adequate shelter, feed, and water. The BLM retains

title to the horse for one year and the horse and facilities are inspected. After one year, the applicant may take title to the horse at which point the horse becomes the property of the applicant. Adoptions are conducted in accordance with 43 CFR § 5750.

Sale with Limitation

Buyers must fill out an application and be pre-approved before they may buy a wild horse. A sale-eligible wild horse is any animal that is more than 10 years old; or has been offered unsuccessfully for adoption at least 3 times. The application also specifies that all buyers are not to sell to slaughter buyers or anyone who would sell the animals to a commercial processing plant. Sale of wild horses is conducted in accordance with the 1971 WFRHBA and congressional limitations.

Long Term Pastures

Since fiscal year 2008, the BLM has removed over 37,400 excess wild horses from the Western States. Most animals not immediately adopted or sold have been transported to long-term grassland pastures in the Midwest.

Potential impacts to wild horses from transport to adoption, sale or long-term grassland pastures (LTP) are similar to those previously described. One difference is that when shipping wild horses for adoption, sale or LTP, animals may be transported for up to a maximum of 24 hours. Immediately prior to transportation, and after every 24 hours of transportation, animals are offloaded and provided a minimum of 8 hours on-the-ground rest. During the rest period, each animal is provided access to unlimited amounts of clean water and two pounds of good quality hay per 100 pounds of body weight with adequate bunk space to allow all animals to eat at one time. The rest period may be waived in situations where the anticipated travel time exceeds the 24-hour limit but the stress of offloading and reloading is likely to be greater than the stress involved in the additional period of uninterrupted travel.

LTPs are designed to provide excess wild horses with humane, and in some cases, life-long care in a natural setting off the public rangelands. There, wild horses are maintained in grassland pastures large enough to allow free-roaming behavior and with the forage, water, and shelter necessary to sustain them in good condition. As of February 2012, about 31,400 wild horses that are in excess of the current adoption or sale demand (because of age or other factors such as economic recession) are currently located on private land pastures in Oklahoma, Kansas, and South Dakota. Establishment of LTPs was subject to a separate NEPA and decision-making process. Located in mid or tall grass prairie regions of the United States, these LTPs are highly productive grasslands compared to the more arid western rangelands. These pastures comprise about 256,000 acres (an average of about 10-11 acres per animal).

Mares and sterilized stallions (geldings) are segregated into separate pastures except at one facility where geldings and mares coexist. Although the animals are placed in LTP, they remain available for adoption or sale to qualified individuals; and foals born to pregnant mares in LTP are gathered and weaned when they reach about 8-12 months of age and are also made available for adoption. The LTP contracts specify the care that wild horses must receive to ensure they remain healthy and well-cared for. Handling by humans is minimized to the extent possible although regular on-the-ground observation by the LTP contractor and periodic counts of the wild horses to ascertain their well-being and safety are conducted by BLM personnel and/or veterinarians. A small percentage of the animals may be humanely euthanized if they are in very poor condition due to age or other factors. Although

horses residing on LTP facilities live longer, on the average, than wild horses residing on public rangelands, natural mortality of wild horses in LTP averages approximately 8% per year, but can be higher or lower depending on the average age of the horses pastured there (GAO-09-77, Page 52).

Euthanasia and Sale Without Limitation

While euthanasia and sale without limitation has been limited by Congressional appropriations, it is allowed under the WFRHBA. Neither option is available for horses under the Department of the Interior's fiscal year 20122017 budgetary appropriations. Although the appropriations restrictions could be lifted in future appropriations bills, it would be contrary to Departmental policy to euthanize or sell without limitations healthy excess wild horses.

Wild Horses Remaining or Released into the HMA following Gather

Under the Proposed Action, the post-gather population of wild horses would be about 75 wild horses, which is the low range of the AML for the Range Creek HMA under this alternative. Reducing population size would also ensure that the remaining wild horses are healthy and vigorous, and not at risk of death or suffering from starvation due to insufficient habitat coupled with the effects of frequent drought (lack of forage and water).

The wild horses that are not captured may be temporarily disturbed and move into another area during the gather operations. With the exception of changes to herd demographics, direct population wide impacts have proven, over the last 20 years, to be temporary in nature with most if not all impacts disappearing within hours to several days of when wild horses are released back into the HMA. No observable effects associated with these impacts would be expected within one month of release, except for a heightened awareness of human presence.

As a result of lower density of wild horses across the HMA following the removal of excess horses, competition for resources would be reduced, allowing wild horses to utilize preferred, quality habitat. Confrontations between stallions would also become less frequent, as would fighting among wild horse bands at water sources. Achieving the AML and improving the overall health and fitness of wild horses could also increase foaling and foaling survival rates over the current conditions.

The primary effects to the wild horse population that would be directly related to this proposed gather would be to herd population dynamics, age structure or sex ratio, and subsequently to the growth rates and population size over time.

The remaining wild horses not captured would maintain their social structure and herd demographics (age and sex ratios). No observable effects to the remaining population associated with the gather impacts would be expected except a heightened shyness toward human contact.

Impacts to the rangeland as a result of the current overpopulation of wild horses would be reduced under the two gather and removal alternatives. Fighting among stud horses would decrease since they would protect their position at water sources less frequently; injuries and death to all age classes of animals would also be expected to be reduced as competition for limited forage and water resources is decreased.

Indirect individual impacts are those impacts which occur to individual wild horses after the initial stress event, and may include spontaneous abortions in mares, and increased social displacement

and conflict in studs. These impacts, like direct individual impacts, are known to occur intermittently during wild horse gather operations. An example of an indirect individual impact would be the brief skirmish which occurs among older studs following sorting and release into the stud pen, which lasts less than two minutes and ends when one stud retreats. Traumatic injuries usually do not result from these conflicts. These injuries typically involve a bite and/or kicking with bruises which don't break the skin. Like direct individual impacts, the frequency of occurrence of these impacts among a population varies with the individual.

Spontaneous abortion events among pregnant mares following capture is also rare, though poor body condition can increase the incidence of such spontaneous abortions. Given the timing of this gather, spontaneous abortion is not considered to be an issue for the proposed gather.

A few foals may be orphaned during gathers. This may occur due to:

- The mare rejects the foal. This occurs most often with young mothers or very young foals;
- The foal and mother become separated during sorting, and cannot be matched;
- The mare dies or must be humanely euthanized during the gather;
- The foal is ill, weak, or needs immediate special care that requires removal from the mother; or
- The mother does not produce enough milk to support the foal.

Often times, foals are gathered that were already orphans on the range (prior to the gather) because the mother rejected it or died. These foals are usually in poor, unthrifty condition. Orphans encountered during gathers are cared for promptly and rarely die or have to be euthanized. Nearly all foals that would be gathered would be over four months of age and some would be ready for weaning from their mothers. In private industry, domestic horses are normally weaned between four and six months of age.

Gathering the wild horses during the fall/winter reduces risk of heat stress, although this can occur during any gather, especially in older or weaker animals. Adherence to the SOPs as well and techniques used by the gather contractor help minimize the risks of heat stress. Heat stress does not occur often, but if it does, death can result.

Through the capture and sorting process, wild horses are examined for health, injury and other defects. Decisions to humanely euthanize animals in field situations would be made in conformance with BLM policy. The BLM Euthanasia Policy (IM-2015-070) is used as a guide to determine if animals meet the criteria and should be euthanized (refer to SOPs Appendix D). Animals that are euthanized for non-gather related reasons include those with old injuries (broken hip, leg) that have caused the animal to suffer from pain or which prevent them from being able to travel or maintain body condition; old animals that have lived a successful life on the range, but now have few teeth remaining, are in poor body condition, or are weak from old age; and wild horses that have congenital (genetic) or serious physical defects such as club foot, or sway back and should not be returned to the range.

MITIGATION MEASURES

None identified.

RESIDUAL IMPACTS

Residual impacts are as disclosed in the analysis above.

SAGE GROUSE

Very few direct negative impacts to greater sage-grouse are expected from the proposed action. The area affected by gather sites and temporary holding facilities would be small, approximately 15 acres. Sites used for water or helicopter traps or for holding areas are typically low value sage-grouse habitat because of proximity to human high use areas, such as roads, stock ponds, and troughs and the resulting degradation of habitat due to compaction, trampling, and vegetation removal. The BLM will coordinate with Utah Division of Wildlife Resources to apply the appropriate seasonal restrictions to avoid disturbances to sage-grouse populations. There is the possibility of sage-grouse broods being disturbed by wild horses during helicopter trapping activities. However, helicopter gather operations are limited to the period of July 1 through 28 February (to avoid the foaling season), and broods would be capable of moving away from the disturbance caused by the operation.

The indirect, and overall, impact of the project would be positive for greater sage-grouse. Wild horses remove more of the plant cover than cattle or sheep, which limits and/or delays vegetative recovery, which can result in reduced vegetative cover for nesting and brooding sage-grouse (BLM/Forest Service 2015). Areas grazed by wild horses have been found to have reduced plant diversity and grass density, and greater abundance of invasive species (BLM/Forest Service 2015). Wild horses can range farther than cattle from water sources, and can therefore impact sage-grouse habitats beyond the reach of cattle, including steep slopes and higher elevations. Lowering the wild horse population would diminish the negative impacts resulting from wild horses and result in improved sage-grouse habitat. Fewer wild horses on the landscape would result in less vegetation removal by horses. Less wild horse pressure on herbaceous vegetation will result in better vegetation vigor to benefit sage-grouse. Improved vegetation condition can provide sage-grouse with important thermal or escape cover, more direct forage, and more habitat for arthropods (important for sage-grouse, especially for chicks) (Beever and Aldridge 2011). Soil compaction, erosion would be lessened and vegetative and biological crust cover would increase. Nesting, brood-rearing, and foraging habitats and insect prey populations would increase (Beever and Herrick 2006).

Furthermore, wild horse removal aids in recovery goals in this area by decreasing grazing pressure on desirable grasses and allow desirable vegetation to better compete against undesirable annual grasses. Decreasing the abundance and presence of undesirable annual grasses will decrease the risk of wildfire, a potential threat to greater sage-grouse in this area. This decrease in fire would also be beneficial to shrub cover, which would be expected to increase.

The CIA for sage-grouse is the Carbon Greater Sage-grouse Population Area. The proposed action would add to the beneficial effects of habitat restoration and rehabilitation projects, while countervailing the negative effects of rights-of-way, mineral development, and other anthropogenic disturbances within the HMA. The proposed action would countervail the reduction in water availability due to drought, although the cumulative effects of drought and wildfire on vegetation could overwhelm any contribution from the proposed action in portions of the HMA..

MITIGATION MEASURES

The Proposed Action incorporates the Comprehensive Animal Welfare Program (CAWP) *(Appendix D*) which has been developed over time. The CAWP was developed as impacts were identified and represent the "best methods" for reducing impacts associated with gathering, handling, transporting and collecting herd data. All other mitigation measures were addressed previously in the proposed action. Additional mitigation measures are not warranted.

RESIDUAL IMPACTS

Residual impacts are as disclosed in the analysis above.

MONITORING AND/OR COMPLIANCE

Monitoring procedures to address specific habitat variables have been established in the Bureau's 4400 and 1734 series handbooks. These monitoring protocols are the accepted Bureau methodologies for collecting habitat based information to determine achievement of habitat based objectives and the standards for rangeland health as developed by the Utah Resource Advisory Council. Specific habitat monitoring procedures and key area selection has already occurred. These methodologies and sites would continue to be used under this Proposed Action. Species monitoring protocols and data collection methods have been established by equine professionals and researchers who initiated the first round of these studies (animal handling techniques). Bureau practices are based on these procedures which are incorporated into both the Proposed Action and alternatives as animal handling techniques. These animal handling techniques would be sufficient to determine the short- and long-term effects of implementing the Proposed Action or alternatives.

ALTERNATIVE 3 – GATHER AND REMOVAL WITHOUT FERTILITY

The following are the impacts expected from the implementation of Alternative 3 to the resources of concern.

LIVESTOCK GRAZING

Direct and Indirect impacts to Livestock under Alternative 3 will similar in nature to those addressed in Alternative 2 (Proposed Action).

MITIGATION MEASURES

Same as the Proposed Action.

RESIDUAL IMPACTS

Residual impacts are as disclosed in the analysis above.

VEGETATION

Impacts of the gather and removal would be similar to Alternative 2; however, wild horse populations may increase at a faster rate and exceed the high end AML sooner. Increasing competition between livestock and wild horses sooner.

MITIGATION MEASURES

Same as the Proposed Action.

RESIDUAL IMPACTS

Residual impacts are as disclosed in the analysis above.

WILD HORSES

Direct and Indirect impacts to Wild Horses under Alternative 3 will similar in nature to those addressed in Alternative 2 (Proposed Action). Fertility control would not be utilized, and the sex ratio would be maintained at approximately 50/50 male to female. Due to both of these agents not being utilized it is believed that the herd will grow at a faster rate than the proposed action which would lead to an increased gather schedule over the proposed action to maintain AML

MITIGATION MEASURES

Same as the Proposed Action.

RESIDUAL IMPACTS

Residual impacts are as disclosed in the analysis above.

Direct and Indirect impacts to Greater Sage-Grouse under Alternative 3 will be similar in nature to those addressed in Alternative 2 (Proposed Action).

MITIGATION MEASURES

Same as the Proposed Action.

RESIDUAL IMPACTS

Residual impacts are as disclosed in the analysis above.

MONITORING AND/OR COMPLIANCE

Same as the Proposed Action.

CUMULATIVE IMPACTS

"Cumulative impacts" are those impacts resulting from the incremental impact of an action when added to other past, present, or reasonably foreseeable actions regardless of what agency or person undertakes such other actions.

Cumulative impacts are impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively sizeable actions taking place over a period of time.

Past, present and reasonably foreseeable activities which would be expected to contribute to the cumulative impacts of implementing the Proposed Action include: Past wild horse selective removal gather which may have altered the structure and composition of the Range Creek HMA, continuing livestock grazing in the grazing allotment, continuing wildlife grazing, continuing wildlife management (adjustment of population numbers), and continued development of (oil and gas/recreational) infrastructure. These past, present and reasonably foreseeable activities would be expected to generate cumulative impacts to the Proposed Action by influencing the habitat quality abundance and continuity for the Range Creek HMA wild horses.

The past events in these areas have created the current wild horse population with its associated structure and composition, and have shaped the patterns of use found today in the herd. Continued development of these parameters would be expected to result in small annual changes in herd structure and behavior with small changes in habitat use over time. These impacts would be expected to be marked by relatively large changes occurring rather slowly over time. The Price Field Office would continue to identify these impacts as they occur, and mitigate them as needed on a project specific basis to maintain habitat quality. At the same time, the horses in this HMA would be expected to continue to adapt to these small changes to availability and distribution of critical habitat components (food, water, shelter, space). The Proposed Action would contribute to the cumulative impacts of these past and foreseeable future actions by maintaining the herd at AML, and establishing a process whereby biological and/or genetic issues associated with herd or habitat fragmentation would become apparent sooner and mitigating measures implemented quicker.

The cumulative effects associated with the capture and removal of excess wild horses include gather-related mortality of less than 1% of the captured animals, about 5% per year associated with transportation, short term holding, adoption or sale with limitations and about 8% per year associated with long-term holding. These rates are comparable to natural mortality on the range ranging from about 5-8% per year for foals (animals under age 1), about 5% per year for horses ages 1-15, and 5-100% for animals age 16 and older (Garrott and Taylor, 1990). In situations where forage and/or water are limited, mortality rates in the wild increase, with the greatest impact to young foals, nursing mares and older horses. Animals can experience lameness associated with trailing to/from water and forage, foals may be orphaned (left behind) if they cannot keep up with their mare, or animals may become too weak to travel. After suffering, often for an extended period, the animals may die. Before these conditions arise, the BLM generally removes the excess animals to prevent their suffering from dehydration or starvation.

While humane euthanasia and sale without limitation of healthy horses for which there is no adoption demand is authorized under the WFRHBA, Congress prohibited the use of appropriated funds between 1987 and 2004 and again in 2010 to present for this purpose. If Congress were to lift the current appropriations restrictions, then it is possible that excess horses removed from the HMA over the next 10 years could potentially be euthanized or sold without limitation consistent with the provisions of the WFRHBA.

The other cumulative effects which would be expected when incrementally adding either of the Action Alternatives to the cumulative study area would include continued improvement of upland and riparian vegetation conditions, which would in turn benefit permitted livestock, native wildlife, and wild horse population as forage (habitat) quality and quantity is improved over the current level. Benefits from a reduced wild horse population would include fewer animals competing for limited

forage and water resources. Cumulatively, there should be more stable wild horse populations, healthier rangelands, healthier wild horses, and fewer multiple use conflicts in the area over the short and long-term. Over the next 15-20 years, continuing to manage wild horses within the established AML range would achieve a thriving natural ecological balance and multiple use relationship on public lands in the area.

5.0 CONSULTATION AND COORDINATION

INTRODUCTION

The issue identification section of Chapter 1 identifies those issues analyzed in detail in Chapter 4. Appendix A provides the rationale for issues that were considered but not analyzed further. The issues were identified through the public and agency involvement process described in below.

PERSONS, GROUPS, AND AGENCIES CONSULTED

Table 5-1 lists the persons, groups, and agencies that were coordinated with or consulted during the preparation of this project. The table also summarizes the conclusions of those processes.

TABLE 5-1: COORDINATION AND CONSULTATION

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
Utah State Historic Preservation Office	National Historic Preservation Action Section 106	Consultation is ongoing.
U.S. Fish and Wildlife Service	Endangered Species Act Section 7	Consultation is ongoing.
Native American Tribes interested in projects within the Price Field Office: Northwestern Band of Shoshoni Nation, Paiute Indian Tribe of Utah, Navajo Nation, Ute Indian Tribe, Hopi Tribe, Southern Ute Tribe, Ute Mountain Ute Tribe, Pueblo of Zuni, Pueblo of Jemez, Shoshone Bannock Tribes, Eastern Shoshone Tribe	Consultation for undertaking, as required by the *Native American Graves Protection and Repatriation Act, the American Indian Religious Freedom Act,* and various executive orders (e.g., Executive Order 13007)	Identified tribes were notified by letter dated April 27, 2018 to describe the proposed action and find out if the tribes have any issues concerning the proposed action. The Southern Ute Indian Tribe responded on June 4, 2018 requesting to be included as a consulting party. None of the other tribes have responded identifying any concerns. Lack of response is interpreted by BLM to indicate that the tribes have no concerns relative to the proposed action
State of Utah, State and Institutional Trust Lands Administration, Renewable Resource Specialist	Consult with SITLA as the agency in control of state lands within the project area	Notification of availability was sent out prior to the Draft EA's release.
Carbon County Commissioners	Consult with County	Notification of availability was sent out prior to the Draft EA's release.
Utah Div. of Wildlife Resources	Consult with UDWR as the agency with expertise on impacts on game species	Data and analysis regarding big game species incorporated into Chapters 3 and 4.
Deniz Bolbol, American Wild Horse Preservation Campaign / Wild Horse Defenders	Consult with identified Interested Publics	Notification of availability was sent out prior to the Draft EA's release.
Neda Demayo, Return to Freedom	Consult with identified Interested Publics	Notification of availability was sent out prior to the Draft EA's release.
Mathew Dillon, Pryor Mountain Wild Mustang Center	Consult with identified Interested Publics	Notification of availability was sent out prior to the Draft EA's release.
Kathy Greg	Consult with identified Interested Publics	Notification of availability was sent out prior to the Draft EA's release.

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
D.J. Schubert, Animal Welfare Institute	Consult with identified Interested Publics	Notification of availability was sent out prior to the Draft EA's release.
Ginger Kathrens, Cloud Foundation	Consult with identified Interested Publics	Notification of availability was sent out prior to the Draft EA's release.
Courtney McVean, Friends of Animals	Consult with identified Interested Publics	Notification of availability was sent out prior to the Draft EA's release.
Val Cecama-Hogsett, Citizens Against Equine Slaughter	Consult with identified Interested Publics	Notification of availability was sent out prior to the Draft EA's release.
Blaire Eastman, Grazing Permittee	Consult with identified Interested Publics	Notification of availability was sent out prior to the Draft EA's release.
John Harja, State of Utah, Governors Office	Consult with State of Utah	Notification of availability was sent out prior to the Draft EA's release.
Nathan Roberts, Utah Grazing Improvement Program	Consult with identified Interested Publics	Notification of availability was sent out prior to the Draft EA's release.
Hunt Consolidated	Consult with adjacent land owners.	Notification of availability was sent out prior to the Draft EA's release.

SUMMARY OF PUBLIC PARTICIPATION

Public involvement was initiated on this Proposed Action on January 5, 2018 by posting on the ePlanning web page and in the public rooms in the Price Field Office and Utah State BLM Office. The Notice described the Proposed Action and solicited public input.

The Utah State Office initiated public involvement at a public hearing about the use of helicopters and motorized vehicles to capture and transport wild horses (or burros) on December 11, 2018 at the BLM's Vernal Field Office in Vernal, Utah. This specific gather was not addressed at that public meeting, though other gathers that are planned within the state of Utah over the next 12 months were. This meeting was advertised in papers and radio stations statewide. During this meeting, the public is given the opportunity to present new information and to voice any concerns regarding the use of these methods to capture wild horses. This process has been in place for over 20 years, and relevant issues associated with these methods have been addressed in the CAWP *(Appendix D*).

Other public meetings have been held and public comment has been solicited on multiple occasions during the formulation of other documents related to the management of wild horses. This input has been carefully considered and has guided the development of this Proposed Action and alternatives. The following concerns were identified in these past meetings.

The capture methodologies currently employed, and proposed for continuation under the Proposed Action and alternatives, have been reviewed in detail. Comments pertaining to this aspect of wild horse management have included concerns over the rate at which horses are herded to the trap site, the timing of the gather, the methods for transporting animals, and the numbers of horses which are captured using various types of capture. BLM developed policy and practices which addressed each of these concerns. These policies/practices have become standard procedure.

A Draft Environmental Assessment (EA) for the Range Creek Wild Horse Gather DOI-BLM-UTG020-2017-0032-EA was made available to the public at the Price Field Office and on-line at https://www.blm.gov/programs/wild-horse-and-burro/herd-management/gathers-and-

removals/utah or on the e-Planning web page at: http://bit.ly/RangeCreekEA; for a 30-day review/comment period beginning on July 12, 2019 and Ending August 12, 2019 (Appendix B)

Comments received during the 30-day public comment period are addressed in Appendix L.

LIST OF PREPARERS

The specialists listed in the following table(s) assisted in the preparation of this EA.

TABLE 5-2 BLM PREPARERS

Name	Title	Responsible for the Following Section(s) of this Document
Mike Tweddell	Natural Resource Specialist: RMS/WH&B	Project Lead and provided information on plan conformance, Environmental Justice, Livestock Grazing, Rangeland Health, Socio-Economic, Vegetation, and Wild Horse Issues.
Jacob Palma Daniel Koffman	NEPA Coordinator	Reviewed this document for the format and National Environmental Policy Act (NEPA) Conformance.

TABLE 5-3 OTHER PREPARERS

Name	Title	Responsible for the Following Section(s) of this Document
Stephanie Bauer	Range Management Specialist, (PFO).	Contributed information pertaining to Invasive Species/Noxious Weeds, Woodland/Forestry
Nicole Lohman William Brant	Archaeologist, (PFO).	Contributed information pertaining to Cultural and Native American Religious Concerns
Ben Kraja	Recreation Planner, (PFO).	Contributed information on ACEC, BLM Natural Areas, Recreation, Wild and Scenic Rivers, and Areas with Wilderness Character.
Dana Truman	Wildlife Biologist (PFO)	Contributed information pertaining to BLM Sensitive Animal Species, BLM Sensitive Plant Species, Fish and Wildlife, Migratory Birds, Threatened and Endangered Plants, Threatened and Endangered Animals.
Jeffery Brower	Hydrologist (PFO)	Contributed information on Air Quality, Greenhouse Gas Emissions, Farmlands,

Name	Title	Responsible for the Following Section(s) of this Document
		Floodplains, Hydrologic Conditions, Soils, Wastes (hazardous of solid), and Water Quality.
Karl Ivory	Range Management Specialist, (PFO)	Contributed information on Wetlands/Riparian Zones.
Dan Dull	Recreation Planner (PFO)	Contributed information on Wilderness/WSA
Mike Glasson	Natural Resource Specialist (PFO)	Contributed information on Geology/ Mineral Resources
Michael Knight	GIS Specialist (PFO)	Contributed information on Visual Resources.
Mike Leschin	Paleontologist (PFO)	Contributed information on Paleontological resources
Stuart Bedke	Fuels Coordinator (PFO)	Contributed information on Fuels / Fire Management
Connie Leschin	Realty Specialist (PFO)	Contributed information on Lands / Access
V. Gus Warr	Wild Horse and Burro Specialist, Utah State Office (USO)	Consult with USO for program conformance and coordination within State and with Washington
Paul Griffin	Wild Horse and Burro Specialist, Washington Office, (WO)	Contributed information on fertility control.

6.0 REFERENCES, GLOSSARY AND ACRONYMS

INTRODUCTION

The following sections list the references cited within this document, the terms used and their definitions, and the acronyms used and their meanings.

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GLOSSARY OF TERMS

ALLOTMENT: An area of land where one or more individuals graze their livestock.

ANIMAL UNIT MONTH: The amount of dry forage required by one animal unit for one month based on a forage allowance of 26 pounds per day.

AUTHORIZED OFFICER: The decision maker who has the delegated authority to for that decision.

BEST MANAGEMENT PRACTICES: A suite of techniques that guide, or may be applied to, management actions to aid in achieving desired outcomes.

CONDITIONS OF APPROVAL: Conditions or requirements under which a decision is made.

ENVIRONMENTAL ASSESSMENT: A concise public document that analyzes the environmental impacts of a proposed action and provides sufficient evidence to determine the level of significance of the impacts.

ENVIRONMENTAL IMPACT STATEMENT: A detailed written statement of environmental effects of a major federal action significantly affecting the quality of the human environment.

FORAGE: Vegetation eaten by animals, especially grazing and browsing animals.

FRAGMENTATION (HABITAT): The break-up of a large land area (such as a forest) into smaller patches isolated by areas converted to a different land type.

IMPACT: A modification of the existing environment caused by an action (such as construction or operation of facilities).

INTERDISCIPLINARY TEAM: Representatives of various disciplines designated as members of a team which was created to prepare an environmental document.

INVASIVE PLANTS: Plants that are not part of (if exotic), or are a minor component of (if native), the original plant community or communities that have the potential to become a dominant or co-

dominant species on the site if their future establishment and growth is not actively controlled by management interventions.

MINIMIZE: To reduce the adverse impact of an operation to the lowest practical level.

MITIGATION: Steps taken to: 1) avoid an impact; 2) minimize an impact; 3) rectify an impact; 4) reduce or eliminate an impact over time; or, 5) compensate for an impact.

MONITORING: The process of collecting and assessing data/information necessary to evaluate the effectiveness of a decision or its conditions of approval.

MULTIPLE USE: The management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people.

NO ACTION ALTERNATIVE: The most likely condition to exist in the future if current management direction were to continue unchanged.

NOXIOUS WEEDS: A plant species designated by Federal of State law as generally possessing one or more of the following characteristics: aggressive and difficult to manage; parasitic; a carrier or host of serious insects or disease; or nonnative, new, or not common to the United States.

PERMIT: A revocable authorization to use public land for a specified purpose for a specified period of time.

PROJECT AREA: The area of land potentially affected by a proposed project.

PROPER FUNCTIONING CONDITION: A measurement that indicates an area's ability to produce desired natural resources in a sustained way.

RANGELAND HEALTH: The degree to which the integrity of the soil, the vegetation, the water, and air as well as the ecological processes of the rangeland ecosystem is balanced and sustained.

SCOPING: The process of identifying the issues, management concerns, preliminary alternatives, and other components of an environmental document.

SIGNIFICANCE: A determination of the degree or magnitude of importance of an effect, whether beneficial or adverse.

UTILIZATION: The proportion or degree of current year's forage production that is consumed or destroyed by animals (including insects).

LIST OF ACRONYMS

The below table contains a list of acronyms and their meanings that are frequently used by the BLM and which may have been used in the writing of this document.

TABLE 6-1: ACRONYMS

Acronym	Meaning
AAEP	American Association of Equine Practitioners
AHPA	American Horse Protection Association
AO	Authorized Officer
AML	Appropriate Management Level
AMP	Allotment Management Plan
APE	Area of Potential Effect
ARMPA	Approved Resource Management Plan Amendment
AUM	Animal Unit Month
AVMA	American Veterinary Medical Association
BLM	Bureau of Land Management
BMP	Best Management Practice
CFR	Code of Federal Regulations
CIAA	Cumulative Impact Analysis Area
CO2	Carbon Dioxide
COR	Contracting Officer Representative
DR	Decision Record
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act
FO	Field Office
FONSI	Finding of No Significant Impact
GAO	Government Accountability Office
GIS	Geographic Information System
GnRH	Gonadotropin-Releasing Hormone
GPS	Global Positioning System
GRSG	Greater Sage Grouse
HMA	Herd Management Area
HMAP	Herd Management Area Plan
HSUS	Humane Society of the United States

Acronym	Meaning
IC	Incident Commander
IDT	Interdisciplinary Team
IM	Instruction Memorandum
IUD	Intrauterine Device
MFP	Management Framework Plan
MSO	Mexican Spotted Owl
NAAQS	National and Utah Ambient Air Quality Standards
NAS	National Academy of Sciences
NEPA	National Environmental Policy Act
NI	Not Impacted
NP	Not Present
NRC	National Research Council
NRHP	National Register of Historic Places
OHV	Off-highway Vehicle
OIG	Office of the Inspector General
ORC	Off Range Corrals
ORP	Off-Range Pastures
PFO	Price Field Office
PHMA	Priority Habitat Management Area
PRIA	Public Rangeland Improvement Act
PRMFP	Price River Management Framework Plan
PRMP	Price Field Office Resource Management Plan
PZP	Porcine Zona Pellucida
RFD	Reasonable Foreseeable Development
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-way
RVMHMP	Range Valley Mountain Habitat Management Plan
SCC	Science and Conservation Center
SHPO	State Historic Preservation Office
SITLA	School and Institutional Trust Lands Administration
UDWR	Utah Division of Wildlife Resources
USDI	U.S. Department of the Interior

Acronym	Meaning
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VHF	Very High Frequency
VRM	Visual Resource Management
WFRHBA	Wild Free Roaming Horses and Burros Act
WH&B	National Wild Horse and Burro Program
WO	Washington Office
WSA	Wilderness Study Area
YBC	Yellow Billed Cuckoo

APPENDICIES

APPENDIX A: INTERDISCIPLINARY TEAM CHECKLIST

INTERDISCIPLINARY TEAM CHECKLIST

RESOURCES AND ISSUES CONSIDERED (INCLUDES SUPPLEMENTAL AUTHORITIES APPENDIX 1 H-1790-1)

Project Title: Range Creek Wild Horse Gather

NEPA Log Number: DOI-BLM-UTG020-2018-0024-EA

File/Serial Number: 4720 (UT-641)

Project Leader: Mike Tweddell

DETERMINATION OF STAFF: *(Choose one of the following abbreviated options for the left column)*

NP = not present in the area impacted by the proposed or alternative actions

NI = present, but not affected to a degree that detailed analysis is required

PI = present with potential for relevant impact that need to be analyzed in detail in the EA

NC = (DNAs only) actions and impacts not changed from those disclosed in the existing NEPA documents cited in Section D of the DNA form. The Rationale column may include NI and NP discussions.

IDT CHECKLIST: TABLE A-1

Determination	Resource/Issue	Rationale for Determination	Signature	Date
NI	Air Quality & Greenhouse Gas Emissions	Overall, air quality in the project area is considered to be in attainment of the NAAQS. There are no regulatory monitoring data for the project area. Dust emissions currently occur from vehicles utilizing the subject roads. It is anticipated that the incremental change from this project's alternatives would be so small as to be undetectable by both models and monitors. No standards have been set by the EPA or other regulatory agencies for greenhouse gases. In addition, the assessment of greenhouse gas emissions and climate change is still in its earliest stages of formulation. Global scientific models are inconsistent, and regional or local scientific models are lacking so that it is not technically feasible to determine the net impacts to climate due to greenhouse gas emissions. It is anticipated that greenhouse gas emissions associated with this action and its alternative(s) would be undetectable by both models and monitors	Peter Kauss	2/21/2018

Determination	Resource/Issue	Rationale for Determination	Signature	Date
NP	BLM natural areas	There are no BLM Natural Areas within the proposed project area as per GIS and RMP review	Ben Kraja	2/13/18
NI	Cultural: Archaeological Resources	Pursuant to 36 CFR 800.4(a) and the Programmatic Agreement between the Advisory Council on Historic Preservation, the Bureau of Land Management – Utah, the Utah State Historic Preservation Office, and School and Institutional Trust Lands Administration Regarding National Historic Preservation Act Responsibilities for Small-Scale Undertakings, consultation with the Utah State Historic Preservation Office (SHPO) and the Native American groups requesting to be consulting parties was conducted on June 24, 2019. A Class III survey will be conducted of utilized trap sites, corrals, and/or proposed development features. The utilized features will be identified on-site during the undertaking and the Class III survey will be conducted by a qualified professional archaeologist. The holding facility used in Nine Mile Canyon is the historic Nutter Corral, determined eligible for the National Register of Historic Places. SHPO consultation was conducted on June 24, 2019. Concurrence was received June 26, 2019.	Nicole Lohman William Brant	12/12/17 2/12/18 6/25/19
NI	Cultural: Native American Religious Concerns	Range Creek includes a high number of cultural resources of significance to modern-day descendant Native American Communities. Pursuant to 36 CFR 800.2(c)(2) and BLM Manual 1780, consultation letters were sent to 14 Tribes on April 27, 2018. The Southern Ute Indian Tribe responded on June 4, 2018 requesting to be included as a consulting party.	Nicole Lohman William Brant	12/12/17 2/12/18 6/25/19
NP	Designated Areas: National Historic Trails	After review of the current RMP and GIS There are no National Historic Trails within the proposed project area.	Ben Kraja	2/13/18
NP	Designated Areas: Areas of Critical Environmental Concern	After review of the current RMP and GIS There are no BLM Areas of Critical Environmental Concern within the proposed project area.	Ben Kraja	2/13/18
NP	Designated Areas: Wild and Scenic Rivers	There are no Wild and Scenic Rivers within the project area as per review of RMP/GIS maps.	Ben Kraja	1/29/18
NP	Designated Areas: Wilderness Study Areas	There are no Wilderness/WSAs within the project area as per review of RMP/GIS maps.	Ben Kraja	2/13/18

Determination	Resource/Issue	Rationale for Determination	Signature	Date
NP	Environmental Justice	No minority or economically disadvantaged communities or populations are within the project area that could be disproportionately adversely affected by the proposed action or alternatives.	Jake Palma Mike Tweddell	2/20/18 6/26/19
NP	Farmlands (prime/unique)	According to the NRCS soil survey and knowledge of the project area, there are no prime or unique farmlands present within the project area.	Stephanie Bauer	2/9/18
NI	Fuels/Fire Management	The proposed project would not conflict with fire management activities. Fire is not affected by activities associated with wild horse gathering.	Stuart Bedke	20 JUNE 2019
NI	Geology / Minerals / Energy Production	There are no conflicts with Geologic Resources. Although the Range Creek vicinity has historically and is currently used for Oil and gas leasing and production, the horse gather will have no impact on existing leases or any future leasing. There are no other fluid or solid mineral leases, sales or mining law projects in this area.	Mike Glasson	01/26/18
NI	Invasive Plants / Noxious Weeds	Surface disturbing activities have the potential to introduce/spread invasive species/noxious weeds. Russian thistle, cheatgrass and halogeton are invasive species that are within the project area along two track roads and fencelines. Noxious weeds present within the project area include musk thistle, houndstongue and Canada thistle. Trap areas are in disturbed locations and are treated with herbicide when needed. Vehicles and equipment will be power washed prior to entering BLM administered lands. Livestock will be fed certified weed free hay a minimum of 72 hours prior to entering BLM administered lands. By employing these BMP methods, the introduction/spread of invasive species/noxious weeds would be greatly reduced. Therefore, negligible impacts to invasive species/noxious weeds is expected.	Stephanie Bauer	2/9/18
NI	Lands/Access	A review of LR2000 and the Master Title Plats showed that the proposed action is compatible with the existing land use and authorized right-of-ways.	Connie Leschin	12/11/17
NI	Lands with Wilderness Characteristics	A review of the RMP and GIS layers conclude that the Airstrip Trap is located within the Cold Spring Draw West LWC unit, the Cottonwood Camp trap is located within the Cottonwood Ridge LWC unit, the Cedar Trap is located within the Desolation Canyon LWC unit. In general, the nature of the management strategies proposed to	Ben Kraja	2/13/18

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		control population(s) would not impact the LWC units. The actions would be short term and temporary, with no long-term or permanent changes to the landscape. Further analysis is not necessary.		
PI	Livestock Grazing & Rangeland Health Standards	Reduced competition between wild horses and livestock would benefit both the remaining wild horses and livestock that utilize the range within the Muddy Creek HMA. The proposed action has been evaluated in light of Utah BLMs Standards for Rangeland Health and the Guidelines for Grazing Management. A Rangeland Health assessment has not been conducted on the HMA since 1999. The management on the HMA was found to be and continues to be consistent with achieving and adhering to the Standards and Guidelines.	Mike Tweddell	12/19/17
NI	Paleontology	There are no surface disturbing activities associated with this proposal and therefore not risk of damage to paleontological resources.	Michael Leschin	1/29/18
NI	Plants: BLM Sensitive	No UT BLM Sensitive plant species have been previously identified in the Project Area. The Middle and Upper Members of the Green River Formation, which constitute suitable habitat for Green River shale endemic plant species, several of which are UT BLM Sensitive, such as Graham's cryptanth (*Cryptantha grahamii*) are present in the Project Area, per Utah geologic data review. However, the Project Area is located outside the known range of these species (nearest documented populations approximately 3.2 miles from Project Area, per BLM GIS data review), these species have not been previously identified in the Project Area (per BLM GIS data review), and the Project Area is separated from known populations by Nine Mile Canyon which creates a geographic barrier. In addition, project activities would be mainly confined to previously established areas; therefore, it is unlikely that these species or their habitat would be impacted by the Proposed Action.	Christine Cimiluca	2/12/18
NI	Plants: Threatened, Endangered, Proposed, or Candidate	The Project Area slightly intersects the 2016 USFWS potential habitat polygon for Uinta Basin hookless cactus (*Sclerocactus wetlandicus*), and the nearest documented populations of this species are located approximately 3.4 miles from the Project Area. However, suitable habitat for this species is not present in the Project Area,	Christine Cimiluca	2/12/18

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		and all trap locations are located several miles from the potential habitat polygon, with the nearest located approximately 3 miles away. These known populations are also separated from the Project Area by Nine Mile Canyon which creates a geographic barrier. As project activities are proposed primarily within these previously established areas, it is unlikely that the species will be impacted by the Proposed Action. The Middle and Upper Members of the Green River Formation, which constitute suitable habitat for proposed listed plant species Graham's beardtongue (*Penstemon grahamii*) are present in the Project Area, per Utah geologic data review. However, the Project Area is located outside the known range of this species (nearest documented populations approximately 2.5 miles from Project Area, per BLM GIS data review), this species has not been previously identified in the Project Area (per BLM GIS data review), and the Project Area is separated from known populations by Nine Mile Canyon which creates a geographic barrier. In addition, project activities would be mainly confined to previously established areas; therefore, it is unlikely that this species or its habitat would be impacted by the Proposed Action. Suitable habitat for additional threatened, endangered, candidate, or proposed plant species is not present in the Project Area, per BLM GIS data review.		
NI	Recreation	The proposed action is in an area (Extensive Recreation Management Area) where recreation opportunities and problems are limited and explicit recreation management is not required. Implementation of the proposed project will have minimal impact on recreation.	Ben Kraja	2/13/18
NI	Socio-Economics	No impact to the social or economic status of the county or nearby communities would occur from this project due to its small size in relation to ongoing development throughout the PFO.	Jake Palma	2/20/18
NI	Soils: Physical / Biological	Multiple capture sites will lower the concentrated impact to localized soil degradation to a negligible level.	Peter Kauss	2/21/2018
PI	Vegetation	Wild Horses can impact vegetative communities by over utilizing vegetative species and trampling plants.	Mike Tweddell	12/19/17
NI	Visual Resources	The Range Creek Herd Management Area is within lands designated as VRM I	Myron Jeffs	12/14/17

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		and II. The management objectives for these classes require preservation or retention of the existing character of the landscape, where any changes to the landscape should be very low and not attract attention. In general, the nature of the management strategies proposed to control population would not impact visual resources. The actions would be short term and temporary, with no long-term or permanent changes to the landscape. Further analysis is not necessary.		
NI	Wastes (hazardous/solid)	No chemicals subject to reporting under SARA Title III will be used, produced, stored, transported, or disposed of annually in association with the project. Furthermore, no extremely hazardous substances, as defined in 40 CFR 355, in threshold planning quantities, will be used, produced, stored, transported, or disposed of in association with the project.	Jake Palma	2/20/18
NI	Water: Groundwater Quality	Spatial review of the proposed Range Creek Wild Horse Gather indicates that surface activities will involve a minor amount of disturbance and interaction with groundwater is not anticipated.	Peter Kauss	2/21/2018
NI	Water: Hydrologic Conditions (stormwater)	Wild horses have the potential to compact soils along trails and areas where animals group-up, especially around ponds or water sources. It is not expected that wild horses would noticeably alter surface water flow patterns and alter the current hydrologic conditions to a degree that would require detailed analysis at this time during round up.	Peter Kauss	2/21/2018
NP	Water: Municipal Watershed / Drinking Water Source Protection	GIS review indicate no drinking water source areas or beneficial uses of watersheds from UDEQ-DWQ.	Peter Kauss	2/21/2018
NI	Water: Steams, Riparian Wetlands, Floodplains	Management actions common to all alternatives for gather and removal include design features to minimize impacts to these resources therefore detailed analysis is not required.	Jerrad Goodell	03/26/2018
NI	Water: Surface Water Quality	The total area of ground disturbance is small and temporary therefore there will be negligible impacts to surface water quality. Therefore no further detailed analysis is required.	Peter Kauss	2/21/2018
NP	Water: Water Rights	The proposed project would not affect any water rights or the ability to use any water rights. Therefore detailed analysis is not required.	Peter Kauss	2/21/2018
NP	Water: Waters of the U.S.	GIS review indicate no navigable waters or waters of the U.S. are within the project area.	Peter Kauss	2/21/2018

Determination	Resource/Issue	Rationale for Determination	Signature	Date
PI	Wild Horses and Burros	Gather/ removal operations would modify the population as a whole as well as affect individual animals during the gather.	Mike Tweddell	12/19/17
NI	Wildlife: Migratory Birds (including raptors)	There are no mapped important migratory bird habitat areas in the project area. However, migratory birds may still be present within the project area. Raptors – There are known golden eagle nests within the project area. Helicopter use near the nest during the nesting period may cause stress, harassment, nest abandonment and potential chick mortality. The design feature of avoiding gather activities until after June 30 and avoiding known nest locations would effectively avoid the critical nesting season and would alleviate any potential impacts to raptors.	Dana Truman	02/20/18
NI	Wildlife: Fish (designated or non-designated)	No effect - There would be no surface water depletion that would affect federally listed fish species that occur downstream. All proposed activities occur in the uplands with no expected off site impacts to watershed,	Dana Truman	1/29/18
NI	Wildlife: Non-USFWS Designated	Gather activities are restricted to After June 30 due to the moratorium of gathering during foaling and to before November due to snow depth with in the project area. This timing restriction avoids impacts to the wildlife that use the area. Blue Grouse – Yearlong crucial – avoids the critical nesting season and no ground disturbance is associated with the project. rocky mountain elk and mule deer – The entire project area is within crucial winter range. Any gather activities would not occur during the winter season, thus, there are no effects. Bighorn Sheep – Substantial year round. Adjacent to but outside of the project area, thus, there are no effects	Dana Truman	2/221/18
PI	Wildlife: BLM Sensitive	Sage Grouse: The gather activities would take place within Utah Priority and Utah General Habitat. One trap location is within one mile from a known lek. Two trap locations are within Utah Priority Habitat, and two trap locations and the two camp locations are within Utah General Habitat according to the designated layers in the ARMPA 2015	Dana Truman And Leah Lewis	02/20/18

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		Others - Several BLM sensitive species including the Bald Eagle have potential to occur within the project area. Based on the nature of the action - A temporary disturbance outside of breading season and crucial winter timing, and no noticeable increase in traffic or human presence there would be no impacts to the BLM sensitive species.		
NI	Wildlife: Threatened, Endangered, Proposed or Candidate	Gather activities are restricted to after June 30 due to the moratorium of gathering during foaling and to before November due to snow depth with in the project area. This timing restrict avoids impacts to the wildlife that use the area. Mexican Spotted Owl (MSO)- The three trap locations (Bishop, Airstrip, and Flat iron) and the two Camps are within the one mile of modeled habitat according to Willey and Spotskey 2000 and greater than three miles away from modeled habitat according to the Lewis 2014 model. MSO designated critical habitat is over four miles from the Airstrip and Flat Iron Trap locations and approximately one mile from the Bishop trap. Based on the nature of the action - A temporary disturbance, increase in helicopter use but no flights over designated critical habitat, no noticeable increase in traffic or human presence, and the distance from critical habitat and modeled habitat there would be no effect to the MSO as a result of the proposed action. Yellow Billed Cuckoo (YBC) – No designated critical habitat within the project area, and no likely occurrence due to the elevation of the proposed action.	Dana Truman	2/20/18
NP	Woodlands/Forestry	There are no merchantable woodland/forestry products within the project area.	Stephanie Bauer	2/9/18

FINAL REVIEW: TABLE A-2

Reviewer Title	Signature	Date	Comments	
Environmental Coordinator				
Authorized Officer				

APPENDIX B: NEWS RELEASE

Will be included in Final

APPENDIX C: 2017 INVENTORY STATISTICAL ANALYSIS

M E M O R A N D U M

To: Mike Tweddell, Paul Griffin (BLM), Stefan Ekernas (USGS)

CC: Dusty Carpenter, Gus Warr, Alan Shepherd, Dean Bolstad (BLM)

From: Bruce Lubow, IIF Data Solutions

Date: 23 August 2017

RE: Statistical analysis for 2017 survey of horse abundance in Range Creek and Muddy Creek HMAs (UT).

SUMMARY TABLE

Survey areas and Dates:	18 April 2017 – Muddy Creek HMA, UT (UT0651) 19 April 2017 – Range Creek HMA, UT (UT0641)
Type of Survey	Simultaneous Double-observer
Aviation Company	Jairus Duncan, El Aero (Elko, NV); Bell B III, N555PP
Agency Personnel	Mike Tweddell, Dusty Carpenter, Jason Carlile (BLM)

TABLE 1. Estimated abundance values (Estimate) are for the numbers of horses in the surveyed areas at the time of survey. 90% confidence intervals are shown in terms of the lower limit (LCL) and upper limit (UCL). The coefficient of variation (CV) is a measure of precision; it is the standard error as a percentage of the estimated abundance. Number of horses seen (No. Seen) leads to the estimated percentage of horses that were present in the surveyed area, but that were not recorded by any observer (% Missed).

Area	**Age Class**	**Estimate (No. Horses)**	LCL[a]	UCL	Std Err	CV	No. Horses Seen	% Missed	Estimated # of Groups	Estimated Group Size	Foals per 100 Adults
Muddy Creek HMA	Total	183 13	173 12	198 15	9.2 0.4	5.0% 3.2%	178	2.7%	31	5.8	7.7
	Foals	170	161		9.1						
	Adults			185		5.4%					
Range Creek HMA	Total	275	265	292	8.9	3.2%	267	2.8%	60	4.6	5.2
	Foals	13	12	16	0.9	7.0%					
	Adults	261	252	278	8.5	3.2%					

a 90% confidence interval based on percentiles of bootstrap simulation results. The lower 90% confidence interval limit (LCL) i s actually less than the number of horses sighted during the survey for these estimates. This is a normal statistical result and reflects the fact that a confidence interval expresses what would likely happen if the survey were repeated. If repeated many times, some surveys would miss more horses and produce lower estimates, even after corrections, than were actually observed during this survey. Clearly, I conclude that there are at least as many horses as were observed during this survey, rather than using the lower confidence limit as a minimum number.

NARRATIVE

In April 2017 Bureau of Land Management (BLM) personnel conducted simultaneous doubleobserver aerial surveys of the wild horses residing in the Range Creek and Muddy Creek herd management areas (HMAs) in Utah (Figure 1). Surveys were conducted using methods recommended by BLM policy (BLM 2010) and a recent National Academy of Sciences review (NRC 2013). I analyzed these data to estimate sighting probabilities for horses, which I then used to correct the raw counts for systematic biases (undercounts) that are known to occur in aerial surveys (Lubow and Ransom 2016), and to provide confidence intervals (which are measures of uncertainty) associated with the abundance estimates.

Abundance Results

The estimated total horse abundance (Table 1) within or associated with the surveyed HMAswas relatively small. Observers recorded 85 horse groups, of which 83 of those horse groups had data recorded in a way suitable to be used in computing statistical estimates of sighting probability. All 85 observations made during 2017 aerial surveys were used to inform the total estimates of abundance. Confidence intervals and coefficients of variation for total horse abundance estimates are well within generally-desirable levels (<10% CV) for management purposes (Table 1). However, despite the seemingly precise results, several problems with the recorded data raise concerns about the accuracy and reliability of these estimates, consequently the abundance estimates I present here must be interpreted with substantial caution as a basis for management decisions. For reasons that are noted in the section on 'Assumptions and Caveats,' below, it is more likely that the true abundance of wild horses in these areas was larger than the estimated values, rather than smaller than the estimated values. Suggestions for improving the accuracy and reliability of future estimates are offered in the Recommendations section.

I estimate the mean size of detected horse groups, after correcting for missed groups, to be 5.0 horses/group across the surveyed area, with a median of 4 horses/group. I estimate 6.2 foals per 100 adult horses at the time of these surveys, but this figure varies substantially among areas (Table 1). Given the April survey date, this value is unlikely to represent all foals born in 2017.

Sighting Probability Results

The combined front observers saw 92.9% of the horse groups (94.6% of the horses) seen by any observer, whereas the back seat observers saw 74.1% of all horse groups (84.3% of horses) seen (Table 2). These results demonstrate that simple raw counts do not fully reflect true abundance without statistical corrections for missed groups made possible by the double observer method and reported here.

The sample size of observations (83 usable horse groups) was sufficient to parameterize sighting probability functions, although it was less than desirable for estimating the effects of all available covariates that could explain variability of sighting probabilities. All observers, including the pilot, appeared to have excellent sighting probability, despite one back seat observers becoming airsick. Limiting of observers to only 3 people, as was done in this survey, is optimal and highly commendable–this practice should be continued on future surveys.

However, some patterns in the recorded data were inconsistent with what is typically seen in this type of survey. These patterns suggest several potential problems, listed here:

1. On 8 observations, the back seat observer recorded as having seen the group was not on the side of the aircraft where the group was located. Similarly, on 10 observations both back seat observers saw a group that was listed as only visible on one side of the aircraft.

2. There were 21 observations recorded as being on the centerline, which is a very high proportion (25.3%) of the total horse groups. It is relatively rare for the aircraft to pass so close to over a horse group that it is not potentially visible from the back seat. On 8 of those observations, a back seat observer was recorded as having seen a group located on the centerline (defined as directly under the aircraft and not visible from the back seat).

3. Every group on the pilot's side of the flight path was seen by the front observers, which is unusual in other surveys given the primary focus of the pilot on flying safely and the obstructions in the cockpit that make some groups on the pilot's side not visible to the primary observer. However, the front-seat observer reported [Mike Twedell, Pers. comm. 7/25/2017] that visibility of both sides from a seat on one side is excellent and nearly equal in this particular aircraft type, so the result may not be an anomaly.

4. All distances were recorded as ≤0.5 miles and all but 13% were recorded as <0.25 miles, even though transect spacing was >1 mile in some locations. This pattern is possible, but it also may suggest inaccurate distance estimation or recording.

Patterns noted as items #1 and #2 led to discussions with specialist Mike Tweddell about how best to handle instances when back seat observers do see horse groups on the opposite side of the flightline. This should improve analyses of future data sets. Groups that were ever available to have been seen from both sides of the ship should be recorded as 'both,' even if they are under the centerline for some part of the flight. 'Center' should only be used to denote groups that were never available to have been seen from the back seat. Back seat observers should only focus out their own side, but sometimes back seat observers happen to see a horse group out the opposite window – that should be recorded, but in cases where a back seat observer looked across and saw a horse group that was only ever on the opposite side, the data recorder should write a note in the comments to clarify that that is what happened.

Because of the uncertainty coming from patterns #1 and #2 noted above, Stefan Ekernas (USGS, Pers. Comm. 18 July 2017) imputed values for the side of the aircraft where horse groups were located based on the side of the ship where the back seat observer who detected the groups was.

Five groups marked as "center" but seen by an observer in the back seat were assumed to have actually been on the side on which they were seen. Three groups seen by back seat observers on both sides but recorded as present on one side were assumed to be located on both sides. Seven groups recorded as present on only one side but seen by both back observers were assumed to be available to both. This procedure would not be expected to have led to a complete correction of the data, however. Groups that could have been seen on both sides but were not are not treated as if they were, leading to over estimates of sighting probability in the back seat. Groups erroneously marked as "center" but actually available to the back seat observers also lead to over estimates of sighting probability. Nevertheless, the corrections probably constitute a better assumption about

true locations than the uncorrected data. Preliminary analyses indicated that higher sighting probability was correlated with the tree cover type, broken cover type, and greater vegetation percentage. These results are implausible and suggest that there may have been some problem with estimating or recording vegetation covariates.

Informed by preliminary analyses, past analyses for this survey area, and *a priori* reasoning, I constructed 64 alterative models, each containing an intercept and one of the possible combinations of 5 covariates: (1) horse group size, (2) horse group activity, (3) rugged terrain type, (4) distance from the transect to the horse group, (5) an additive effect for observations at Range Creek HMA, and (6) and average effect for back-seat observers. I did not consider models with individual back seat observer effects due essentially no support for this alternative in preliminary analyses. I did not consider effects for cover types or percent vegetation cover due to the problems discovered in the data and preliminary analyses listed above. I also did not consider an effect for reduced visibility on the pilot's side because all groups on the pilot's side were seen by the combined front observers. I eliminated consideration of an effect of snow cover due to too few observations with snow (13) and minimal variation (<30% snow cover for all observations; ≤10% for 96.4% of observations). The 14 of 22 groups that were recorded on the centerline and which had no back seat observer detection were assumed to have sighting probability of 0.0 for back seat observers. Sighting probability for the 1 group listed and additional 10 groups that were imputed to have been visible on both sides of the flight line visible on both sides of the aircraft were computed based on the assumption that both back seat observers could independently have seen them, thereby increasing the chance of being seen.

Support (measured as % of AIC_c model weight) was very high for group size (98.5%), modest for an effect for Range Creek (43.5%), activity (42.8%), rugged terrain (31.5%), and minimal (<30%) for the effects of distance and average back seat observer. As expected, estimated sighting probability was higher for groups that were larger and closer, and lower for groups in rugged terrain. Activity reduced visibility and back seat observers had lower average sighting probability than the combined front seat observers (Table 3).

Estimated overall sighting probabilities, $\hat{p}$, for the combined observers ranged across horse groups from 0.493-1.0. Six groups (7.1%) had $\hat{p} < 0.8$, all of which were groups of 1 horse in rugged terrain at Muddy Creek and 5 of these were on the centerline, so not visible to the backseat observers. Comparing actual horses seen to the estimated abundance computed from overall

$\hat{p}$, I estimate that 2.8% of the horses present during the survey were never seen by any of the observers (Table 1). This is a remarkably high sighting rate considering the presence of rugged terrain (63.8% of observations), modest vegetation cover (20-70% for 96.3% of observations), and mostly small groups (<10 horses for 90.4% of observations).

Assumptions and Caveats

Although the sample size available for this analysis was adequate, a larger survey would provide additional information about sighting probability and the effect of various covariates, thereby increasing confidence in the results. The reliability of results from any abundance survey that is based on the simultaneous double-observer method rests on several important assumptions, discussed below. Given several potential sources of bias, listed below, it is more likely that the estimates are somewhat lower, rather than higher, than the true abundance.

1. The results obtained from these surveys are estimates of the horses present in the areas surveyed at the time of the survey and should not be used to make inferences beyond this context. I must presume that pre-flight planning by the district specialists and the USGS aerial survey advisor led to the surveyed areas including as much as possible of the areas used by horses using the surveyed HMAs. Two sections of the Muddy Creek HMA were not surveyed: the portion north of Interstate 70 and area of deep canyons in the southcentral portion of the HMA. Abundance estimates must be interpreted as applicable only to the areas surveyed; the assumed absence of horses from these unsurveyed areas cannot be corroborated with the survey data.

Although fences and topographic barriers can provide deterrents to animal movement that help to contain them within the areas surveyed, these barriers may not present either a continuous, unbroken barrier or an impenetrable one. Range Creek is surrounded by canyons that seem likely to deter if not prevent horse movement. Significant topographic barriers are also present along some boundaries of the Muddy Creek survey area. The survey was extended beyond the HMA boundary to the west, but not necessarily as far as horses might move; however none were found more than a mile outside the boundary. Only minor topographic barriers exist to the east of Muddy Creek HMA where the survey only extended to the HMA boundary, so any horses that might have moved beyond that boundary are not been included in the abundance estimates. Local fencing does not appear to sufficiently supplement natural barriers to preclude horse movements across the HMA boundary. The survey did extend beyond the Muddy Creek HMA boundaries in a few locations, but not all of the way to obvious barriers (Figure 1). Thus, the surveys did not necessarily extend as far beyond the HMA boundaries as horses might move. Consequently, there is the possibility that temporary emigration from the surveyed areas may have contributed to some animals residing in or near the target HMAs not being present in the surveyed areas and the numbers of animals found within the survey areas at another time could differ substantially. If there were any wild horses that are part of the local herds but were outside of the surveyed areas, then the estimates in Table 1 would be lower than the true abundance.

2. The validity of the analysis rests on the assumption that all groups of animals are flown over once during a survey period, and thus have exactly one chance to be counted by the front and back seat observers, or that groups flown over more than once are identified and considered only once in the analysis. Horse movements during a survey can potentially bias results if those movements result in unintentional double counting or undercounting of unavailability of groups. Groups counted more than once would constitute 'double counting,' which would lead to estimates that are biased higher than the true number of groups present. Additionally, groups that were never available to be seen (for example, due to temporary emigration from the study area or due to moving, undetected, from an unsurveyed area to one already surveyed) can lead to estimates that are negatively biased compared to the true abundance.

Each HMA was surveyed in a single day, thereby minimizing the potential for horse movement during the survey, although each HMA required 3 flights with intervening fuel stops thereby creating some opportunity for horse to move undetected from areas survey to areas not survey or vice versa. The identification of 'marker' horses (horses with unusual coloration) in observed group was recorded on paper, and variation in group sizes probably helped the observers to reduce the risk of double counting during aerial surveys. Photographs of groups were not used after landing to identify any groups that might have been inadvertently recorded twice. Unfortunately, there is no

effective way after the survey to correct for the converse problem of horses fleeing and evading the possibility of detection entirely.

3. This method assumes that all horse groups with identical sighting covariate values have equal sighting probability. If there is additional variability in sighting probability not accounted for in the sighting models, such heterogeneity could lead to a negative bias (underestimate) of the abundance. In other words, the double-observer method tends, if anything, to provide underestimates of abundance. Problems with the recorded data and the modest sample size leave open the possibility that other factors not considered resulted in variation in actual sighting probabilities that are not fully modeled.

4. It must be assumed that the number of animals in each group is counted accurately. In very large groups it may be common to miss a few animals unless photographs are taken and scrutinized after the flight. Relying on raw counts could lead to biased estimates of abundance The current draft of the standard operating procedures for aerial surveys requires use of photography for all groups of >20 horses; however I advise that it be used for groups of >10 horses. Observers in this survey circled over large groups to get as accurate a count as possible and used photography for groups consisting of >20 horses. There were only 7 groups with >10 horses and 1 group with >20 horses in the dataset, so the risk of undercounting group size was reduced.

5. Inconsistencies in the 'side of ship' data recording posed some difficulties to the analysis. Because it was difficult to interpret the exact pattern of which observers saw each group on which side of the flight line, the data may not be an accurate reflection of what was actually encountered during the survey. In future surveys where 'side of ship' is recorded in a way that is consistent with SOPs, one will have greater confidence in the type of estimates presented here in Table 1. Despite that, these analyses did reveal the expected relationships between detection probability several covariates; as such, the results Table 1 for this survey should be expected to be far superior to reliance on a raw count only of animals seen.

Recommendations for Future Surveys

Several observations about the data may offer opportunities to improve future surveys.

1. Increasing sighting probability increases precision of the abundance estimates. Although the sighting probability appears to be very high, the fact that 100% of horse groups located on the pilot's side of the flight path were reported as being seen by the front seat observers was unusual, but may be valid give the nearly panoramic view available from either side of the Bell B III helicopter. Sighting probabilities as high as were estimated here seem unusual given the topography, vegetation, and reported airsickness of the more experienced back-seat observer combined with the inclusion of a less experienced observer in the back seat. It is vital that observers act independently and do not report sightings that were based on information or clues received from other observers–the accurate and complete recoding of groups missed by each observer is vital to the success of the analysis.

The number of observers (3) was optimal and seat positions were rotated correctly. This should be continued on future flights, preferably with the same front seat observer and rear seat observers.

Surveys should always use at least 2 observers with high acuity, training, and experience, as was done on this survey. While it is often necessary to include an inexperienced observer on a survey to provide training, it is not advisable to include >1 observer with low acuity or experience on the same flight. In this case, it is understandable that a highly experienced observer had some unexpected airsickness. These things happen sometimes, and airsickness can be disorienting. It is particularly important that the data recorder be very well trained on the survey methodology and protocols and is able to both observe and efficiently record data accurately. The pilot should be asked to slow down or circle when extra time is needed to obtain or record accurate data.

2. Predefined transect spacing varied from approximate 0.5-0.75 miles over the more rugged topography at Range Creek HMA, and from 0.75-1.75 miles at Muddy Creek with the wider spacing in very open terrain were it was adequate. The pilot followed the planned flight path very well, except when the protocol required deviations in order to count and photograph horse groups. Given the high sighting probabilities, the small magnitude and weak support for the effect of distance estimated from these data, and the reported ability and frequent occurrence of horse groups being sighted at much greater distances than the transect width, it would be advisable to space transects further apart in areas of high visibility on future surveys. Wider transects would also save flight time and cost.

3. I emphasize the importance of photography for 2 purposes: (1) to verify the count of larger groups of horses, and (2) to help identify groups that were seen twice so they are not double counted in the final tally. Surveys should always use a reliable, highresolution camera with an adequate telephoto or zoom lens for the distance between observer and horses. In this survey photos were only taken of the 1 group with >20 horses, but photography was not used for the second purpose. Photos of groups >10 horses should be taken in the future and all photos should be checked for both accurate counts and potential duplicate sightings.

4. The absence of major barriers to movement near the boundaries of the Muddy Creek HMA makes it difficult to ensure that the horses present during the survey represent the entire resident horses in the area of these surveys that might use this area at various times. The proximity of additional horses in areas near these suggests that there could be interchanges of horses among these areas as well as horses located in lands outside the boundaries of these official management areas.

5. The recording of data did not always match the prescribed protocol. This is most evident in the indication of the location of horses relative to the aircraft ('side of ship'). It is essential that all survey personnel are well acquainted with the protocols for determining

'side of ship,' especially the more subtle definitions for "center" and "both." Also, to improve distance estimates in future surveys, it could be useful for everyone on the crew to 'calibrate' distance estimates by looking closely at landmarks (preferably domestic horses or livestock of similar size) that the pilot marks with a GPS unit, and then flies past at distances of ¼ mile, ½ mile, and 1 mile. The protocol for recording vegetation cover type and percentage should also be carefully reviewed. Participation of the USGS survey advisor on the next survey, as was planned for this year but cancelled due to a competing commitment, is highly recommended.

6. If logistical problems preclude recording the 'side of ship' and covariate data properly in future surveys, then the possibility of using the photo mark-resight

methodology (Lubow and Ransom 2009) to estimate horse abundance in these HMAs should be reconsidered. This survey methodology was applied successfully in a previous survey of Range Creek HMA in 2014. This method could solve several problems: more data could be collected, overall sighting probability could be increased due to multiple sighting opportunities, the movement of horses in reaction to the helicopter would be help meet the methodology assumptions instead of risking violation of those assumptions as it does in simultaneous double count, and heterogeneity of sighting probabilities that is not explicitly modeled could be measured implicitly and accounted for. Furthermore, only a single experienced observer is required and data recording requirements are much lower. The most important requirement for this alternative method to work is that these HMAs have adequate variation in horse color to visually distinguish every group reliably. One notable drawback is that the cost of the photo mark-resight alternative would be 2 or more times higher, depending on the number of repeat surveys used.

Table 2. Tally of raw counts of horses and horse groups by observer (front, back, and both) forming the basis for sighting probability model fitting for data from April 2017 survey of Range Creek HMA and Muddy Creek HMA, UT.

Observer	Groups Seen (Raw Count)	Horses Seen Rate[a]	Actual Sighting (groups)	Actual Sighting Rate[a]	Observer	(Raw Count)	(Raw Count)
Front	92.8%	94.5%	77	415			
Back	62	370	74.7%	84.3%			
Both	56	346	67.5%	78.8%	**Combined**	83	439

[a] Percentage of all groups seen that were seen by each observer.

Table 3. Effect of observers and sighting condition covariates on estimated sighting probability of horse groups for both front and rear observers during the April 2017 survey of Muddy Creek HMA and Range Creek HMA, UT. Baseline case (bold) presents the predicted sighting probability for a group of 4 horses (the median group size observed) at Muddy Creek that are, not moving, in smooth terrain, at a distance of 0.125 miles from the observer (the most common recorded distance) with the average back-seat observer. Other example cases vary a covariate or observer, one effect at time, as indicated in the left-most column, to illustrate the relative magnitude of each effect. Sighting probabilities for each row should be compared to the baseline (first row) to see the effect of the change in each observer or condition. Baseline values are shown in bold wherever they occur. Sighting probabilities are weighted averages across all 64 models considered (Burnham and Anderson 2002).

	Sighting Probability, Front Observer[a]	Sighting Probability, Back Observer	Sighting Probability, Combined Observers
Baseline	**88.9%**	**88.3%**	**98.7%**
Effect of group size (N=1)	65.2%	63.9%	87.4%
Effect of active group	84.7%	83.9%	97.5%
Effect of rugged	86.9%	86.3%	98.2%
Effect of distance = 0.375	88.0%	87.4%	98.5%
Effect of Range Creek	92.3%	91.9%	99.4%

[a] Sighting probability for the front observers acting as a team when the horses were on the pilot's side of the flight path, regardless of which of the front observers saw the horses first.

Literature Cited

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Lubow, B. C., and J. I. Ransom. 2016. Practical bias correction in aerial surveys of large mammals: validation of hybrid double-observer with sightability method against known abundance of feral horse (*Equus caballus*) populations. PLoS-ONE 11(5):e0154902.

doi:10.1371/journal.pone.0154902.

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Figure: Appendix C-1 & C-2 (following pages). Results from the April 2017 survey of (1) Range Creek HMA, UT and (2) Muddy creek HMA, UT. Map shows survey tracks flown (white lines), locations of observed horse groups (black and white circles), and surveyed HMA boundaries: Range Creek HMA (blue) and Muddy Creek HMA (red). Other areas near those surveyed but not surveyed at the same time that are visible in this figure: Range Creek HA (dark green), Sinbad HA (light green), Sinbad HMA (yellow), and Hill Creek HA (magenta and orange) and Winter Ridge HA (purple).

Figure: Appendix C-1

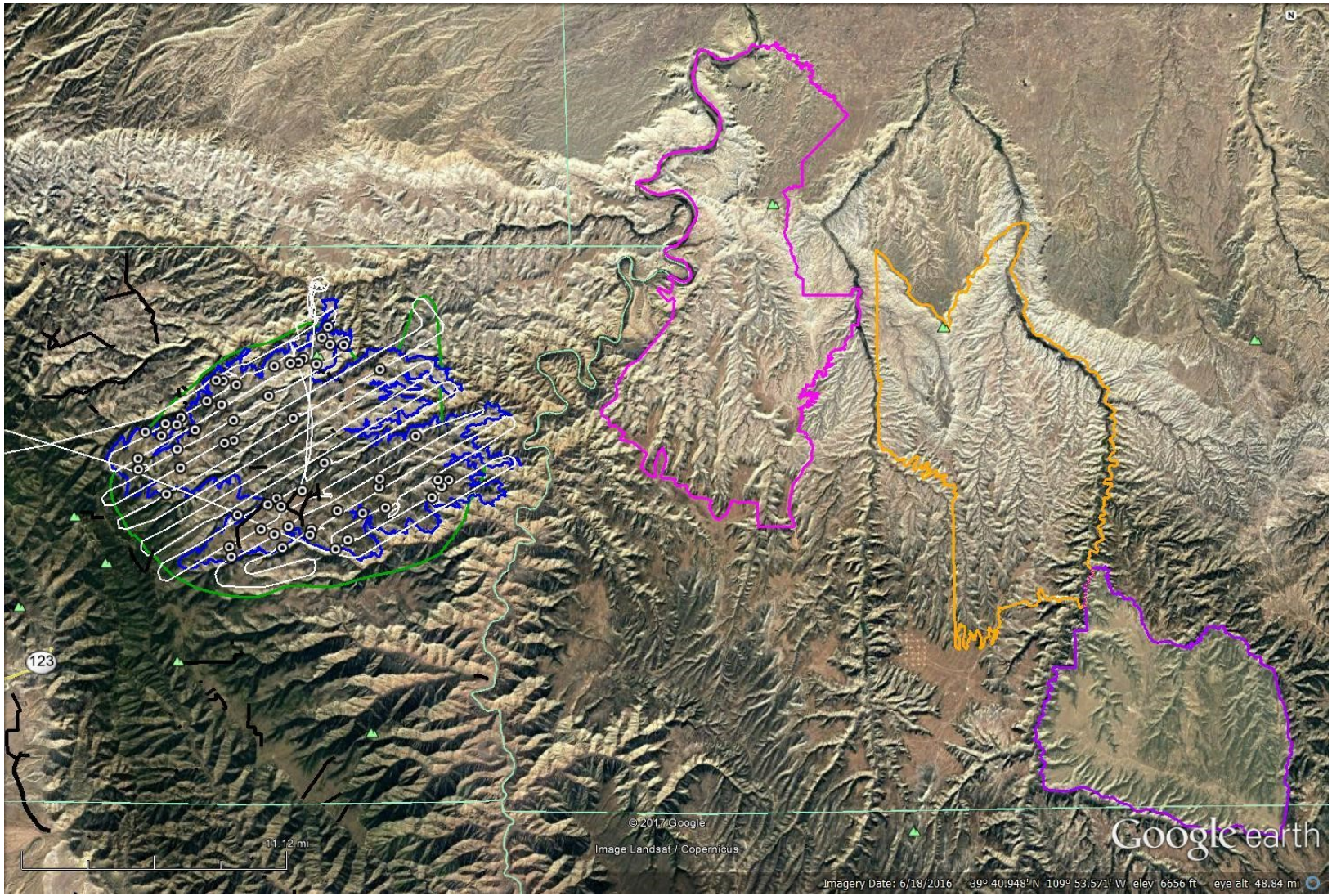
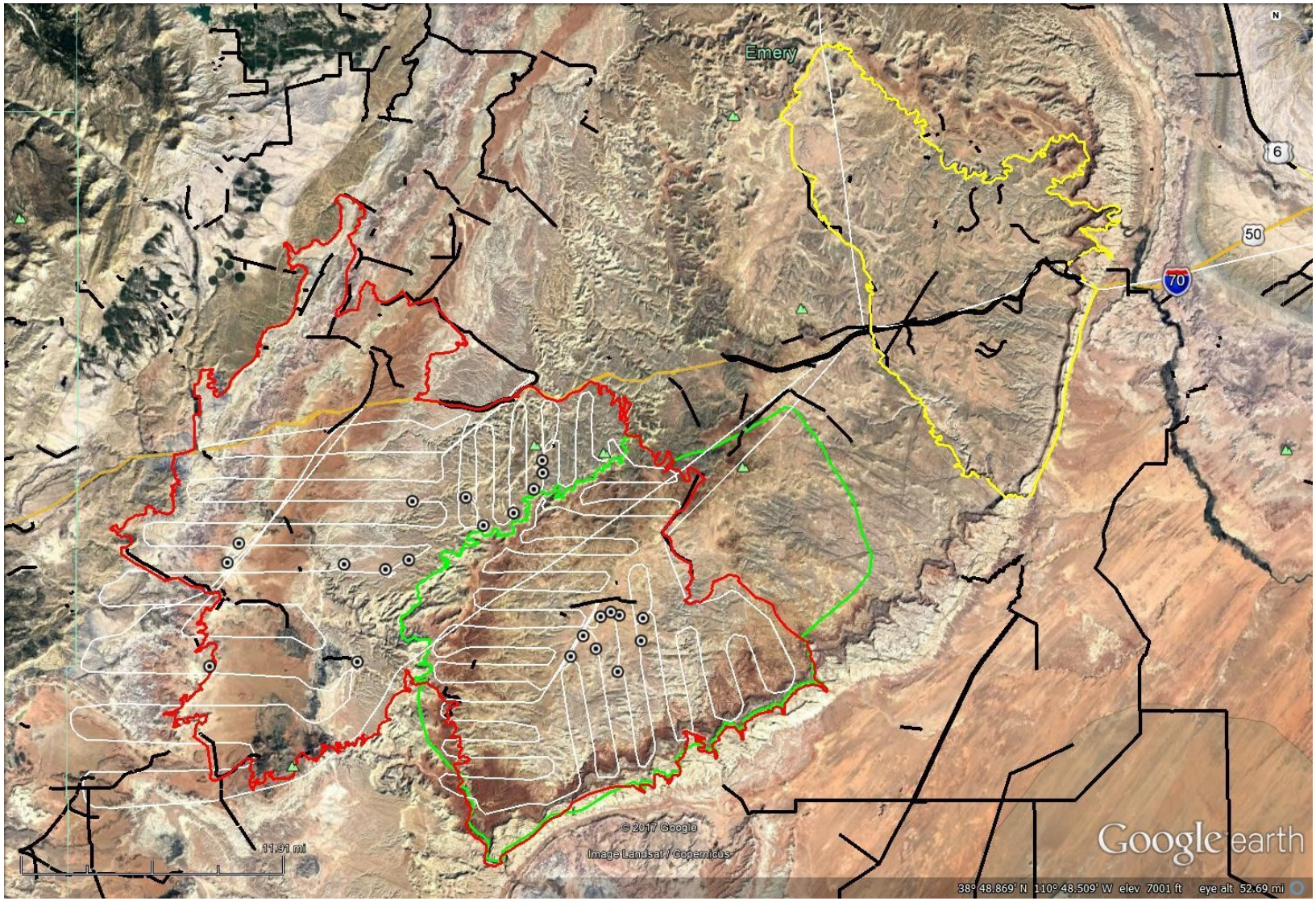


Figure: Appendix C-2



Range Creek Inventory Photos 2017

Muddy Creek Inventory Photos 2017

APPENDIX D: CAWP GATHER STANDARDS

COMPREHENSIVE ANIMAL WELFARE PROGRAM

FOR WILD HORSE AND BURRO GATHERS

STANDARDS

Developed by

The Bureau of Land Management

Wild Horse and Burro Program

in collaboration with

Carolyn L. Stull, PhD

Kathryn E. Holcomb, PhD

University of California, Davis

School of Veterinary Medicine

June 30, 2015

WELFARE ASSESSMENT STANDARDS for GATHERS

CONTENTS

STANDARDS

Standard Definitions

Major Standard: Impacts the health or welfare of WH&Bs. Relates to an alterable equipment or facility standard or procedure. Appropriate wording is "must," "unacceptable," "prohibited."

Minor Standard: unlikely to affect WH&Bs health or welfare or involves an uncontrollable situation. Appropriate wording is "should."

Lead COR = Lead Contracting Officer's Representative

COR = Contracting Officer's Representative

PI = Project Inspector

WH&Bs = Wild horses and burros

I. FACILITY DESIGN

A. Trap Site and Temporary Holding Facility

1. The trap site and temporary holding facility must be constructed of stout materials and must be maintained in proper working condition, including gates that swing freely and latch or tie easily. (major)

2. The trap site should be moved close to WH&B locations whenever possible to minimize the distance the animals need to travel.(minor)

3. If jute is hung on the fence posts of an existing wire fence in the trap wing, the wire should be either be rolled up or let down for the entire length of the jute in such a way that minimizes the possibility of entanglement by WH&Bs unless otherwise approved by the Lead COR/COR/PI. (minor)

4. Fence panels in pens and alleys must be not less than 6 feet high for horses, 5 feet high for burros, and the bottom rail must not be more than 12 inches from ground level. (major)

5. The temporary holding facility must have a sufficient number of pens available to sort WH&Bs according to gender, age, number, temperament, or physical condition. (major)

a. All pens must be assembled with capability for expansion. (major)

b. Alternate pens must be made available for the following: (major)

1) WH&Bs that are weak or debilitated

2) Mares/jennies with dependent foals

c. WH&Bs in pens at the temporary holding facility should be maintained at a proper stocking density such that when at rest all WH&Bs occupy no more than half the pen area. (minor)

6. An appropriate chute designed for restraining WH&Bs must be available for necessary procedures at the temporary holding facility. This does not apply to bait trapping operations unless directed by the Lead COR/COR/PI. (major)

7. There must be no holes, gaps or openings, protruding surfaces, or sharp edges present in fence panels or other structures that may cause escape or possible injury. (major)

8. Padding must be installed on the overhead bars of all gates and chutes used in single file alleys. (major)

9. Hinged, self-latching gates must be used in all pens and alleys except for entry gates into the trap, which may be secured with tie ropes. (major)

10. Finger gates (one-way funnel gates) used in bait trapping must be constructed of materials approved by the Lead COR/COR/PI. Finger gates must not be constructed of materials that have sharp ends that may cause injuries to WH&Bs, such as "T" posts, sharpened willows, etc. (major)

11. Water must be provided at a minimum rate of ten gallons per 1000 pound animal per day, adjusted accordingly for larger or smaller horses, burros and foals, and environmental conditions, with each trough placed in a separate location of the pen (i.e. troughs at opposite ends of the pen). Water must be refilled at least every morning and evening. (major)

12. The design of pens at the trap site and temporary holding facility should be constructed with rounded corners. (minor)

13. All gates and panels in the animal holding and handling pens and alleys of the trap site must be covered with materials such as plywood, snow fence, tarps, burlap, etc. approximately 48” in height to provide a visual barrier for the animals. All materials must be secured in place.(major)

These guidelines apply:

a. For exterior fences, material covering panels and gates must extend from the top of the panel or gate toward the ground.(major)

b. For alleys and small internal handling pens, material covering panels and gates should extend from no more than 12 inches below the top of the panel or gate toward the ground to facilitate visibility of animals and the use of flags and paddles during sorting. (minor)

c. The initial capture pen may be left uncovered as necessary to encourage animals to enter the first pen of the trap. (minor)

14. Non-essential personnel and equipment must be located to minimize disturbance of WH&Bs. (major)

15. Trash, debris, and reflective or noisy objects should be eliminated from the trap site and temporary holding facility. (minor)

B. Loading and Unloading Areas

1. Facilities in areas for loading and unloading WH&Bs at the trap site or temporary holding facility must be maintained in a safe and proper working condition, including gates that swing freely and latch or tie easily. (major)

2. The side panels of the loading chute must be a minimum of 6 feet high and fully covered with materials such as plywood or metal without holes that may cause injury. (major)

3. There must be no holes, gaps or openings, protruding surfaces, or sharp edges present in fence panels or other structures that may cause escape or possible injury. (major)

4. All gates and doors must open and close easily and latch securely. (major)

5. Loading and unloading ramps must have a non-slip surface and be maintained in a safe and proper working condition to prevent slips and falls. Examples of non-slip flooring would include, but not be limited to, rubber mats, sand, shavings, and steel reinforcement rods built into ramp. There must be no holes in the flooring or items that can cause an animal to trip. (major)

6. Trailers must be properly aligned with loading and unloading chutes and panels such that no gaps exist between the chute/panel and floor or sides of the trailer creating a situation where a WH&B could injure itself. (major)

7. Stock trailers should be positioned for loading or unloading such that there is no more than 12" clearance between the ground and floor of the trailer for burros and 18" for horses. (minor)

II. CAPTURE TECHNIQUE

A. Capture Techniques

1. WH&Bs gathered on a routine basis for removal or return to range must be captured by the following approved procedures under direction of the Lead COR/COR/PI. (major)

a. Helicopter

b. Bait trapping

2. WH&Bs must not be captured by snares or net gunning. (major)

3. Chemical immobilization must only be used for capture under exceptional circumstances and under the direct supervision of an on-site veterinarian experienced with the technique. (major)

B. Helicopter Drive Trapping

1. The helicopter must be operated using pressure and release methods to herd the animals in a desired direction and should not repeatedly evoke erratic behavior in the WH&Bs causing injury or exhaustion. Animals must not be pursued to a point of exhaustion; the on-site veterinarian must examine WH&Bs for signs of exhaustion. (major)

2. The rate of movement and distance the animals travel must not exceed limitations set by the Lead COR/COR/PI who will consider terrain, physical barriers, access limitations, weather, condition of the animals, urgency of the operation (animals facing drought, starvation, fire, etc.) and other factors. (major)

a. WH&Bs that are weak or debilitated must be identified by BLM staff or the contractors. Appropriate gather and handling methods should be used according to the direction of the Lead COR/COR/PI. (major)

b. The appropriate herding distance and rate of movement must be determined on a case-by-case basis considering the weakest or smallest animal in the group (e.g., foals, pregnant mares, or horses that are weakened by body condition, age, or poor health) and the range and environmental conditions present. (major)

c. Rate of movement and distance travelled must not result in exhaustion at the trap site, with the exception of animals requiring capture that have an existing severely compromised condition prior to gather. Where compromised animals cannot be left on the range or where doing so would only serve to prolong their suffering, euthanasia will be performed in accordance with BLM policy. (major)

3. WH&Bs must not be pursued repeatedly by the helicopter such that the rate of movement and distance travelled exceeds the limitation set by the Lead COR/COR/PI. Abandoning the pursuit or alternative capture methods may be considered by the Lead COR/COR/PI in these cases. (major)

4. When WH&Bs are herded through a fence line en route to the trap, the Lead COR/COR/PI must be notified by the contractor. The Lead COR/COR/PI must determine the appropriate width of the opening that the fence is let down to allow for safe passage through the opening. The Lead COR/COR/PI must decide if existing fence lines require marking to increase visibility to WH&Bs. (major)

5. The helicopter must not come into physical contact with any WH&B. The physical contact of any WH&B by helicopter must be documented by Lead COR/COR/PI along with the circumstances. (major)

6. WH&Bs may escape or evade the gather site while being moved by the helicopter. If there are mare/dependent foal pairs in a group being brought to a trap and half of an identified pair is thought to have evaded capture, multiple attempts by helicopter may be used to bring the missing half of the pair to the trap or to facilitate capture by roping. In these instances, animal condition and

fatigue must be evaluated by the Lead COR/COR/PI or on-site veterinarian on a case-by-case basis to determine the number of attempts that can be made to capture an animal.(major)

7. Horse captures must not be conducted when ambient temperature at the trap site is below 10ºF or above 95ºF without approval of the Lead COR/COR/PI. Burro captures must not be conducted when ambient temperature is below 10ºF or above 100ºF without approval of the Lead COR/COR/PI. The Lead COR/COR/PI will not approve captures when the ambient temperature exceeds 105 ºF. (major)

C. Roping

1. The roping of any WH&B must be approved prior to the procedure by the Lead COR/COR/PI. (major).

2. The roping of any WH&B must be documented by the Lead COR/COR/PI along with the circumstances. WH&Bs may be roped under circumstances which include but are not limited to the following: reunite a mare or jenny and her dependent foal; capture nuisance, injured or sick WH&Bs or those that require euthanasia; environmental reasons such as deep snow or traps that cannot be set up due to location or environmentally sensitive designation; and public and animal safety or legal mandates for removal. (major)

3. Ropers should dally the rope to their saddle horn such that animals can be brought to a stop as slowly as possible and must not tie the rope hard and fast to the saddle so as to intentionally jerk animals off their feet. (major)

4. WH&Bs that are roped and tied down in recumbency must be continuously observed and monitored by an attendant at a maximum of 100 feet from the animal. (major)

5. WH&Bs that are roped and tied down in recumbency must be untied within 30 minutes. (major)

6. If the animal is tied down within the wings of the trap, helicopter drive trapping within the wings will cease until the tied-down animal is removed. (major)

7. Sleds, slide boards, or slip sheets must be placed underneath the animal's body to move and/or load recumbent WH&Bs. (major)

8. Halters and ropes tied to a WH&B may be used to roll, turn, position or load a recumbent animal, but a WH&B must not be dragged across the ground by a halter or rope attached to its body while in a recumbent position. (major)

9. Animals captured by roping must be evaluated by the on-site/on-call veterinarian within four hours after capture, marked for identification at the trap site, and be re-evaluated periodically as deemed necessary by the on-site/on-call veterinarian. (major)

D. Bait Trapping

1. WH&Bs may be lured into a temporary trap using bait (feed, mineral supplement, water) or sexual attractants (mares/jennies in heat) with the following requirements:

a. The period of time water sources other than in the trap site are inaccessible must not adversely affect the wellbeing of WH&Bs, wildlife or livestock, as determined by the Lead COR/COR/PI. (major)

b. Unattended traps must not be left unobserved for more than 12 hours. (major)

c. Mares/jennies and their dependent foals must not be separated unless for safe transport. (major)

d. WH&Bs held for more than 12 hours must be provided with accessible clean water at a minimum rate of ten gallons per 1000 pound animal per day, adjusted accordingly for larger or smaller horses, burros and foals and environmental conditions. (major)

e. WH&Bs held for more than 12 hours must be provided good quality hay at a minimum rate of 20 pounds per 1000 pound adult animal per day, adjusted accordingly for larger or smaller horses, burros and foals. (major)

1) Hay must not contain poisonous weeds, debris, or toxic substances. (major)

2) Hay placement must allow all WH&Bs to eat simultaneously. (major)

III. WILD HORSE AND BURRO CARE

A. Veterinarian

1. On-site veterinary support must be provided for all helicopter gathers and on-site or on-call support must be provided for bait trapping. (major)

2. Veterinary support must be under the direction of the Lead COR/COR/PI. The on-site/on-call veterinarian will provide consultation on matters related to WH&B health, handling, welfare, and euthanasia at the request of the Lead COR/COR/PI. All decisions regarding medical treatment or euthanasia will be made by the on-site Lead COR/COR/PI. (major)

B. Care

1. Feeding and Watering

a. Adult WH&Bs held in traps or temporary holding pens for longer than 12 hours must be fed every morning and evening with water available at all times other than when animals are being sorted or worked. (major)

b. Water must be provided at a minimum rate of ten gallons per 1000 pound animal per day, adjusted accordingly for larger or smaller horses, burros and foals, and environmental conditions, with each trough placed in a separate location of the pen (i.e. troughs at opposite ends of the pen). . (major)

c. Good quality hay must be fed at a minimum rate of 20 pounds per 1000 pound adult animal per day, adjusted accordingly for larger or smaller horses, burros and foals. (major)

i. Hay must not contain poisonous weeds or toxic substances. (major)

ii. Hay placement must allow all WH&Bs to eat simultaneously. (major)

d. When water or feed deprivation conditions exist on the range prior to the gather, the Lead COR/COR/PI should adjust the watering and feeding arrangements in consultation with the onsite veterinarian as necessary to provide for the needs of the animals. (minor)

2. Dust abatement

a. Dust abatement by spraying the ground with water must be employed when necessary at the trap site and temporary holding facility. (major)

3. Trap Site

a. Dependent foals or weak/debilitated animals must be separated from other WH&Bs at the trap site to avoid injuries during transportation to the temporary holding facility. Separation of dependent foals from mares must not exceed four hours unless the Lead COR/COR/PI authorizes a longer time or a decision is made to wean the foals. (major)

4. Temporary Holding Facility

a. All WH&Bs in confinement must be observed at least once daily to identify sick or injured WH&Bs and ensure adequate food and water. (major)

b. Foals must be reunited with their mares/jennies at the temporary holding facility within four hours of capture unless the Lead COR/COR/PI authorizes a longer time or foals are old enough to be weaned during the gather. (major)

c. Non-ambulatory WH&Bs must be located in a pen separate from the general population and must be examined by the BLM horse specialist and/or on-call or on-site veterinarian as soon as possible, no more than four hours after recumbency is observed. Unless otherwise directed by a veterinarian, hay and water must be accessible to an animal within six hours after recumbency.(major)

d. Alternate pens must be made available for the following: (major)

1) WH&Bs that are weak or debilitated

2) Mares/jennies with dependent foals

e. Aggressive WH&Bs causing serious injury to other animals should be identified and relocated into alternate pens when possible. (minor)

f. WH&Bs in pens at the temporary holding facility should be maintained at a proper stocking density such that when at rest all WH&Bs occupy no more than half the pen area. (minor)

C. Biosecurity

1. Health records for all saddle and pilot horses used on WH&B gathers must be provided to the Lead COR/COR/PI prior to joining a gather, including: (major)

a. Certificate of Veterinary Inspection (Health Certificate, within 30 days).

b. Proof of:

1) A negative test for equine infectious anemia (Coggins or EIA ELISA test) within 12 months.

2) Vaccination for tetanus, eastern and western equine encephalomyelitis, West Nile virus, equine herpes virus, influenza, Streptococcus equi, and rabies within 12 months.

2. Saddle horses, pilot horses and mares used for bait trapping lures must not be removed from the gather operation (such as for an equestrian event) and allowed to return unless they have been observed to be free from signs of infectious disease for a period of at least three weeks and a new Certificate of Veterinary Examination is obtained after three weeks and prior to returning to the gather. (major)

3. WH&Bs, saddle horses, and pilot horses showing signs of infectious disease must be examined by the on-site/on-call veterinarian. (major)

a. Any saddle or pilot horses showing signs of infectious disease (fever, nasal discharge, or illness) must be removed from service and isolated from other animals on the gather until such time as the horse is free from signs of infectious disease and approved by the on-site/on-call veterinarian to return to the gather. (major)

b. Groups of WH&Bs showing signs of infectious disease should not be mixed with groups of healthy WH&Bs at the temporary holding facility, or during transport. (minor)

4. Horses not involved with gather operations should remain at least 300 yards from WH&Bs, saddle horses, and pilot horses being actively used on a gather. (minor)

IV. HANDLING

A. Willful Acts of Abuse

1. Hitting, kicking, striking, or beating any WH&B in an abusive manner is prohibited. (major)

2. Dragging a recumbent WH&B without a sled, slide board or slip sheet is prohibited. Ropes used for moving the recumbent animal must be attached to the sled, slide board or slip sheet unless being loaded as specified in Section II. C. 8. (major)

3. There should be no deliberate driving of WH&Bs into other animals, closed gates, panels, or other equipment. (minor)

4. There should be no deliberate slamming of gates and doors on WH&Bs. (minor)

5. There should be no excessive noise (e.g., constant yelling) or sudden activity causing WH&Bs to become unnecessarily flighty, disturbed or agitated. (minor)

B. General Handling

1. All sorting, loading or unloading of WH&Bs during gathers must be performed during daylight hours except when unforeseen circumstances develop and the Lead COR/CO/PI approves the use of supplemental light. (major)

2. WH&Bs should be handled to enter runways or chutes in a forward direction. (minor)

3. WH&Bs should not remain in single-file alleyways, runways, or chutes longer than 30 minutes. (minor)

4. Equipment except for helicopters should be operated and located in a manner to minimize flighty behavior . (minor)

C. Handling Aids

1. Handling aids such as flags and shaker paddles must be the primary tools for driving and moving WH&Bs during handling and transport procedures. Contact of the flag or paddle end of primary handling aids with a WH&B is allowed. Ropes looped around the hindquarters may be used from horseback or on foot to assist in moving an animal forward or during loading. (major)

2. Electric prods must not be used routinely as a driving aid or handling tool. Electric prods may be used in limited circumstances only if the following guidelines are followed:

a. Electric prods must only be a commercially available make and model that uses DC battery power and batteries should be fully charged at all times. (major)

b. The electric prod device must never be disguised or concealed. (major)

c. Electric prods must only be used after three attempts using other handling aids (flag, shaker paddle, voice or body position) have been tried unsuccessfully to move the WH&Bs. (major)

d. Electric prods must only be picked up when intended to deliver a stimulus; these devices must not be constantly carried by the handlers. (major)

e. Space in front of an animal must be available to move the WH&B forward prior to application of the electric prod. (major)

f. Electric prods must never be applied to the face, genitals, anus, or underside of the tail of a WH&B. (major)

g. Electric prods must not be applied to any one WH&B more than three times during a procedure (e.g., sorting, loading) except in extreme cases with approval of the Lead COR/COR/PI. Each exception must be approved at the time by the Lead COR/COR/PI. (major)

h. Any electric prod use that may be necessary must be documented daily by the Lead COR/COR/PI including time of day, circumstances, handler, location (trap site or temporary holding facility), and any injuries (to WH&B or human). (major)

V. TRANSPORTATION

A. General

1. All sorting, loading, or unloading of WH&Bs during gathers must be performed during daylight hours except when unforeseen circumstances develop and the Lead COR/CO/PI approves the use of supplemental light. (major)

2. WH&Bs identified for removal should be shipped from the temporary holding facility to a BLM facility within 48 hours. (minor)

a. Shipping delays for animals that are being held for release to range or potential on-site adoption must be approved by the Lead COR/COR/PI. (major)

3. Shipping should occur in the following order of priority; 1) debilitated animals, 2) pairs, 3) weanlings, 4) dry mares and 5) studs. (minor)

4. Planned

5. transport time to the BLM preparation facility from the trap site or temporary holding facility must not exceed 10 hours. (major)

6. WH&Bs should not wait in stock trailers and/or semi-trailers at a standstill for more than a combined period of three hours during the entire journey. (minor)

B. Vehicles

1. Straight-deck trailers and stock trailers must be used for transporting WH&Bs. (major)

a. Two-tiered or double deck trailers are prohibited. (major)

b. Transport vehicles for WH&Bs must have a covered roof or overhead bars containing them such that WH&Bs cannot escape. (major)

2. WH&Bs must have adequate headroom during loading and unloading and must be able to maintain a normal posture with all four feet on the floor during transport without contacting the roof or overhead bars. (major)

3. The width and height of all gates and doors must allow WH&Bs to move through freely. (major)

4. All gates and doors must open and close easily and be able to be secured in a closed position. (major)

5. The rear door(s) of the trailers must be capable of opening the full width of the trailer. (major)

6. Loading and unloading ramps must have a non-slip surface and be maintained in proper working condition to prevent slips and falls. (major)

7. Transport vehicles more than 18 feet and less than 40 feet in length must have a minimum of one partition gate providing two compartments; transport vehicles 40 feet or longer must have at least two partition gates to provide a minimum of three compartments. (major)

8. All partitions and panels inside of trailers must be free of sharp edges or holes that could cause injury to WH&Bs. (major)

9. The inner lining of all trailers must be strong enough to withstand failure by kicking that would lead to injuries. (major)

10. Partition gates in transport vehicles should be used to distribute the load into compartments during travel. (minor)

11. Surfaces and floors of trailers must be cleaned of dirt, manure and other organic matter prior to the beginning of a gather. (major)

C. Care of WH&Bs during Transport Procedures

1. WH&Bs that are loaded and transported from the temporary holding facility to the BLM preparation facility must be fit to endure travel. (major)

a. WH&Bs that are non-ambulatory, blind in both eyes, or severely injured must not be loaded and shipped unless it is to receive immediate veterinary care or euthanasia. (major)

b. WH&Bs that are weak or debilitated must not be transported without approval of the Lead COR/COR/PI in consultation with the on-site veterinarian. Appropriate actions for their care during transport must be taken according to direction of the Lead COR/COR/PI. (major)

2. WH&Bs should be sorted prior to transport to ensure compatibility and minimize aggressive behavior that may cause injury. (minor)

3. Trailers must be loaded using the minimum space allowance in all compartments as follows: (major)

a. 12 square feet per adult horse.

b. 6.0 square feet per dependent horse foal.

c. 8.0 square feet per adult burro.

d. 4.0 square feet per dependent burro foal.

4. The Lead COR/COR/PI in consultation with the receiving Facility Manager must document any WH&B that is recumbent or dead upon arrival at the destination. (major)

a. Non-ambulatory or recumbent WH&Bs must be evaluated on the trailer and either euthanized or removed from the trailers using a sled, slide board or slip sheet. (major)

5. Saddle horses must not be transported in the same compartment with WH&Bs. (major)

VI. EUTHANASIA OR DEATH

A. Euthanasia Procedure during Gather Operations

1. An authorized, properly trained, and experienced person as well as a firearm appropriate for the circumstances must be available at all times during gather operations. When the travel time

between the trap site and temporary holding facility exceeds one hour or if radio or cellular communication is not reliable, provisions for euthanasia must be in place at both the trap site and temporary holding facility during the gather operation. (major)

2. Euthanasia must be performed according to American Veterinary Medical Association euthanasia guidelines (2013) using methods of gunshot or injection of an approved euthanasia agent. (major)

3. The decision to euthanize and method of euthanasia must be directed by the Authorized Officer or their Authorized Representative(s) that include but are not limited to the Lead COR/COR/PI who must be on site and may consult with the on-site/on-call veterinarian. (major)

4. Photos needed to document an animal's condition should be taken prior to the animal being euthanized. No photos of animals that have been euthanized should be taken. An exception is when a veterinarian or the Lead COR/COR/PI may want to document certain findings discovered during a postmortem examination or necropsy. (minor)

5. Any WH&B that dies or is euthanized must be documented by the Lead COR/COR/PI including time of day, circumstances, euthanasia method, location, a description of the age, gender, and color of the animal and the reason the animal was euthanized. (major)

6. The on-site/on-call veterinarian should review the history and conduct a postmortem physical examination of any WH&B that dies or is euthanized during the gather operation. A necropsy should be performed whenever feasible if the cause of death is unknown. (minor)

B. Carcass Disposal

1. The Lead COR/COR/PI must ensure that appropriate equipment is available for the timely disposal of carcasses when necessary on the range, at the trap site, and temporary holding facility. (major)

2. Disposal of carcasses must be in accordance with state and local laws. (major)

3. WH&Bs euthanized with a barbiturate euthanasia agent must be buried or otherwise disposed of properly. (major)

4. Carcasses left on the range should not be placed in washes or riparian areas where future runoff may carry debris into ponds or waterways. Trenches or holes for buried animals should be dug so the bottom of the hole is at least 6 feet above the water table and 4-6 feet of level earth covers the top of the carcass with additional dirt mounded on top where possible. (minor)

CAWP

REQUIRED DOCUMENTATION AND RESPONSIBILITIES OF LEAD COR/COR/PI

Required Documentation

Section Documentation

II.B.5 Helicopter contact with any WH&B.

II.C.2 Roping of any WH&B.

III.B.3.a and III.B.4.b

III.C.1 Reason for allowing longer than four hours to reunite foals with mares/jennies. Does not apply if foals are being weaned.

Health status of all saddle and pilot horses.

IV.C.2.hAll uses of electric prod.

V.C.4 Any WH&B that is recumbent or dead upon arrival at destination following transport.

VI.A.5 Any WH&B that dies or is euthanized during gather operation.

Responsibilities

Section Responsibility

I.A.10 Approve materials used in construction of finger gates in bait trapping

II.A.1 Direct gather procedures using approved gather technique.

II.B. 2 Determine rate of movement and distance limitations for WH&B helicopter gather.

II.B.2.a Direct appropriate gather/handling methods for weak or debilitated WH&B.

II.B.3 Determine whether to abandon pursuit or use other capture method in order to avoid repeated pursuit of WH&B.

II.B.4 Determine width and need for visibility marking when using opening in fence en route to trap.

II.B.6 Determine number of attempts that can be made to capture the missing half of a mare/foal pair that has become separated.

II.B.7 Determine whether to proceed with gather when ambient temperature is outside the range of 10°F to 95°F for horses or 10°F to 100°F for burros.

II.C.1 Approve roping of any WH&B.

II.D.1.a Determine period of time that water outside a bait trap is inaccessible such that wellbeing of WH&Bs, wildlife, or livestock is not adversely affected.

III.A.2 Direct and consult with on-site/on-call veterinarian on any matters related to WH&B health, handling, welfare and euthanasia.

III.B.1.e Adjust feed/water as necessary, in consultation with onsite/on call veterinarian, to provide for needs of animals when water or feed deprivation conditions exist on range.

III.B.4.c Determine provision of water and hay to non-ambulatory animals.

IV.C.2.g Approve use of electric prod more than three times, for exceptional cases only.

V.A.1 Approve sorting, loading, or unloading at night with use of supplemental light.

V.A.2.a Approve shipping delays of greater than 48 hours from temporary holding facility to BLM facility.

V.C.1.b Approve of transport and care during transport for weak or debilitated WH&B.

VI.A.3 Direct decision regarding euthanasia and method of euthanasia for any WH&B; may consult with on-site/on-call veterinarian.

VI.B.1 Ensure that appropriate equipment is available for carcass disposal.

APPENDIX E: ADD DESIGN FEATURES

NATIONAL SELECTIVE REMOVAL POLICY

- Gather operations will be conducted in accordance with the Comprehensive Animal Welfare Program for Wild Horse and Burro Gathers (CAWP) described in Appendix D and/or the National Wild Horse Gather Contract as adjusted or amended through the National and State wild horse and burro program direction.
- When gather objectives require gather efficiencies of 50-80% or more of the animals to be captured from multiple gather sites (traps) within the HMA, the helicopter drive method and helicopter assisted roping from horseback will be the primary gather methods used. Post-gather, every effort will be made to return released animals (if any) to the same general area from which they were gathered.
- Bait and/or water trapping may be used provided the gather operations timeframe is consistent with current animal and resource conditions. Bait and/or water trapping may also be selected as the primary method to maintain the population within AML and other special circumstances as appropriate.
- An Animal and Plant Inspection Service (APHIS) or other licensed veterinarian may be on-site during gathers, as needed, to examine animals and make recommendations to BLM for care and treatment of wild horses. Decisions to humanely euthanize animals in field situations will be made in conformance with BLM policy.
- Data including sex and age distribution, reproduction, survival, condition class information (using the Henneke rating system), color, size, and other information may also be recorded, along with the disposition of that animal (removed or released). Hair and/or blood samples will be acquired in accordance with current guidance (IM # 2009-062), to determine whether BLMs management is maintaining acceptable genetic diversity (avoiding inbreeding depression).

DATA COLLECTION

Wild burro herd data which may be collected includes data to determine population characteristics (age/sex/color/etc.), assess herd health (pregnancy/parasite loading/physical condition/etc.) and determine herd history and genetic profile (hair sampling) (IM # 2009-062).

Wild Horse and Burro Specialists would be responsible for collecting population data. Data collected during the gather and adoption preparation operations may be used to determine which individual wild horses would be selected for return to the HMA and would aid in future analysis in Herd Management Area Plans. The extent to which data is collected would vary to meet specific needs pertaining to the HMA. The following data may be collected:

1. Collecting Blood and Hair Samples:
   Unless there is a previously recognized concern regarding low genetic diversity in a particular herd, it is not necessary to collect genetic information at every gather. Typical herds should be sampled every ten to 15 years (two to three gather cycles). The Sinbad HMA is due to have genetic information collected.

   Hair samples would be collected and analyzed to compare with established genetic baseline data (genetic diversity, historical origins, unique markers, and norms for the population). The samples would be collected from the animals released back into the HMAs and from some of the animals

removed from the HMA.

Minimum sample size is 25 animals or 25% of the post-gather populations, not to exceed 100 animals per HMA or separate breeding population. A sample is defined as 30 hairs with roots (about the diameter of a pencil). Hair samples would be taken from both Jennies and Jacks. Age would not be a defining factor in determining which animals to sample.

The test would consist of looking at 29 systems (17 typing and 12 DNA). The data would be compared to similar data from both domestic and other wild burro populations. The primary value of this data is to compare it to baseline samples to identify genetic drift and any narrowing of diversity through inbreeding. A sample of DNA would be preserved for each horse tested.
Samples would be sent to Dr. Gus Cothran at the College of Veterinary Medicine at Texas A&M University for analysis. BLM qualified personnel would collect the hair samples.

Blood and/or hair samples may be taken for the purposes of furthering genetic ancestry studies and incorporation into the Herd Management Area Plans (HMAPs).

2. Herd Health and Viability Data Collection
   Data related to age, sex, color, overall health, pregnancy, or nursing status would be collected from each animal captured. The sex and age of each release animal gathered would be recorded during sorting procedures at the gather holding facility and/or at the preparation facility. An estimate of the number, sex and age of horses evading capture would also be recorded.

   Information on reproduction and survival would be collected to the extent possible, through documentation of the wild horses captured during the gather, and the age of those released following the gather. In addition, blood or hair samples may be collected from individuals within the herd for health records and/or viability data collection.

3. Characteristics:
   Color and size of the animals would be recorded. Any characteristics as to type (or similarities to domestic breeds) would be noted if determined. The genetic analysis would provide a comparison of domestic breeds with the wild horses sampled. Any incidence of negative genetic traits (parrot mouth, club feet etc.) or other abnormalities would be noted as well. A representative population of wild horses would be selected for release.

4. Condition Class:
   A body condition class score would be recorded based on the Henneke System.

5. Other Data:
   Other data such as temperament may be collected as determined by the Authorized Officer or Wild Horse Specialist.

RADIO COLLARING AND TAGGING

Radio collaring and tagging may be used to do research on habitat interactions, seasonal use of ranges, survival and density dependence, recruitment, fecundity, fertility, population growth and other subjects of value to the management of free-roaming wild horses.

During the gather horses would be fitted with Global Positioning System (GPS) and/or Very High Frequency (VHF) radio collars. Collars would be placed on adult horses that are 3 years of age or older and that have a Henneke body condition score of 4 or greater. The design and vendor of the collar would be based on the results of the ongoing USGS radio collar study at the BLM Pauls Valley adoption facility in Oklahoma. All radio collars would have a manual release mechanism in case of emergency, and a timed release which will be programmed to release at the end of the planned study time. No collars would remain on wild horses indefinitely. If the collar drop-off mechanism fails at the end of the study, radio collars would be removed by capturing the individual burro to remove collars manually, or in a management gather.

TEMPORARY HOLDING FACILITIES DURING GATHERS

Wild horses gathered would be transported from the trap sites to a temporary holding corral near the HMA in goose-neck trailers or straight-deck semi-tractor trailers. At the temporary holding corral, the wild horses will be aged and sorted into different pens based on sex. The horses would be provided an ample supply of good quality hay and water. Mares and their un-weaned foals would be kept in pens together. All horses identified for retention in the HMA would be penned separately from those animals identified for removal as excess.

At the temporary holding facility, a veterinarian, when present, would provide recommendations to the BLM regarding care, treatment, and if necessary, euthanasia of the recently captured wild horses. Any animals affected by a chronic or incurable disease, injury, lameness or serious physical defect (such as severe tooth loss or wear, club foot, and other severe congenital abnormalities) would be humanely euthanized using methods acceptable to the American Veterinary Medical Association (AVMA).

TRANSPORT, SHORT TERM HOLDING, AND ADOPTION PREPARATION

Wild horses removed from the range as excess would be transported to the receiving short-term holding facility in a goose-neck stock trailer or straight-deck semi-tractor trailers. Trucks and trailers used to haul the wild horses would be inspected prior to use to ensure wild horses could be safely transported. Wild horses would be segregated by age and sex when possible and loaded into separate compartments. Jennies and their un-weaned foals may be shipped together depending on age and size of foals. Jennies and un-weaned foals would not be separated for longer than 12 hours. Transportation of recently captured wild horses would be limited to a maximum of 8 hours.

Upon arrival, recently captured wild horses would be off-loaded by compartment and placed in holding pens where they would be fed good quality hay and water. Most wild horses begin to eat and drink immediately and adjust rapidly to their new situation. At the short-term holding facility, a veterinarian would provide recommendations to the BLM regarding care, treatment, and if necessary, euthanasia of the recently captured wild horses. Any animals affected by a chronic or incurable disease, injury, lameness or serious physical defect (such as severe tooth loss or wear, club foot, and other severe congenital abnormalities) that was not diagnosed previously at the temporary holding corrals at the gather site would be humanely euthanized using methods acceptable to the AVMA. Wild horses in very thin condition or animals with injuries are sorted and placed in hospital pens, fed separately and/or treated for their injuries. Recently captured wild horses, generally jennies, in very thin condition may have difficulty transitioning to feed. A small percentage of animals can die during this transition; however, some of these animals are in such poor condition that it is unlikely they would have survived if left on the range. At short-term corral facilities, a minimum of

700 square feet is provided per animal.

After recently captured wild horses have transitioned to their new environment, they are prepared for adoption or sale. Preparation involves freeze-marking the animals with a unique identification number, vaccination against common diseases, castration, and de-worming.

PUBLIC PARTICIPATION

Prior to conducting a gather, a communication plan or similar document summarizing the procedures to follow when media or interested public request information or viewing opportunities during the gather should be prepared.

The public must adhere to guidance from the agency representative and viewing must be prearranged.

SAFETY

Safety of BLM employees, contractors, members of the public, and the wild horses will be given primary consideration. The following safety measures will be used by the Authorized Officer and all others involved in the operation as the basis for evaluating safety performance and for safety discussions during the daily briefings:

A briefing between all parties involved in the gather will be conducted each morning.

All BLM personnel, contractors and volunteers will wear protective clothing suitable for work of this nature. BLM will alert observers of the requirement to dress properly (see Wild Horse and Burro Operational Hazards, BLM file 4720, UT-067). BLM will assure that members of the public are in safe observation areas. Observation protocols and ground rules will be developed for the public and will be enforced to keep both public and BLM personnel in a safe environment.

The handling of hazardous, or potentially hazardous materials such as liquid nitrogen and vaccination needles will be accomplished in a safe and conscientious manner by BLM personnel or the contract veterinarian.

RESPONSIBILITY AND LINES OF COMMUNICATION

The local WH&B Specialist / Project Manager from the PFO, have the direct responsibility to ensure/make sure that Instruction Memorandum # 2013-060 Wild Horse and Burro Gather: Management by Incident Command System is followed.

Gather Research Coordinator (GCR) from the PFO, will have the direct responsibility to ensure compliance with all data collection and sampling. The GCR will also ensure appropriate communication with Field Office Manager, WO260 National Research Coordinator, College of Veterinary Medicine at Texas A&M University, and Animal Plant Health Inspection Service (APHIS).

The PFO Assistant Manager will take an active role to ensure the appropriate lines of communication are established between the field, Field Office, State Office, and Delta Wild Horse Corrals.

All employees involved in the gathering operations will keep the best interests of the animals at the forefront at all times.

APPENDIX F: SOP FOR FERTILITY

Standard Operating Procedures for Population-Level Fertility Control Treatments One-Year Liquid Vaccine

The following implementation and monitoring requirements are part of the Proposed Action:

1. PZP vaccine would be administered through darting by trained BLM personnel or collaborating partners only. For any darting operation, the designated personnel must have successfully completed a nationally recognized wildlife darting course and who have documented and successful experience darting wildlife under field conditions.
2. All mares targeted for treatment will be clearly identifiable through photographs to enable darters and HMA managers to positively identify the animals during the project and at the time of removal during subsequent gathers.
3. Mares that have never been treated would receive 0.5 cc of PZP vaccine emulsified with 0.5 cc of Freund's Modified Adjuvant (FMA) and loaded into darts at the time a decision has been made to dart a specific mare. Mares identified for re-treatment receive 0.5 cc of the PZP vaccine emulsified with 0.5 cc of Freund's Incomplete Adjuvant (FIA).
4. The liquid dose of PZP vaccine is administered using 1.0 cc Pneu-Darts with 1.5" barbless needles fired from either Dan Inject® or Pneu-Dart® capture gun.
5. Only designated darters would mix the vaccine/adjuvant and prepare the emulsion. Vaccine-adjuvant emulsion would be loaded into darts at the darting site and delivered by means of a capture gun. Designated darters will follow safety guidance on EPA labeling for all adjuvants.
6. Delivery of the vaccine would be by intramuscular injection into the left or right hip/gluteal muscles while the mare is standing still.
7. Safety for both humans and the horse is the foremost consideration in deciding to dart a mare. The Dan Inject® gun would not be used at ranges in excess of 30 m while the Pneu-Dart® capture gun would not be used over 50 m, and no attempt would be taken when other persons are within a 30-m radius of the target animal.
8. No attempts would be taken in high wind (greater than 15 mph) or when the horse is standing at an angle where the dart could miss the hip/gluteal region and hit the rib cage. The ideal is when the dart would strike the skin of the horse at a perfect 90° angle.
9. If a loaded dart is not used within two hours of the time of loading, the contents would be transferred to a new dart before attempting another horse. If the dart is not used before the end of the day, it would be stored under refrigeration and the contents transferred to another dart the next day. Refrigerated darts would not be used in the field.
10. No more than two people should be present at the time of a darting. The second person is responsible for locating fired darts. The second person should also be responsible for identifying the horse and keeping onlookers at a safe distance.

11. To the extent possible, all darting would be carried out in a discrete manner. However, if darting is to be done within view of non-participants or members of the public, an explanation of the nature of the project would be carried out either immediately before or after the darting.

12. Attempts will be made to recover all darts. To the extent possible, all darts which are discharged and drop from the horse at the darting site would be recovered before another darting occurs. In exceptional situations, the site of a lost dart may be noted and marked, and recovery efforts made at a later time. All discharged darts would be examined after recovery in order to determine if the charge fired and the plunger fully expelled the vaccine. Personnel conducting darting operations should be equipped with a two-way radio or cell phone to provide a communications link with the Project Veterinarian for advice and/or assistance. In the event of a veterinary emergency, darting personnel would immediately contact the Project Veterinarian, providing all available information concerning the nature and location of the incident.

13. In the event that a dart strikes a bone or imbeds in soft tissue and does not dislodge, the darter would follow the affected horse until the dart falls out or the horse can no longer be found. The darter would be responsible for daily observation of the horse until the situation is resolved.

Monitoring and Tracking of Treatments

1. At a minimum, estimation of population growth rates using helicopter or fixed-wing surveys will be conducted before any subsequent gather. During these surveys it is not necessary to identify which foals were born to which mares; only an estimate of population growth is needed (i.e. # of foals to # of adults).

2. Population growth rates of herds selected for intensive monitoring will be estimated every year post-treatment using helicopter or fixed-wing surveys. During these surveys it is not necessary to identify which foals were born to which mares, only an estimate of population growth is needed (i.e. # of foals to # of adults). If, during routine HMA field monitoring (on-the-ground), data describing mare to foal ratios can be collected, these data should also be shared with the NPO for possible analysis by the USGS.

3. A PZP Application Data sheet will be used by field applicators to record all pertinent data relating to identification of the mare (including photographs if mares are not freeze-marked) and date of treatment. Each applicator will submit a PZP Application Report and accompanying narrative and data sheets will be forwarded to the NPO (Reno, Nevada). A copy of the form and data sheets and any photos taken will be maintained at the field office.

4. A tracking system will be maintained by NPO detailing the quantity of PZP issued, the quantity used, disposition of any unused PZP, the number of treated mares by HMA, field office, and State along with the freeze-mark(s) applied by HMA and date.

APPENDIX G: MIXING PROCEDURES

PZP Mixing Vaccine and Adjuvant

Equipment Needed

2 5.0 cc glass syringes

1.5 inch needle

vial of adjuvant

vial of PZP

Luer-Lok connector

1.0 cc C-type or P-type Pneu-Dart dart with 1.5 inch barbless needle

Procedures

1. Place the 1.5 inch needle on a glass syringe
2. Draw out 0.5 cc of adjuvant
3. Using the same syringe, draw up the 0.5 cc of PZP
4. Holding the syringe very carefully (because the plunger can slip out), take off the needle and attach the syringe to the second syringe using the Luer-Lok connector (have the Luer-lok connector already attached to the second syringe).
5. Push the PZP-adjuvant mixture back and forth through the two syringes 100 times. The resulting emulsion will become thick and look white. **THIS PROCEDURE IS VERY IMPORTANT AND IS RELATED TO THE PRESENTATION OF THE ANTIGEN AND THE SUBSEQUENT EFFICACY OF THE VACCINE.**
6. Make sure all the emulsion is in one syringe.
7. Holding the first syringe very carefully (the one with the emulsion), remove the second syringe, leaving the Luer-Lock on the first syringe.

If you are loading a 2.0 or 3.0 mL plastic syringe for hand-delivery, attach the glass syringe to the plastic syringe and inject the PZP emulsion in to the plastic syringe. It is helpful if you move the plunger of the plastic syringe just a bit before pumping the PZP emulsion into it. After loading the plastic syringe, disconnect the glass syringe and connect an 18g. 1.5 inch needle on the plastic syringe.

APPENDIX H: DATA SHEETS

HORSE IMMUNOCONTRACEPTION DATA SHEET

HORSE MANAGEMENT AREA: Range Creek HMA

HORSE IDENTIFICAION NUMBER/NAME: _____

HORSE COLOR: _____

OTHER MARKINGS/BRANDS: _____

Inoculation Dates	PZP Dose (µg)[2]	Adjuvant	Delivery System[3]	Injection Site[4]	Vaccine Lot Number

POST-INOCULATION REPRODUCTIVE HISTORY (Diagnosed pregnancies and/or births)
DESCRIBE ANY:

[2] Standard dose is 100 µg with raw vaccine

[3] Pneu-Dart unless otherwise noted

[4] Left or right hip

1. Drugs administered to this horse concurrent with study (name of drug, dose, date):

2. Post-treatment health problems (with particular reference to injection-site abscesses):

3. Additional remarks:

APPENDIX I: POPULATION MODEL

Range Creek 2018 Population Modeling

To complete the population modeling for the Range Creek Herd Management Area, version 1.40 of the WinEquus program, created April 2, 2002, was utilized.

Objectives of Population Modeling

Review of the data output for each of the simulations provided many use full comparisons of the possible outcomes for each alternative. Some of the questions that need to be answered through the modeling include:

- Do any of the Alternatives "crash" the population?
- What effect does fertility control have on population growth rate?
- What effects do the different alternatives have on the average population size?
- What effects do the different alternatives have on the genetic health of the herd?

Population Data, Criteria, and Parameters utilized for Population Modeling
All simulations used the survival probabilities, foaling rates, and sex ratio at birth that was supplied with the WinnEquus population for the Garfield HMA.

Sex ratio at Birth:

43% Females

57% Males

The following percent effectiveness of fertility control was utilized in the population modeling for Alternative 2:

Year 1: 94%, Year 2: 82%, Year 3: 68%

The following table displays the contraception parameters utilized in the population model for Alternative 2:

Contraception Criteria

(Alternative 2)

Age	Percentages for Fertility Treatment
1	0%
2	100%
3	100%
4	100%
5	100%
6	100%
7	100%
8	100%

9	100%
10-14	100%
15-19	100%
20+	100%

Population Modeling Criteria

The following summarizes the population modeling criteria that are common to the Proposed Action and all alternatives:

- Starting year: 2018
- Initial Gather Year: 2018
- Gather interval: regular interval of three years
- Gather for fertility treatment regardless of population size: No
- Continue to gather after reduction to treat females: Yes
- Sex ratio at birth: 57% Males
- Percent of the population that can be gathered: 80%
- Minimum age for long term holding facility horses: Not Applicable
- Foals are not included in the AML
- Simulations were run for 10 years with 100 trials each

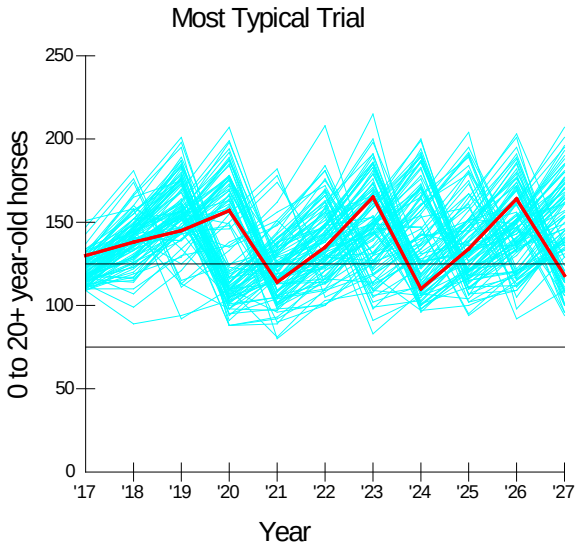
The following table displays the population modeling parameters utilized in the model:

Population Modeling Parameters

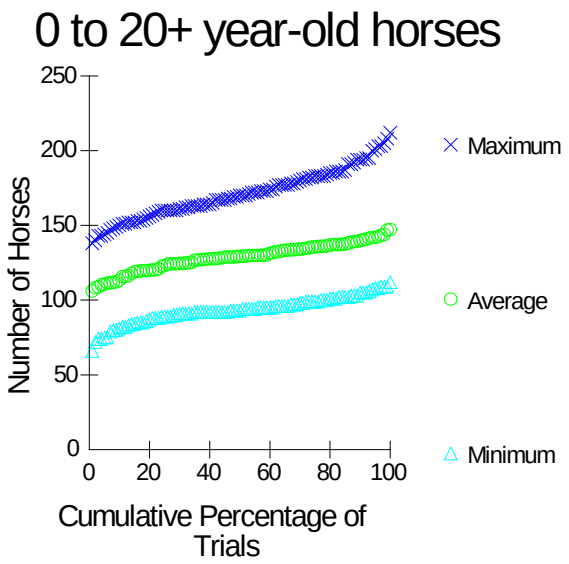
Modeling Parameter	**Alternative 2:** Selective Removal of Excess Wild Horses to within AML range, implement Population Growth Suppression with Sex Ratio adjustment	**Alternative 3:** Gather and Remove Excess Animals to within AML range without Fertility Control or Sex Ratio Adjustment.	**Alternative 1:** No Action (No Removal & No Fertility Control)
Management by removal, 60:40 adjustment in sex ratio, and fertility control	Yes	No	N/A
Management by removal, and fertility control	No	No	No
Management by removal only	No	Yes	N/A
Threshold Population Size Following Gathers	125	125	N/A
Target Population Size Following gather	75	75	N/A
Gather for fertility control regardless of population size	No	No	N/A

Gather continue after removals to treat additional females	No	No	N/A
Effectiveness of Fertility Control: Year 1	94%	N/A	N/A
Effectiveness of Fertility Control: Year 2	82%	N/A	N/A
Effectiveness of Fertility Control: Year 3	68%	N/A	N/A

Proposed Action (Alternative 2): Selective Removal of Excess Wild Horses to within AML range, implement Population Growth Suppression with Sex Ratio adjustment



Population Size



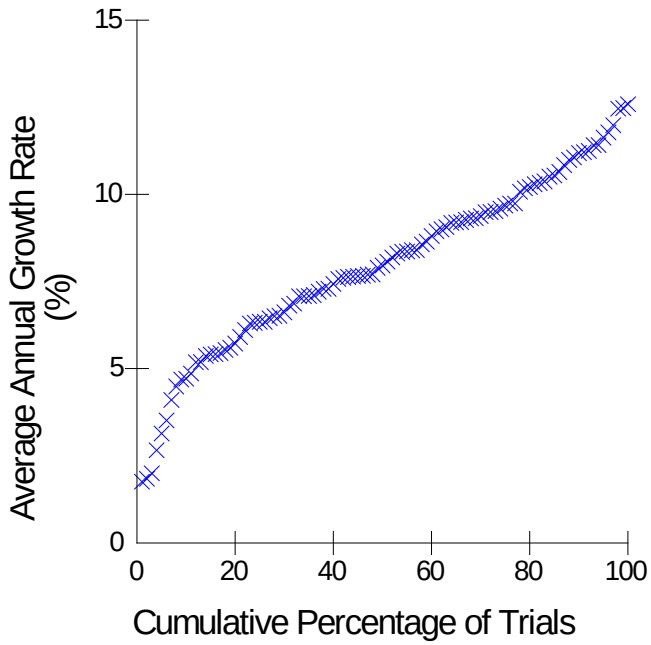
Population Sizes in 11 Years*

	Minimum	Average	Maximum
Lowest Trial	66	106	138
10th Percentile	82	114	150
25th Percentile	89	124	160
Median Trial	94	129	170
75th Percentile	99	136	183
90th Percentile	105	140	194
Highest Trial	112	147	212

* 0 to 20+ year-old horses

Explanation

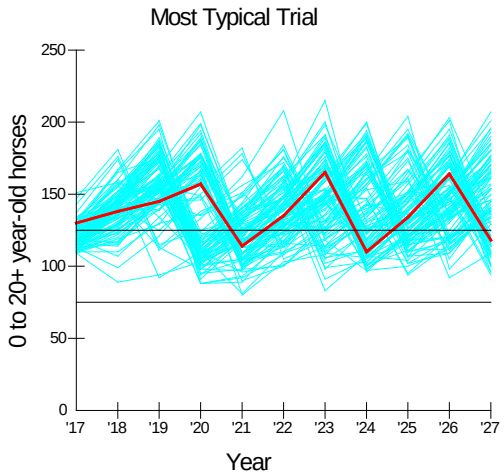
In 11 years and 100 trials, the lowest number of 0 to 20+ year-old horses ever obtained was 66 and the highest was 212. In half the trials, the minimum population size in 11 years was less than 94 and the maximum was less than 170. The average population size across the 11 years ranged from 106 to 147.



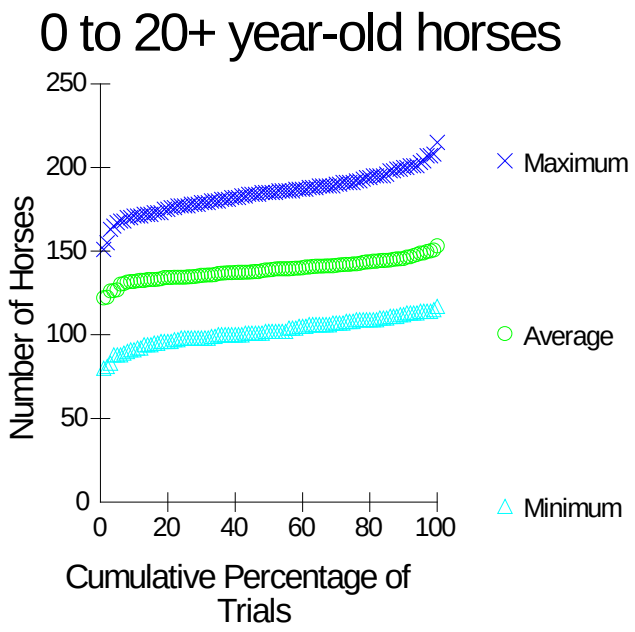
Average Growth Rate in 10 Years

Lowest Trial	1.8%
10th Percentile	4.8%
25th Percentile	6.3%
Median Trial	8.0%
75th Percentile	9.7%
90th Percentile	11.2%
Highest Trial	12.6%

Alternative 3: Gather and Remove Excess Animals to within AML range without Fertility Control or Sex Ratio Adjustment.



Population Size



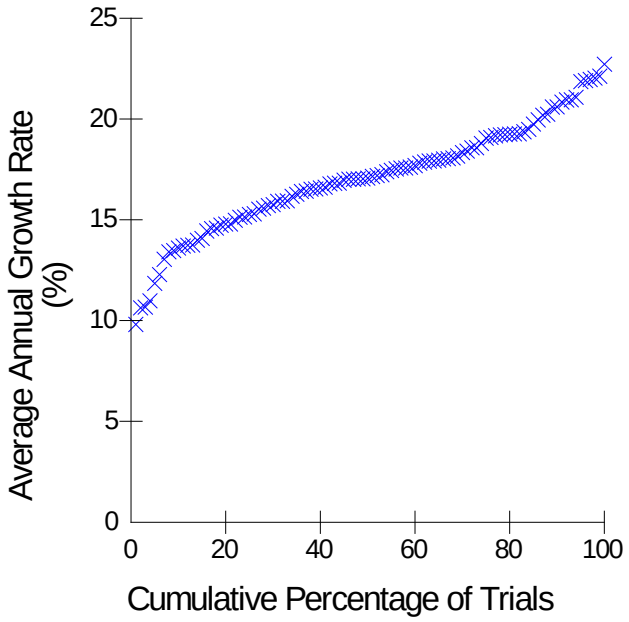
Population Sizes in 11 Years*

	Minimum	Average	Maximum
Lowest Trial	80	122	151
10th Percentile	92	132	171
25th Percentile	98	134	177
Median Trial	102	139	185
75th Percentile	108	142	192
90th Percentile	112	146	200
Highest Trial	117	153	215

* 0 to 20+ year-old horses

Explanation

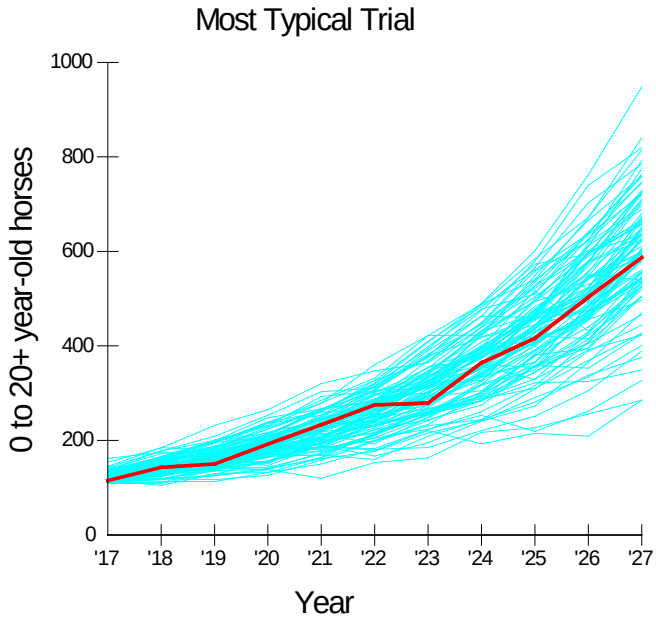
In 11 years and 100 trials, the lowest number of 0 to 20+ year-old horses ever obtained was 80 and the highest was 215. In half the trials, the minimum population size in 11 years was less than 102 and the maximum was less than 185. The average population size across 11 years ranged from 122 to 153.



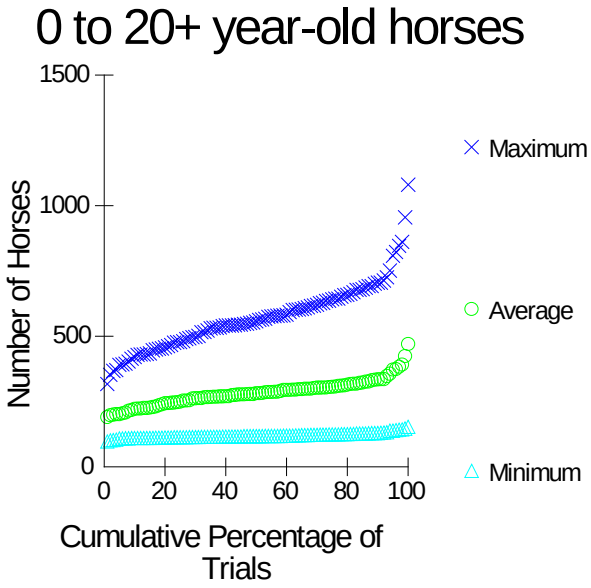
Average Growth Rate in 10 Years

Lowest Trial	9.8
10th Percentile	13.6
25th Percentile	15.3
Median Trial	17.1
75th Percentile	19.1
90th Percentile	20.7
Highest Trial	22.7

Alternative 1: No Action (No Removal & No Fertility Control)



Population Size

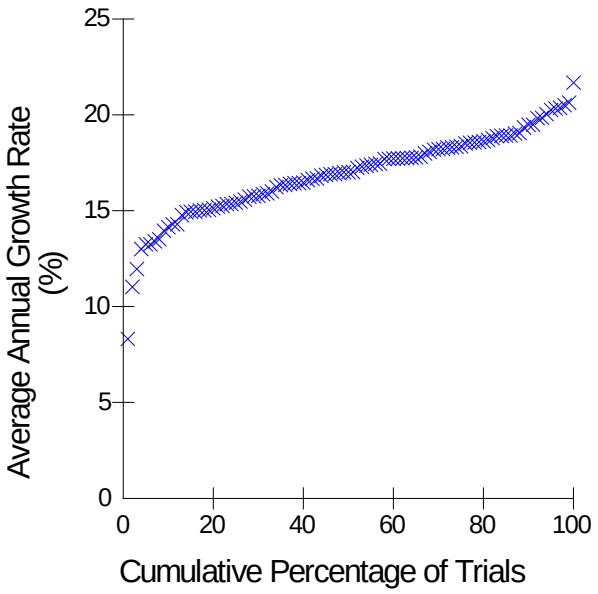


	Population Sizes in 11 Years*		
	Minimum	Average	Maximum
Lowest Trial	97	190	317
10th Percentile	110	222	424
25th Percentile	113	251	479
Median Trial	117	282	560
75th Percentile	124	307	642
90th Percentile	130	335	705

Highest Trial	153	470	1080

* 0 to 20+ year-old horses

Explanation
In 11 years and 100 trials, the lowest number of 0 to 20+ year-old horses ever obtained was 97 and the highest was 1080. In half the trials, the minimum population size in 11 years was less than 117 and the maximum was less than 560. The average population size across 11 years ranged from 190 to 470.



Average Growth Rate in 10 Years	
Lowest Trial	8.3
10th Percentile	14.2
25th Percentile	15.4
Median Trial	17.0
75th Percentile	18.4
90th Percentile	19.5
Highest Trial	21.7

APPENDIX J: ALTERNATIVES CONSIDERED BUT ELIMINATED

ALTERNATIVES CONSIDERED BUT ELIMINATED

The following alternatives were considered but dismissed from detailed analysis for the reasons described below.

PROVIDE SUPPLEMENTAL FEED AND WATER

Providing supplemental feed (hay) or hauling water (other than during a short-term emergency situation) does not meet the definition of minimum feasible management and is inconsistent with current law, regulation and policy. Refer to 43 CFR 4710.4.

MANAGE THE ENTIRE POPULATION AS A NON-BREEDING POPULATION OF GELDINGS

Insert description of alternative and why it was dismisse One possible management alternative which has been suggested is to manage the Range Creek HMA in its entirety as a non-breeding population of geldings. This alternative would require a land use plan amendment or revision. Therefore, it was not analyzed in detail at this time.

RETURN A PORTION OF THE POPULATION AS A NON-BREEDING POPULATION

This alternative would involve capturing, gelding and returning a portion of the population as a non-breeding population, once the population is brought to low AML. This alternative was not brought forward for detailed analysis because it is inconsistent with the Price RMP, and the Range Creek HMAP.

RETURN THE HMA TO HERD AREA STATUS WITH ZERO AML

Another alternative which has been suggested is to return the Range Creek HMA to Herd Area status and establish the AML as "0" animals. Resource concerns such as lack of forage, lack of water, and conflicts with other resources make this alternative an unviable solution. The available forage and water resources are expected to be adequate to support a population of 75-125 animals, therefore this alternative was not considered in detail.

REMOVE OR REDUCE LIVESTOCK WITHIN THE HMA

This alternative would involve no removal of wild horses and instead address the excess wild horse numbers through the removal or reduction of livestock within the HMA. This alternative was not brought forward for detailed analysis because it is outside of the scope of the analysis, is inconsistent with both the Price RMP and the WFRHBA, which directs the Secretary to immediately remove excess wild horses, and is inconsistent with multiple use management. Livestock grazing can only be reduced following the process outlined in the regulations found at 43 CFR Part 4100. Several reductions and changes have been made to livestock grazing within the allotment associated with the Range Creek HMA through this process. The elimination of livestock grazing in an area would require an amendment to the Price RMP. Such changes to livestock grazing cannot be made through a wild horse gather decision.

A livestock permit renewal was completed in 1999 on the Green River allotment within and adjacent to the Range Creek HMA. This renewal had an Environmental Assessment and Decision Record completed. The decision established stocking rates for livestock. The decision also established

seasons of use, areas of use, kind and class of livestock and management actions to improve livestock distribution. These management actions included the establishment of grazing systems, allowable use levels, salting and herding practices. Livestock grazing continues to be evaluated for the allotment and use areas within the Range Creek HMA. Monitoring and evaluation of livestock grazing is in accordance with the Price RMP's Livestock Grazing Section, which states:

GRA-1 Manage grazing and rangeland health according to the *Standards for Rangeland Health and Guidelines for Grazing Management for BLM Lands in Utah*, and in 43 CFR 4100 et seq. based on historical use and dependent on the availability of forage and water.

GRA-2 Based on Taylor Grazing Act guidance that directs that public "land and its resources must be preserved from destruction or unnecessary injury," temporarily adjust forage allocations as needed during periods of forage depletion caused by severe drought or other natural causes such as fire. Additional guidance is found in the *Standards for Rangeland Health and Guidelines for Grazing Management for BLM Lands in Utah*. During times when extreme climatic conditions exist, the BLM will manage and adjust grazing practices to maintain and work toward meeting Standards for Rangeland Health for Public Lands in the PFO, see Appendix R-7.

GRA-3 Base changes in levels of use or continuance of permitted use on current laws, policy, and monitoring data, analysis in accordance with NEPA. The analysis process will consider LUP program decision objectives and priorities in relation to livestock grazing and achievement of *Standards for Rangeland Health* on a case-by-case basis.

The BLM is currently authorized to remove livestock from the HMA, "if necessary to provide habitat for wild horses or burros, to implement herd management actions, or to protect wild horses or burros from disease, harassment or injury" under CFR 4710.5. This authority is usually applied in cases of emergency and not for general management of wild horses or burros in a manner that would be inconsistent with the land-use plan and the separate decisions establishing the appropriate levels of livestock grazing and wild horse use, respectively. Available data also indicates that wild horse use – including where livestock use has been excluded – has resulted in excessive vegetative utilization.

GATHER THE HMA TO THE AML UPPER LIMIT

A post-gather population size at the upper level of the AML range would result in the AML being exceeded with the next foaling season. This would be unacceptable for several reasons.

The AML represents "that 'optimum number' of wild horses which results in a thriving natural ecological balance and avoids a deterioration of the range" (Animal Protection Institute, 109 Interior Board of Land Appeals (IBLA) 119; 1989). The IBLA has also held that, "Proper range management dictates removal of horses before the herd size causes damage to the rangeland. Thus, the optimum number of horses is somewhere below the number that would cause resource damage" (Animal Protection Institute, 118 IBLA 63, 75; 1991).

The upper level of the AML established within the HMA represents the maximum population for which thriving natural ecological balance would be maintained. The lower level represents the number of animals to remain in the HMA following a wild horse gather, in order to allow for a periodic gather cycle, and to prevent the population from exceeding the established AML between gathers.

Additionally, gathering to the upper range of AML would result in the need to follow up with another gather within one year (with resulting stress on the wild horse population), and could result in overutilization of vegetation resources and damage to the rangeland if the BLM is unable to gather the excess horses in the HMA on an annual basis. This alternative would not reduce the wild horse population growth rate of 20% in the Range Creek HMA and the BLM would not be able to conduct periodic gathers and still maintain a thriving natural ecological balance. For these reasons, this alternative did not receive further consideration in this document.

FERTILITY CONTROL TREATMENT ONLY INCLUDING USING BAIT/WATER TRAPPING TO DART MARES WITH PZP OR OTHER CONTRACEPTIVE VACCINE REMOTELY (NO REMOVAL)

Population modeling (Appendix I) was completed to analyze the potential impacts associated with conducting gathers about every 2-3 years over the next 20 year period to treat captured mares with fertility control. Under this alternative, no excess wild horses would be removed. While the average population growth would be reduced to about (11) percent per year, AML would not be achieved and the damage to the range associated with wild horse overpopulation would continue. This alternative would not meet the Purpose and Need for the Action, and would be contrary to the WFRHBA, and was dismissed from further study.

The use of remote darting to administer PZP or other contraceptive vaccines within HMAs where the horses are not accustomed to human activity has been shown to be very difficult. In the Cedar Mountain HMA during a two year study where administration of PZP by remote darting was to occur not a single horse was successfully darted. This method has been affective in some HMAs where the wild horses are more approachable but the Range Creek HMA is not such an area, so this method of administering PZP was dismissed from further study.

BAIT OR WATER TRAP ONLY

Providing an alternative considered but eliminated from detailed analysis was use of bait and/or water trapping as the primary gathering method. The use of bait and water trapping, though effective in specific areas and circumstances, would not be timely, cost-effective or practical as the primary gather method for this HMA due to the timing of the proposed gather. However, water or bait trapping may be used to achieve the desired goals of Alternatives 2-4 if gather efficiencies are too low using a helicopter or a helicopter gather cannot be scheduled. This alternative was dismissed from detailed study as a primary gather method for the following reasons: (1) the project area is too large to effectively use this gather method; (2) road access for vehicles to potential trapping locations necessary to get equipment in/out as well as safely transport gathered wild horses is limited; and (3) the presence of scattered water sources on state, private and public lands inside the HMA would make it almost impossible to restrict wild horse access to the extent necessary to effectively gather and remove the excess animals through bait and/or water trapping to achieve management goals.

WILD HORSE NUMBERS CONTROLLED BY NATURAL MEANS

This alternative was eliminated from further consideration because it is contrary to the WFRHBA which requires the BLM to prevent the range from deterioration associated with an overpopulation of wild horses. It is also inconsistent with the Price RMP, which directs that Price Field Office BLM conduct gathers as necessary to achieve and maintain the AML. The alternative of using natural controls to achieve a desirable AML has not been shown to be feasible in the past. Wild horses in the Range Creek HMA are not substantially regulated by predators (which includes mountain lions and

bears). In addition, wild horses are a long-lived species with documented foal survival rates exceeding 95% and they are not a self-regulating species. This alternative would result in a steady increase in numbers which would continually exceed the carrying capacity of the range until severe and unusual conditions that occur periodically-- such as blizzards or extreme drought-- cause catastrophic mortality of wild horses.

GATHER AND RELEASE EXCESS WILD HORSES EVERY TWO YEARS AND APPLY TWO YEAR PZP OR OTHER CONTRACEPTIVE VACCINE TO HORSES FOR RELEASE

Another alternative to gather a substantial portion of the existing population (90%) and implement fertility control treatment only, without removal of excess horses was modeled using a two-year gather/treatment interval over a 10 year period, based on expected effectiveness of PZP-22 pellet vaccine. Based on WinEquus population modeling, this alternative would not result in attainment of AML for the HMA. The wild horse population would continue to have an average population growth rate of 2.3% to 13.7% adding to the current wild horse overpopulation, albeit at a slower rate of growth than the No Action Alternative. The modeling reflected an average population size in 11 years of 127 to 236 wild horses under a two-year treatment interval. In 90% of the trials, this alternative would not decrease the existing overpopulation of wild horses, resource concerns and rangeland deterioration would continue, and implementation would result in substantially increased gather and fertility control costs relative to the alternatives that remove excess wild horses to the AML range. In addition to not achieving AML, the time needed to complete a gather would also increase over time, because the more frequently an area is gathered, the more difficult wild horses are to trap. They become very evasive and learn to evade the helicopter by taking cover in treed areas and canyons. Wild horses would also move out of the area when they hear a helicopter, thereby further reducing the overall gather efficiency. Frequent gathers would increase the stress to wild horses, as individuals and as entire herds. It would become increasingly more difficult over time to repeat gathers every two years to successfully treat a large portion of the population. For these reasons, this alternative was dropped from detailed study.

USE ALTERNATIVE CAPTURE TECHNIQUES INSTEAD OF HELICOPTERS TO CAPTURE EXCESS WILD HORSES

An alternative using capture methods other than helicopters to gather excess wild horses was suggested, other than bait/water trapping, through the public review process. As no specific alternative methods were suggested, the BLM identified chemical immobilization, net gunning, and wrangler/horseback drive trapping as potential methods for gathering horses. Net gunning techniques normally used to capture big games also rely on helicopters. Chemical immobilization is a very specialized technique and strictly regulated. Currently the BLM does not have sufficient expertise to implement either of these methods and they would be impractical to use given the size of the HMA, access limitations and approachability of the horses.

Use of wrangler on horseback drive-trapping to remove excess wild horses can be fairly effective on a small scale; but due to the number of excess horses to be removed, the large geographic size of the HMA, access limitations and approachability of the horses this technique would be ineffective and impractical. Horseback drive-trapping is also very labor intensive and can be very harmful to the domestic horses and the wranglers used to herd the wild horses. For these reasons, this alternative was eliminated from further consideration.

FIELD DARTING FERTILTIY TREATMENT ONLY FOR POPULATION SUPPRESSION

BLM would administer PZP in the one year dose inoculations by field darting the mares. This method is currently approved for use and is being utilized by BLM in other HMAs. This alternative was dismissed from detailed study for the following reasons: (1) the size of the area at 55,000 acres is to large to use this method; (2) the presence of water sources scattered throughout the HMA and several streams running through it, makes it almost impossible to restrict wild horse access to be able to dart horses consistently; and (3) horse behavior limits their approachability/accessibility, so that the number of mares expected to be treated via darting would be insufficient to control growth. For these reasons, this alternative was determined to not be an effective or feasible method for applying PZP to wild horses from the Range Creek HMA.

APPENDIX K: FERTILITY CONTROL

PORCINE ZONA PELLUCIDA (PZP) VACCINE

The immune-contraceptive Porcine Zona Pellucida (PZP) vaccine is currently being used on over 75 areas managed for wild horses by the National Park Service, US Forest Service, and the Bureau of Land Management and its use is appropriate for free-ranging wild horse herds. Taking into consideration available literature on the subject, the National Research Council concluded in their 2013 report that PZP was one of the preferable available methods for contraception in wild horses and burros (NRC 2013). PZP use can reduce or eliminate the need for gathers and removals (Turner et al. 1997). PZP vaccines meet most of the criteria that the National Research Council (2013) used to identify promising fertility control methods, in terms of delivery method, availability, efficacy, and side effects. It has been used extensively in wild horses (NRC 2013), and in a population of feral burros in territory of the US (Turner et al. 1996). PZP is relatively inexpensive, meets BLM requirements for safety to mares and the environment, and is commercially produced as ZonaStat-H, an EPA-registered product (EPA 2012, SCC 2015), or as PZP-22, which is a formulation of PZP in polymer pellets that can lead to a longer immune response (Turner et al. 2002, Rutberg et al. 2017). It can easily be remotely administered in the field in cases where mares are relatively approachable.

Under the Proposed Action, the BLM would return to the HMA as needed to re-apply PZP-22 and / or ZonaStat-H and initiate new treatments in order to maintain contraceptive effectiveness in controlling population growth rates. Both forms of PZP can safely be reapplied as necessary to control the population growth rate. Even with repeated booster treatments of PZP, it is expected that most, if not all, mares would return to fertility. Once the population is at AML and population growth seems to be stabilized, BLM could use population planning software (WinEquus II, currently in development by USGS Fort Collins Science Center) to determine the required frequency of re-treating mares with PZP.

PZP DIRECT EFFECTS

When injected as an antigen in vaccines, PZP causes the mare's immune system to produce antibodies that are specific to zona pellucida proteins on the surface of that mare's eggs. The antibodies bind to the mare's eggs surface proteins (Liu et al. 1989), and effectively block sperm binding and fertilization (Zoo Montana, 2000). Because treated mares do not become pregnant but other ovarian functions remain generally unchanged, PZP can cause a mare to continue having regular estrus cycles throughout the breeding season. Research has demonstrated that contraceptive efficacy of an injected PZP vaccine is approximately 90% for mares treated twice in the first year and boostered annually (Kirkpatrick et al., 1992). Approximately 60% to 85% of mares are successfully contracepted for one year when treated simultaneously with a liquid primer and PZP-22 pellets (Rutberg et al. 2017). In addition, among mares, PZP contraception appears to be reversible, with most treated mares returning to fertility over time. PZP vaccine application at the capture site does not appear to affect normal development of the fetus or foal, hormone health of the mare or behavioral responses to stallions, should the mare already be pregnant when vaccinated (Kirkpatrick et al. 2002). The vaccine has no apparent effect on pregnancies in progress or the health of offspring (Kirkpatrick and Turner 2003).

The NRC (2013) criterion by which PZP is not a good choice for wild horse contraception was duration. The ZonaStat-H formulation of the vaccine tends to confer only one year of efficacy. Some

studies have found that a PZP vaccine in long-lasting pellets (PZP-22) can confer multiple years of contraception (Turner et al. 2007), particularly when boostered with subsequent PZP vaccination (Rutberg et al. 2017). Other trial data, though, indicate that the pelleted vaccine may only be effective for one year (J. Turner, University of Toledo, Personal Communication, w/Paul Griffin).

Following a gather, application of PZP for fertility control would reduce fertility in a large percentage of mares for at least one year (Ransom et al. 2011). Recruitment of foals into the population may be reduced over a three- year period. Gather efficiency would likely not exceed 85% via helicopter, and may be less with bait and water trapping, so there would be a portion of the female population uncaptured that is not treated in any given year. Additionally, some mares may not respond to the fertility control vaccine, but instead will continue to foal normally.

In most cases, PZP contraception appears to be temporary and reversible (Kirkpatrick and Turner 2002, Joonè et al. 2017), does not appear to cause out-of-season births (Kirkpatrick and Turner 2003), and has no ill effects on ovarian function if contraception is not repeated for more than five consecutive years on a given mare. Although the rate of long-term or permanent sterility following repeated vaccinations with PZP has not been quantified, it must be acknowledged that this could be a result for some number of wild horses receiving multiple repeat PZP vaccinations. Even though it is not the intent of PZP treatment, the permanent sterility of a fraction of treated mares is a potential result that would be consistent with the contraceptive purpose of applying the vaccine to wild mares.

Although most treatments with PZP will be reversible, repeated treatment with PZP may lead to long-term infertility (Feh 2012) and, perhaps, direct effects on ovaries (Gray and Cameron 2010). Bechert et al. (2013) found that ovarian function was affected by the SpayVac PZP vaccination, but that there were no effects on other organ systems. Mask et al. (2015) demonstrated that equine antibodies that resulted from SpayVac immunization could bind to oocytes, ZP proteins, follicular tissues, and ovarian tissues, but it is possible that result is specific to SpayVac, which may have lower PZP purity than ZonaStat or PZP-22 (Hall et al. 2016b). Joonè et al. (2017) found effects on ovaries after SpayVac PZP vaccination in some treated mares, but normal estrus cycling had resumed 10 months after the last treatment. SpayVac is a patented formulation of PZP in liposomes that can lead to multiple years of infertility (Roelle et al. 2017) but which is not reliably available for BLM to use at this time. Kirkpatrick et al. (1992) noted effects on ovaries after three years of treatment with PZP. Observations at Assateague Island National Seashore indicate that the more times a mare is consecutively treated, the longer the time lag before fertility returns, but that even mares treated 7 consecutive years did return to ovulation (Kirkpatrick and Turner 2002). Other studies have reported that continued applications of PZP may result in decreased estrogen levels (Kirkpatrick et al., 1992) but that decrease was not biologically significant, as ovulation remained similar between treated and untreated mares (Powell and Monfort 2001). Permanent sterility for mares treated consecutively 5-7 years was observed by Nunez et al. (2010, 2017). In a graduate thesis, Knight (2014) suggested that repeated treatment with as few as three to four years of PZP treatment may lead to longer-term sterility, and that sterility may result from PZP treatment before puberty.

If a mare is already pregnant, the PZP vaccine has not been shown to affect normal development of the fetus or foal, or the hormonal health of the mare with relation to pregnancy. In mice, Sacco et al. (1981) found that antibodies specific to PZP can pass from mother mouse to pup via the placenta or colostrum, but that did not apparently cause any innate immune response in the offspring: the level of those antibodies were undetectable by 116 days after birth. There was no indication in that study that the fertility or ovarian function of those pups was compromised, nor is BLM aware of any such

results in horses or burros.

On-range observations from 20 years of application to wild horses indicate that PZP application in wild mares does not generally cause mares to foal out of season or late in the year (Kirkpatrick and Turner 2003). Nunez's (2010) research showed that a small number of mares that had previously been treated with PZP foaled later than untreated mares and expressed the concern that this late foaling "may" impact foal survivorship and decrease band stability, or that higher levels of attention from stallions on PZP-treated mares might harm those mares. However, that paper provided no evidence that such impacts on foal survival or mare well-being actually occurred. Rubenstein (1981) called attention to a number of unique ecological features of horse herds on Atlantic barrier islands, which calls into question whether inferences drawn from island herds can be applied to western wild horse herds. Ransom et al. (2013), though, identified a potential shift in reproductive timing as a possible drawback to prolonged treatment with PZP, stating that treated mares foaled on average 31 days later than non-treated mares. Those results, however, showed that over 81% of the documented births in this study were between March 1 and June 21, i.e., within the normal spring season. Ransom et al. (2013) advised that managers should consider carefully before using PZP in small refugia or rare species. Wild horses and burros in Utah do not generally occur in isolated refugia, and they are not a rare species. Moreover, an effect of shifting birth phenology was not observed uniformly: in two of three PZP-treated wild horse populations studied by Ransom et al. (2013), foaling season of treated mares extended three weeks and 3.5 months, respectively, beyond that of untreated mares. In the other population, the treated mares foaled within the same time period as the untreated mares. Moreover, Ransom et al. (2013) found no negative impacts on foal survival even with an extended birthing season.

Mares receiving the vaccine would experience slightly increased stress levels associated with handling while being vaccinated and freeze-marked. Newly captured mares that do not have markings associated with previous fertility control treatments would be marked with a new freeze-mark for the purpose of identifying that mare, and identifying her PZP vaccine treatment history. This information would also be used to determine the number of mares captured that were not previously treated, and could provide additional insight regarding gather efficiency.

Most mares recover from the stress of capture and handling quickly once released back to the HMA, and none are expected to suffer serious long term effects from the fertility control injections, other than the direct consequence of becoming temporarily infertile. Injection site reactions associated with fertility control treatments are possible in treated mares (Roelle and Ransom 2009, Bechert et al. 2013), but swelling or local reactions at the injection site are expected to be minor in nature. Roelle and Ransom (2009) found that the most time-efficient method for applying PZP is by hand-delivered injection of 2-year pellets when horses are gathered. They observed only two instances of swelling from that technique. Use of remotely delivered, 1-year PZP is generally limited to populations where individual animals can be accurately identified and repeatedly approached. The dart-delivered formulation produced injection-site reactions of varying intensity, though none of the observed reactions appeared debilitating to the animals (Roelle and Ransom 2009). Joonè et al. (2017) found that injection site reactions had healed in most mares within 3 months after the booster dose, and that they did not affect movement or cause fever. The longer term nodules observed did not appear to change any animal's range of movement or locomotor patterns and in most cases did not appear to differ in magnitude from naturally occurring injuries or scars.

GONADOTROPIN RELEASING HORMONE (GNRH) VACCINE

The gonadotropin releasing hormone (GnRH) vaccine known as GonaCon is another existing vaccine that has been federally approved for use in wild horses as a contraceptive vaccine. Its use would be possible under alternatives 2 or 3. GonaCon could serve as the contraceptive vaccine for limiting population growth in this population. However, no mares would be treated with both PZP and GonaCon. Potential effects of GonaCon are analyzed below.

REGISTRATION AND SAFETY OF GONACON-EQUINE

The immune-contraceptive GonaCon-Equine vaccine meets most of the criteria that the National Research Council of the National Academy of Sciences (NRC 2013) used to identify the most promising fertility control methods, in terms of delivery method, availability, efficacy, and side effects. GonaCon-Equine is approved for use by authorized federal, state, tribal, public and private personnel, for application to wild and feral equids in the United States (EPA 2013, 2015). Its use is appropriate for free-ranging wild horse herds. Taking into consideration available literature on the subject, the National Research Council concluded in their 2013 report that GonaCon-B (which is produced under the trade name GonaCon-Equine for use in feral horses and burros) was one of the most preferable available methods for contraception in wild horses and burros (NRC 2013). GonaCon-Equine has been used on feral horses in Theodore Roosevelt National Park and on wild horses in one BLM-administered HMA (BLM 2015). GonaCon-Equine can be remotely administered in the field in cases where mares are relatively approachable, using a customized pneumatic dart (McCann et al. 2017). Use of remotely delivered (dart-delivered) vaccine is generally limited to populations where individual animals can be accurately identified and repeatedly approached within 50 m (BLM 2010).

As with other contraceptives applied to wild horses, the long-term goal of GonaCon-Equine use is to reduce or eliminate the need for gathers and removals (NRC 2013). GonaCon-Equine vaccine is an EPA-approved pesticide (EPA, 2009a) that is relatively inexpensive, meets BLM requirements for safety to mares and the environment, and is produced in a USDA-APHIS laboratory. Its categorization as a pesticide is consistent with regulatory framework for controlling overpopulated vertebrate animals, and in no way is meant to convey that the vaccine is lethal; the intended effect of the vaccine is as a contraceptive. GonaCon is produced as a pharmaceutical-grade vaccine, including aseptic manufacturing technique to deliver a sterile vaccine product (Miller et al. 2013). If stored at 4° C, the shelf life is 6 months (Miller et al 2013).

Miller et al. (2013) reviewed the vaccine environmental safety and toxicity. When advisories on the product label (EPA 2015) are followed, the product is safe for users and the environment (EPA 2009b). EPA waived a number of tests prior to registering the vaccine, because GonaCon was deemed to pose low risks to the environment, so long as the product label is followed (Wang-Chaill et al. 2017, *in press*).

Under the Proposed Action, the BLM would return to the HMA as needed to re-apply GonaCon-Equine and initiate new treatments in order to maintain contraceptive effectiveness in controlling population growth rates. GonaCon-Equine can safely be reapplied as necessary to control the population growth rate. Even with one booster treatment of GonaCon-Equine, it is expected that most, if not all, mares would return to fertility at some point, although the average duration of effect after booster doses has not yet been quantified. It is unknown what would be the expected rate for the return to fertility rate in mares boosted more than once with GonaCon-Equine. Once the herd size in the project area is at AML and population growth seems to be stabilized, BLM could make a

determination as to the required frequency of new mare treatments and mare re-treatments with GonaCon, to maintain the number of horses within AML.

GNRH VACCINE DIRECT EFFECTS

GonaCon-Equine is one of several vaccines that have been engineered to create an immune response to the gonadotropin releasing hormone peptide (GnRH). GnRH is a small peptide that plays an important role in signaling the production of other hormones involved in reproduction in both sexes. GnRH is highly conserved across mammalian taxa, so some inferences about the mechanism and effects of GonaCon-Equine in horses can be made from studies that used different anti-GnRH vaccines, in horses and other taxa. Other anti-GnRH vaccines include: Improvac (Imboden et al. 2006, Botha et al. 2008, Janett et al. 2009b Schulman et al. 2013, Dalmau et al. 2015), made in South Africa; Equity (Elhay et al. 2007), made in Australia; Improvest, for use in swine (Bohrer et al. 2014); Repro-BLOC (Boedeker et al. 2011); and Bopriva, for use in cows (Balet et al. 2014). Of these, GonaCon-Equine, Improvac, and Equity are specifically intended for horses. Other anti-GnRH vaccine formulations have also been tested, but did not become trademarked products (e.g., Goodloe 1991, Dalin et al 2002, Stout et al. 2003, Donovan et al. 2013). The effectiveness and side-effects of these various anti-GnRH vaccines may not be the same as would be expected from GonaCon-Equine use in horses. Results could differ as a result of differences in the preparation of the GnRH antigen, and the choice of adjuvant used to stimulate the immune response. While GonaCon-Equine can be administered as a single dose, most other anti-GnRH vaccines require a primer dose and at least one booster dose to be effective.

GonaCon has been produced by USDA-APHIS (Fort Collins, Colorado) in several different formulations, the history of which is reviewed by Miller et al. (2013). In any vaccine, the antigen is the stimulant to which the body responds by making antigen-specific antibodies. Those antibodies then signal to the body that a foreign molecule is present, initiating an immune response that removes the molecule or cell. GonaCon vaccines present the recipient with hundreds of copies of GnRH as peptides on the surface of a linked protein that is naturally antigenic because it comes from invertebrate hemocyanin (Miller et al 2013). Early GonaCon formulations linked many copies of GnRH to a protein from the keyhole limpet [GonaCon-KHL], but more recently produced formulations where the GnRH antigen is linked to a protein from the blue mussel [GonaCon-B] proved less expensive and more effective (Miller et al. 2008). GonaCon-Equine is in the category of GonaCon-B vaccines.

Adjuvants are included in vaccines to elevate the level of immune response, inciting recruitment of lymphocytes and other immune cells which foster a long-lasting immune response that is specific to the antigen. For some formulations of anti-GnRH vaccines, a booster dose is required to elicit at contraceptive response, though GonaCon can cause short-term contraception in a fraction of treated animals from one dose (Powers et al. 2011, Gionfriddo et al. 2011a, Baker et al. 2013, Miller et al 2013). The adjuvant used in GonaCon, Adjuvac, generally leads to a milder reaction than Freunds complete adjuvant (Powers et al. 2011). Adjuvac contains a small number of killed *Mycobacterium avium* cells (Miller et al. 2008, Miller et al. 2013). The antigen and adjuvant are emulsified in mineral oil, such that they are not all presented to the immune system right after injection; it is thought that the mineral oil emulsion leads to a depot effect and longer-lasting immune response (Miller et al. 2013). Miller et al. (2008, 2013) have speculated that, in cases where memory-B leukocytes are protected in immune complexes in the lymphatic system, it can lead to years of immune response. Increased doses of vaccine may lead to stronger immune reactions, but only to a certain point; when

Yoder and Miller (2010) tested varying doses of GonaCon in prairie dogs, antibody responses to the 200μg and 400μg doses were equal to each other but were both higher than in response to a 100μg dose.

The most direct result of successful GnRH vaccination is that it has the effect of decreasing the level of GnRH signaling in the body, as evidenced by a drop in leutinizing hormone levels, and a cessation of ovulation. Antibody titer measurements are proximate measures of the antibody concentration in the blood specific to a given antigen. Anti-GnRH titers generally correlate with a suppressed reproduction system (Gionfriddo et al. 2011a, Powers et al. 2011). Various studies have attempted to identify a relationship between anti-GnRH titer levels and infertility, but that relationship has not been universally predictable or consistent. The time length that titer levels stay high appears to correlate with the length of suppressed reproduction (Dalin et al. 2002, Levy et al. 2011, Donovan et al. 2013, Powers et al. 2011). For example, Goodloe (1991) noted that mares did produce elevated titers and had suppressed follicular development for 11-13 weeks after treatment, but that all treated mares ovulated after the titer levels declined. Similarly, Elhay (2007) found that high initial titers correlated with longer-lasting ovarian and behavioral anoestrus. However, Powers et al. (2011) did not identify a threshold level of titer that was consistently indicative of suppressed reproduction despite seeing a strong correlation between antibody concentration and infertility, nor did Schulman et al. (2013) find a clear relationship between titer levels and mare acyclicity.

In many cases, young animals appear to have higher immune responses, and stronger contraceptive effects of anti-GnRH vaccines than older animals (Brown et al. 1994, Curtis et al. 2001, Stout et al. 2003, Schulman et al. 2013). Vaccinating with GonaCon at too young an age, though, may prevent effectiveness; Gionfriddo et al. (2011a) observed weak effects in 3-4 month old fawns. It has not been possible to predict which individuals of a given age class will have long-lasting immune responses to the GonaCon vaccine. Gray (2010) noted that mares in poor body condition tended to have lower contraceptive efficacy in response to GonaCon-B. Miller et al. (2013) suggested that higher parasite loads might have explained a lower immune response in free-roaming horses than had been observed in a captive trial. At this time it is unclear what the most important factors affecting efficacy are.

Females that are successfully contracepted by GnRH vaccination enter a state similar to anestrus, have a lack of or incomplete follicle maturation, and no ovarian cycling (Botha et al. 2008). A leading hypothesis is that anti-GnRH antibodies bind GnRH in the hypothalamus – pituitary 'portal vessels,' preventing GnRH from binding to GnRH-specific binding sites on gonadotroph cells in the pituitary, thereby limiting the production of gonadotropin hormones, particularly leutinizing hormone [LH] and, to a lesser degree, follicle-stimulating hormone [FSH] (Powers et al. 2011, NRC 2013). This reduction in LH (and FSH), and a corresponding lack of ovulation, has been measured in response to treatment with anti-GnRH vaccines (Boedeker et al. 2011, Garza et al. 1986).

Females successfully treated with anti-GnRH vaccines have reduced progesterone levels (Garza et al 1986, Stout et al. 2003, Imboden et al. 2006, Elhay 2007, Botha et al. 2008, Killian et al. 2008, Miller et al. 2008, Janett et al. 2009a, Schulman et al. 2013, Balet et al 2014, Dalmau et al. 2015) and β-17 estradiol levels (Elhay et al. 2007), but no great decrease in estrogen levels (Balet et al. 2014). Reductions in progesterone do not occur immediately after the primer dose, but can take several weeks or months to develop (Elhay et al 2007, Botha et al. 2008, Schulman et al. 2013, Dalmau et al. 2015). This indicates that ovulation is not occurring and corpora lutea, formed from post-ovulation follicular tissue, are not being established.

Changes in hormones associated with anti-GnRH vaccination lead to measurable changes in ovarian structure and function. The volume of ovaries reduced in response to treatment (Garza et al. 1986, Dalin et al. 2002, Imboden et al. 2006, Elhay et al. 2007, Botha et al. 2008, Gionfriddo 2011a, Dalmau et al. 2015). Treatment with an anti-GnRH vaccine changes follicle development (Garza et al. 1986, Stout et al. 2003, Imboden et al. 2006, Elhay et al. 2007, Donovan et al. 2013, Powers et al. 2011, Balet et al 2014) , with the result that ovulation does not occur. A related result is that the ovaries can exhibit less activity and cycle with less regularity or not at all in anti-GnRH vaccine treated females (Goodloe 1991, Dalin et al. 2002, Imboden et al. 2006, Elhay et al. 2007, Janett et al. 2009a, Donovan et al. 2013, Powers et al. 2011). In studies where the vaccine required a booster, this result was generally observed within several weeks after delivery of the booster dose.

GNRH VACCINE CONTRACEPTIVE EFFECTS

The NRC (2013) review pointed out that single doses of GonaCon-Equine do not lead to high rates of initial effectiveness, or long duration. Initial effectiveness of one dose of GonaCon-Equine vaccine appears to be lower than for a combined primer plus booster dose of the PZP vaccine Zonastat-H (Kirkpatrick et al. 2011), and the initial effect of a single GonaCon dose can be limited to as little as one breeding season. However, preliminary results on the effects of boostered doses of GonaCon-Equine indicate that it can have high efficacy and longer-lasting effects in free-roaming horses (Baker et al. 2017) than the one-year effect that is generally expected from a single booster of Zonastat-H.

GonaCon and other anti-GnRH vaccines can be injected while a female is pregnant (Miller et al. 2000, Powers et al. 2011, Baker et al. 2013) – in such a case, a successfully contracepted mare would be expected to give birth during the following foaling season, but to be infertile during the same year's breeding season. Thus, a mare injected in November of 2019 would not show the contraceptive effect (i.e., no new foal) until spring of 2021.

Too few studies have reported on the various formulations of anti-GnRH vaccines to make generalizations about differences between products, but GonaCon formulations were consistently good at causing loss of fertility in a statistically significant fraction of treated mares for at least one year (Killian et al. 2009, Gray et al. 2010, Baker et al. 2013, 2017). With few exceptions (e.g., Goodloe 1991), anti-GnRH treated mares gave birth to fewer foals in the first season when there would be an expected contraceptive effect (Botha et al. 2008, Killian et al. 2009, Gray et al. 2010, Baker et al. 2013). Goodloe (1991) used an anti-GnRH-KHL vaccine with a triple adjuvant, in some cases attempting to deliver the vaccine to horses with a hollow-tipped 'biobullet', but concluded that the vaccine was not an effective immunocontraceptive in that study.

Not all mares should be expected to respond to the GonaCon-equine vaccine; some number should be expected to continue to become pregnant and give birth to foals. In studies where mares were exposed to stallions, the fraction of treated mares that are effectively contracepted in the year after anti-GnRH vaccination varied from study to study, ranging from ~50% (Baker et al. 2017), to 61% (Gray et al. 2010) to ~90% (Killian et al. 2006, 2008, 2009). Miller et al. (2013) noted lower effectiveness in free-ranging mares (Gray et al. 2010) than captive mares (Killian et al. 2009). Some of these rates are lower than the high rate of effectiveness typically reported for the first year after PZP vaccine treatment (Kirkpatrick et al. 2011). In the one study that tested for a difference, darts and hand-injected GonaCon doses were equally effective in terms of fertility outcome (McCann et al. 2017).

In studies where mares were not exposed to stallions, the duration of effectiveness also varied. A

primer and booster dose of Equity led to anoestrus for at least 3 months (Elhay et al 2007). A primer and booster dose of Improvac also led to loss of ovarian cycling for all mares in the short term (Imboden et al. 2006). It is worth repeating that those vaccines do not have the same formulation as GonaCon.

Results from horses (Baker et al. 2017) and other species (Curtis et al. 2001) suggest that providing a booster dose of GonaCon-Equine would increase the fraction of temporarily infertile animals to higher levels than would a single vaccine dose alone.

Longer-term infertility has been observed in some mares treated with anti-GnRH vaccines, including GonaCon-Equine. In a single-dose mare captive trial with an initial year effectiveness of 94%, Killian et al. (2008) noted infertility rates of 64%, 57%, and 43% in treated mares during the following three years, while control mares in those years had infertility rates of 25%, 12% and 0% in those years. GonaCon effectiveness in free-roaming populations was lower, with infertility rates consistently near 60% for three years after a single dose in one study (Gray et al. 2010) and annual infertility rates decreasing over time from 55% to 30% to 0% in another study with one dose (Baker et al. 2017). Similarly, gradually increasing fertility rates were observed after single dose treatment with GonaCon in elk (Powers et al. 2011) and deer (Gionfriddo et al. 2011a).

Baker et al. (2017) observed a return to fertility over 4 years in mares treated once with GonaCon, but then noted extremely low fertility rates of 0% and 16% in the two years after the same mares were given a booster dose four years after the primer dose. These are extremely promising preliminary results from that study in free-roaming horses; a third year of post-booster monitoring is ongoing in summer 2017, and researchers on that project are currently determining whether the same high-effectiveness, long-term response is observed after boosting with GonaCon after 6 months, 1 year, 2 years, or 4 years after the primer dose. Four of nine mares treated with primer and booster doses of Improvac did not return to ovulation within 2 years of the primer dose (Imboden et al. 2006), though one should probably not make conclusions about the long-term effects of GonaCon-Equine based on results from Improvac.

It is difficult to predict which females will exhibit strong or long-term immune responses to anti-GnRH vaccines (Killian et al. 2006, Miller et al. 2008, Levy et al. 2011). A number of factors may influence responses to vaccination, including age, body condition, nutrition, prior immune responses, and genetics (Cooper and Herbert 2001, Curtis et al. 2001, Powers et al. 2011). One apparent trend is that animals that are treated at a younger age, especially before puberty, may have stronger and longer-lasting responses (Brown et al. 1994, Curtis et al. 2001, Stout et al. 2003, Schulman et al. 2013). It is plausible that giving ConaGon-Equine to prepubertal mares will lead to long-lasting infertility, but that has not yet been tested.

To date, short term evaluation of anti-GnRH vaccines, show contraception appears to be temporary and reversible. Killian et al. noted long-term effects of GonaCon in some captive mares (2009). However, Baker et al. (2017) observed horses treated with GonaCon-B return to fertility after they were treated with a single primer dose; after four years, the fertility rate was indistinguishable between treated and control mares. It appears that a single dose of GonaCon results in reversible infertility but it is unknown if long term treatment would result in permanent infertility.

Other anti-GnRH vaccines also have had reversible effects in mares. Elhay (2007) noted a return to ovary functioning over the course of 34 weeks for 10 of 16 mares treated with Equity. That study

ended at 34 weeks, so it is not clear when the other six mares would have returned to fertility. Donovan et al. (2013) found that half of mares treated with an anti-GnRH vaccine intended for dogs had returned to fertility after 40 weeks, at which point the study ended. In a study of mares treated with a primer and booster dose of Improvac, 47 of 51 treated mares had returned to ovarian cyclicity within 2 years; younger mares appeared to have longer-lasting effects than older mares (Schulman et al. 2013). In a small study with a non-commercial anti-GnRH vaccine (Stout et al. 2003), three of seven treated mares had returned to cyclicity within 8 weeks after delivery of the primer dose, while four others were still suppressed for 12 or more weeks. In elk, Powers et al. (2011) noted that contraception after one dose of GonaCon was reversible. In white-tailed deer, single doses of GonaCon appeared to confer two years of contraception (Miller et al. 2000). Ten of 30 domestic cows treated became pregnant within 30 weeks after the first dose of Bopriva (Balet et al. 2014).

Permanent sterility as a result of single-dose or boostered GonaCon-Equine vaccine, or other anti-GnRH vaccines, has not been recorded, but that may be because no long-term studies have tested for that effect. It is conceivable that some fraction of mares could become sterile after receiving one or more booster doses of GonaCon-Equine, but the rate at which that could be expected to occur is currently unknown. If some fraction of mares treated with GonaCon-Equine were to become sterile, though, that result would not be contrary to the WFRHBA of 1971, as amended.

In summary, based on the above results related to fertility effects of GonaCon and other anti-GnRH vaccines, application of a single dose of GonaCon-Equine to gathered wild horses could be expected to prevent pregnancy in perhaps 30%-60% of mares for one year. Some smaller number of wild mares should be expected to have persistent contraception for a second year, and less still for a third year. Applying one booster dose of GonaCon to previously-treated mares should lead to two or more years with relatively high rates (80+%) of additional infertility expected, with the potential that some as-yet-unknown fraction of boostered mares may be infertile for several to many years. There is no data to support speculation regarding efficacy of multiple boosters of GonaCon-Equine; however, given it is formulated as a highly immunogenic long-lasting vaccine, it is reasonable to hypothesize that additional boosters would increase the effectiveness and duration of the vaccine.

GonaCon-Equine only affects the fertility of treated animals; untreated animals will still be expected to give birth. Even under favorable circumstances for population growth suppression, gather efficiency might not exceed 85% via helicopter, and may be less with bait and water trapping. The uncaptured portion of the female population would still be expected to have normally high fertility rates in any given year, though those rates could go up slightly if contraception in other mares increases forage and water availability.

GNRH VACCINE EFFECTS ON OTHER ORGAN SYSTEMS

Mares receiving any vaccine would experience slightly increased stress levels associated with handling while being vaccinated and freeze-marked, and potentially microchipped. Newly captured mares that do not have markings associated with previous fertility control treatments would be marked with a new freeze-mark for the purpose of identifying that mare, and identifying her vaccine treatment history. This information would also be used to determine the number of mares captured that were not previously treated, and could provide additional insight regarding gather efficiency. Most mares recover from the stress of capture and handling quickly once released back to the HMA, and none are expected to suffer serious long term effects from the fertility control injections, other than the direct consequence of becoming temporarily infertile.

Injection site reactions associated with immunocontraceptive treatments are possible in treated mares (Roelle and Ransom 2009). Whether injection is by hand or via darting, GonaCon-Equine is associated with some degree of inflammation, swelling, and the potential for abscesses at the injection site (Baker et al. 2013). Swelling or local reactions at the injection site are generally expected to be minor in nature, but some may develop into draining abscesses. When PZP vaccine was delivered via dart it led to more severe swelling and injection site reactions (Roelle and Ransom 2009), but that was not observed with dart-delivered GonaCon (McCann et al. 2017). Mares treated with one formulation of GnRH-KHL vaccine developed pyogenic abscesses (Goodloe 1991). Miller et al. (2008) noted that the water and oil emulsion in GonaCon will often cause cysts, granulomas, or sterile abscesses at injection sites; in some cases, a sterile abscess may develop into a draining abscess. In elk treated with GonaCon, Powers et al. (2011) noted up to 35% of treated elk had an abscess form, despite the injection sites first being clipped and swabbed with alcohol. Even in studies where swelling and visible abscesses followed GonaCon immunization, the longer term nodules observed did not appear to change any animal's range of movement or locomotor patterns (Powers et al. 2013, Baker et al. 2017).

The result that other formulations of anti-GnRH vaccine may be associated with less notable injection site reactions in horses may indicate that the adjuvant formulation in GonaCon leads a single dose to cause a stronger immune reaction than the adjuvants used in other anti-GnRH vaccines. Despite that, a booster dose of GonaCon-Equine appears to be more effective than a primer dose alone (Baker et al. 2017). Horses injected in the hip with Improvac showed only transient reactions that disappeared within 6 days in one study (Botha et al. 2008), but stiffness and swelling that lasted 5 days were noted in another study where horses received Improvac in the neck (Imboden et al. 2006). Equity led to transient reactions that resolved within a week in some treated animals (Elhay et al. 2007). Donovan et al. noted no reactions to the canine anti-GnRH vaccine (2013). In cows treated with Bopriva there was a mildly elevated body temperature and mild swelling at injection sites that subsided within 2 weeks (Balet et al. 2014).

Several studies have monitored animal health after immunization against GnRH. GonaCon treated mares did not have any measurable difference in uterine edema (Killian 2006, 2008). Powers et al. (2011, 2013) noted no differences in blood chemistry except a mildly elevated fibrinogen level in some GonaCon treated elk. In that study, one sham-treated elk and one GonaCon treated elk each developed leukocytosis, suggesting that there may have been a causal link between the adjuvant and the effect. Curtis et al. (2008) found persistent granulomas at GonaCon-KHL injection sites three years after injection, and reduced ovary weights in treated females. Yoder and Miller (2010) found no difference in blood chemistry between GonaCon treated and control prairie dogs. One of 15 GonaCon treated cats died without explanation, and with no determination about cause of death possible based on necropsy or histology (Levy et al. 2011). Other anti-GnRH vaccine formulations have led to no detectable adverse effects (in elephants; Boedeker et al. 2011), though Imboden et al. (2006) speculated that young treated animals might conceivably have impaired hypothamic or pituitary function.

Kirkpatrick et al. (2011) raised concerns that anti-GnRH vaccines could lead to adverse effects in other organ systems outside the reproductive system. GnRH receptors have been identified in tissues outside of the pituitary system, including in the testes and placenta (Khodr and Siler-Khodr 1980), ovary (Hsueh and Erickson 1979), bladder (Coit et al. 2009), heart (Dong et al. 2011), and central nervous system, so it is plausible that reductions in circulating GnRH levels could inhibit

physiological processes in those organ systems. Kirkpatrick et al. (2011) noted elevated cardiological risks to human patients taking GnRH agonists (such as leuprolide), but the National Academy of Sciences (2013) concluded that the mechanism and results of GnRH agonists would be expected to be different from that of anti-GnRH antibodies; the former flood GnRH receptors, while the latter deprive receptors of GnRH.

GNRH VACCINE EFFECTS ON FETUS AND FOAL

Although fetuses are not explicitly protected under the WFRHBA of 1971, as amended, it is prudent to analyze the potential effects of GonaCon-Equine or other anti-GnRH vaccines on developing fetuses and foals. GonaCon had no apparent effect on pregnancies in progress, foaling success, or the health of offspring, in horses that were immunized in October (Baker et al. 2013), elk immunized 80-100 days into gestation (Powers et al. 2011, 2013), or deer immunized in February (Miller et al. 2000). Kirkpatrick et al. (2011) noted that anti-GnRH immunization is not expected to cause hormonal changes that would lead to abortion in the horse, but this may not be true for the first 6 weeks of pregnancy (NRC 2013). Curtis et al. (2011) noted that GonaCon-KHL treated white tailed deer had lower twinning rates than controls, but speculated that the difference could be due to poorer sperm quality late in the breeding season, when the treated does did become pregnant. Goodloe (1991) found no difference in foal production between treated and control animals.

Offspring of anti-GnRH vaccine treated mothers could exhibit an immune response to GnRH (Khodr and Siler-Khodr 1980), as antibodies from the mother could pass to the offspring through the placenta or colostrum. In the most extensive study of long-term effects of GonaCon immunization on offspring, Powers et al. (2012) monitored 15 elk fawns born to GonaCon treated cows. Of those, 5 had low titers at birth and 10 had high titer levels at birth. All 15 were of normal weight at birth, and developed normal endocrine profiles, hypothalamic GnRH content, pituitary gonadotropin content, gonad structure, and gametogenesis. All the females became pregnant in their second reproductive season, as is typical. All males showed normal development of secondary sexual characteristics. Powers et al. (2012) concluded that suppressing GnRH in the neonatal period did not alter long-term reproductive function in either male or female offspring. Miller et al. (2013) report elevated anti-GnRH antibody titers in fawns born to treated white tailed deer, but those dropped to normal levels in 11 of 12 of those fawns, which came into breeding condition; the remaining fawn was infertile for three years.

Direct effects on foal survival are equivocal in the literature. Goodloe (1991), reported lower foal survival for a small sample of foals born to anti-GnRH treated mares, but she did not assess other possible explanatory factors such as mare social status, age, body condition, or habitat in her analysis (NRC 2013). Gray et al. (2010) found no difference in foal survival in foals born to free-roaming mares treated with GonaCon.

There is little empirical information available to evaluate the effects of GnRH vaccination on foaling phenology. It is possible that immunocontracepted mares returning to fertility late in the breeding season could give birth to foals at a time that is out of the normal range (Nunez et al. 2010, Ransom et al 2013). Curtis et al. (2001) did observe a slightly later fawning date for GonaCon treated deer in the second year after treatment, when some does regained fertility late in the breeding season. In anti-GnRH vaccine trials in free-roaming horses, there were no published differences in mean date of foal production (Goodloe 1991, Gray et al. 2010). Unpublished results from an ongoing study of GonaCon treated free-roaming mares indicate that some degree of aseasonal foaling is possible (D.

Baker, Colorado State University, personal communication to Paul Griffin, BLM WH&B Research Coordinator). Because of the concern that contraception could lead to shifts in the timing of parturitions for some treated animals, Ransom et al. (2013) advised that managers should consider carefully before using PZP immunocontraception in small refugia or rare species. Wild horses and burros in most areas do not generally occur in isolated refugia, they are not a rare species at the regional, national, or international level, and genetically they represent descendants of domestic livestock with most populations containing few if any unique alleles (NAS 2013). Moreover, in PZP-treated horses that did have some degree of parturition date shift, Ransom et al. (2013) found no negative impacts on foal survival even with an extended birthing season; however, this may be more related to stochastic, inclement weather events than extended foaling seasons. If there were to be a shift in foaling date for some treated mares, the effect on foal survival may depend on weather severity and local conditions; for example, Ransom et al. (2013) did not find consistent effects across study sites.

INDIRECT EFFECTS OF FERTILITY CONTROL VACCINATIONS

The following sections would be expected to apply to the application of both PZP and GnRH vaccines unless specifically identified.

One expected long-term, indirect effect on wild horses treated with fertility control would be an improvement in their overall health. Many treated mares would not experience the biological stress of reproduction, foaling and lactation as frequently as untreated mares, and their better health is expected to be reflected in higher body condition scores (Nunez et al. 2010). After a treated mare returns to fertility, her future foals would be expected to be healthier overall, and would benefit from improved nutritional quality in the mares' milk. This is particularly to be expected if there is an improvement in rangeland forage quality at the same time, due to reduced wild horse population size. Past application of fertility control has shown that mares' overall health and body condition remains improved even after fertility resumes. PZP treatment may increase mare survival rates, leading to longer potential lifespan (Ransom et al. 2014a). To the extent that this happens, changes in lifespan and decreased foaling rates could combine to cause changes in overall age structure in a treated herd (i.e., Roelle et al. 2010). Observations of mares treated in past gathers showed that many of the treated mares were larger than, maintained higher body condition than, and had larger healthy foals than untreated mares. Following resumption of fertility, the proportion of mares that conceive and foal could be increased due to their increased fitness; this has been called a 'rebound effect.' More research is needed to document and quantify these hypothesized effects; however, it is believed that repeated contraceptive treatment may minimize this rebound effect.

Body condition of anti-GnRH-treated females was equal to or better than that of control females in published studies. Ransom et al. (2014) observed no difference in mean body condition between GonaCon-B treated mares and controls. Goodloe (1991) found that GnRH-KHL treated mares had higher survival rates than untreated controls. In other species, treated cats gained more weight than controls (Levy et al. 2011), as did treated young female pigs (Bohrer et al. 2014).

Following resumption of fertility, the proportion of mares that conceive and foal could be increased due to their increased fitness; this has been called by some a 'rebound effect.' Elevated fertility rates have been observed after horse gathers and removals (Kirkpatrick and Turner 1991). More research is needed to document and quantify these hypothesized effects; however, it is believed that repeated contraceptive treatment may minimize this postulated rebound effect.

Because successful fertility control would reduce foaling rates and population growth rates, another indirect effect would be to reduce the number of wild horses that have to be removed over time to achieve and maintain the established AML. So long as the level of contraceptive treatment is adequate, the lower expected birth rates can compensate for any expected increase in the survival rate of treated mares. Also, reducing the numbers of wild horses that would have to be removed in future gathers could allow for removal of younger, more easily adoptable excess wild horses, and thereby could eliminate the need to send additional excess horses from this area to long term pastures (LTPs). A high level of physical health and future reproductive success of fertile mares within the herd would be sustained, as reduced population sizes would be expected to lead to more availability of water and forage resources per capita.

Reduced population growth rates and smaller population sizes would also allow for continued and increased environmental improvements to range conditions within the project area, which would have long-term benefits to wild horse habitat quality. As the population nears or is maintained at the level necessary to achieve a thriving natural ecological balance, vegetation resources would be expected to recover, improving the forage available to wild horses and wildlife throughout the HMA. With a more optimal distribution of wild horses across the HMA, at levels closer to a thriving ecological balance, there would also be less trailing and concentrated use of water sources, which would have many benefits to the wild horses still on the range. There would be reduced competition among wild horses using the water sources, and less fighting would occur among studs and individual animals to access water sources. Water quality and quantity would continue to improve to the benefit of all rangeland users including wild horses. Wild horses would also have to travel less distance back and forth between water and desirable foraging areas.

Should fertility treatment, including booster doses continue into the future, with treatments given on a schedule to maintain a lowered reproductive rate in the herd, the chronic cycle of overpopulation and large gathers and removals may no longer occur, but instead a consistent abundance of wild horses could be maintained resulting in continued improvement of overall habitat conditions and animal health. While it is conceivable that widespread and continued treatment with fertility control vaccines could reduce the birth rates of the population to such a point that birth is consistently below mortality, that outcome is not likely unless a very high fraction of the mares present are all treated with primer and booster doses, and perhaps repeated booster doses.

BEHAVIORAL EFFECTS OF FERTILITY CONTROL VACCINATIONS

Behavioral differences should be considered as potential consequences of contraception. The NRC report (2013) noted that all successful fertility suppression has effects on mare behavior, mostly as a result of the lack of pregnancy and foaling and concluded that the use of PZP and GnRH was a good choice for use in the program.

PZP VACCINE

The result that PZP-treated mares may continue estrus cycles throughout the breeding season can lead to behavioral differences, when compared to mares that are fertile. Such behavioral differences should be considered as potential consequences of successful contraception.

Ransom and Cade (2009) delineate behaviors that can be used to test for quantitative differences due to treatments. Ransom et al. (2010) found no differences in how PZP-treated and untreated mares allocated their time between feeding, resting, travel, maintenance, and most social behaviors in three

populations of wild horses, which is consistent with Powell's (1999) findings in another population. Likewise, body condition of PZP-treated and control mares did not differ between treatment groups in Ransom et al.'s (2010) study. Nunez (2010) found that PZP-treated mares had higher body condition than control mares in another population, presumably because energy expenditure was reduced by the absence of pregnancy and lactation. Knight (2014) found that PZP-treated mares had better body condition, lived longer and switched harems more frequently, while mares that foaled spent more time concentrating on grazing and lactation and had lower overall body condition. Studies on Assateague Island (Kirkpatrick and Turner 2002) showed that once fillies (female foals) that were born to mares treated with PZP during pregnancy eventually breed, they produce healthy, viable foals.

In two studies involving a total of four wild horse populations, both Nunez et al. (2009) and Ransom et al. (2010) found that PZP-treated mares were involved in reproductive interactions with stallions more often than control mares, which is not surprising given the evidence that PZP-treated females of other mammal species can regularly demonstrate estrus behavior while contracepted (Shumake and Killian 1997, Heilmann et al. 1998, Curtis et al. 2001). There was no evidence, though, that mare welfare was affected by the increased level of herding by stallions noted in Ransom et al. (2010). Nunez's later analysis (2017) noted no difference in mare reproductive behavior as a function of contraception history.

Ransom et al. (2010) found that control mares were herded by stallions more frequently than PZP-treated mares, and Nunez et al. (2009, 2014, 2017) found that PZP-treated mares exhibited higher infidelity to their band stallion during the non-breeding season than control mares. Madosky et al. (2010) and Knight (2014) found this infidelity was also evident during the breeding season in the same population that Nunez et al. (2009, 2010, 2014, 2017) studied; they concluded that PZP-treated mares changing bands more frequently than control mares could lead to band instability. Nunez et al. (2009), though, cautioned against generalizing from that island population to other herds. Nuñez et al. (2014) found elevated levels of fecal cortisol, a marker of physiological stress, in mares that changed bands. The research is inconclusive as to whether all the mares' movements between bands were related to the PZP treatments themselves or the fact that the mares were not nursing a foal, and did not demonstrate any long-term negative consequence of the transiently elevated cortisol levels. The authors (Nunez et al. 2014) concede that these effects "…may be of limited concern when population reduction is an urgent priority." In contrast to transient stresses, Creel et al (2013) highlight that variation in population density is one of the most well-established causal factors of chronic activation of the hypothalamic-pituitary-adrenal axis, which mediates stress hormones; high population densities and competition for resources can cause chronic stress. Creel also states that "…there is little consistent evidence for a negative association between elevated baseline glucocorticoids and fitness." Band fidelity is not an aspect of wild horse biology that is specifically protected by the WFRHBA of 1971. It is also notable that Ransom et al. (2014b) found higher group fidelity after a herd had been gathered and treated with a contraceptive vaccine; in that case, the researchers postulated that higher fidelity may have been facilitated by the decreased competition for forage after excess horses were removed. At the population level, available research does not provide evidence of the loss of harem structure among any herds treated with PZP. Long-term implications of these changes in social behavior are currently unknown, but no negative impacts on the overall animals or populations welfare or well-being have been noted in these studies.

The National Research Council (2013) found that harem changing was not likely to result in serious adverse effects for treated mares:

> "The studies on Shackleford Banks (Nuñez et al., 2009; Madosky et al., 2010) suggest that there is an interaction between pregnancy and social cohesion. The importance of harem stability to mare well-being is not clear, but considering the relatively large number of free-ranging mares that have been treated with liquid PZP in a variety of ecological settings, the likelihood of serious adverse effects seem low."

Nunez (2010) stated that not all populations will respond similarly to PZP treatment. Differences in habitat, resource availability, and demography among conspecific populations will undoubtedly affect their physiological and behavioral responses to PZP contraception, and need to be considered. Kirkpatrick et al. (2010) concluded that: "the larger question is, even if subtle alterations in behavior may occur, this is still far better than the alternative," and that the "…other victory for horses is that every mare prevented from being removed, by virtue of contraception, is a mare that will only be delaying her reproduction rather than being eliminated permanently from the range. This preserves herd genetics, while gathers and adoption do not."

GNRH VACCINE

The result that GonaCon treated mares may have suppressed estrous cycles throughout the breeding season can lead treated mares to behave in ways that are functionally similar to pregnant mares.

While successful in mares, GonaCon and other anti-GnRH vaccines are expected to induce fewer estrous cycles when compared to non-pregnant control mares. This has been observed in many studies (Garza et al. 1986, Curtis et al. 2001, Dalin et al. 2002, Killian et al. 2006, Dalmau et al. 2015). In contrast, PZP vaccine is generally expected to lead mares to have more estrous cycles per breeding season, as they continue to be receptive to mating while not pregnant. Females treated with GonaCon had less estrous cycles than control or PZP-treated mares (Killian et al. 2006) or deer (Curtis et al. 2001). Thus, concerns about PZP treated mares receiving more courting and breeding behaviors from stallions (Nunez et al. 2009, Ransom et al. 2010) are not generally expected to be a concern for mares treated with anti-GnRH vaccines (Botha et al. 2008).

Ransom et al. (2014) found that GonaCon treated mares had similar rates of reproductive behaviors that were similar to those of pregnant mares. Among other potential causes, the reduction in progesterone levels in treated females may lead to a reduction in behaviors associated with reproduction. Despite this, some females treated with GonaCon or other anti-GnRH vaccines did continue to exhibit reproductive behaviors, albeit at irregular intervals and durations (Dalin et al. 2002, Stout et al. 2003, Imboden et al. 2006), which is a result that is similar to spayed (ovariectomized) mares (Asa et al. 1980). Gray et al. (2009) found no difference in sexual behaviors in mares treated with GonaCon and untreated mares. When progesterone levels are low, small changes in estradiol concentration can foster reproductive estrous behaviors (Imboden et al. 2006). Owners of anti-GnRH vaccine treated mares reported a reduced number of estrous-related behaviors under saddle (Donovan et al. 2013). Treated mares may refrain from reproductive behavior even after ovaries return to cyclicity (Elhay et al. 2007). Studies in elk found that GonaCon treated cows had equal levels of precopulatory behaviors as controls (Powers et al. 2011), though bull elk paid more attention to treated cows late in the breeding season, after control cows were already pregnant (Powers et al. 2011).

Stallion herding of mares, and harem switching by mares are two behaviors related to reproduction that might change as a result of contraception. Ransom et al. (2014) observed a 50% decrease in herding behavior by stallions after the free-roaming horse population at Theodore Roosevelt National Park was reduced via a gather, and mares there were treated with GonaCon-B. The increased harem tending behaviors by stallions were directed to both treated and control mores. It is difficult to separate any effect of GonaCon from changes in horse density and forage following horse removals.

Mares in untreated free-roaming populations change bands; some have raised concerns over effects of PZP vaccination on band structure (Nunez et al. 2009), with rates of band fidelity being suggested as a measure of social stability. With respect to treatment with GonaCon or other anti-GnRH vaccines, it is probably less likely that treated mares will switch harems at higher rates than untreated animals, because treated mares are similar to pregnant mares in their behaviors (Ransom et al. 2014). Indeed, Gray et al. (2009) found no difference in band fidelity in a free-roaming population of horses with GonaCon treated mares, despite differences in foal production between treated and untreated mares. Ransom et al. (2014) actually found increased levels of band fidelity after treatment, though this may have been partially a result of changes in overall horse density and forage availability.

Even in cases where there may be changes in band fidelity, the National Research Council's 2013 report titled *Using Science to Improve the BLM Wild Horse and Burro Program* ("NRC Report") found that harem changing was not likely to result in serious adverse effects for treated mares:

> "The studies on Shackleford Banks (Nuñez et al., 2009; Madosky et al., 2010) suggest that there is an interaction between pregnancy and social cohesion. The importance of harem stability to mare well-being is not clear, but considering the relatively large number of free-ranging mares that have been treated with liquid PZP in a variety of ecological settings, the likelihood of serious adverse effects seem low."

Kirkpatrick et al. (2010) concluded that "the larger question is, even if subtle alterations in behavior may occur, this is still far better than the alternative."

Gray et al. (2009) and Ransom et al. (2014) monitored non-reproductive behaviors in GonaCon treated populations of free-roaming horses. Gray et al. (2009) found no difference between treated and untreated mares in terms of activity budget, sexual behavior, proximity of mares to stallions, or aggression. Ransom et al. (2014) found only minimal differences between treated and untreated mare time budgets, but those differences were consistent with differences in the metabolic demands of pregnancy and lactation in untreated mares, as opposed to non-pregnant treated mares.

The NRC Report (2013) provides a comprehensive review of the literature on the behavioral effects of contraception that puts Dr. Nuñez et al. (2009, 2010) research into the broader context of all of the available scientific literature, and cautions, based on its extensive review of the literature that:

> ". . . in no case can the committee conclude from the published research that the behavior differences observed are due to a particular compound rather than to the fact that treated animals had no offspring during the study. That must be borne in mind particularly in interpreting long-term impacts of contraception (e.g., repeated years of reproductive "failure" due to contraception)."

GENETIC EFFECTS OF FERTILITY CONTROL VACCINATIONS

In HMAs where large numbers of wild horses have recent and / or an ongoing influx of breeding animals from other areas with wild or feral horses, contraception is not expected to cause an unacceptable loss of genetic diversity or an unacceptable increase in the inbreeding coefficient. In any diploid population, the loss of genetic diversity through inbreeding or drift can be prevented by large effective breeding population sizes (Wright 1931) or by introducing new potential breeding animals (Mills and Allendorf 1996). The NRC report recommended that managed herds of wild horses would be better viewed as components of interacting metapopulations, with the potential for interchange of individuals and genes taking place as a result of both natural and human-facilitated movements. In the last 10 years, there has been a high realized growth rate of wild horses in most areas administered by the BLM, such that most alleles that are present in any given mare are likely to already be well represented in her siblings, cousins, and more distant relatives. With the exception of horses in a small number of well-known HMAs that contain a relatively high fraction of alleles associated with old Spanish horse breeds (NRC 2013), the genetic composition of wild horses in lands administered by the BLM is consistent with admixtures from domestic breeds. As a result, in most HMAs, applying fertility control to a subset of mares is not expected to cause irreparable loss of genetic diversity. Improved longevity and an aging population are expected results of contraceptive treatment that can provide for lengthening generation time; this result which would be expected to slow the rate of genetic diversity loss (Hailer et al., 2006). Based on a population model, Gross (2000) found that an effective way to retain genetic diversity in a population treated with fertility control is to preferentially treat young animals, such that the older animals (which contain all the existing genetic diversity available) continue to have offspring. Conversely, Gross (2000) found that preferentially treating older animals (preferentially allowing young animals to breed) leads to a more rapid expected loss of genetic diversity over time.

Even if it is the case that repeated treatment with fertility control may lead to prolonged infertility, or even sterility in some mares, most HMAs have only a low risk of loss of genetic diversity if logistically realistic rates of contraception are applied to mares. Wild horses in most herd management areas are descendants of a diverse range of ancestors coming from many breeds of domestic horses. As such, the existing genetic diversity in the majority of HMAs does not contain unique or historically unusual genetic markers. Past interchange between HMAs, either through natural dispersal or through assisted migration (i.e. human movement of horses) means that many HMAs are effectively indistinguishable and interchangeable in terms of their genetic composition. Roelle and Oyler-McCance (2015) used the VORTEX population model to simulate how different rates of mare sterility would influence population persistence and genetic diversity, in populations with high or low starting levels of genetic diversity, various starting population sizes, and various annual population growth rates. Their results show that the risk of the loss of genetic heterozygosity is extremely low except in case where starting levels of genetic diversity are low, initial population size is 100 or less, and the intrinsic population growth rate is low (5% per year), and very large fractions of the female population are permanently sterilized.

Many factors influence the strength of a vaccinated individual's immune response, potentially including genetics, but also nutrition, body condition, and prior immune responses to pathogens or other antigens (Powers et al. 2013). One concern that has been raised with regards to genetic diversity is that treatment with immunocontraceptives could possibly lead to an evolutionary increase in the frequency of individuals whose genetic composition fosters weak immune responses (Cooper and Larson 2006, Ransom et al. 2014a). This premise is based on an assumption that lack of response to PZP is a heritable trait, and that the frequency of that trait will increase over time in a

population of PZP-treated animals. Cooper and Herbert (2001) reviewed the topic, in the context of concerns about the long-term effectiveness of immunocontraceptives as a control agent for exotic species in Australia. They argue that imunocontraception could be a strong selective pressure, and that selecting for reproduction in individuals with poor immune response could lead to a general decline in immune function in populations where such evolution takes place. Other authors have also speculated that differences in antibody titer responses could be partially due to genetic differences between animals (Curtis et al. 2001, Herbert and Trigg 2005). Although this topic may merit further study, lack of clarity should not preclude the use of immunocontraceptives to help stabilize extremely rapidly growing herds.

BLM is not aware of any studies that have quantified the heritability of a lack of response to immunocontraception such as PZP vaccine or GonaCon-Equine in horses. At this point there are no studies available from which one could make conclusions about the long-term effects of sustained and widespread immunocontraception treatments on population-wide immune function. Although a few, generally isolated, feral horse populations have been treated with high fractions of mares receiving PZP immunocontraception for long-term population control (e.g., Assateague Island and Pryor Mountains), no studies have tested for changes in immune competence in those areas. Relative to the large number of free-roaming feral horses in the western United States, immunocontraception has not been used in the type of widespread or prolonged manner that might be required to cause a detectable evolutionary response at a large scale.

Magiafoglou et al. (2003) clarify that if the variation in immune response is due to environmental factors (i.e., body condition, social rank) and not due to genetic factors, then there will be no expected effect of the immune phenotype on future generations. It is possible that general health, as measured by body condition, can have a causal role in determining immune response, with animals in poor condition demonstrating poor immune reactions (NRC 2013).

Correlations between immune response and physical factors such as age and body condition have been documented; it remains untested whether or not those factors play a larger role in determining immune response to immunocontraceptives than heritable traits. Several studies discussed above noted a relationship between the strength of individuals' immune responses after treatment with GonaCon or other anti-GnRH vaccines, and factors related to body condition. For example, age at immunization was a primary factor associated with different measures of immune response, with young animals tending to have stronger and longer-lasting responses (Stout et al. 2003, Schulman et al. 2013). It is also possible that general health, as measured by body condition, can have a causal role in determining immune response, with animals in poor condition demonstrating poor immune reactions (Gray 2009, NRC 2013). Miller et al. (2013) speculated that animals with high parasite loads also may have weaker immune reactions to GonaCon.

Correlations between such physical factors and immune response would not preclude, though, that there could also be a heritable response to immunocontraception. In studies not directly related to immunocontraception, immune response has been shown to be heritable (Kean et al. 1994, Sarker et al. 1999). Unfortunately, predictions about the long-term, population-level evolutionary response to immunocontraceptive treatments would be speculative at this point, with results likely to depend on several factors, including: the strength of the genetic predisposition to not respond to GonaCon-Equine; the heritability of that gene or genes; the initial prevalence of that gene or genes; the number of mares treated with a primer dose of GonaCon-Equine (which generally has a short-acting effect, if any); the number of mares treated with a booster dose of GonaCon-Equine (which appears to cause

a longer-lasting effect); and the actual size of the genetically-interacting metapopulation of horses within which the GonaCon treatment takes place.

INTRA-UTERINE DEVICES (IUDS)

Up through the present time (June 2019), BLM has not used IUDs to control fertility as a wild horse and burro fertility control method on the range. The BLM has supported and continues to support research into the development and testing of effective and safe IUDs for use in wild horse mares (Baldrighi et al. 2017). However, existing literature on the use of IUDs in horses allows for inferences about expected effects of any management alternatives that might include use of IUDs.

IUDs are considered a temporary fertility control method that does not generally cause future sterility (Daels and Hughes 1995). Use of IUDs is an effective fertility control method in women, and IUDs have historically been used in livestock management, including in domestic horses. IUDs in mares may cause physiological effects including discomfort, infection, perforation of the uterus (by a hard IUD), endometritis, uterine edema (Killian et al. 2008), and pyometra (Klabnik-Bradford et al. 2013). In women, deaths attributable to IUD use may be as low as 1.06 per million (Dales and Hughes 1995).

The exact mechanism by which IUDs prevent pregnancy is uncertain (Daels and Hughes 1995), but the presence of an IUD in the uterus may, like a pregnancy, prevent the mare from coming back into oestrus (Turner et al. 2015). However, some domestic mares did exhibit repeated estrus cycles during the time when they had IUDs (Killian et al. 2008). The main cause for an IUD to not be effective at contraception is its failure to stay in the uterus (Daels and Hughes 1995). As a result, one of the major challenges to using IUDs to control fertility in mares on the range is preventing the IUD from being dislodged or otherwise ejected over the course of daily activities, which include, at times, frequent breeding.

At this time, it is thought that any IUD inserted into a pregnant mare may cause the pregnancy to terminate, which may also cause the IUD to be expelled. For that reason, it is expected that IUDs would only be inserted in non-pregnant (open) mares. Some method of testing for pregnancy status, such as palpation or ultrasound examination, could be used as a precursor to determining whether a given mare is a candidate for IUD use. If a mare has a zygote or very small, early phase embryo, it is possible that it will fail to develop further, but without causing the expulsion of the IUD.

Hard IUDs, such as metallic or glass marbles, may prevent pregnancy (Nie et al. 2003) but can pose health risks to domestic mares (Turner et al. 2015, Freeman and Lyle 2015). Marbles may break into shards (Turner et al. 2015), and uterine irritation that results from marble IUDs may cause chronic, intermittent colic (Freemand and Lyle 2015). Metallic IUDs may cause severe infection (Klabnik-Bradford et al. 2013).

In domestic ponies, Killian et al. (2008) explored the use of three different IUD configurations, including a silastic polymer O-ring with copper clamps, and the “380 Copper T” and “GyneFix” IUDs designed for women. The longest retention time for the three IUD models was seen in the “T” device, which stayed in the uterus of several mares for 3-5 years. Reported contraception rates for IUD-treated mares were 80%, 29%, 14%, and 0% in years 1-4, respectively. They surmised

that pregnancy resulted after IUD fell out of the uterus. Killian et al. (2008) reported high levels of progesterone in non-pregnant, IUD-treated ponies.

Soft IUDs may cause relatively less discomfort than hard IUDs (Dales and Hughes 1995). Daels and Hughes (1995) tested the use of a flexible O-ring IUD, made of silastic, surgical-grade polymer, measuring 40 mm in diameter; in five of six breeding domestic mares tested, the IUD was reported to have stayed in the mare for at least 10 months. In mares with IUDs, Daels and Hughes (1995) reported some level of uterine irritation, but surmised that the level of irritation was not enough to interfere with a return to fertility after IUD removal.

Several types of flexible IUDs are being tested for use in breeding mares. When researchers attempted to replicate the O-ring study (Daels and Hughes 1995) in an USGS / Oklahoma State University (OSU) study with breeding domestic mares, using various configurations of silicone O-ring IUDs, the IUDs fell out at unacceptably high rates over time scales of less than 2 months (Baldrighi et al. 2017). Subsequently, the USGS / OSU researchers have been testing a Y-shaped IUD to determine retention rates and assess effects on uterine health; results are still pending but retention rates were much higher (Holyoak et al., unpublished results). A researcher from the University of Massachusetts has developed a magnetic IUD (2019) that has been effective at preventing estrus in non-breeding domestic mares. When two sizes of those magnetic IUDs were tested in breeding domestic mares, they fell out at high rates (Holyoak et al., unpublished results), but the magnetic IUDs will be undergoing additional testing in breeding mares in the near future (Gradil 2019).

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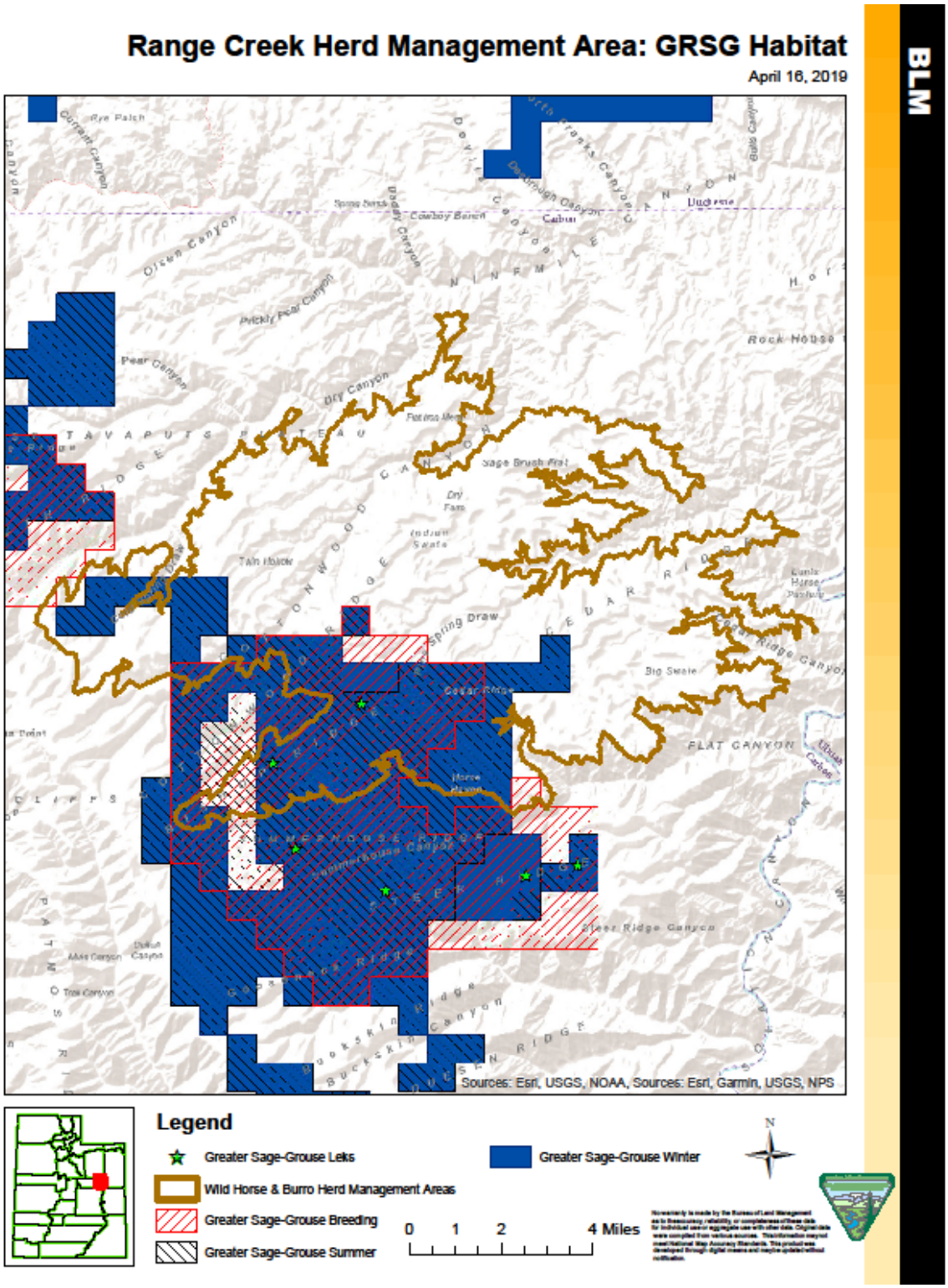
APPENDIX L: PUBLIC COMMENTS

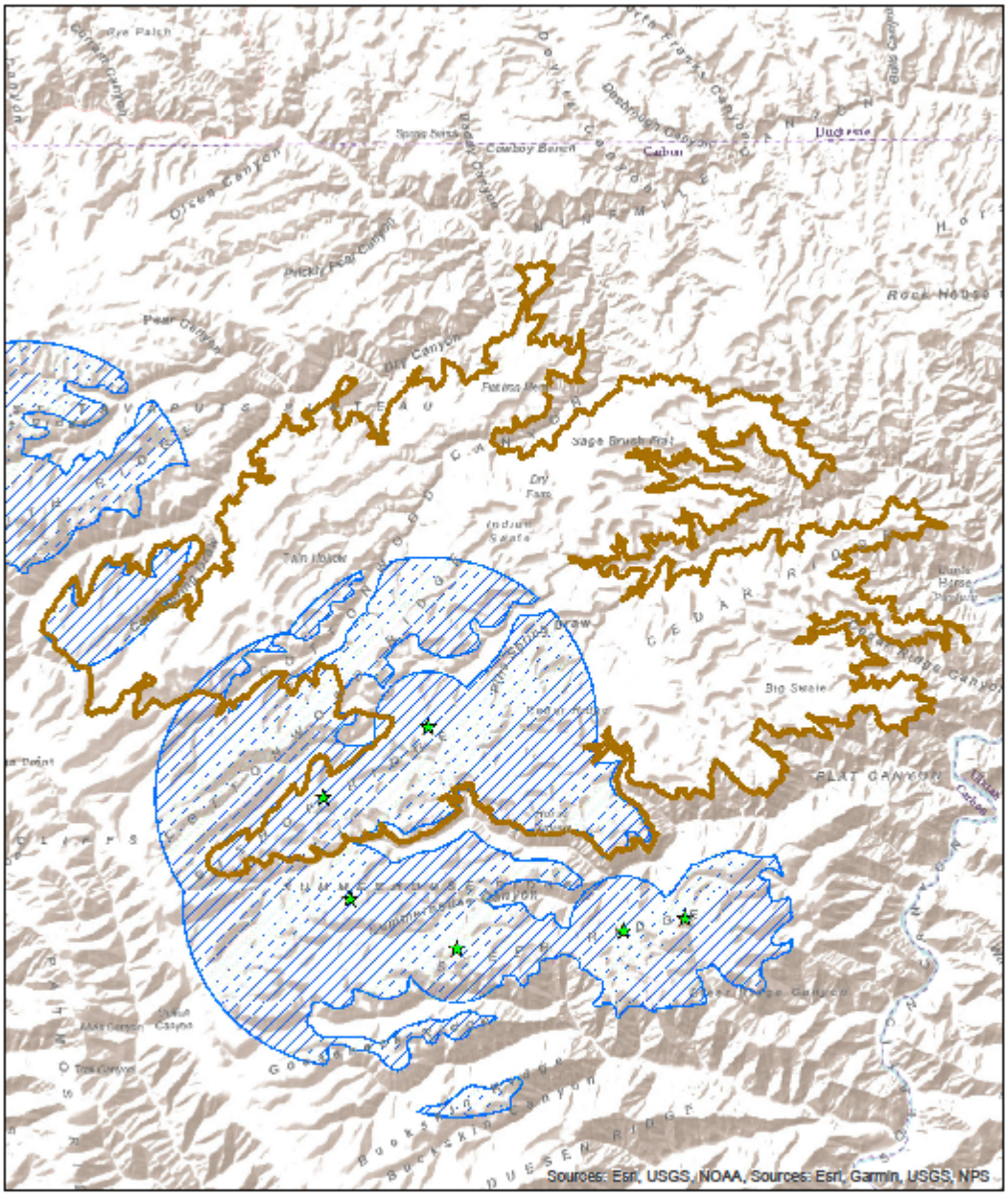
Will be included in Final

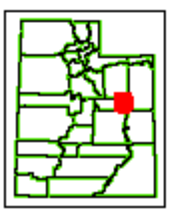

Range Creek Herd Management Area: GRSG Habitat
April 16, 2019
BLM
Sources: Esri, USGS, NOAA, Sources: Esri, Garmin, USGS, NPS
Legend
Greater Sage-Grouse Leks
Wild Horse & Burro Herd Management Areas
Greater Sage-Grouse Breeding
Greater Sage-Grouse Summer
Greater Sage-Grouse Winter
0 1 2 4 Miles
N

Range Creek Herd Management Area: GRSG PHMA

April 16, 2019

BLM



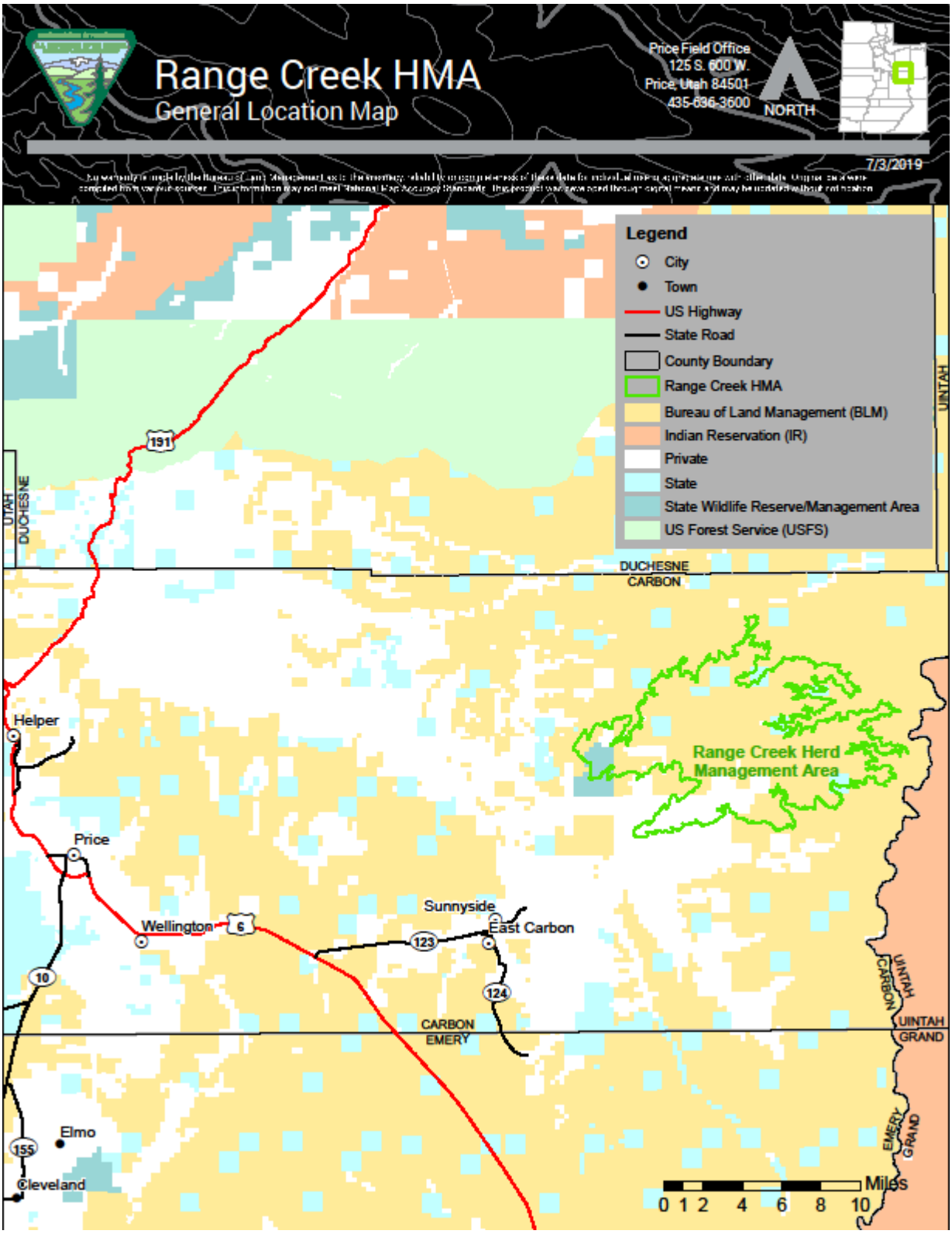


Legend

- Wild Horse & Burro Herd Management Areas
- Priority Habitat Management Area
- Greater Sage-Grouse Leks

0 1 2 4 Miles

N


Range Creek HMA
General Location Map
Price Field Office
125 S. 600 W.
Price, Utah 84501
435-636-3600
NORTH
7/3/2019
Legend
City
Town
US Highway
State Road
County Boundary
Range Creek HMA
Bureau of Land Management (BLM)
Indian Reservation (IR)
Private
State
State Wildlife Reserve/Management Area
US Forest Service (USFS)
UTAH
DUCHESNE
191
DUCHESNE
CARBON
UINTAH
Helper
Price
Wellington
6
10
Sunnyside
East Carbon
123
124
Range Creek Herd
Management Area
CARBON
EMERY
UINTAH
CARBON
UINTAH
GRAND
EMERY
GRAND
Elmo
155
Cleveland
0 1 2 4 6 8 10
Miles