UNITED STATES

DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

ENVIRONMENTAL ASSESSMENT

SINBAD WILD BURRO HERD MANAGEMENT AREA GATHER PLAN

DOI-BLM-UT-G020-2020-0017-EA

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TABLE OF CONTENTS

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1.0 INTRODUCTION

This Environmental Assessment (EA) has been prepared to disclose and analyze the environmental consequences relative to the Bureau of Land Management (BLM), Price Field Office (PFO) proposal to gather burros and implement fertility control within the Sinbad Herd Management Area (HMA)[1] over a 10-year period after any initial gather. 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. 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 the appropriate level of NEPA review as found in regulation 40 CFR 1501.3. An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a statement of "Finding of No Significant Impact" (FONSI). 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 (RMP)/Final EIS (*10, 31, 2008*). 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.

BACKGROUND

BLM wild burros are a variety of the domesticated African wild ass, *Equus africanus asinus*. Domestic burros are believed to have been brought to the American Southwest in the early sixteenth century by Spanish explorers (Abella, 2008) and were used by many people in many tasks in the centuries since. Some of these animals escaped or were deliberately turned out, forming herds of wild burros.

With passage of the Wild Free-Roaming Horses and Burros Act of 1971Congress found that: "Wild free-roaming horses and burros are living symbols of the historic and pioneer spirit of the West". In addition, the Secretary was ordered to "manage wild free-roaming horses and burros in a manner that is designed to achieve and maintain a thriving natural ecological balance on the public lands". From the passage of the Act, through present day, the Bureau of Land Management (BLM) Price Field

[1] Herd Management Areas (HMAs) are areas that the BLM manages for wild horse and burro populations on federal lands. Herd Areas (HAs) are general areas where feral burro and horse herds existed at the time of the passage of the Wild and Free-Roaming Horses and Burros Act of 1971.

Office (PFO) has endeavored to meet the requirements of this portion of the Act. The procedures and policies implemented to accomplish this mandate have been constantly evolving over the years.

Throughout this period, BLM experience has grown, and the knowledge of the effects of current and past management on wild horses and burros has increased. For example, wild horses have been shown to be capable of 18 to 25% increases in numbers annually (NAS 2013). This can result in a doubling of the wild horse population about every 3-4 years. There is less published information about wild burros, but similar population growth rates have been reported for wild burros in the U.S. (Woodward and Ohmart 1976, Norment and Douglas 1977) and for feral donkeys in Australia (Choquenot 1991), but more information would be needed to determine whether those rates are typical. Burros are both socially and behaviorally very different from wild horses (Schoenecker et al., 2015). Burros (also known as Donkeys) may have a social system in which males are territorial in some cases or may consort with somewhat stable bands of females in other cases. Group composition and size, dominance relationships, and access to breeding vary considerably among populations (McDonnell, 1998). At the same time, nationwide awareness and attention on wild burro management has grown. As these factors have come together, the emphasis of the wild horse and burro program has shifted.

Program goals include maintaining a "thriving natural ecological balance," with reference to appropriate management level (AML) for individual herds and maintaining healthy populations. In the past two decades, goals have also explicitly included conducting gathers and applying contraceptive treatments to achieve and maintain wild horse and burro populations within the established AML, so as to manage for healthy wild horse and burro populations and healthy rangelands. The use of fertility control methods such as immunocontraceptive vaccines, intrauterine devices (IUDs), sex ratio manipulation, and – in some cases – having a non-reproducing segment in the population, can help reduce total wild horse and burro population growth rates in the short term, increase gather intervals, and decrease the number of excess horses and burros that must be removed from the range. Other management efforts include conducting accurate population inventories and genetic monitoring to inform management decisions. Decreasing the numbers of excess wild horse and burros 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 burros must also be consistent with Standards and Guidelines for Rangeland Health.

APPROPRIATE MANAGEMENT LEVEL

The Appropriate Management Level (AML) is defined as the number of adult wild horses or burros[2] that can be sustained within a designated HMA, which achieves and maintains a thriving natural ecological balance[3] in keeping with the multiple-use management concept for the area. The AML was

[2] Unweaned foals do not count toward AML. A foal is typically weaned between 6 to 12 months of age; weaning is dependent upon the mother's health and other environmental conditions.

[3] The Interior Board of Land Appeals (IBLA) defined the goal for managing wild horse (or burro) populations in a thriving natural ecological balance as follows: "As the court stated in Dahl vs. Clark, supra at 594, the 'benchmark test' for determining the suitable number of wild horses on the public range is 'thriving natural ecological balance.'"

originally established for the San Rafael Planning unit which includes the Sinbad HMA wild burros in the San Rafael Resource Management Plan ((SRRMP) 1989, RMP-33). The 2008 Price Field Office RMP further defined that when it split the originally identified distribution of horses and burros within the Sinbad HMA and set the Sinbad HMA as burros only, set the AML at 50-70 and combined the horses with the Muddy Creek HMA (WHB-3, 4 5, 9 & 10, PRMP P.86).

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)[4]. 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 or burro gather, in order to allow for a periodic gather cycle, and to prevent the population from exceeding the established AML between gathers.

The Sinbad HMA does have a Herd Management Area Plan (HMAP) signed in 1993, though the Price RMP is more recent. In October of 2008, the BLM signed the Price Resource Management Plan (RMP), which adjusted the AML for wild burros, changed certain management objectives and gave direction for the future management of the Sinbad HMA (WHB-1, 2, 3, 4, 5, 7, 10, 12, & 13, PRMP, P.87). The HMA is managed in accordance with the HMAP, current policies and regulations for wild horses and burros, and the Price RMP, with management objectives specific to the HMA. The Sinbad HMAP may 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 AML was set based on monitoring data and followed a thorough public review, in keeping with NEPA. The current AML is set for the population of not less than 50 and not more than 70 burros. AML is not being reconsidered in this EA. Vegetative data was analyzed by the BLM to test the validity and adequacy of the AML in relation to current adjudication levels of forage on the grazing allotments that encompass the Sinbad HMA. It was determined that with the current adjudication of 420 AUMs to wild burros, the AML of 50 to 70 wild burros within the Sinbad HMA is correct (Table 1). The Price RMP calls for maintaining genetic viability in the herd. Viability in this context is as part of a broader metapopulation (NAS2013) of interacting BLM-managed burro herds. AML of the Sinbad HMA, of itself, is relatively low but the herd's relative geographic isolation can be mitigated by interchange between this herd and other herds of BLM-managed wild burros. Gaining additional information about genetic diversity, based on analysis of hair follicle samples, will be possible as wild burros in this area can be handled in conjunction with scheduled gather operations. Results of genetic

[4] In the words of the conference committee which adopted this standard: 'The goal of WH&B management should be to maintain a thriving ecological balance (TNEB) between WH&B populations, wildlife, livestock, and vegetation, and to protect the range from the deterioration associated with overpopulation of wild horses and burros."

monitoring could be used to inform future management decisions about the herd, including any future considerations of moving burros from other populations into the Sinbad population.

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

HMA	Total Acres	Appropriate Management Level	Estimated Population	% of AML	Removal*
Sinbad HMA (March 01, 2021)	99,241	50-70 (60**)	269	384 - 538 (448)	199-219 (209)
Sinbad HMA (January 2022)	99,241	50-70 (60)	328	468 - 656 (546)	258-278 (268)

* Removal numbers calculated by using the estimated population and subtracting the low- and high-end AML. (269-70=199)

** for discussion purposes AML will be discussed as 60, calculations will be based off that.

Gathers conducted in 1989, 1996, 2001, 2008, 2016 and 2020 gathered and removed a total of approximately 466 wild burros from within and near the Sinbad HMA. The estimated population of wild burros within the Sinbad HMA as of March 01, 2021 is 269 burros. This figure is based upon the gather and release completed in April 2016, and on subsequent information collected by USGS and the 36 head removed in 2020 during an emergency gather outside the HMA. USGS has been conducting ongoing studies of burro demography in the Sinbad HMA from 2016-2020; that study includes ground-based estimates of herd size, resulting from close monitoring of uniquely freeze-branded and other identifiable individuals (USGS, unpublished data). In April 2016, 236 wild burros were gathered, of which 133 were removed and 103 returned. Accounting for returned animals and others that were found to have remained in the HMA, the estimated population in Spring 2016 was 112, this estimate was based on known individuals left after the gather and individually marked/returned animals for the demographic monitoring conducted by USGS. The USGS research since the most recent gather has identified 225 adults with an additional 25 foals being born in 2019 (USGS, unpublished data); this number is taken to be the most informative estimate of current herd size. Based on these well-substantiated estimates of herd size, the herd grew from 112 in 2016 to 250, four years later. This implies that the annual growth rate for this herd of wild burros was 22% per year (i.e., $\sqrt[4]{(250/112)} = 1.22$). Projected herd size by January 2022 will be 328.

As is true for any estimates of wildlife abundance or herd size, there is always some level of uncertainty about the exact numbers of wild burros in any HA/HMA or non-HMA area. The estimates shown here reflect the most likely number of burros, based on the best information available to the BLM and may not account for every animal within the HMA. Since the 2016 gather, the Sinbad HMA has had an aerial population inventory completed once or twice annually in conjunction with USGS, using the simultaneous-double count method to develop and improve the BLMs estimation techniques of wild burros. The development of a hybrid double observer sight ability model created in part from data collected from Sinbad will help further define and clarify the current estimate. However, the results of those aerial surveys are not available as of yet, due to ongoing data collection in other burro HMAs. The ground-based estimates of burro herd size from USGS researchers, based on radio-collared, marked, and unmarked individuals, are the most reliable information available.

Additional burros may occur in the herd area for several other reasons that include but are not limited to the following: (1) wild burros may have been captured illegally by members of the public in other wild burro areas and moved into this area (this illegal activity has been suspected in past years) and (2) domestic or estray burros may have been released into the HMA. In February of 2014, three (3) domestic burros were illegally released just outside of the Sinbad HMA and were reported to the BLM. The Emery County Animal Control Officer removed these burros from public lands with assistance from the BLM. This is only one case within the Price Field Office where domestic horses or burros are known to have been released onto public lands, but it may be indicative of other cases of the same happening, unbeknownst to BLM.

By January 2022, the use by wild burros would exceed the forage allocated for wild burros (420 AUM's) in the Sinbad HMA by over 400% (1,740 AUM's). Based upon all the information available at this time, the BLM has determined that 199 excess wild burros exist (above high AML) within and adjacent to the HMA as of March 2021. It is expected that the number of excess burros will be 328 by Summer of 2021. If the next gather takes places after 2021, then the excess number will be higher, and will be determined based on the best available information about herd size, whether from aerial surveys or from USGS demographic study.

PURPOSE AND NEED FOR THE PROPOSED ACTION

The need of the Proposed Action is to restore and maintain populations of wild burros within and outside the HMA to the AML management objectives established in the Price RMP. The BLM's purposes or objectives are to: slow the wild burro population growth rate; remove excess wild burros from the range, protect multiple use rangeland resources from deterioration associated with an overpopulation of wild burro within and outside the HMA; manage wild burro herds to achieve and maintain viable, vigorous, and stable populations and healthy individuals; and restore and maintain a thriving natural ecological balance and multiple use relationship on the public lands consistent with the provisions of Federal Land Policy and Management Act (FLPMA), Section 1333 (a) of the *Wild Free-Roaming Horses and Burros Act of 1971.*

CONFORMANCE WITH BLM LAND USE PLAN(S)

Plan Conformance: The Alternatives 1 and 2 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 includes the goals to manage wild burros at appropriate management levels (AML) to ensure a thriving natural ecological balance among wild horse populations, wildlife, livestock, vegetation resources, and other resource values; to manage wild burros to achieve and maintain viable, vigorous, and stable populations, and to allow introductions of wild horses and burros from other herd areas to maintain genetic viability. The RMP does not recognize any need to manage the Sinbad herd of wild burros as if they were genetically isolated, unique, or separate from the larger population of wild burros living in other BLM managed herds. The RMP does contain the following decisions that specifically apply to management of the Sinbad 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-5; The current portion of the Sinbad HMA that supports horses has been combined with the Muddy Creek HMA. The area of the Sinbad HMA that supports burros will remain the Sinbad HMA.
- 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-10; Sinbad HMA; 99,210 Acres; 50-70 (burros)
- 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 No Action alternative may not be in conformance with the Price RMP.

Alternatives 1 and 2 are also consistent with the North San Rafael Swell Habitat Management Plan (NSRSHMP), approved in 1997. The No Action alternative may not be in conformance with the NSRSHMP.

The Sinbad Wild Horse and Burro Habitat Management Area Plan (HMAP), approved July 1993, established, through vegetative studies, the AML of "30 to 70 wild burros". It also stated: "only adult numbers will be used to determine herd size", and "the total population would range from a low of 30 to a high of 70 animals". This established the AML and forage allocation at that time, through population and vegetative studies, as estimated and recommended in the Price River Management Framework Plan (PRMFP). (note: this AML was superseded by the Price RMP, which established AML as 50-70)

Alternatives 1 and 2are 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. The No Action alternative may not be in conformance with the Fundamentals of Rangeland Health and Utah's Standards for Rangeland Health and Guidelines for Grazing Management.

RELATIONSHIP TO STATUTES, REGULATIONS, OR OTHER PLANS

Alternatives 1 and 2 would comply with the following:

Alternatives 1 and 2 comply 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 burros would be conducted in conformance with all applicable state statutes.

The No Action Alternative may not be in conformance with the WFRHBA.

Alternatives 1 and 2 are in conformance with all applicable regulations at 43 CFR 4700 and policies. The No Action Alternative may not be in conformance with the 43 CFR 4700 regulations. The following are excerpts from 43 CFR relating to the protection, management, and control of wild burros 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.

Alternatives 1 and 2 are consistent with the Emery County General Plan update signed, 2016, which states: "Emery County supports the wise use, conservation and protection of the nation's public lands and the resources associated with these lands, including prudent and appropriate management prescriptions established to achieve wise use." The No Action alternative may not be consistent with the Emery County General Plan

Alternatives 1 and 2 would comply with the following laws regulations, policies, and plans to the maximum extent possible. The No Action Alternative may not be in conformance with these laws, regulations, policies, and plans.

- Taylor Grazing Act (TGA) of 1934
- FLPMA of 1976 (43 U.S.C. 1701 et seq.) as amended
- PRIA of 1978
- Endangered Species Act (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
- 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
- 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 BLM's Purpose and Need. The BLM's authorized officer will decide whether to implement all, part, or none of the action alternatives as described in chapter 2 to manage wild burros within the HMA. The authorized officer's decision would not adjust livestock use within the HMA, or AML for wild burros within the HMA.

By law, BLM is required to control any overpopulation, by removing excess animals, once a determination has been made that excess animals are present. In addition, decreasing the numbers of excess wild burros 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 and Utah Policy.

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, other agencies, public land users, and the BLM interdisciplinary team.

Public involvement was initiated on this Proposed Action on March 11, 2020 by posting on the ePlanning web page. Additional public involvement activities are described in chapter 5. No public interest has been expressed in this project as a result of the ePlanning posting.

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. In addition, 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.

The alternatives were reviewed by an interdisciplinary team composed of resource specialists from the PFO. This team identified resources within the Sinbad HMA which might be affected and identified 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. Rationale for dismissing specific resources from detailed analysis are also contained in Appendix A. Those issues caused by the Proposed Action and/or alternatives are carried forward throughout this analysis and are identified briefly as follows.

LIVESTOCK GRAZING

How will the alternatives affect livestock grazing within and near the HMA?

VEGETATION

How will the alternatives affect vegetation within and near the HMA?

WILD HORSES AND BURROS

How will the alternatives affect the viability of the Sinbad HMA, the viability of the burro population, or the health of individual burros?

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 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: Proposed Action –Utilize periodic gathers and selective removal of excess burros to achieve and maintain the AML range while maintaining a healthy population for a 10-year period after the initial gather. Also implement population growth suppression utilizing approved fertility control vaccines and possible use of IUDs, to reduce the annual population growth and maintain AML, once achieved.

Alternative 2: Gather and remove excess animals to within AML range without the implementation of population growth suppression techniques (fertility control vaccines, IUDs, or sex ratio adjustment). Use periodic gathers to maintain AML for a 10-year period after the initial gather.

Alternative 3: No Action – Continue existing management. Do not gather burros or implement population growth suppression tools.

The Action Alternatives were developed to respond to the purpose and need (achieve and maintain the established AML, slow the population growth rate, to ensure a thriving natural ecological balance, remove excess wild burros from the range, prevent further deterioration to the range within and outside the HMA, and manage wild burro herds to achieve and maintain viable, vigorous, and stable populations and healthy individuals). 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.

GATHER AND REMOVAL MANAGEMENT ACTIONS COMMON TO ALTERNATIVES 1 & 2

GATHER AND REMOVAL PROCEDURES

- Within the HMA, gathers would target areas with heavy concentrations of wild burros. Outside the HMA, gathers would target all wild burros.
- All removed wild burros would be transported to BLM holding facilities where they would be prepared for: 1) adoption and/or sale to qualified individuals who can provide them with a good home; 2) removal to off range pastures; or 3) any other disposition authorized by law.

- 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 C. 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. 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.
- Each gather would include multiple trap, bait, or temporary holding facility sites. 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 burros as to their age, sex, temperament and /or physical condition, and eligibility to be returned 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 burro that they believe would not tolerate the handling stress associated with transportation, adoption preparation, or holding. No wild burro 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 2021-007.
- Wild burro herd data which may be collected during the gather operations includes data to determine population characteristics (age/sex/color/etc.), to assess herd health (pregnancy/parasite loading/physical condition/etc.), and to monitor herd genetic diversity (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 burros after achieving AML within the HMA and release of older less adoptable wild burros back to the HMA.
- Additional design features are described in Appendix D. Standards from the Comprehensive Animal Welfare Program for wild horse and burro gathers are contained in Appendix C.

HELICOPTER DRIVE TRAP OPERATIONS

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 CAWP (Appendix C).

Helicopter drive trapping involves use of a helicopter to herd wild burros into a temporary trap. The CAWP (Appendix C) 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 burros. Traps would be set in an area with high probability of access by burros using the topography, if possible, to assist with capturing excess wild burros 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 burros. The wings form an alley way used to guide the burros 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 burros 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. Once burros 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 burros. BLM staff would be present on the gather at all times to observe animal condition, ensure humane treatment of wild burros, and ensure contract requirements are met.

BAIT/WATER TRAPPING OPERATIONS

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 burros residing within the area, and at the most effective time periods, time is required for the burros 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 burro area, or around a pre-set water or bait source. The portable panels would be set up to allow wild burros to go freely in and out of the corral until they have adjusted to it. When the wild burros fully adapt to the corral, it is fitted with a gate system. The acclimation of the burros creates a low stress trapping method. During this acclimation period the burros would experience some stress due to the panels being setup and perceived access restriction to the water/bait source.

When actively trapping wild burros, the trap would be staffed or checked on a daily basis by either BLM personnel or authorized contractor staff. Burros 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 burros 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 burros 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 burros at a given location, which can also relieve the resource pressure caused by too many burros. As the proposed

bait and/or water trapping in this area is a low stress approach to gathering wild burros, such trapping can continue into the foaling season without harming the jennies or foals.

A few of the previously used bait traps are located near the San Rafael Reef Wilderness Area. The Wilderness boundary will be clearly marked prior to the bait traps being installed. This design feature will ensure that all the ground disturbing activities occur outside the newly designated wilderness area.

GATHER RELATED TEMPORARY HOLDING FACILITIES (CORRALS)

Wild burros 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 burros would be sorted into different pens based on sex. The burros would be aged and provided good quality hay and water. Jennies 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 burros. 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 burros 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 burros 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 burros would be inspected prior to use to ensure wild burros can be safely transported. Wild burros would be segregated by age and sex when possible and loaded into separate compartments. Jennies and their un-weaned foals may be shipped together. Transportation of recently captured wild burros is limited to a maximum of 10 hours.

Upon arrival, recently captured wild burros are off-loaded by compartment and placed in holding pens where they are provided good quality hay and water. Most wild burros 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 burros. Wild burros in very thin condition or animals with injuries are sorted and placed in hospital pens, fed separately and/or treated for their injuries.

AXTELL (ORC/ OFF RANGE PASTURE)

Due to its location in relation to the HMA, the removed burros will most likely be transported to Axtell, a contract facility set up for burros. Jennies and sterilized jacks (geldings) are segregated into separate paddocks/pastures. Although the animals are placed in Axtel, they remain available for

adoption or sale to qualified individuals; and foals born to pregnant jennies are gathered and weaned when they reach about 8-12 months of age and are also made available for adoption. The contract specifies the care that wild burros 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 contractor and periodic counts of the wild burros to ascertain their well-being and safety are conducted by BLM personnel and/or veterinarians.

After recently captured wild burros 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. At ORC facilities, a minimum of 700 square feet of space is provided per animal.

TRANSPORT, ADOPTION OR SALE

When shipping wild burros for adoption, or sale, 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.

ADOPTION

Adoption applicants are required to have at least a 400 square foot corral with panels that are at least 4 ½ feet tall. Applicants are required to provide adequate shelter, feed, and water. The BLM retains title to the burro for one year and inspects the burro and facilities during this period. After one year, the applicant may take title to the burro, at which point the burro 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 burro. A sale-eligible wild burro 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 burro to slaughter buyers or anyone who would sell the animals to a commercial processing plant. Sales of wild burros are conducted in accordance with the 1971 WFRHBA and congressional limitations.

EUTHANASIA OR SALE WITHOUT LIMITATIONS

Under the WFRHBA, healthy excess wild burros 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 burros 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 burros 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) 2021-007 or most current edition). Conditions requiring humane euthanasia occur infrequently and are described in more detail in Washington Office Instruction Memorandum 2021-007 Attachment 2.

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.

BEST MANAGEMENT PRACTICES

- Any bait/trap locations will be required to have certified weed free feed.
- Equipment and vehicles would be power washed to remove any mud or debris prior to entering BLM administered lands.
- Horses and other animals will be required to be cleaned and be free of any mud and vegetative materials before entering BLM administered lands.
- Horses are required to be fed certified noxious weed free hay for a minimum of 72 hours prior to entering BLM administered lands.
- Any hay fed to horses while on BLM administered lands will be required to be certified noxious weed free.
- Avoidance by helicopters of the cliffs and canyons along the eastern edge, during the lambing period (4/15-6/15) will ensure no impacts to Desert Big Horn.

ALTERNATIVE 1 – PROPOSED ACTION

The principal management goal for the HMA is to maintain 50 to 70 wild burros (the established AML range) on the HMA and keep burros within the HMA. Therefore, the Proposed Action is to gather and remove excess wild burros to achieve the established AML and use periodic gathers to remove excess wild burros to maintain AML over a 10-year period following the initial gather. Also the Proposed Action implements population growth suppression utilizing approved fertility control vaccines and possible use of IUDs, to reduce the annual population growth and maintain AML, once achieved. The expectations for the Proposed Action include both short and long-term outcomes. The short-term results are to achieve AML and bring growth rates to less than eleven percent annually. The long-term results are to reduce the need for gathers and removals, without jeopardizing the genetic

diversity of the population (as measured by observed heterozygosity) and to improve animal and rangeland condition.

Table 2. Population Growth Estimate (Alternative 1 – Gathers with Fertility Treatments)

Year	Population Estimate	11% Net herd Growth	Estimated Number of Burros Over AML (60)
January 2021	269	59	209
January 2022	50	6	-
January 2023	56	6	2
January 2024	62	7	9
January 2025	69	8	17
January 2026	77	8	25

Maintenance gather would be planned to occur after 2026, dependent on scheduling with other gathers.

INITIAL GATHER TO ACHIEVE THE AML

Based on the projected January 2022 population, the initial gather, if conducted in fall 2021, would require the capture of approximately 300 wild burros, the removal of up to 278 wild burros, and the fertility treatment and release of the remaining captured burros (it is anticipated that up to 20 jennies would be treated with the first gather). If fewer than 300 wild burros are caught during the initial gather, subsequent gathers would be conducted as necessary to achieve the AML. Subsequent gathers are likely since normal capture success is 70 to 80 percent of a population which equates to approximately 262 burros or less, which is lower than the initial capture need of 300.

MAINTENACE GATHERS OVER A 10 YEAR PERIOD

The BLM would conduct follow-up gathers over a 10-year period to remove any additional wild burros necessary to maintain the AML as well as to implement the fertility control component of the Proposed Action for wild burros remaining in the HMA. The target removal number for any maintenance gathers would be based off population inventories for the HMA and the resulting projection of excess animals over AML. 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 (burros' 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 following 10-year period, which provides maximum effectiveness for fertility control application. Funding limitations and competing priorities might affect the timing of the initial gather as well as of subsequent gathers and fertility control components of the Proposed Action.

FERTILITY CONTROL STANDARD OPERATIONS

Fertility control vaccines are administered only to females. In concert with the proposed gather and removal activities, to control population growth rates and maintain AML, all jennies released back to the HMA would be treated with fertility control vaccine (GonaCon, PZP)[5] or have insertion of an intrauterine device (IUD). The procedures to be followed for implementation of fertility control are discussed below and detailed in Appendix E.

- Fertility control treatment would be conducted in accordance with the approved standard operating and post-treatment monitoring procedures. All breeding age jennies selected for release back to the range would be treated with approved fertility control vaccines, which would slow reproduction of the treated jennies for one to three breeding seasons.
- Any jennies that would receive fertility control vaccines or IUDs would be individually marked/microchipped and/or be individually recognizable without error. No jenny would be treated unless she has been identified for treatment.
- Flexibility in determining which jennies 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; or if it becomes clear that allowing an individual to continue breeding might have a negative effect on the genetic diversity of the herd. This information would be documented on the Data Sheet.
- 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 jennies treated), lost darts, negative reactions/BLM action taken for that jenny, number of new/current year foals counted/observed, unique circumstances, off road vehicular use, general rangeland condition/water availability, volunteer efforts, relevant 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.

FERTILITY CONTROL VACCINES

The PFO proposes to apply fertility control vaccines to all released jennies through the use of a primary and booster dose inoculation by hand or dart, depending on the ability to handle the animals. This would be done on the Sinbad HMA for 10 years after the initial gather (i.e., through 2031 if the first gather is in 2021), 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 burros within the AML range of 50-70 wild burros.

The preferred method of delivery for the primary vaccine dose would be by hand injection. However, if a jenny is individually identifiable (i.e., because she has a unique hip brand number as a result of the USGS study), then the initial dose could be delivered by dart.

[5] 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.

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 Manual (SCC, mixing procedures in Appendix F). 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. An attempt would be made to recover all darts (normally about a 98% recovery is expected).

The PFO would work with the National WH&B Office in Reno, Nevada, the USDA and any approved private distributors to order the GnRH vaccine. The USDA/ Distributor 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 projectors. An attempt would be made to recover all darts (normally about a 98% recovery is expected).

Jennies may also receive booster vaccine doses if they are captured in subsequent gather operations. Otherwise, jennies may be targeted for vaccine booster dose delivery via dart. If it is determined that a jenny or jennies cannot be approached within darting range on foot, then baiting would be used to invite the burros to within darting distance for treatment. Baiting would be with water, salt, mineral, or weed free hay in areas that burros utilize in their normal movements throughout the HMA. Burros may need to be trapped at bait stations, which would enable them to be darted at close range, and then released. The procedures to be followed for facility vaccines are discussed below and detailed in Appendix E.

- Any new fertility control vaccines could be used as directed through the most recent direction of the National Wild Horse and Burro Program. The use of any new fertility control vaccines would use the most current best management practices and humane procedures available for the implementation of the new controls.
- Fertility control vaccine use would follow SOPs listed in Appendix F. The PZP vaccine protocol would be examined annually, in line with any new instructions provided by the Science and Conservation Center (SCC; Billings, MT). The field use of GnRH vaccine does not require mixing of the adjuvant.
- Immunocontraception Data Sheets would be prepared and updated as presented in Appendix G. An individual jenny's previous records would be reviewed prior to any darting activity.
- Fertility control vaccines would be administered upon completion of the first gather 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.
- Following darting protocols, each jenny treated with fertility control vaccine 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 jennies identified for re-

treatment would be created. That information would be loaded into a format that is easy to use in the field (i.e., book or electronic device).

- New jennies (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 inspecting the teeth of animals upon capture. Unmarked individuals identified for treatment would be given a freeze mark on the left hip prior to initial treatment.

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 (or other authorized personnel) 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 Sinbad burros must be trained for this task. Additionally, all work would be conducted in accordance with the SOPs (Appendix E) and mixing procedures (Appendix F).

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.

INTRAUTERINE DEVICE (IUD)

If IUDs are applied to any jennies in the Sinbad HMA, they would first need to be captured. A qualified veterinarian would examine the pregnancy status of any jenny that is a candidate for IUD application, using rectal palpation or ultrasound. An IUD would only be inserted into non-pregnant ('open') jennies. The specific type of IUD to be used would depend on currently available studies at the time, but would not include marbles, ball bearings, or other *ad hoc* IUDs that are known to cause high rates of injury or risk.

GENETIC DIVERSITY AND HERD VITALITY

The BLM WHB management handbook (2010) suggests non-binding guidelines that should cause the loss of observed heterozygosity to be less than or equal to 1% per generation. At the AML level established for the HMA (50-70) and based on known seasonal movements of the burros within the HMA, sufficient levels of genetic diversity should be maintained to avoid high inbreeding risk, because BLM will periodically introduce burros from other HMAs to maintain genetic diversity in the long term. This recommendation is in keeping with the BLM WHB management handbook (2010), and also was suggested by an earlier analysis of genetic samples (Cothran 2002).

Every 4-5 years 1-3 jacks or jennies from a different HMA, with similar or desired characteristics of the burros within the Sinbad HMA would be released to maintain the genetic diversity (observed heterozygosity) in the herd. All burros identified to remain in the HMA population after being gathered would be selected to maintain a diverse age structure, herd characteristics and body type (conformation).

BURRO IDENTIFICATION

During past treatments, jennies have been freeze branded on the hip and the neck. These brands would help in the identification of the individuals. During any future gathers, new brands would-be put-on individuals and microchipped prior to being released back to the HMA. Color, leg and face markings, and any other unique markings or scars could identify some individuals without a brand. Once each burro 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. Unique numbers would be assigned to all individuals and documented on the Data Sheets. A young burro under 18 months would be tracked on its mother's Data Sheet. A burro over 18 months of age would receive its own number and Data Sheet.

RECORD KEEPING

All darting, foaling, and health data would be recorded as per the Data Sheet (Appendix G). 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. Thereafter, only treatment updates or new jenny 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 and burros, though a certified pesticide handler does need to receive shipments of the drug.

ALTERNATIVE 2 – GATHER WITHOUT FERTILITY CONTROL

Under this Alternative, the initial gather and maintenance gathers would be conducted over the next ten years as described in Alternative 1 with the goal to keep population within the AML range (Table 3). This alternative would not include any use of population growth suppression measures on the wild burros remaining in the HMA. All wild burros residing outside the Sinbad HMA would be gathered and removed.

Table 3. Population Growth Estimate (Alternative 2 – Gathers with No Fertility Treatments)

Year	Population Estimate	22% Net herd Growth	Estimated Number of Burros Over AML (60)
January 2021	269	59	209
January 2022	50	11	1
January 2023	61	13	14
January 2024	74	17	28
January 2025	91	20	51*
January 2026	111	24	75*

- Maintenance gather would be planned to occur in 2025/2026, dependent on scheduling with other gathers.

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

ALTERNATIVE 3 – NO ACTION

Under the No Action Alternative, management would continue as follows:

- Existing monitoring including utilization, forage condition, water availability, animal health, and periodic population census would continue.
- Individual nuisance gathers would continue to occur to address nuisance complaint and public safety concerns.
- Gathers to remove excess wild burros would not occur. There would be no active management to control the size of the wild burro population, control growth rates, or manage the wild burro population at AML. The wild burro population would likely continue to increase at an approximate rate of 22% per year. Within five years, the wild burro population could exceed 726 (see Table 4), which would be 1,210% above AML. Wild burros residing outside the HMA would remain in areas not designated for management of wild burros and population numbers would continue to increase.

Table 4. Population Growth Estimate (No Action Alternative)

Year	Population Estimate	22% Net herd Growth	Estimated Number of Burros Over AML (60)
January 2021	269	59	209
January 2022	328	72	268
January 2023	400	88	340
January 2024	488	107	428
January 2025	595	131	535
January 2026	726	160	666

The No Action Alternative would not be in conformance with existing laws and regulations which require the authorized officer to remove excess animals immediately upon determination that excess wild burros are present and their removal is necessary. Although the No Action Alternative does not comply with the WFRHBA and does not meet the purpose and need for the action in this EA, it is

included as a basis for comparison with the action alternatives, and to assess the effects of not removing excess burro at this time.

ALTERNATIVES CONSIDERED BUT ELIMINATED

Alternatives considered but eliminated from further analysis are included in Appendix H, 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 Sinbad HMA is approximately 99,241 acres of Federal, and State lands located 30 miles west of Green River, Utah *(Map* 1). The general boundary extends up to 19 miles on both sides of I-70 from the San Rafael Reef to Eagle Canyon. Access is provided to the HMA via Interstate 70 and then by county and BLM roads. Annual precipitation is approximately 8.5 inches, with an average of 5 inches coming during the summer (May through September). Precipitation as of May 2021 was 1.10 inches or 13 percent of normal at the Ferron weather station, according to data collected since 1948. As of June 8, 2021, the Palmer Drought Severity Index placed the entire Price Field Office in a D4 Exceptional-Drought status. Temperatures in Ferron, Utah ranges from an average monthly high of 75 degrees Fahrenheit in the summer to 24 degrees in the winter (NOAA, 2020). Of the 99,241 acres in the HMA approximately 89,465 are public land acres and 9,776 acres are state lands (Table 5). The topography of the HMA is typical of the San Rafael Swell area, varying from extremely rough to fairly level terrain on limestone benches. The steep sided mesas and deeply incised drainages in the northern and southeastern portions on the HMA could potentially create problems gathering burros.

The wild burros are thought to primarily use the open benches and parks, but aerial surveys and USGS research have confirmed that they do also use wooded areas, and deep canyons occasionally. General distribution of burros shows heavy concentration and utilization of vegetation on the South side of Interstate 70, focused within the flats surrounding Big Pond, Red Draw, Cliff Dweller Flat and Jerrys Flat. Burros have begun moving outside the HMA into the Nielson Draw, Georges Draw and Lone Man Draw. A few burros remain on the north side of I-70.

Table 5. Sinbad HA and HMA Land Status

Surface Management Agency	Herd Area (acres)*	Herd Management Area (acres)
Bureau of Land Management	254,850	89,465
Utah State Trust Land	30,668	9,776
Total Acreage	285,518	99,241

*Herd Area acreage includes lands that contain horses that was combined with the Muddy Creek horse HA, (Price RMP, 2008)

The HMA has several undeveloped springs and seeps that are used as water sources by the wild burros, as well as 7 reservoirs, and multiple rock tanks. The San Rafael River, itself, is accessible in some locations. Most of the developed water sources are in fair condition, with most in need of general maintenance.

For analysis purposes the Project area will be reviewed as the HMA as well as that portion of the Big Pond Allotment outside the HMA but frequented by burros.

RESOURCES/ISSUES BROUGHT FORWARD FOR ANALYSIS

LIVESTOCK GRAZING

The Sinbad Herd Area (HA) lies within the Big Pond, Black Dragon, Box Flat, Iron Wash, Mexican Bend and North Sinbad Allotments (Map 2). The Big Pond, Black Dragon, Buckmaster, Iron Wash, Mexican Bend, North Sinbad, and Oil Well Flat Allotments encompass the Sinbad HMA. The Box Flat grazing allotment occurs outside of the Sinbad Herd Management Area (HMA). Burros cannot access the Box Flat Allotment due to a 2,000 ft vertical cliff that is impassable. Due to the lack of burros occurring within the Box Flat allotment, it is not carried forward in further analysis. The Iron Wash allotment occurs within the boundary of the HA and HMA. The only reason the HMA is within the Iron Wash allotment is due to a mapping discrepancy, where the allotment boundary is on the west side of the San Rafael Reef and the HMA boundary is on the east side of the reef. The burros occasionally move into the portion of the HA within the Iron Wash allotment when burro numbers are in excess of established AML. These burros have been known to move back and forth through the reef in several locations.

Livestock grazing use on all the affected grazing allotments have averaged less than 50 percent of permitted use from 2015 till 2020 grazing periods, due to drought conditions that limited forage and water sources. Overlap of areas of use between wild burros and livestock does occur on specific sites (specifically the Black Dragon and Big Pond Allotments) causing competition for forage, water, and space. The Black Dragon Allotment has been held to an average of 33 percent from 2015 till 2020. Wild burros, wildlife, and livestock compete directly for the same space, water and forage resources. Yearlong wild burro grazing reduces forage availability for livestock. Grazing by excess wild burros 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 allotments are listed below in Table 6.

TABLE 6. Grazing allotment numbers, season of use, and AUMs						% of HMA within allotment	6-year average use (2015-2020)
Allotment	Livestock		Season of Use		AUMs		
	No.	Kind	From	To			
Black Dragon (35004)	521	Cattle	10/16	02/28	3,223	54.8%	33%
	446	Cattle	03/01	04/30		54,404 acres	1,076 AUMs

TABLE 6. Grazing allotment numbers, season of use, and AUMs						% of HMA within allotment	6-year average use (2015-2020)
Allotment	Livestock		Season of Use		AUMs		
	No.	Kind	From	To			
Big Pond (45002)	329	Cattle	10/01	03/31	2,241	2.3%	41%
	202	Cattle	05/11	06/20		2,288 acres	914 AUMs
Iron Wash (35031) North Pasture	232	Cattle	11/1	4/15	1,266	3.7% 3,684 acres	59% 750 AUMs
Mexican Bend (35045)	151	Cattle	11/12	05/25	980	2.5% 2,478 acres	71% 700 AUMs
North Sinbad (35056)	505	Cattle	11/01	05/10	3,204	36.1% 35,892 acres	59% 1,890 AUMs
Oil Well Flat (25060)*	406 12	Cattle Horses	10/16	04/30	2,730	0.26% 259 acres	43% 1,183 AUMs
Buckmaster (34013)*	157	Cattle	12/01	5/15	858	0.49% 492 acres	91% 780 AUMs
TOTAL	**2,949** **12**	Cattle Horses			**14,487**	**99,241 acres**	**50%** **7,293 AUMs**

*Inclusion of the Oil Well Flat and Buckmaster Allotments are considered mapping errors, as the acreage is low, and burros have never been documented in the allotments. These allotments will not be carried any further in the analysis.

Utilization levels on the HMA mainly by burros have been heavy south of the interstate on most of the uplands near reservoirs and adjacent to trail heads coming out of the canyons where rock tanks are found (BLM 4700 Files). Utilization of primary forage species over the majority of the HMA was nearly 90 percent for last year's growth (BLM 4700 Files).

When water and feed become depleted, wildlife and wild burros will move to a new location, while livestock must be removed. Overlap between burros 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 allotments depend on reservoirs, snow, and a few springs during the period they are on the allotment. Several small springs, seeps and rock tanks are scattered throughout the allotments and HMA. During normal precipitation years, these small springs, seeps, and rock tanks disperse wild burro use throughout the HMA reducing competition between livestock and wild burros. During drought years, these small springs, seeps, and rock tanks can dry up and wild burros must move to other water sources. This increases competition between wild burros and livestock.

Data showing damage to local fence lines from burros does not exist. It is anticipated that burros could damage fences similarly to cattle under certain circumstances, 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, but do not stop the natural and free roaming nature of the wild burros but are necessary for livestock management. Damage to fence lines within and adjacent to the HMA are most likely due to natural events such as flash flood events, aging wood post's loosing staples or human damage (i.e. gates left open, posts run over by vehicles).

VEGETATION

The HMA ranges from 4,400 to 7,000 feet in elevation and supports vegetation types ranging from mixed conifer to salt desert shrub, and grasslands. The salt desert shrub vegetation type dominates the HMA. Primary forage species are Indian ricegrass (*Achnatherum hymenoides*), Needle and Thread (*Hesperostipa comata*), James galleta *(Pleuraphis jamesii*), sand dropseed (*Sporobolus cryptandrus*), winter fat (*Krascheninnikovia lanata*), and fourwing saltbush (*Atriplex canescens*).

Historical trend photo/cover data were collected intermittently between the late 1960's and mid 1980's. This data has limited value due to age and intermittent nature of the data. In addition, data collection methods appeared to vary between years. Frequency trend studies were established at several locations within the HMA in the early 1980's. Data has been collected from these studies as part of the monitoring program for the Price Field Office.

Analysis of the Frequency data for the Black Dragon portion of the HMA was completed in December 2012; using the Multi-response Block Procedure, for data collected since 1992. The overall long-term trend for the Black Dragon portion of the HMA is static.

Analysis of the Frequency data for the Big Pond portion of the project area was completed in December 2015; using the Multi-response Block Procedure, for data collected since 1985. The overall long-term trend for the Big Pond portion of the project area is static.

Analysis of the Frequency data for the Iron Wash portion of the HMA was completed in 2006; using the Multi-response Block Procedure, for data collected since 1984. The overall long-term trend for the Iron Wash portion of the HMA is static.

Analysis of the Frequency data for the North Sinbad portion of the HMA was completed in December 2015; using the Multi-response Block Procedure, for data collected since 1998. The overall long-term trend for the North Sinbad portion of the HMA is static.

Frequency data for the Mexican Bend portion of the HMA has not been completed due to lack of data.

Starting in 2009 the BLM PFO started converting all of its trend study locations that collect Frequency Data to the Utah Monitoring Manual for Upland Rangelands (Utah BLM Manual H-4400-1) methodology. Due to the conversion the data collected since that time cannot be statistically analyzed against the data prior to that time. As the data is collected every 3 to 5 years, and a minimum of 3 collection cycles need to occur prior to analysis, enough data has not been collected at this time to analyze.

Rangeland Health Assessments were completed on 4 of the 5 grazing allotments within the HMA area from 2002 through 2008. The Mexican Bend allotment has not been assessed. Nested Frequency, utilization, Rangeland Health Assessments, actual use, climate, etc. were utilized to determine whether the Standards and Guidelines for Healthy Rangelands were being achieved. Without exception all five of the allotments were not meeting one Standard. All assessments determined that the Clean Water standard was not being met due to the San Rafael River being listed on Utah's 303(d) report to Congress as exceeding water quality standards for Total Dissolved Solids (TDS), prior to entering the allotments. The other three standards for Upland Soils, Riparian Areas, and Native Species were determined to be meeting standards. Due to the Upland Soils and Riparian Areas meeting standards for Rangeland Health it indicates that they are not contributing to the high level of TDS in the San Rafael River. The final determination points to agricultural returns upstream from the allotments as the major contributor of TDS to the San Rafael River.

Vegetative resources are currently being affected within the herd area due to lower than normal precipitation 5 out of the last 10 years which has reduced vegetative growth and vigor. The southern portion of the HMA is in severe vegetative stress. Utilization of primary forage species over the majority of the HMA was nearly 90 percent for last year's growth (BLM 4700 Files). Although livestock numbers were reduced from the allotments in the Sinbad HMA during the last five years, excess wild burros 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 also allowed soil loss and erosion.

The National Oceanic and Atmospheric Administration (NOAA), Long Term Palmer Drought Index June 8, 2021) and Price Field Office precipitation data all place the HMA in a D4 "Exceptional Drought" condition class.

WILD BURROS

As described earlier, the current AML that is set for the area is no less than 50, and no more than 70 burros. There have been 5 gathers conducted in the last 26 years, in 1996, 2001, 2008, 2016 and 2020 in and adjacent to the current Sinbad HMA. During the most recent planned gather in 2016, two hundred thirty-six wild burros were gathered, and one hundred thirty-three were removed. The most common burro color phenotype in the HMA is Black.

As discussed in Chapter 1, Background Section Table 1, the population as of March 1, 2021 is 269 burros. The HMA has an estimated average 22 percent annual herd growth rate, based on the recent growth rate from April 2016 to March 2020. Due to previous gathers the majority of the burros are anticipated to be less than 10 years of age, with burros as old as 20^{+} years sometimes being found.

SINBAD HERD GENETICS

Genetic analysis of samples from 30 individuals gathered during the 2001 gather showed that genetic variability of the Sinbad herd is relatively high. "The Sinbad population is the only feral burro herd yet tested where *Ho* (Observed Heterozygosity) is higher than *He* (Expected Heterozygosity) which yields a negative *Fis* (Estimated Inbreeding Level, (=1-Ho/He)) value. This negative *Fis* indicates there is no evidence of inbreeding within this population" (Cothran, 2002). Dr. Cothran (2002) did not identify any unique alleles in the sampled animals from the Sinbad wild burro herd.

BLM does not recognize any need to manage the Sinbad herd of wild burros as genetically isolated, unique, or separate from other wild burro herds. Therefore, maintaining wild burro genetic viability in the Sinbad HMA can be aided by periodic interchange with wild burros in other herds. The National Academies of Sciences (2013) recommended that single HMAs should not be considered isolated genetic populations. Rather, managed herds of wild burros should be considered as components of interacting metapopulations, connected by interchange of individuals and genes due to both natural and human-facilitated movements. In the specific case of burros in Sinbad HMA, the ancestry appears to be of mixed origin. These animals are part of part of a larger metapopulation (NAS 2013) that has demographic and genetic connections with other BLM-managed herds. Dr. Cothran (Cothran, 2002) stated that, "The Sinbad burro population had its greatest similarity with the Poitou donkey among the domestic breeds…It is unlikely that this breed has any direct relationship to the Sinbad population…Second highest S was with the Standard donkey. This is probably the type of donkey that Sinbad population is derived from." The Poitou is known for its size, large ears, and black or brown coat with a grey underbelly and white nose and eye rings. A Poitou never has a cross upon his shoulders or back. Poitou's are also known for their "bourailloux" or coat of great length (OSU, 2010). The Sinbad burros may have gained or retained some of the characteristics of the Poitou (i.e., the brown/black coat and white nose and eye rings) but some burros within the HMA also show characteristics of the standard Jack (grey body with a black cross upon his shoulders and back). None of the burros within the Sinbad HMA display the bourailloux.

Herds in the larger metapopulation of wild burros (i.e., from multiple HMAs) have a background of shared domestic breed heritage and natural and intentional movements of animals between herds. Introductions from other HMAs may augment observed heterozygosity, which is a measure of genetic diversity, the result of which will also be to reduce the risk of inbreeding-related health effects. Introducing fertile animals every generation (about every 8-10 years) is a standard management technique that can alleviate potential inbreeding concerns (BLM 2010).

The 2013 National Academies of Sciences report included evidence that shows that the Sinbad HMA herd is not genetically unusual, with respect to other wild burro herds. Specifically, Appendix F of the 2013 NAS report is a table showing the estimated 'fixation index' (Fst) values between 25 pairs of samples from wild horse herds. Fst is a measure of genetic differentiation, in this case as estimated by the pattern of microsatellite allelic diversity analyzed by Dr. Cothran's laboratory. Low values of Fst indicate that a given pair of sampled herds has a shared genetic background. The lower the Fst value, the more genetically similar are the two sampled herds. Values of Fst under approximately

0.05 indicate virtually no differentiation. Values of 0.10 indicate very little differentiation. Only if values are above about 0.15 are any two sampled subpopulations considered to have evidence of elevated differentiation (Frankham et al. 2010). Fst values for the Sinbad HMA herd had pairwise Fst values that were less than 0.05 with 1 other sampled herd, and Fst less than 0.10 with 7 additional herds. These results support the interpretation that Sinbad HMA wild burros are components in a highly connected metapopulation that includes herds in many other HMAs.

SINBAD HERD MANAGEMENT AREA AND HERD LOCATION

The burros have been concentrated on the south side of the HMA for greater than 10 years now, with a few burros moving back and forth to the North side of the HMA. As part of the 2016 gather, half the burros returned were put on the north side of the HMA, but most of those had moved to the south side as of summer 2019. Typically, the burros will move out into the ridgelines, canyons, and breaks of the HMA during the winter where they can utilize snow as their main water source. During the spring, summer and fall the burros will move back into the open parks and bowls. This is the period of time when the burros are readily seen from Interstate 70.

Rangeland resources and wild burro health have been and are currently being affected within the Sinbad HMA, due to drought and wild burro overpopulation. Excess wild burros above AML have reduced available water and forage, resulting in increased competition for available resources. A general review of burro effects on rangeland ecosystems is included in Appendix I

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

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 – PROPOSED ACTION

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

LIVESTOCK GRAZING

The allotments have livestock grazing privileges designated for cattle. Overlap of areas of use between wild burros and livestock occurs on specific sites on the allotment causing competition for forage and water resources. Yearlong wild burro grazing reduces forage availability for livestock. Grazing by excess wild burros 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's for the allotments.

Under Alternative 1, competition for forage and water between wild burros and livestock would be directly reduced by gathering and removing burro, or by fertility control efforts to slow population growth, which would limit the need for concerted management on the affected grazing allotment. Past experience has shown that gather operations have few direct impacts to cattle grazing. Livestock located near gather activities would be temporarily disturbed or displaced by the helicopter and the increased vehicle traffic during gather operations. Typically, livestock would move back into the area (if pushed out) once gather operations cease.

Bait trapping would not be completed when livestock are in the area, so there would be no direct impact.

Reducing and maintaining the population of wild burros within the Sinbad HMA to levels within AML would reduce wild burro utilization of the forage resource below its present level, keeping it in line with management objectives and the amount of forage allocated for wild burros. 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. Under this alternative, it is anticipated that the herd will not reach the upper AML until 2026 or later.

MITIGATION MEASURES

None identified.

RESIDUAL IMPACTS

Residual impacts are as disclosed in the analysis above.

VEGETATION

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 burros 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 burro 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.

Indirect impacts would be associated with immediate improvements in range and forage condition from gathering and removal of excess burro and burros outside the HMA, and long-term improvement of habitat quality from slowed population growth through fertility treatments. Achieving and maintaining the established AML, would benefit the vegetation by reducing the grazing pressure on the forage resources. Removal of excess wild burros would reduce the population to levels that would be in balance with the available water sources and forage availability. Maintaining AML within the Sinbad HMA would prevent overgrazing, damage by trampling or pawing, and would help promote improved rangeland health. Maintenance of AML would also assist with keeping burros from pushing out into areas adjacent to the HMA as well.

MITIGATION MEASURES

None identified.

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.

WILD BURROS

Impacts take the form of direct and indirect impacts and may occur on either the individual or the population as a whole. Impacts may be short term (under 1 year) or long term (greater than a year).

GENERAL IMPACTS TO INDIVIDUAL BURROS

Direct individual impacts are those impacts which occur to individual burros and are immediately associated with implementation of the Proposed Action. These impacts include handling stress associated with the roundup, capture, sorting, animal handling, fertility control applications, and transportation of the animals. The intensity of these impacts varies by individual and are indicated by behaviors ranging from nervous agitation to physical distress. Mortality of individuals from the effects of capture and handling is infrequent but may be expected to occur in one half to one percent of burros gathered in a given round-up (GAO 2008). Scasta (2019) summarized mortality rates from 70 BLM WH&B gathers across nine states, from 2010-2019. The total rate of mortalities was 1.2%, but the majority of those deaths were attributable to euthanasia of animals with pre-existing conditions.

Treatment area selection protocols have been developed with the CAWP *(Appendix C*) which would minimize impacts associated with handling stress. There are no indications that these direct impacts persist beyond a short time following the stress event.

Indirect individual impacts are those impacts which occur to individual burros after the initial stress event. Indirect individual impacts may include spontaneous abortions in jennies, and increased social displacement and conflict in jacks. These impacts, like direct individual impacts, are known to occur intermittently during wild burro gather operations. An example of an indirect individual impact would be the brief skirmish which occurs with older jacks following sorting and release into the jack pen which lasts less than two minutes and ends when one jack retreats. Traumatic injuries do not occur in most cases; however, they do occur. These injuries typically involve a bite and/or kicking with bruises which do not break the skin. Like direct individual impacts, the frequency of occurrence of these impacts among a population varies with the individuals. Spontaneous abortion events among jennies following captures are not common, and if they occur, they very rarely result in complications or adverse effects on the dame's health or wellbeing. Spontaneous abortion is not considered to be an issue for either of the two proposed capture methods.

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

- The jenny rejecting the foal which occurs most often with young mothers or very young foals,
- The foal and mother becoming separated during sorting and cannot be matched;
- The jenny 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, 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. The majority of 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 burros are normally weaned between four and six months of age.

Gathering the wild burros 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 CAWP 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.

GENERAL IMPACTS TO BURRO POPULATIONS

Population-wide direct impacts are immediate effects which would occur during or immediately following implementation of the Proposed Action. The social structure of burros, which lacks stable harem breeding units, combined with year-round breeding (BLM SRP, 2005); would not be expected to be impacted to the extent normally anticipated with a wild horse gather.

Population-wide indirect impacts would not appear immediately as a tangible effect and are more difficult to quantify.

A reduction of wild burros should increase the availability of forage plants that are preferred by burros, which ought to release the remaining population from pressure due to inadequate food availability. Reduced competition for forage and water between livestock, wildlife and wild burros would be expected to result in an improved natural ecological balance by avoiding range deterioration. However, "free-ranging horse populations are often limited by removals to levels below food-limited carrying capacity, so population growth rate could be increased by the removals through compensatory population growth related to decreased competition for forage (NAS, 2013)."

FERTILITY CONTROL VACCINES AND IUDS IMPACTS

Using 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. No finding of excess animals is required for BLM to pursue contraception only management activities 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 animals from an HMA's population, so if a wild horse or burro population is in excess of AML, then contraception alone would result in some continuing environmental effects of overpopulation. Successful contraception reduces future reproduction. Limiting future population increases of burros could limit increases in environmental damage from higher densities of burros than currently exist. Burros are long-lived, potentially reaching 20 years of age or more in the wild and, if the population is above AML, treated burros returned to the HMA may continue exerting negative environmental effects throughout their life span. In contrast, if burros above AML are removed when they 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 gather activities on the environment, as well as wild horse and burro 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 expected effects use of fertility control vaccines and, potentially, IUDs, are discussed in depth in Appendix I. Most of those effects are based on observations from horses, under the assumption that burro physiology is similar enough to horses that effects will be comparable. Fertility control vaccines and IUDs do not change the wild, free-roaming nature of treated horses or burros. Several of the most notable effects include the following. Jennies treated with fertility control vaccines (i.e., PZP vaccine or GonaCon vaccine) generally carry any already-developing fetuses to term. Successfully treated jennies are prevented from conceiving by the immune response. PZP vaccine (ZonaStat) effects generally last for one year. A first dose of GonaCon may lead to only marginal (40-60%) efficacy for one year, and lower in the second year, but a booster dose of GonaCon may cause long lasting (4+ year) effects at high rates (85% efficacy). PZP vaccine does not generally prevent treated females from continuing to have estrus cycles, so they may be repeatedly bred over the course of a breeding season. PZP vaccine may cause ovarian disfunction, especially after repeated doses. GonaCon vaccine tends to reduce estrus activity, so a treated female may engage in behaviors more typical of pregnant females. PZP vaccines and GonaCon vaccine can cause injection site reactions, which may include abscesses and granulomas, though these do not generally reduce mobility. IUDs can only be used in open females and prevent pregnancy only so long as the IUD is retained in the uterus. Jennies screened for IUD use would need to be handled briefly in a chute with adequate restraint to allow for pregnancy status examination and IUD placement. Although fertility control vaccines and IUDs may temporarily reduce the number of breeding females in a herd, those animals may return to fertility after the effects of vaccines wear off, or IUDs fall out or are removed. Genetic effects of a reduced number of breeding females can be counteracted by periodic introduction of animals from other herds. Given the numbers of females treated and the frequency of treatment, it is not expected that use of fertility control vaccines would lead to strong evolutionary selection for immunocompromised animals.

Successful implementation of a fertility control program could reduce the annual reproductive rate on Sinbad to 11% from the natural rate of 20%. If implemented when the HMA has reached low end AML it could be expected that it would take between five and ten years for the HMA to reach upper AML of 70 head.

Impacts to individual animals could occur as a result of stress associated with the gather, capture, processing and transportation of animals. The intensity of these impacts would vary by individual and would be indicated by behaviors ranging from nervous agitation to physical distress. Mortality of individual burros from these activities is rare but can occur. Other impacts to individual wild horses include separation of members of individual bands and removal of animals from the population.

The BLM has been gathering excess wild horses and burros from public lands since 1975, and has been using helicopters for such gathers since the late 1970's. Refer to Appendix C, for information on the methods that are utilized to reduce injury or stress to wild horses and burros during gathers. Since 1989, BLM Utah has gathered and removed 466 excess animals from the Sinbad HMA. Of these, gather related mortality has averaged less than 1%, which is very low when handling wild animals. This data affirms that the use of helicopters and motorized vehicles are a safe, humane, effective and practical means for gathering and removing excess wild horses and burros from the range.

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 burros residing within the area and at the most effective time periods, time is required for the burros 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 burro area, or around a pre-set water or bait source. The portable panels would be set up to allow wild burros to go freely in and out of the corral until they have adjusted to it. When the wild burros fully adapt to the corral, it is fitted with a gate system. The acclimatization of the burros creates a low stress trap. During this acclimation period the burros would experience some stress due to the panels being setup and perceived access restriction to the water/bait source.

When actively trapping wild burros, the trap would be checked on a daily basis. Burros 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 burros 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 burros in the area; reach AML; implement population growth suppression measures; or 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 burros 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 burros at a given location, which can also relieve the resource pressure caused by too many burros. As the proposed bait and/or water trapping in this area is a low stress approach to gathering of wild burros, such trapping can continue into the foaling season without harming the jennies or foals. Conversely, it has been documented that at times water trapping could be stressful to wild burros due to their reluctance related to approaching new, human structures or intrusions. In these situations, wild burros may avoid watering or may travel greater distances in search of other watering sources.

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

TEMPORARY HOLDING FACILITIES IMPACTS

Wild burros 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 burros will be aged and sorted into different pens based on sex. The burros will be provided ample supply of good quality hay and water. Jennies and their un-weaned foals will be kept in pens together. All burros identified for retention in the HMA will be penned separately from those animals identified for removal as excess. All jennies identified for release will be treated with fertility control vaccine in accordance with the SOPs for Fertility Control Implementation in Appendix E.

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 burros. 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 IMPACTS

Wild burros 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 burros will be inspected prior to use to ensure wild burros can be safely transported. Wild burros will 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. Jenny and un-weaned foals are not separated for longer than 12 hours. Transportation of recently captured wild burros is limited to a maximum of 10 hours. During transport, potential impacts to individual burros can include stress, as well as slipping, falling, kicking, biting, or being stepped on by another animal. Unless wild burros are in extremely poor condition, it is rare for an animal to die during transport.

Upon arrival, recently captured wild burros are off-loaded by compartment and placed in holding pens where they are fed good quality hay and water. Most wild burros 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 burros. 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 burros 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 burros, 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.

After recently captured wild burros 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 burros are similar to those that can occur during transport. Injury or mortality during the preparation process is low but can occur.

At ORC, a minimum of 700 square feet is provided per animal. Mortality at ORC 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.

WILD BURROS REMAINING OR RELEASED INTO THE HMA FOLLOWING GATHER

Under the Proposed Action, the post-gather population of wild burros would be about 50 wild burros, which is the low range of the AML for the Sinbad HMA. Reducing population size would also ensure that the remaining wild burros 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 burros 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 burros 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 burros across the HMA following the removal of excess burros, competition for resources would be reduced, allowing wild burros to utilize preferred, quality habitat. Confrontations between jacks would also become less frequent, as would fighting among wild burro bands at water sources. Achieving the AML and improving the overall health and fitness of wild burros could also increase foaling and foaling survival rates over the current conditions.

Ungathered Burros and Herd Management Area Impacts

The remaining wild burros 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 burros would be reduced under the two gather and removal alternatives. Fighting among jack burros 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.

Spontaneous abortion events among pregnant jennies following capture is also rare, though poor body condition can increase the incidence of such spontaneous abortions.

MITIGATION MEASURES

None identified.

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 4700, 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 2 – GATHER AND REMOVAL WITHOUT FERTILITY CONTROL

The following are the impacts expected from the implementation of Alternative 2 to the resources of concern.

LIVESTOCK GRAZING

Direct and Indirect impacts to Livestock under Alternative 2 will be similar in nature to those addressed in Alternative 1 (Proposed Action). However, wild burro populations would rebound at a faster rate and exceed the high-end AML as soon as 2026. Higher burro levels increase competition between livestock and wild burros sooner and quicker population increases result in a shorter recovery time for the rangeland resources from present burro grazing pressure impacts.

VEGETATION

Impacts of the gather and removal would be similar to Alternative 1. However, wild burro populations would rebound at a faster rate and exceed the high end AML as soon as 2026. Higher burro levels increase pressure on natural forage and quicker population increases result in a shorter recovery time for the rangeland resources from present burro grazing pressure impacts.

WILD BURROS

Direct and Indirect impacts to Wild Burros under Alternative 2 will be similar in nature to those addressed in Alternative 1 (Proposed Action), in regard to gather and handling activities. Fertility control methods would not be utilized so fertility related impacts as disclosed in Alternative 1 would not occur. From USGS unpublished data we can expect anywhere from an 11.4% to 20% annual increase in the herd. This faster growth rate as compared to the proposed action would cause more

resource damage and require more frequent gathers over the period of the proposed action, to try and attain AML. The sex ratio would be maintained at approximately 50/50 male to female. Due to the lack of fertility control it is expected that the herd will grow at a faster annual rate than the proposed action so that the herd is projected to return to the upper AML range by 2026 as disclosed in Table 3. At that rate, within 10 years the HMA could contain upwards of 365 burros if additional maintenance gathers are not completed.

MONITORING AND/OR COMPLIANCE

Same as the Proposed Action.

ALTERNATIVE 3 – NO ACTION

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

LIVESTOCK GRAZING

Direct impacts from not managing burros within the Sinbad HMA would have a negative effect on livestock grazing within the identified grazing allotments. Within five years, the wild burro population could exceed 726 (see Table 4), which would be 1,210% above AML. Increased numbers of burros would adversely affect vegetative resources, which burros, livestock and wildlife compete for, as well as an increased competition for water resources and an increasingly negative impact upon the springs and streams. Grazing allotments would be closed to livestock grazing and or permittees would be required to reduce numbers as burro numbers increase and available forage decreases due to excessive burro numbers.

VEGETATION

Currently, the population is 448% above AML, and forage is 90% used despite livestock reductions. In 5 years, the population could be at 1,210% above AML, and there would be insufficient forage to support that population so the excess animals would spread into adjacent areas to find resources and reduce competition. However, the Price RMP does not allow for their management in adjacent areas, so this alternative would be out of conformance with the RMP. 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 burro use. Impacts would be created by hoof action as the burros travel to and from water as well as disturbance created by the foraging of the burros on individual plants, which would eventually result in a reduced carrying capacity. This is an ongoing impact to vegetation but would be increased exponentially by allowing the burro herd to continue growing until the population density was so great as to cause some reduction in population growth due to starvation and reduced survival of foals as the body condition of Jennie's declines (i.e., self-regulation of the population).

WILD BURROS

The Interior Board of Land Appeals (IBLA) through case No. 118 IBLA 75 (Animal Protection Institute Et. AI., 1991) has pointed out that in concurrence with The Wild Free-Roaming Burro And Burro Act of 1971 (Public Law 92-195) "excess animals" must be removed from an area in order to preserve and maintain a thriving natural ecological balance and multiple-use relationship in that area (16 U.S.C. 1332(t)(1988).

Alternative 3 is contrary to the WFRHBA which requires the BLM to "prevent the range from deterioration associated with the overpopulation" of wild burros and "preserve and maintain a thriving natural ecological balance and multiple use relationships in that area". It is also inconsistent with the Price Field Office RMP, which directs the Price Field Office BLM to conduct gathers as necessary to achieve and maintain AML. This alternative of using natural controls to achieve a desirable AML has not been shown to be feasible in the past. Wild burros in the Sinbad HMA are not substantially regulated by predators. In addition, wild burros are a long-lived species with expected foal survival rates that may exceed 95%. If the March 1, 2020 herd size (250) grows unabated for 10 years at an annual growth rate of 20%, that would lead to an expected herd size of approximately 1,550 by early 2030. Even if annual growth of the herd slows to 15%, the net herd size by 2030 would be exceed 1,100 burros. There is no mechanism of self-regulation in this species, other than through the action of limited forage availability and, ultimately, starvation (NAS 2013). 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 large snow storm events or extreme drought – cause catastrophic mortality of wild burros.

"Literature clearly demonstrates that density dependence due to food limitations will reduce population growth rates in equids and other large herbivores through reduced fecundity and survival. The total annual population increment will decline at higher densities. Some of the reduction in annual population increment at high densities will probably be due to reduced fertility, and much of the reduction can also be expected to be due to increased mortality. The literature and the case studies show that although density dependence can regulate population sizes, responses will probably include increased numbers of animals in poor body condition and high numbers of animals dying from starvation" (NAS, 2013).

The HMA is managed under the objectives of the Price RMP, the Sinbad HMAP and current regulations and policies with no additional objectives specific to the management of wild burros within the Sinbad HMA.

If the No Action Alternative is taken, excess wild burros would not be removed from within the Sinbad 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 2021 (or the soonest feasible time period). 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 burro population continues to grow. The number of areas experiencing severe utilization by wild burros 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 burros 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 burros, domestic livestock, and native wildlife would increase.

Wild burros are a long-lived species with documented survival rates that may exceed 90% (Douglas and Hurst 1993), and which do not have the ability to self-regulate their population size (NAS 2013).

Predation and disease have not substantially regulated wild burro population levels within the Sinbad HMA. Some mountain lion predation may occur but does not appear to be substantial. Coyotes are not prone to prey on wild burros unless the burros are 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 burro numbers for the foreseeable future, which would continue to exceed the carrying capacity of the range. Individual burros would be at greater risk of death by starvation and lack of water. The population of wild burros would compete for the available water and forage resources, affecting jennies and foals most severely. Social stress would increase. Fighting among jack burros would increase as they protect their position at scarce water sources, as well as injuries and death to all age classes of animals.

From USGS unpublished data we can expect anywhere from an 11.4% to 20% annual increase in the herd. This faster growth rate as compared to the proposed action would cause more resource damage and require more frequent gathers over the period of the proposed action, to try and attain AML. Starting with the 2020 estimate of 245 head, with the above stated annual increase within 4 years the HMA would contain between 377 and 508 head of burros, within 10 years the HMA and surrounding lands could contain upwards of 1,516 burros.

If the burro herd size reaches extremely high levels, substantial loss of the wild burros in the HMA due to starvation or lack of water would have consequences on the ability of the natural environment in the HMA to sustain the herd in the long run. Continued decline of rangeland health and irreparable damage to vegetative, soil and riparian resources, would have 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 burro population, and would not promote a thriving natural ecological balance.

As populations increase beyond the capacity of the available habitat, more groups of burros would leave the boundaries of the HMA in search of forage and water. This alternative would result in increasing numbers of wild burros 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."

MONITORING AND/OR COMPLIANCE

See monitoring section for the proposed action for monitoring protocols.

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.

LIVESTOCK AND GRAZING

The area of cumulative impact analysis area for livestock and grazing is the boundary of the six affected grazing allotments because that is where burro, livestock, and wildlife grazing will overlap. Past, present and reasonably foreseeable activities include: past wild burro selective removal gather which may have altered the structure and composition of the Sinbad HMA, continuing livestock grazing, continuing wildlife grazing, continuing wildlife management (adjustment of population numbers), and continued development of recreational infrastructure.

The cumulative effects to livestock from the capture and removal of excess wild burros include potential disturbance during the time of helicopter use, temporary displacement from trap and holding facility areas, and decreased competition between domestic and wild herds and increased forage availability The cumulative effects associated with livestock and wildlife grazing include competition for forage. The cumulative effects from recreational infrastructure include human presence patterns which may result in location becoming no longer available for livestock use.

The Proposed Action would contribute to the cumulative impacts of these past and foreseeable future actions by maintaining the herd at AML and creating a slowed repopulation rate. This would result in improvement of upland and riparian vegetation conditions, which would in turn benefit permitted livestock, native wildlife, and wild burro population as forage (habitat) quality and quantity is improved over the current level. Benefits from a reduced wild burro population would include fewer animals competing for limited forage and water resources. Cumulatively, there should be more stable wild burro populations, healthier rangelands, healthier wild burros, and fewer multiple use conflicts in the area over the short and long-term. Over the next 10 years, continuing to manage wild burros within the established AML range would achieve a thriving natural ecological balance and multiple use relationship on public lands in the area. Alternative 2 will also result in the cumulative impacts described for the Proposed Action; however, the effects will not be as long lived since the fertility treatments would not occur and a natural growth rate will occur under this alternative. Under Alternative 2, the herd is anticipated to exceed AML within 5 years unless additional gathers occur to keep the herd numbers low. The No Action alternative will not result in benefits to forage quality and quantity or competition with livestock and wildlife since the excess horses would not be gathered. Under the no action alternative, the herd will leave the HMA, fewer AUMs would be available for wildlife and livestock, and the burro herd will become more stressed as resources are consumed, and eventually a die-off is anticipated when the number of burros exceed the capacity of the land.

VEGETATION

The area of cumulative impact analysis area for vegetation is the boundary of the six affected grazing allotments because that is where vegetation is affected by burro, livestock, and wildlife grazing. Past, present and reasonably foreseeable activities include: past wild burro selective removal gather which may have altered the structure and composition of the Sinbad HMA, continuing livestock

grazing, continuing wildlife grazing, continuing wildlife management (adjustment of population numbers), ongoing drought, and continued development of recreational infrastructure.

The cumulative effects to vegetation from the capture and removal of excess wild burros include increased forage availability. The cumulative effects associated with livestock and wildlife grazing include competition for forage. Even with the currently reduced livestock numbers, the forage in the cumulative impact area is approximately 90% used. The cumulative effects from recreational infrastructure include human presence patterns which may result in loss of vegetation in areas of recreational development or heavy use.

The Proposed Action would contribute to the cumulative impacts of these past and foreseeable future actions by maintaining the herd at AML and creating a slowed repopulation rate. This would result in improvement of upland and riparian vegetation conditions, which would in turn benefit permitted livestock, native wildlife, and wild burro population as forage (habitat) quality and quantity is improved over the current level. Benefits from a reduced wild burro population would include fewer animals competing for limited forage. Over the next 10 years, continuing to manage wild burros within the established AML range would achieve a thriving natural ecological balance and multiple use relationship on public lands in the area. Alternative 2 will also result in the cumulative impacts described for the Proposed Action; however, the effects will not be as long lived since the fertility treatments would not occur and a natural growth rate will occur under this alternative. Under Alternative 2, the herd is anticipated to exceed AML within 5 years unless additional gathers occur to keep the herd numbers low. The No Action alternative will not result in benefits to vegetation quality and quantity since the excess horses would not be gathered.

WILD BURROS

The area of cumulative impact analysis area for wild burros is the Sinbad HMA and the Big Pond grazing allotment (see map 2) because it is the area in which burros frequently move within and outside the HMA. Past, present and reasonably foreseeable activities include past wild burro selective removal gather which may have altered the structure and composition of the Sinbad HMA, continuing livestock grazing in the grazing allotments, continuing wildlife grazing, continuing wildlife management (adjustment of population numbers), and continued development of recreational infrastructure.

The cumulative effects to wild burros associated with the capture and removal of excess wild burros 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 (GAO, 2008). 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 aged 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/jennies and older horses/burros. 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 jenny, 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. The

cumulative effects associated with livestock and wildlife grazing include competition for forage. The cumulative effects from recreational infrastructure include human presence patterns which may result in location avoidance by burros. In total, these past, present and reasonably foreseeable activities influence the habitat quality, abundance, and continuity for the Sinbad HMA wild burros. They have shaped and will continue to shape the current wild burro population's structure, composition, behaviors, and patterns of use found These impacts occur rather slowly over time. At the same time, the burros 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, creating a slowed repopulation rate, and allowing for genetic monitoring that would allow for any substantial decrease in observed heterozygosity to become apparent sooner. This would result in improvement of upland and riparian vegetation conditions, which would in turn benefit permitted livestock, native wildlife, and wild burro population as forage (habitat) quality and quantity is improved over the current level. Benefits from a reduced wild burro population would include fewer animals competing for limited forage and water resources. Cumulatively, there should be more stable wild burro populations, healthier rangelands, healthier wild burros, and fewer multiple use conflicts in the area over the short and long-term. Over the next 10 years, continuing to manage wild burros within the established AML range would achieve a thriving natural ecological balance and multiple use relationship on public lands in the area. Alternative 2 will also result in the cumulative impacts described for the Proposed Action, however the effects will not be as long lived since the fertility treatments would not occur and a natural growth rate will occur under this alternative. Under Alternative 2, the herd is anticipated to exceed AML within 5 years unless additional gathers occur to keep the herd numbers low. The No Action alternative will not result in benefits to forage quality and quantity or competition with livestock and wildlife since the excess horses would not be gathered. Under the no action alternative, the herd will leave the HMA, the herd will become more stressed as resources are consumed, and eventually a die-off is anticipated when the number of burros exceed the capacity of the land.

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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	USHPO consultation has been completed previously for other gathers. Should a trap location need to be moved the sight would be cleared and any consultation requirements completed.
U.S. Fish and Wildlife Service	Endangered Species Act Section 7	Consultation with FWS is not needed given that no effects are anticipated to occur to T&E species under any of the alternatives.
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 June 2, 2021 to describe the proposed action and find out if the tribes have any issues concerning the proposed action. The Paiute Indian Tribe of Utah responded, but did not have 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	Consultation is ongoing as part of the NEPA process.
Emery County Commissioners	Consult with County	Consultation is ongoing as part of the NEPA process.
Utah Div. of Wildlife Resources	Consult with UDWR as the agency with expertise on impacts on game species	Consultation is ongoing as part of the NEPA process.
Neda Demayo, Return to Freedom	Consult with identified Interested Publics	Consultation is ongoing as part of the NEPA process.

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
Mathew Dillon, Pryor Mountain Wild Mustang Center	Consult with identified Interested Publics	Consultation is ongoing as part of the NEPA process.
Kathy Greg	Consult with identified Interested Publics	Consultation is ongoing as part of the NEPA process.
D.J. Schubert, Animal Welfare Institute	Consult with identified Interested Publics	Consultation is ongoing as part of the NEPA process.
Ginger Kathrens, Cloud Foundation	Consult with identified Interested Publics	Consultation is ongoing as part of the NEPA process.
Courtney McVean, Friends of Animals	Consult with identified Interested Publics	Consultation is ongoing as part of the NEPA process.
Grazing Permittees	Consult with identified Interested Publics	Consultation is ongoing as part of the NEPA process.

SUMMARY OF PUBLIC PARTICIPATION

Public involvement was initiated on this Proposed Action on March 11, 2020 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 BLM initiated public involvement at a public hearing about the use of helicopters and motorized vehicles to capture and transport wild horses (or burros) on May 25, 2021 by holding a virtual public hearing using Zoom. This specific gather was not addressed at that public meeting, though other gathers that are planned within the state of Utah and other states over the next 12 months were. This meeting was advertised in papers and radio stations nationwide. 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 and burros. This process has been in place for over 20 years, and relevant issues associated with these methods have been addressed in the CAWP *(Appendix C*).

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 and burros. 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 and burro management have included concerns over the rate at which horses and burros are herded to the trap site, the timing of the gather, the methods for transporting animals, and the numbers of horses and burros 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 Sinbad Wild Burro Gather DOI-BLM-UTG020-2020-0017-EA will be made available to the public for a 30-day public comment period at the Price Field Office and on-line at

https://www.blm.gov/programs/wild-burro-and-burro/herd-management/gathers-and-removals/utah

or on the e-Planning web page at:

http://bit.ly/SinbadEA;

The comment period will occur from July 21, 2021 through August 20, 2021 (Appendix B)

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, Livestock Grazing and Rangeland Health, Vegetation, and Wild Burro Issues.
Stephanie Howard	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 Vegetation
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,	Contributed information on fertility control and genetic diversity.

Name	Title	Responsible for the Following Section(s) of this Document
	Washington Office, (WO)	

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.

REFERENCES CITED

Abella, S, 2008. *A Systematic Review of Wild Burro Grazing Effects on Mojave Desert Vegetation, USA*. Environmental Management, DOI 10.1007/s00267-008-9105-7

Bartholow, J.M. 2004. An economic analysis of alternative fertility control and associated management techniques for three BLM wild horse herds. USGS Open-File Report 2004-1199.

Bartholow, J. 2007. Economic benefit of fertility control in wild horse populations. The Journal of Wildlife Management 71:2811-2819.

BLM. 2010. Wild horses and burros management handbook, H-4700-1. Bureau of Land Management, Washington, DC.

Choquenot, D. 1991. Density-dependent growth, body condition, and demography in feral donkeys: testing the food hypothesis. Ecology 72:805-813.

Cothran, E. Gus, 2002. *Genetic Analysis of the Sinbad, UT Feral Burro Herd.* Lexington, KY: University of Kentucky, Department of Veterinary Science. 6 pp

Department of Animal Science, (OSU); *Breeds of Livestock,* Retrieved April 22, 2010. http://www.ansi.okstate.edu/breeds/other/donkey/poitou

de Seve, C.W. and Boyles Griffin, S.L. 2013. An economic model demonstrating the long-term cost benefits of incorporating fertility control into wild horse (Equus caballus) management in the United States. Journal of Zoo and Wildlife Medicine 44(4s:S34-S37.

Douglas, C.L. and T.L. Hurst. 1993. Review and annotated bibliography of feral burro literature. National Park Service / University of Nevada Las Vegas NPS/WRUNLV/NRTR-93/3 D40. Contribution Number CPSU/UNLV 044/02.

Frankham, R., J. D. Ballou, and D. A. Briscoe. 2010. Introduction to conservation genetics, second edition. Cambridge University Press, New York, New York.

Garrott, R.A., and L. Taylor. 1990. Dynamics of a Feral Horse Population in Montana. Journal of Wildlife Management 54 (4): 603-612.

Garrott, R. A., & Oli, M. K. (2013). A Critical Crossroad for BLM's Wild Horse Program. Science, 341(6148), 847-848.

Government Accountability Office (GAO). 2008. Bureau of Land Management; Effective Long-Term Options Needed to Manage Unadoptable Wild Horses. Report to the Chairman, Committee on Natural Resources, House of Representatives, GAO-09-77.

Griffin, P.C., 2015, *Estimated abundance of wild burros surveyed on Bureau of Land Management Lands in 2014:* U.S. Geological Survey Open-File Report 2015-1084, 42 p., http://dx.doi.org/10.3133/ofr20151084. Gross. 2000. A dynamic simulation model for evaluating effects of removal and contraception on genetic variation and demography of Pryor Mountain wild horses. Biological Conservation 96:319-330.

Hampton, J.O., Hyndman, T.H., Barnes, A. and Collins, T. 2015. Is wildlife fertility control always humane? Animals 5:1047-1071.

Hobbs, N.T., D.C. Bowden and D.L. Baker. 2000. Effects of Fertility Control on Populations of Ungulates: General, Stage-Structured Models. Journal of Wildlife Management 64:473-491.

Interior Board of Land Appeals 88-591, 88-638, 88-648, 88-679 at 127

109 Interior Board of Land Appeals 119 API 1989.

118 Interior Board of Land Appeals 75.

Kirkpatrick, J.F. and Turner Jr, J.W. 1991. Compensatory reproduction in feral horses. The Journal of Wildlife Management 55:649-652.

McCann, B., D. Baker, J. Powers, A. Denicola, B. Soars, and M. Thompson. 2017 Delivery of GonaCon-Equine to feral horses (*Equus caballus*) using prototype syringe darts. International Wildlife Fertility Control Conference abstract.

McDonnell, S. M. 1998. Reproductive behavior of donkeys (Equus asinus). Applied Animal Behaviour Science, 60, 277-282

National Academy of Science, 2013, *Using Science to Improve the BLM Wild Horse and Burro Program, A Way Forward,* 383 pp

Norment, C. and C. L. Douglas. 1977. Ecological studies of feral burros in Death Valley. Technical Report CPSU/UNLV 17. Cooperative National Park Resources Study Unit, University of Nevada, Department of Biological Sciences. 264 pages.

Scasta, J. D. 2019. Mortality and operational attributes relative to feral horse and burro capture techniques based on publicly available data from 2010-2019. Journal of Equine Veterinary Science, 102893.

Schoenecker, K.A., S.R.B. King, L.C. Zeigenfuss, and K.R. Searle. 2015. *Demography of two wild burro populations in the western USA.* USGS proposal and study plan for research. 42 pp

Schoenecker, K.A, and B.C. Lubow. *In press*. Application of a hybrid model to reduce bias and improve precision in population estimates for elk (Cervus elaphus) inhabiting a cold desert ecosystem. Journal of King Saud University – Science, doi: http://dx.doi.org/10.1016/j.jksus.2015.09.004.

Smith, M.A., 1986. Potential Competitive Interactions Between Feral Horses and Other Grazing Animals. Equine Veterinary Science, 6(5):238-239.

United States Department of Interior, Bureau of Land Management, Utah State Office, 2010 Utah Monitoring Manual for Upland Rangelands. Utah BLM Manual H-4400-1.

United States Department of Interior, Bureau of Land Management, Price Field Office, 2008 *Sinbad Emergency Wild Horse Gather Plan* (DNA #UT-070-2008-082)

United States Department of Interior, Bureau of Land Management, 2005 *Strategic Research Plan, Wild Horse and Burro Management,* 45 pp

United States Department of Interior, Bureau of Land Management, Price Field Office, 2001 *Wild Burro Gather and Removal, Sinbad Herd Management Area* (EA #UT-070-01-29)

United States Department of Interior, Bureau of Land Management, Price Field Office, 1996 *Wild Burro Capture Plan, Sinbad Herd Management Area Plan*

United States Department of Interior, Bureau of Land Management, Price Field Office, 1991 *North San Rafael Habitat Management Plan*

United States Department of Interior, Bureau of Land Management, Price Field Office, 1989 *Black Dragon Wild Burro Removal, Sinbad Herd Management Area (EA# UT-067-89-18).*

United States Department of Interior, Bureau of Land Management, Price Field Office, *1993 Sinbad Herd Management Area Plan,* 34 pp

United States Department of Interior, Bureau of Land Management, Price Field Office, 2016 Sinbad Herd Management Area, Wild Burro Gather and Removal and Research Plan (EA #UT-G020-2015-050)

United States Department of Interior, Bureau of Land Management, 2005 *Strategic Research Plan, Wild Horse and Burro Management,* 45 pp

United States Department of Interior, Bureau of Land Management, Price Field Office, Wild Horse and Burro Files, 4700 Files

Woodward, S., and R. Ohmart. 1976. Habitat use and fecal analysis of feral burros (Equus asinus), Chemehuevi Mountains, California, 1974. Journal of Range Management 29:482-485.

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.

APPROPRIATE MANAGEMENT LEVEL: The number of adult wild horses or burros 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.

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.

COMPREHENSIVE ANIMAL WELFARE PROGRAM: Program developed to monitor the health and wellbeing of wild horses and burros during gather operations.

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
AUM	Animal Unit Month
AVMA	American Veterinary Medical Association
BLM	Bureau of Land Management
BMP	Best Management Practice
CAWP	Comprehensive Animal Welfare Program
CFR	Code of Federal Regulations
COR	Contracting Officer Representative
DR	Decision Record
EA	Environmental Assessment
EIS	Environmental Impact Statement
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
GIS	Geographic Information System
GnRH	Gonadotropin-Releasing Hormone
GPS	Global Positioning System
HMA	Herd Management Area
HMAP	Herd Management Area Plan
HSUS	Humane Society of the United States
IC	Incident Commander
IDT	Interdisciplinary Team
IM	Instruction Memorandum

Acronym	Meaning
IUD	Intrauterine Device
MFP	Management Framework Plan
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
ORC	Off Range Corrals
ORP	Off-Range Pastures
PFO	Price Field Office
PRIA	Public Rangeland Improvement Act
PRMFP	Price River Management Framework Plan
PRMP	Price Field Office Resource Management Plan
PZP	Porcine Zona Pellucida
RMP	Resource Management Plan
ROD	Record of Decision
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
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WFRHBA	Wild Free Roaming Horses and Burros Act
WH&B	National Wild Horse and Burro Program
WO	Washington Office

APPENDICES

APPENDIX A: INTERDISCIPLINARY TEAM CHECKLIST

INTERDISCIPLINARY TEAM CHECKLIST

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

Project Title: Sinbad Burro Gather and NAS Research

NEPA Log Number: DOI-BLM-UT-G020-2020-0017-EA

File/Serial Number: 4720 / UT-652B

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.

Determination	Resource/Issue	Rationale for Determination	Signature	Date
NI	Air Quality & Greenhouse Gas Emissions	Dust and vehicle emissions would be generated during the project. However, impacts from emissions are expected to be short term (during the project only) and small (vehicles accessing the site and conducting the work) so that they would be indistinguishable from background emissions as measured by monitors or within the margin of error of existing models.	Joseph Rodarme	2/13/2020
NP	BLM natural areas	There are no BLM Natural Areas within the proposed project area as per GIS and RMP review	Jaydon Mead	3/5/2020
NI	Cultural: Archaeological Resources	The Area of Potential Effect for the proposed Sinbad Burro gather includes those areas selected for stationing. If stations are located on previously disturbed areas, do not incorporate sand stone walls or cliff faces, and are less than 50 acres, an intensive cultural resource survey will be waived. As none of these caveats are met and there are no recorded historic properties within the APE, the project is waived from cultural inventory	William Brant	5/28/2021

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		and a determination of "no historic properties affected" is made pursuant to 36 CFR800.4(d)(1).		
NI	Cultural: Native American Religious Concerns	Previous consultations with tribal authorities during the preparation of DOI-BLM-UT-G020-2015-050-EA did not identify areas of tribal importance within the proposed undertaking's APE.	William Brant	1/28/2020
NP	Designated Areas: National Historic Trails	There are no National Historic Trails within the proposed project area as per GIS and RMP review	Jaydon Mead	3/5/2020
NI	Designated Areas: Areas of Critical Environmental Concern	After review of GIS records and the Approved RMP, the I-70 and San Rafael Canyon ACECs are within the project area. The proposed action and short-term nature of the activity will have no impacts on the ACEC's because existing disturbance would be used for staging areas.	Jaydon Mead	3/5/2020
NP	Designated Areas: Wild and Scenic Rivers	There are no Wild and Scenic Rivers within the project area as per GIS and RMP review.	Jaydon Mead	3/5/2020
NP	Designated Areas: Wilderness Study Areas	There are no Wilderness Study Areas within the project area as per GIS and RMP review.	Jaydon Mead	3/5/2020
NI	Designated Areas: Wilderness	A few of the bait traps are located near the San Rafael Reef Wilderness Area. The Wilderness boundary will be clearly marked prior to the bait traps being installed. This design feature will ensure that all the ground disturbing activities will only occur outside the newly designated wilderness area. Therefore, there are no impacts to Wilderness.	Jaydon Mead	3/5/2020
NI	Environmental Justice	The BLM reviewed the Headwaters Economics BLM Socioeconomic Profile for Emery County (data source: https://headwaterseconomics.org /tools/blm-profiles/). The percent of the county's populations that are minority does not exceed the percent in the state. The county does have poverty percentages that exceed the percent in the state. However, this project will not disproportionately adversely affect minority or economically disadvantaged communities or populations because there are no populations in the project area.	Stephanie Howard	6/17/21
NP	Farmlands (prime/unique)	According to the NRCS soils surveys and knowledge of the soils, there are no prime and unique soils mapped within the project area.	Stephanie Bauer	1/16/20
NI	Fuels/Fire Management	Implementation of the proposed action would have no significant impact on Fuels/Fire Management because the project is small in scope and wild burros have minimal impact on fire suppression tactics or fuels projects. Future impacts	Stuart Bedke	14 JAN 2020

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		would be negligible. Follow any seasonal fire restrictions on http://utahfireinfobox.com		
NI	Geology / Minerals / Energy Production	The proposed action will not have any direct impact to any locatable, leaseable or salable solid or fluid mineral resources because it will be temporary in nature.	Rebecca Anderson	01/15/20
NI	Invasive Plants / Noxious Weeds	Surface disturbing activities have the potential to introduce/spread invasive species/noxious weeds. There are no known noxious weeds within the project area. Cheatgrass, halogeton and Russian thistle are invasive species that are present within the project area. Negligible impacts to invasive species/noxious weeds are expected because the proposed holding facilities are located in previously disturbed locations. Any bait/trap locations will be required to have certified weed free feed. The project will be required to follow Best Management Practices such as power washing equipment and vehicles to remove any mud or debris prior to entering BLM administered lands. Horses and other animals will be required to be cleaned and be free of any mud and vegetative materials before entering BLM administered lands. Horses are required to be fed certified noxious weed free hay for a minimum of 72 hours prior to entering BLM administered lands and any hay fed to horses while on BLM administered lands will be required to be certified noxious weed free.	Stephanie Bauer	1/16/20
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	Veronica Kratman	1/17/20
NI	Lands with Wilderness Characteristics	A couple trap locations identified in the proposed action are within the San Rafael Reef LWC Unit. This units was determined to possess wilderness characteristics of size criteria, naturalness, and opportunities for solitude or unconfined primitive recreation. Although this area was determined to possess wilderness characteristics, the RMP "…does not provide any specific management decisions to protect, preserve, or maintain wilderness characteristics for the [San Rafael Reef Unit]…" (*2008 FEIS pg. 4-173*). These units are to be managed for more purposes than solely preserving wilderness characteristics. Therefore the proposed action is consistent with management decisions in the RMP. Potential impacts to naturalness and	Jaydon Mead	3/5/2020

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		opportunities for solitude are short term. Because this project is short term/temporary, meaning it will be removed when not being used, it has been determined that there are no impacts to Lands with Wilderness Characteristics.		
PI	Livestock Grazing	Livestock compete with wild burros for available forage and water resources. Depending on timing of gather could cause temporary displacement or disturbance of livestock.	Mike Tweddell	1/13/2020
NI	Paleontology	The proposed project will have minimal surface disturbance and is unlikely to uncover any paleontological resources. Operations could uncover vertebrate fossils and if this happens, work should immediately halt in that location and the Price Field Office should be notified	Rebecca Anderson	1/15/20
NI	Plants: BLM Sensitive	After review of BLM records there are no known populations or habitat for BLM sensitive plants within the project area where ground disturbance is expected to occur, which is primarily on the flat ground of limestone benches surrounding the traps. These areas are currently frequented by burro herds and exposed to relatively high use by livestock, feral burros, feral horses, and recreation.	Kegen Benson	1/27/20
NI	Plants: Threatened, Endangered, Proposed, or Candidate	After review of BLM records there are no known populations or habitat for Threatened, Endangered, or Candidate plants within the project area where ground disturbance is expected occur, which is primarily on the flat ground of limestone benches surrounding the traps. These areas are currently frequented by burro herds and exposed to relatively high use by livestock, feral burros, feral horses, and recreation.	Kegen Benson	1/27/20
NI	Rangeland Health Standards	The components of Rangeland Health Standards; Vegetation, Soils, Water Quality and Riparian areas are addressed individually in other sections of the checklist. 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 was conducted on the HMA in June of 2008. 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	1/13/2020
NI	Recreation	The proposed action is located in the San Rafael Special Recreation Management Area (SRMA). The short term gather and minimal use of the area will have no impacts or effects on recreation users in the area.	Jaydon Mead	3/5/2020

Determination	Resource/Issue	Rationale for Determination	Signature	Date
NI	Socio-Economics	The BLM reviewed the Headwaters Economics BLM Socioeconomic Profile for Emery County (data source: https://headwaterseconomics.org/tools/blm-profiles/). This project will not affect the social and economic status of the counties to a degree that detailed analysis is required because the project will not create new jobs. Instead it will bring in a few existing workers from other areas to complete the work which may result in minimal hospitality expenditures however the duration of the project's individual activities are short term and dispersed throughout the project's 10-year lifetime.	Stephanie Howard	6/17/21
NI	Soils: Physical / Biological	Soils conditions would not be affected by this project because all disturbances would be widely dispersed and proposed holding facilities are located on previously disturbed sites.	Stephanie Bauer	1/16/20
PI	Vegetation	Impacts expected are a result of over utilization of forage species, and potential impacts to vegetation from disturbance associated with proposed gather.	Stephanie Bauer	1/16/20
NI	Visual Resources	The proposed action is located within the VRM I, II and III. The temporary gathering sites are short term in nature and will be removed upon completion of the gather. This will have no impacts to VRM in the long term.	Jaydon Mead	3/5/2020
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. Trash would be confined in a covered container and disposed of in an approved landfill. No burning of any waste will occur due to this project. Human waste will be disposed of in an appropriate manner in an approved sewage treatment center.	Jaydon Mead	3/5/2020
NI	Water: Groundwater Quality	No impact to water quality due to the minimal ground disturbance of this project.	Rebecca Anderson	1/15/20
NI	Water: Hydrologic Conditions (stormwater)	Water: Hydrologic Conditions (stormwater) would not be affected by this project because all disturbances would be minimal.	Rebecca Anderson	1/15/20
NI	Water:	There are no Municipal Watershed/Drinking Water Source	Rebecca Anderson	1/15/20

Determination	Resource/Issue	Rationale for Determination	Signature	Date
	Municipal Watershed / Drinking Water Source Protection	Protection Zones within or near the project area per GIS review.		
NI	Water: Steams, Riparian Wetlands, Floodplains	The catch points will not be located in streams, riparian areas, wetlands or floodplains. By removing animals from the area, there will be less pressure on water resources and the ability to provide drinking water for animals.	Rebecca Anderson	1/15/20
NI	Water: Surface Water Quality	This proposed action will have limited surface disturbance and so is not expected to impact water quality or quantity.	Rebecca Anderson	1/15/20
NI	Water: Water Rights	Changes in water quality or quantity in the watershed can affect the ability to use and develop water rights. This proposed action will have limited surface disturbance and is not expected to impact water quality or quantity, therefore no impact to water rights is expected and further analysis is not required.	Rebecca Anderson	1/15/20
NI	Water: Waters of the U.S.	Waters of the U.S. includes tributaries to navigable waters, there are intermittent streams near the project area that flow into the Green River. Due to the limited surface disturbance, the proposed action is not expected to impact this resource, therefore detailed analysis is not required.	Rebecca Anderson	1/15/20
PI	Wild Horses and Burros	Expected impacts from the proposed action to individual burros and the herd include handling stress, effects to genetic diversity, animal health, and condition.	Mike Tweddell	1/13/2020
NI	Wildlife: Migratory Birds (including raptors)	Migratory Birds: Portions of the project Area are in or within 1 mile from riparian habitat. However, no direct impacts to migratory songbirds or migratory bird breeding habitat are expected within the project footprint as trap and storage areas will avoid riparian habitat. Raptors: Burrowing owl, golden eagle, and ferruginous hawk have potential to forage in the area as the prey species these predatory birds rely upon inhabit the Project Area. The cliff and canyon habitat on the eastern boundary of the HMA is quality nesting habitat. Avoidance of cliffs and canyons by helicopters, as outlined in the EA, is sufficient to mitigate disturbance to these species.	Kegen Benson	1/27/20
NI	Wildlife: Fish (designated or non-designated)	There would be no surface water depletion that would affect federally listed fish species that occur downstream. The Project Area does include ephemeral and intermittent streams, but due to the limited surface disturbance and best management practices (i.e., avoiding streambeds and riparian areas) outlined in	Kegen Benson	1/27/20

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		the proposed action the activity is not expected to have any discernible impact to intermittent or ephemeral streams, or to the perennial streams they drain to, nor to any aquatic wildlife possibly contained therein.		
NI	Wildlife: Non-USFWS Designated	The primary wildlife species of concern in this area are desert bighorn sheep (DBH) and pronghorn antelope. Other wildlife found in the area includes coyotes, mountain lions, cottontails, ravens, and great basin gopher snakes. Removal of the burros would result in a reduction in competition for forage, water, and habitat and incrementally decrease the opportunity for transmission of disease. The eastern portion of the HMA is within critical DBH habitat. Avoidance by helicopters of the cliffs and canyons along the eastern edge, during the lambing period (4/15-6/15) will ensure no impacts to DBH. The level limestone benches surrounding the traps, where disturbance and activities are expected to be highest, is not of outsized importance to area wildlife and the short duration of the projected is not anticipated to have any impacts.	Kegen Benson	1/27/20
NI	Wildlife: BLM Sensitive	There is habitat for several bat species, burrowing owl, kit fox, and great plains toad within the Project Area. However, following the plans outlined in the EA (i.e., mostly avoiding canyons, streams, and riparian areas, situating traps in areas currently frequented by burros and exposed to relatively high use, and performing activities during the day) will mitigate any possible impacts to these species.	Kegen Benson	1/27/20
NP	Wildlife: Threatened, Endangered, Proposed or Candidate	After GIS review, there are no known occurrences of federally listed or candidate species in the project area. There is no designated critical habitat within the HMA boundaries. The area lacks sufficient riparian vegetation to support southwester willow flycatcher or yellow billed cuckoo, and Mexican spotted owl modeled habitat is restricted to canyons.	Kegen Benson	1/27/20
NP	Woodlands/Forestry	There are no merchantable woodland/forestry products within the project area per GIS review..	Stephanie Bauer	1/16/20

FINAL REVIEW:

Reviewer Title	Signature	Date
Environmental Coordinator		
Authorized Officer		

APPENDIX B: PUBLIC NOTICE

APPENDIX C: 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.h All 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 D: ADDITIONAL 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 C 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 and burros. 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 monitoring (hair follicle 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 burros 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 samples at every gather. Typical herds should be sampled every ten to 15 years (BLM H-4700-1 2010). The Sinbad HMA is due to have genetic information collected.

   Hair follicle samples would be collected for genetic monitoring, and analyzed to compare with established genetic baseline data (genetic diversity, historical origins, and checking for any unique markers). 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, but sampled individuals would not include mothers and foals, because that could falsely inflate estimates of inbreeding coefficient.

Analysis would be based on 12 microsatellite DNA markers. 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 any loss in genetic diversity (in terms of observed heterozygosity). A sample of DNA would be preserved for each burro tested. Samples are currently 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.

Hair follicle samples may be taken for the purposes of additional genetic studies and incorporation of such results into the Herd Management Area Plans (HMAPs).

SOPs for genetic sample collection are as follows:
The BLM has been collecting genetic health information about its wild horse and burro populations since the early 1990's. As of 2009, approximately 75% of the 177 HMAs that BLM administers have been tested and many have been retested. Based on this data, inbreeding is apparently rare in wild horse populations. Most wild horse herds that have been sampled exhibit moderate levels of genetic heterozygosity. Based on this analysis, approximately 12.5% of the herds tested have heterozygosity levels (observed heterozygosity (Ho)) below the assumed critical level of .310. These are herds that could begin to show inbreeding effects. Approximately 15% of the herds tested are within just 2% heterozygosity (.330) of the critical level. A population that is maintained at less than 100-120 adult animals may begin to lose variation fairly quickly. The herds that are just above the critical threshold level could drop very quickly. Only a very small number (approximately 5) of the 199 HMAs have exhibited characteristics possibly attributable to inbreeding, such as cataract blindness, dwarfism, parrot-mouth, or club-foot deformities. Thus, there does not appear to be any immediate cause for concern about inbreeding depression in wild horse herds.

The Wild Free-Roaming Horses and Burros Act requires that horses and burros on public lands be managed in a manner that achieves and maintains thriving ecological balance. Maintenance of such a balance frequently requires that wild horse populations be kept small. When population size is too small, it will inevitably lead to decreased genetic variation and possible inbreeding. However, it is possible to manage small populations in a manner that will minimize the loss of variation and inbreeding and if necessary, counteract the loss. The first step in this process is an assessment of the current genetic status of the population that will be followed by periodic monitoring assessments.

Genetic marker analysis can provide information about both the past and the future of a population. Because gene markers are passed from one generation to the next, they can tell us something about the ancestry of a population. Also, because demographics can affect the distribution of genetic markers within a population, these markers can often be used to interpret past populational

characteristics. In the same way, current demographic conditions can be used to make predictions about the future level of variability of gene markers.

Prior to 2006, blood samples from wild horses and burros were collected during gather operations and analyzed by Dr. Gus Cothran (University of Kentucky) for establishing baseline genetic data. With Dr. Cothran's move to Texas A&M University, this analysis is now being done using hair samples. A new baseline does not need to be established through hair analysis if blood analysis has already been completed. 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). Following processing, a sample of DNA will be preserved (frozen) for each horse tested. A report on the analysis of the population will be provided by Dr. Cothran. Reports are to be kept on file at local Field Offices and also at the National Program Office. Attachment 1 contains the instructions for collecting, handling, and shipping of the hair samples.

While it is preferred to collect the hair samples from horses or burros that are released back to the herd management area (HMA), samples may also be collected from removed horses if necessary. In complexes or HMAs where separate breeding populations are thought to exist, each group of animals in a distinct population should be sampled separately. Do not mix samples from different horses or different breeding populations. Mixing samples from non-interbreeding herds can give misleading estimates of genetic variation. Minimum sample size is 25 animals or 25% of the post-gather population, not to exceed 100 animals per HMA or separate breeding population. Samples should be collected from males and females in the same approximate ratio as the population. Animals of any age class may be sampled. Burros should be sampled in the same manner as horses.

The data will be compared to similar data from both domestic and other wild horse/burro populations. The primary value of this initial data is a baseline against which future samples can be compared to identify genetic drift and any narrowing of diversity through inbreeding. In the short term, diversity can be determined, herds may be separated or combined for management based on the data, rare alleles identified and a determination of founders (historical origin of herd).

GENETICS DATA COLLECTION INSTRUCTIONS

Analysis of DNA to determine genetic diversity of wild horse and burro (WH&B) herds is now being done using hair samples rather than blood 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 10-15 years. A new baseline does not need to be established through hair analysis if blood analysis has already been completed. Please follow the instructions below for collecting the hair samples and call Alan Shepherd, WH&B Research Coordinator, if you have any questions.

While it is preferred to sample release horses you may also sample removed horses if necessary. In complexes or HMAs where separate breeding populations are thought to exist, each group of animals in a distinct population should be sampled separately. Do not mix samples from different horses or different breeding populations. Minimum sample size is 25 animals or 25% of the post-gather population, not to exceed 100 animals per population. Samples should be collected from males and females in the same approximate ratio as the population. Animals of any age class may be sampled. Burros should be sampled in the same manner as horses.

1. You will need one plain white paper envelope, a white #10 business envelope works best, for each horse. Do NOT routinely use plastic or zip-lock bags; do NOT use plastic coated envelopes or envelopes with windows in them.

2. Hair samples must be obtained by pulling the hair NOT cutting or shaving it off the horse. The DNA is in the root follicle not the hair itself. Mane hair will work, but on foals or young horses you may need to obtain tail hair. Please submit about 30 hairs per animal. A bundle of 30 hairs is about the diameter of a pencil.

   The easiest way to pull a good sample is to grasp a bundle of hair and wrap it around a clean mane comb or hoof pick. Holding the bundle close to the neck, pull *straight out* firmly. Foal hair is more brittle and tends to break off. If you are having trouble getting hair with the root attached, try obtaining a tail hair sample instead.

3. Check that you have the hair roots or hair bulbs attached to the hair at the base. They feel like little bumps on the end of each hair.

4. Keep the hair in a loose bundle pointed in one direction or twist it together and place it in an envelope. You can cut off excess hair and leave only a few inches with the hair root attached to put in the envelop if that is easier.

5. Seal the envelope and *write the sample number on the envelope*. Write the sample number along with the horse's color, sex and age on the data collection sheet. If animals cannot be aged in years, at least record adult, yearling or foal.

Keep stray hairs out of the comb and off your clothes so they don't contaminate the next sample.

Please NOTE: It is best to sample when the hair is dry. If you need to sample when it is raining or the horses are wet, then DO use zip-lock bags for each sample AND keep the samples cool not frozen (refrigerate then shipped with cold packs) until they arrive at the lab.

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 burros 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 provided as a result of genetic monitoring would provide a comparison of domestic breeds with the wild burros sampled. Any incidence of negative genetic traits (parrot mouth, club feet etc.) or other abnormalities observed by BLM staff would be noted as well. A representative population of wild burros 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.

TEMPORARY HOLDING FACILITIES DURING GATHERS

Wild burros 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 burros 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. Jennies and their un-weaned foals would be kept in pens together. All burros 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 burros. 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 burros 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 burros would be inspected prior to use to ensure wild burros could be safely transported. Wild burros 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 burros would be limited to a maximum of 8 hours.

Upon arrival, recently captured wild burros would be off-loaded by compartment and placed in holding pens where they would be fed good quality hay and water. Most wild horses and burros 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 and burros. 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 and burros 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 burros, 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 and burros 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 and burros 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 E: SOPS FOR FERTILITY CONTROL VACCINES

Standard Operating Procedures for PZP Vaccine Treatments; One-Year Liquid Vaccine

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

1. Fertility 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 jennies 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. This will be accomplished by marking each individual with a freeze mark on the hip. Additionally, ear tags may be placed in an ear to assist in positively identifying individuals when they are long haired.
3. Only designated darters would prepare the emulsion. Vaccine-adjuvant emulsion would be loaded into darts at the darting site and delivered by means of a projector gun. Designated darters will follow safety guidance on EPA labeling for all adjuvants.
4. Delivery of the vaccine would be by intramuscular injection into the left or right hip/gluteal muscles while the jenny is standing still.
5. Safety for both humans and the burro is the foremost consideration in deciding to dart a jenny. The Dan Inject® gun would not be used at ranges in excess of 30 m while the Pneu-Dart® 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.
6. No attempts would be taken in high wind (greater than 15 mph) or when the animal 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.
7. 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.
8. 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.
9. 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.
10. Attempts will be made to recover all darts. To the extent possible, all darts which are discharged and drop from the burro 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.

11. 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 jennies; 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 jennies, 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 jenny to foal ratios can be collected, these data should also be shared with the NPO for possible analysis by the USGS.
3. An Application Data sheet will be used by field applicators to record all pertinent data relating to identification of the jenny (including photographs if jennies are not freeze-marked) and date of treatment. Each applicator will submit an 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.

Standard Operating Procedures for GonaCon Vaccine Treatments

Administering the GonaCon Vaccine by Hand-Injection

1. For initial and booster treatments, mares would ideally receive 2.0 ml of GonaCon-Equine. However, experience has demonstrated that only 1.8 ml of vaccine can typically be loaded into 2 cc darts, and this dose has proven successful. Calculations below reflect a 1.8 ml dose.
2. With each injection, the vaccine should be injected into the left or right hind quarters of the mare, above the imaginary line that connects the point of the hip (hook bone) and the point of the buttocks (pin bone).
3. Darts should be weighed to the nearest hundredth gram by electronic scale when empty, when loaded with vaccine, and after discharge, to ensure that 90% (1.62 ml) of the vaccine has been injected. Animals receiving <50% should be darted with another full dose; those receiving >50% but <90% should receive a half dose (1 ml). All darts should be weighed to verify a combination of ≥1.62 ml has been administered. Therefore, every effort should be made to recover darts after they have fallen from animals.

4. A booster vaccine may be administered 90 or more days after the first injection to improve efficacy of the product over subsequent years.
5. Free ranging animals may be photographed using a telephoto lens and high-quality digital receiver as a record of treated individuals, and the injection site can be recorded on data sheets to facilitate identification by animal markings and potential injection scars.
6. A tracking system would be maintained by NPO detailing the lot number(s) of the vaccine, quantity of vaccine issued, the quantity used, the date of vaccination, disposition of any unused vaccine, the date disposed, the number of treated mares by HMA, field office, and State along with the freeze-mark(s) applied by HMA and date.

Preparation of Darts for GonaCon Vaccine Remote Delivery:

1. The vaccine is distributed as preloaded doses (2 mL) in labeled syringes. Upon receipt, the vaccine should be kept refrigerated (4° C) until use. Do not freeze. The vaccine has a 6-month shelf-life from the time of production and the expiration date will be noted on each syringe that is provided. Important: label instructions must be followed for this product.
2. Although infrequent, dart injections can result in partial injections of the vaccine, and shots are missed. As a precaution, it is recommended that extra doses of the vaccine be ordered to accommodate failed delivery (~15 %). To determine the amount of vaccine delivered, the dart must be weighed before loading, and before and after delivery in the field.
3. For best results, darts with a gel barb should be used. (i.e. 2 cc Pneu-Dart brand darts configured with Slow-inject technology, 3.81 cm long 14 ga.tri-port needles, and gel collars positioned 1.27 cm ahead of the ferrule)
4. Wearing latex gloves, darts are numbered and filled with vaccine by attaching a loading needle (7.62 cm; provided by dart manufacturer) to the syringe containing vaccine and placing the needle into the cannula of the dart to the fullest depth possible. Slowly depress the syringe plunger and begin filling the dart. Periodically, tap the dart on a hard surface to dislodge air bubbles trapped within the vaccine. Due to the viscous nature of the fluid, air entrapment typically results in a maximum of approximately 1.8 ml of vaccine being loaded in the dart. The dart is filled to max once a small amount of the vaccine can be seen at the tri-ports.
5. Important! Do not load and refrigerate darts the night before application. When exposed to moisture and condensation, the edges of gel barbs soften, begin to dissolve, and will not hold the dart in the muscle tissue long enough for full injection of the vaccine. The dart needs to remain in the muscle tissue for a minimum of 1 minute to achieve dependable full injection. Sharp gel barbs are critical.
6. Darts (configured specifically as described above) can be loaded in the field and stored in a cooler prior to application. Darts loaded, but not used can be maintained in a cooler at about 4° C and used the next day, but do not store in a refrigerator or any other container likely to cause condensation.

APPENDIX F: PZP VACCINE 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 G: PZP VACCINE DATA SHEETS

HORSE IMMUNOCONTRACEPTION DATA SHEET

HORSE MANAGEMENT AREA: Sinbad HMA

HORSE IDENTIFICAION NUMBER/NAME: _____

HORSE COLOR: _____

OTHER MARKINGS/BRANDS: _____

Inoculation Dates	PZP Dose (µg)[6]	Adjuvant	Delivery System[7]	Injection Site[8]	Vaccine Lot Number

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

[6] Standard dose is 100 µg with raw vaccine

[7] Pneu-Dart unless otherwise noted

[8] 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 H: 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

One possible management alternative which has been suggested is to manage the Sinbad HMA in its entirety as a non-breeding population of geldings. This alternative is out of conformance with the Price RMP which requires the BLM to manage population for genetic viability. Therefore, it was not analyzed in detail.

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, the Sinbad HMAP or the 4700 Handbook. The 4700 Handbook suggests use of sex ratio adjustments and releasing geldings in areas where low AML is greater than 150 head.

CHANGE THE HMA TO HERD AREA STATUS WITH ZERO AML

Another alternative which has been suggested is to change the Sinbad HMA to Herd Area status and establish the AML as "0" animals. HMA vs HA status is a land use planning level decisions. Since this EA is not a land use plan amendment, this alternative is outside the scope of this document and was not considered in detail.

REMOVE OR REDUCE LIVESTOCK WITHIN THE HMA

This alternative would involve no removal of wild burros and instead address the excess forage use through the removal or reduction of livestock within the HMA. This alternative was not brought forward for detailed analysis because it is inconsistent with the WFRHBA, which directs the Secretary to immediately remove excess wild horses and burros.

In addition, livestock grazing allotment numbers can only be reduced following the process outlined in the regulations found at 43 CFR Part 4100. Further, the elimination of livestock grazing in an area

would require an amendment to the Price RMP. Since this EA is not a 43 CFR 4100 project, and is not a land use plan amendment, this alternative is outside the scope of this document and was not considered in detail.

GATHER THE HMA TO THE AML UPPER LIMIT

This alternative would be ineffective (not responsive to the purpose and need) for three reasons.

First, 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. 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 burro 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.

Second, the AML represents "that 'optimum number' of wild horses and burros 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 burro gather in order to allow for a periodic gather cycle, and to prevent the population from exceeding the established AML between gathers.

Third, this alternative would not slow the wild horse population growth rate Sinbad HMA.

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

Under this alternative, no excess wild burros would be removed. This alternative would be ineffective (not responsive to the purpose and need) because there would still be an existing burro herd in excess of the AML with the potential for future herd size growth. As such, AML would not be achieved and the damage to the range associated with wild burro overpopulation would continue. This alternative is also contrary to the WFRHBA, , which directs the Secretary to immediately remove excess wild horses and burros .

Note: 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 technically infeasible. 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 effective in some HMAs where the wild horses and burros are more approachable, but the Sinbad HMA is not such an area, so this method of administering PZP was dismissed from further study.

BAIT OR WATER TRAP ONLY

The use of bait and water trapping exclusively, though effective in specific areas and circumstances, would not be technically or economically feasible as the primary gather method for this HMA because: (1) the project area is too large to effectively use this gather method – the presence of scattered water sources on state, private and public lands inside the HMA would make it impossible to restrict wild burros access to water to the extent necessary to effectively gather and remove the excess animals; and (2) vehicle access to get equipment in/out of potential trapping locations as well as safely transport gathered wild horses and burros is limited.

WILD BURRO NUMBERS CONTROLLED BY NATURAL MEANS

Using natural controls to achieve a desirable AML is technically infeasible. Wild burros in the Sinbad HMA are not substantially regulated by predators (which includes mountain lions and bears). In addition, wild burros are a long-lived species with foal survival rates that can exceed 95% and they are not a self-regulating species (NAS 2013). 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 burros. This alternative is contrary to the WFRHBA which requires the BLM to prevent the range from deterioration associated with an overpopulation of wild horses and burros. 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.

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

An alternative to gather a substantial portion of the existing population (90%) and implement fertility control treatment only every two years, without removal of excess burros is ineffective (not responsive to the purpose and need) for the same reasons as the fertility control only alternative (above).

Note: this alternative also has technical feasibility issues. The more frequently burros in an area are gathered, the more difficult they are to trap. They learn to evade the helicopter by taking cover in treed areas and canyons. Wild burros may also move out of the area when they hear a helicopter, thereby further reducing the overall gather efficiency.

USE ALTERNATIVE CAPTURE TECHNIQUES INSTEAD OF HELICOPTERS

Through the public review process alternative capture methods (other than helicopters) were requested but 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, so would not meet the intent of this suggested alternative. Chemical immobilization is a very specialized technique that is strictly regulated, and currently the BLM does not have expertise to implement this method so it is technically infeasible. Use of wrangler on horseback drive-trapping to remove excess wild burros is technically and economically infeasible for the same reasons described in the bait trapping only alternative(above). 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 burros.

FIELD DARTING FERTILITY TREATMENT ONLY FOR POPULATION SUPPRESSION

BLM would administer PZP vaccine in the one year dose inoculations, or GonaCon vaccine, by field darting the jennies. This alternative would be ineffective (not responsive to the purpose and need) for the same reasons as the fertility treatment only alternative (above).

APPENDIX I: LITERATURE REVIEW

FERTILITY CONTROL VACCINES, IUDS, AND WHB EFFECTS ON RANGELANDS

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). ZonaStat can easily be remotely administered in the field in cases where mares are relatively approachable. Although PZP-22 pellets have been delivered via darting in trial studies (Rutberg et al 2017, Carey et al. 2019), BLM does not plan to use darting for PZP-22 delivery until there is more demonstration that PZP-22 can be reliably delivered via dart.

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, Carey et al. 2019). 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 several BLM-administered HMA (BLM 2015a, BLM 2015b, BLM 2017, BLM 2018, BLM 2019). 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 burros from this area to off range pastures (ORPs). 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 burro 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 burros and wildlife throughout the HMA. With a more optimal distribution of wild burros 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 burros still on the range. There would be reduced competition among wild burros using the water sources, and less fighting would occur among individual animals to access water sources. Water quality and quantity would continue to improve to the benefit of all rangeland users including wild burros. Wild burros 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 burros 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.

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." Nuñez (2018) and Jones et al. (2019, 2020) noted that band stallions of mares that have received PZP treatment can exhibit changes in behavior and physiology. 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 and buros, 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 and burros 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 and burros 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. As a result, in most HMAs, applying fertility control to a subset of jennies 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 growth suppression (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 (or burros) 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 and burros allows for inferences about expected effects of any management alternatives that might include use of IUDs. Although there is less published literature about IUD effects in burros than there is for horses, the physiological effects may be presumed to be comparable, although the size of the IUD would, presumably, need to be tailored to be appropriate for burros.

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 and burros. 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 or jennies 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 or jenny 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 or jennies. 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 or jenny is a candidate for IUD use. If a mare or jenny 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. The authors (Killian et al. 2008) 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).

REFERENCES CITED

Asa, C.S., D.A. Goldfoot, M.C. Garcia, and O.J. Ginther. 1980. Sexual behavior in ovariectomized and seasonally anovulatory pony mares (*Equus caballus*). Hormones and Behavior 14:46-54.

Baker, D.L., J.G. Powers, M.O. Oehler, J.I. Ransom, J. Gionfriddo, and T.M. Nett. 2013. Field evaluation of the Immunocontraceptive GonaCon-B in Free-ranging Horses (*Equus caballus*) at Theodore Roosevelt National Park. Journal of Zoo and Wildlife Medicine 44:S141-S153.

Baker, D.L., J.G. Powers, J. Ransom, B. McCann, M. Oehler, J. Bruemmer, N. Galloway, D. Eckery, and T. Nett. 2017. Gonadotropin-releasing hormone vaccine (GonaCon-Equine) suppresses fertility in free-ranging horses (*Equus caballus*): limitations and side effects. International Wildlife Fertility Control Conference abstract.

Baldrighi, J.M., C.C. Lyman, K. Hornberger, S.S. Germaine, A. Kane, and G.R. Holyoak. 2017. Evaluating the efficacy and safety of silicone O-ring intrauterine devices as a horse contracetive through a captive breeding trial. Clinical Theriogenology 9:471.

Balet, L., F. Janett, J. Hüsler, M. Piechotta, R. Howard, S. Amatayakul-Chantler, A. Steiner, and G. Hirsbrunner, 2014. Immunization against gonadotropin-releasing hormone in dairy cattle:

Antibody titers, ovarian function, hormonal levels, and reversibility. Journal of Dairy Science 97:2193-2203.

Bechert, U., Bartell, J., Kutzler, M., Menino, A., Bildfell, R., Anderson, M. and Fraker, M. 2013. Effects of two porcine zona pellucida immunocontraceptive vaccines on ovarian activity in horses. The Journal of Wildlife Management 77:1386-1400.

Bohrer, B.M., W.L. Flowers, J.M. Kyle, S.S. Johnson, V.L. King, J.L. Spruill, D.P. Thompson, A.L. Schroeder, and D.D. Boler. 2014. Effect of gonadotropin releasing factor suppression with an immunological on growth performance, estrus activity, carcass characteristics, and meat quality of market gilts. Journal of Animal Science 92:4719-4724.

Botha, A.E., M.L. Schulman, H.J. Bertschinger, A.J. Guthrie, C.H. Annandale, and S.B. Hughes. 2008. The use of a GnRH vaccine to suppress mare ovarian activity in a large group of mares under field conditions. Wildlife Research 35:548-554.

BLM. 2010. Wild horses and burros management handbook, H-4700-1. Bureau of Land Management, Washington, DC.

BLM. 2015a. Antelope HMA (Water Canyon sub-area) wild horse growth suppression pilot program; environmental assessment. Bureau of Land Management, Ely District Office, Ely, Nevada.

BLM. 2015b. Cold Springs HMA Population Management Plan; environmental assessment. Bureau of Land Management, Vale District/Malheur Field Office, Vale, Oregon.

BLM. 2017. Muddy Creek Wild Horse Herd Management Area Gather Plan; environmental assessment. Bureau of Land Management, Green River District/Price Field Office, Price, Utah.

BLM. 2018. Eagle Complex Wild Horse Gather Final Environmental Assessment: environmental assessment. Bureau of Land Management, Ely District Office, Ely, Nevada.

BLM. 2019 Range Creek Wild Horse Herd Management Area Gather Plan; environmental assessment. Bureau of Land Management, Green River District/Price Field Office, Price, Utah.

Brown, B.W., P.E. Mattner, P.A.Carroll, E.J. Holland, D.R. Paull, R.M. Hoskinson, and R.D.G. Rigby. 1994. Immunization of sheep against GnRH early in life: effects on reproductive function and hormones in rams. Journal of Reproduction and Fertility 101:15-21.

Carey, K.A., A. Ortiz, K. Grams, D. Elkins, J.W. Turner, and A.T. Rutberg. 2019. Wildlife Research 46:713-718.

Coit, V.A., F.J. Dowell, and N.P.Evans. 2009. Neutering affects mRNA expression levels for the LH-and GnRH-receptors in the canine urinary bladder. Theriogenology 71:239-247.

Cooper, D.W. and Herbert, C.A., 2001. Genetics, biotechnology and population management of over-abundant mammalian wildlife in Australasia. Reproduction, Fertility and Development, 13:451-458.

Cooper, D.W. & Larsen, E. 2006. Immunocontraception of mammalian wildlife: ecological and immunogenetic issues. Reproduction, 132, 821–828.

Creel et al. 2013. The ecology of stress: effects of the social environment. Functional Ecology 27:66-80.

Curtis, P.D., Pooler, R.L., Richmond, M.E., Miller, L.A., Mattfeld, G.F. and Quimby, F.W. 2001. Comparative effects of GnRH and porcine zona pellucida (PZP) immunocontraceptive vaccines for controlling reproduction in white-tailed deer (Odocoileus virginianus). Reproduction (Cambridge, England) Supplement 60:131-141.

Curtis, P.D., R.L. Pooler, M.E. Richmond, L.A. Miller, G.F. Mattfeld, and F.W. Quimby. 2008. Physiological Effects of gonadotropin-releasing hormone immunocontraception in white-tailed deer. Human-Wildlife Conflicts 2:68-79.

Daels, P.F, and J.P. Hughes. 1995. Fertility control using intrauterine devices: an alternative for population control in wild horses. Theriogenology 44:629-639.

Dalmau, A., A. Velarde, P. Rodríguez, C. Pedernera, P. Llonch, E. Fàbrega, N. Casal, E. Mainau, M. Gispert, V. King, and N. Slootmans. 2015. Use of an anti-GnRF vaccine to suppress estrus in crossbred Iberian female pigs. Theriogenology 84:342-347.

Dalin, A.M., Ø. Andresen, and L. Malmgren. 2002. Immunization against GnRH in mature mares: antibody titres, ovarian function, hormonal levels and oestrous behaviour. Journal of Veterinary Medicine Series A 49:125-131.

Dong, F., D.C. Skinner, T. John Wu, and J. Ren. 2011. The Heart: A Novel Gonadotrophin-Releasing Hormone Target. Journal of Neuroendocrinology 23:456-463.

Donovan, C.E., T. Hazzard, A. Schmidt, J. LeMieux, F. Hathaway, and M.A. Kutzler. 2013. Effects of a commercial canine gonadotropin releasing hormone vaccine on estrus suppression and estrous behavior in mares. Animal Reproduction Science, 142:42-47.

Elhay, M., A. Newbold, A. Britton, P. Turley, K. Dowsett, and J. Walker. 2007. Suppression of behavioural and physiological oestrus in the mare by vaccination against GnRH. Australian Veterinary Journal 85:39-45.

EPA (United States Environmental Protection Agency). 2009a. Pesticide Fact Sheet: Mammalian Gonadotropin Releasing Hormone (GnRH), New Chemical, Nonfood Use, USEPA-OPP, Pesticides and Toxic Substances. US Environmental Protection Agency, Washington, DC

EPA (United States Environmental Protection Agency). 2009b. Memorandum on GonaCon ™ Immunocontraceptive Vaccine for Use in White-Tailed Deer. Section 3 Registration. US Environmental Protection Agency, Washington, DC.

Environmental Protection Agency (EPA). 2012. Porcine Zona Pellucida. Pesticide fact Sheet. Office of Chemical Safety and Pollution Prevention 7505P. 9 pages.

EPA (United States Environmental Protection Agency). 2013. Notice of pesticide registration for GonaCon-Equine. US Environmental Protection Agency, Washington, DC.

EPA (United States Environmental Protection Agency). 2015. Label and CSF Amendment. November 19, 2015 memo and attachment from Marianne Lewis to David Reinhold. US Environmental Protection Agency, Washington, DC.

Feh, C., 2012, September. Delayed reversibility of PZP (porcine zona pellucida) in free-ranging Przewalski's horse mares. In International Wild Equid Conference. Vienna, Austria: University of Veterinary Medicine.

Freeman, C.E., and S.K. Lyle. 2015. Chronic intermittent colic in a mare attributed to uterine marbles. Equine Veterinary Education 27:469-473.

Garza, F., D.L. Thompson, D.D. French, J.J. Wiest, R.L. St George, K.B. Ashley, L.S. Jones, P.S. Mitchell, and D.R. McNeill. 1986. Active immunization of intact mares against gonadotropin-releasing hormone: differential effects on secretion of luteinizing hormone and follicle-stimulating hormone. Biology of Reproduction 35:347-352.

Gionfriddo, J.P., A.J. Denicola, L.A. Miller, and K.A. Fagerstone. 2011a. Efficacy of GnRH immunocontraception of wild white-tailed deer in New Jersey. Wildlife Society Bulletin 35:142-148.

Goodloe, R.B., 1991. Immunocontraception, genetic management, and demography of feral horses on four eastern US barrier islands. UMI Dissertation Services.

Gradil, C. 2019. The Upod IUD: a potential simple, safe solution for long-term, reversible fertility control in feral equids. Oral presentation at the Free Roaming Equids and Ecosystem Sustainability Summit, Reno, Nevada.

Gray, ME., 2009. The influence of reproduction and fertility manipulation on the social behavior of feral horses (*Equus caballus*). Dissertation. University of Nevada, Reno.

Gray, M.E., D.S. Thain, E.Z. Cameron, and L.A. Miller. 2010. Multi-year fertility reduction in free-roaming feral horses with single-injection immunocontraceptive formulations. Wildlife Research 37:475-481.

Gray, M. E. and E. Z. Cameron. 2010. Does contraceptive treatment in wildlife result in side effects? A review of quantitative and anecdotal evidence. Reproduction 139:45-55.

Gross. 2000. A dynamic simulation model for evaluating effects of removal and contraception on genetic variation and demography of Pryor Mountain wild horses. Biological Conservation 96:319-330.

Hailer, F., Helander, B., Folkestad, A.O., Ganusevich, S.A., Garstad, S., Hauff, P., Koren, C., Nygård, T., Volke, V., Vilà, C. and Ellegren, H. 2006. Bottlenecked but long-lived: high genetic diversity retained in white-tailed eagles upon recovery from population decline. Biology Letters 2:316-319.

Hall, S. E., B. Nixon, and R. J. Aiken. 2016b. Non-surgical sterilization methods may offer a sustainable solution to feral horse (Equus caballus) overpopulation. Reproduction, Fertility and Development, published online: https://doi.org/10.1071/RD16200

Heilmann, T.J., Garrott, R.A., Cadwell, L.L. and Tiller, B.L. 1998. Behavioral response of free-ranging elk treated with an immunocontraceptive vaccine. The Journal of wildlife management, pp.243-250.

Herbert, C.A. and T.E. Trigg. 2005. Applications of GnRH in the control and management of fertility in female animals. Animal Reproduction Science, 88:141-153.

Hsueh, A.J.W. and G.F. Erickson. 1979. Extrapituitary action of gonadotropin-releasing hormone: direct inhibition ovarian steroidogenesis. Science 204:854-855.

Imboden, I., F. Janett, D. Burger, M.A. Crowe, M. Hässig, and R. Thun. 2006. Influence of immunization against GnRH on reproductive cyclicity and estrous behavior in the mare. Theriogenology 66:1866-1875.

Janett, F., U. Lanker, H. Jörg, E. Meijerink, and R. Thun. 2009a. Suppression of reproductive cyclicity by active immunization against GnRH in the adult ewe. Schweizer Archiv fur Tierheilkunde 151:53-59.

Janett, F., R. Stump, D. Burger, and R. Thun. 2009b. Suppression of testicular function and sexual behavior by vaccination against GnRH (Equity™) in the adult stallion. Animal Reproduction Science 115:88-102.

Jones, M.M., and C.M.V. Nunez. 2019. Decreased female fidelity alters male behavior in a feral horse population managed with immunocontraception. Applied Animal Behaviour Science 214:34-41.

Jones, M.M., L. Proops, and C.M.V. Nunez. 2020. Rising up to the challenge of their rivals: mare infidelity intensifies stallion response to playback of aggressive conspecific vocalizations. Applied Animal Behaviour Science (in press): 104949.

Joonè, C.J., Bertschinger, H.J., Gupta, S.K., Fosgate, G.T., Arukha, A.P., Minhas, V., Dieterman, E. and Schulman, M.L. 2017. Ovarian function and pregnancy outcome in pony mares following immunocontraception with native and recombinant porcine zona pellucida vaccines. Equine Veterinary Journal 49:189-195.

Kean, R.P., A. Cahaner, A.E. Freeman, and S.J. Lamont. 1994. Direct and correlated responses to multitrait, divergent selection for immunocompetence. Poultry Science 73:18-32.

Khodr, G.S., and T.M. Siler-Khodr. 1980. Placental luteinizing hormone-releasing factor and its synthesis. Science 207:315-317.

Killian, G., N.K. Diehl, L. Miller, J. Rhyan, and D. Thain. 2006. Long-term efficacy of three contraceptive approaches for population control of wild horses. In Proceedings-Vertebrate Pest Conference.

Killian, G., D. Thain, N.K. Diehl, J. Rhyan, and L. Miller. 2008. Four-year contraception rates of mares treated with single-injection porcine zona pellucida and GnRH vaccines and intrauterine devices. Wildlife Research 35:531-539.

Killian, G., T.J. Kreeger, J. Rhyan, K. Fagerstone, and L. Miller. 2009. Observations on the use of GonaCon™ in captive female elk (*Cervus elaphus*). Journal of Wildlife Diseases 45:184-188.

Kirkpatrick, J.F. and Turner Jr, J.W. 1991. Compensatory reproduction in feral horses. The Journal of Wildlife Management 55:649-652.

Kirkpatrick, J.F., Liu, I.M.K., Turner, J.W., Naugle, R. and Keiper, R. 1992. Long-term effects of porcine zonae pellucidae immunocontraception on ovarian function in feral horses (*Equus caballus*). Journal of Reproduction and Fertility, 94:437-444.

Kirkpatrick, J.F. and Turner A. 2002. Reversibility of action and safety during pregnancy of immunization against porcine zona pellucida in wild mares (*Equus caballus*). Reproduction Supplement 60:197-202.

Kirkpatrick, J.F. and Turner A. 2003. Absence of effects from immunocontraception on seasonal birth patterns and foal survival among barrier island wild horses. Journal of Applied Animal Welfare Science 6:301-308.

Kirkpatrick, J.F., A.T. Rutberg, and L. Coates-Markle. 2010. Immunocontraceptive reproductive control utilizing porcine zona pellucida (PZP) in federal wild horse populations, 3rd edition. P.M. Fazio, editor. Downloaded from http://www.einsten.net/pdf/110242569.pdf

Kirkpatrick, J.F., R.O. Lyda, and K. M. Frank. 2011. Contraceptive vaccines for wildlife: a review. American Journal of Reproductive Immunology 66:40-50.

Knight, C. M. 2014. The effects of porcine zona pellucida immunocontraception on health and behavior of feral horses (Equus caballus). Graduate thesis, Princeton University.

Klabnik-Bradford, J., M.S. Ferrer, C. Blevins, and L. Beard. 2013. Marble-induced pyometra in an Appaloosa mare. Clinical Theriogenology 5: 410.

Levy, J.K., J.A. Friary, L.A. Miller, S.J. Tucker, and K.A. Fagerstone. 2011. Long-term fertility control in female cats with GonaCon™, a GnRH immunocontraceptive. Theriogenology 76:1517-1525.

Liu, I.K.M., Bernoco, M. and Feldman, M., 1989. Contraception in mares heteroimmunized with pig zonae pellucidae. Journal of Reproduction and Fertility, 85:19-29.

Madosky, J.M., Rubenstein, D.I., Howard, J.J. and Stuska, S., 2010. The effects of immunocontraception on harem fidelity in a feral horse (Equus caballus) population. Applied Animal Behaviour Science, 128:50-56.

Magiafoglou, A., Schiffer, M., Hoffman, A.A. & McKechnie, S.W. 2003. Immunocontraception for population control: will resistance evolve? Immunology and Cell Biology, 81, 152–159.

Mask, T.A., Schoenecker, K.A., Kane, A.J., Ransom, J.I. and Bruemmer, J.E., 2015. Serum antibody immunoreactivity to equine zona protein after SpayVac vaccination. Theriogenology, 84:.261-267.

McCann, B., D. Baker, J. Powers, A. Denicola, B. Soars, and M. Thompson. 2017 Delivery of GonaCon-Equine to feral horses (*Equus caballus*) using prototype syringe darts. International Wildlife Fertility Control Conference abstract.

Miller, L.A., J.P. Gionfriddo, K.A. Fagerstone, J.C. Rhyan, and G.J. Killian. 2008. The Single-Shot GnRH Immunocontraceptive Vaccine (GonaCon™) in White-Tailed Deer: Comparison of Several GnRH Preparations. American Journal of Reproductive Immunology 60:214-223.

Miller, L.A., K.A. Fagerstone, and D.C. Eckery. 2013. Twenty years of immunocontraceptive research: lessons learned. Journal of Zoo and Wildlife Medicine 44:S84-S96.

Miller, L.A., and K.A. Fagerstone. 2000. Induced infertility as a wildlife management tool. Proceedings of the 19th Vertebrate Pest Conference. UC Davis, Davis, California.

Mills, L.S. and Allendorf, F.W., 1996. The one-migrant-per-generation rule in conservation and management. Conservation Biology 10:1509-1518.

National Research Council (NRC). 2013. *Using science to improve the BLM wild horse and burro program: a way forward*. National Academies Press. Washington, DC.

Nie, G.J., K.E., Johnson, T.D. Braden, and J. G.W. Wenzel. 2003. Use of an intra-uterine glass ball protocol to extend luteal function in mares. Journal of Equine Veterinary Science 23:266-273.

Nuñez, C.M.V., Adelman, J.S., Mason, C., and Rubenstein, D.I. 2009. Immunocontraception decreases group fidelity in a feral horse population during the non-breeding season. Applied Animal Behaviour Science 117:74-83.

Nuñez, C.M., Adelman, J.S. and Rubenstein, D.I. 2010. Immunocontraception in wild horses (*Equus caballus*) extends reproductive cycling beyond the normal breeding season. PloS one, 5(10), p.e13635.

Nuñez, C.M.V, Adelman, J.S., Smith, J., Gesquiere, L.R. and Rubenstein, D.I., 2014. Linking social environment and stress physiology in feral mares (*Equus caballus*): group transfers elevate fecal cortisol levels. General and Comparative Endocrinology, 196, pp.26-33.

Nuñez, C.M., J.S. Adelman, H.A. Carr, C.M. Alvarez, and D.I. Rubenstein. 2017. Lingering effects of contraception management on feral mare (*Equus caballus*) fertility and social behavior. Conservation Physiology 5(1): cox018; doi:10.1093/conphys/cox018.

Powell, D.M. 1999. Preliminary evaluation of porcine zona pellucida (PZP) immunocontraception for behavioral effects in feral horses (*Equus caballus*). Journal of Applied Animal Welfare Science 2:321-335.

Powell, D.M. and Monfort, S.L. 2001. Assessment: effects of porcine zona pellucida immunocontraception on estrous cyclicity in feral horses. Journal of Applied Animal Welfare Science 4:271-284.

Powers, J.G., D.L. Baker, T.L. Davis, M.M. Conner, A.H. Lothridge, and T.M. Nett. 2011. Effects of gonadotropin-releasing hormone immunization on reproductive function and behavior in captive female Rocky Mountain elk (*Cervus elaphus nelsoni*). Biology of Reproduction 85:1152-1160.

Powers, J.G., D.L. Baker, M.G. Ackerman, J.E. Bruemmer, T.R. Spraker, M.M. Conner, and T.M. Nett. 2012. Passive transfer of maternal GnRH antibodies does not affect reproductive development in elk (*Cervus elaphus nelson*) calves. Theriogenology 78:830-841.

Powers, J.G., Baker, D.L., Monello, R.J., Spraker, T.J., Nett, T.M., Gionfriddo, J.P., and Wild, M.A. 2013. Effects of gonadotropin-releasing hormone immunization on reproductive function and behavior in captive female Rocky Mountain elk (*Cervus elaphus nelsoni*). Journal of Zoo and Wildlife Medicine meeting abstracts S147.

Ransom, J.I. and Cade, B.S. 2009. Quantifying equid behavior: A research ethogram for free-roaming feral horses. U.S. Geological Survey Techniques and Methods Report 2-A9.

Ransom, J.I., Cade, B.S. and Hobbs, N.T. 2010. Influences of immunocontraception on time budgets, social behavior, and body condition in feral horses. Applied Animal Behaviour Science 124:51-60.

Ransom, J.I., Roelle, J.E., Cade, B.S., Coates-Markle, L. and Kane, A.J. 2011. Foaling rates in feral horses treated with the immunocontraceptive porcine zona pellucida. Wildlife Society Bulletin 35:343-352.

Ransom, J.I., Hobbs, N.T. and Bruemmer, J. 2013. Contraception can lead to trophic asynchrony between birth pulse and resources. PloS one, 8(1), p.e54972.

Ransom, J. I., J. G. Powers, N. T. Hobbs, and D. L. Baker. 2014a. Ecological feedbacks can reduce population-level efficacy of wildlife fertility control. Journal of Applied Ecology 51:259-269.

Ransom, J.I., Powers, J.G., Garbe, H.M., Oehler Sr., M.W., Nett, T.M., Baker, D.L. 2014b. Behavior of feral horses in response to culling and GnRH immunocontraception. Applied Animal Behaviour Science 157: 81-92.

Roelle, J.E., and Ransom, J.I. 2009. Injection-site reactions in wild horses (Equus caballus) receiving an immunocontraceptive vaccine: U.S. Geological Survey Scientific Investigations Report 2009–5038, 15 p.

Roelle, J.E., Singer, F.J., Zeigenfuss, L.C., Ransom, J.I., Coates-Markle, F L., and Schoenecker, K.A. 2010. Demography of the Pryor Mountain Wild Horses, 1993–2007. U.S. Geological Survey Scientific Investigations Report 2010-5125.

Roelle, J.E. and S.J. Oyler-McCance. 2015. Potential demographic and genetic effects of a sterilant applied to wild horse mares (No. 2015-1045). US Geological Survey.

Roelle, J.E., S.S. Germaine, A.J. Kane, and B.S. Cade. 2017. Efficacy of SpayVac ® as a contraceptive in feral horses. Wildlife Society Bulletin 41:107-115.

Rubenstein, D.I. 1981. Behavioural ecology of island feral horses. Equine Veterinary Journal 13:27-34.

Rutberg, A., K. Grams, J.W. Turner, and H. Hopkins. 2017. Contraceptive efficacy of priming and boosting does of controlled-release PZP in wild horses. Wildlife Research: http://dx.doi.org/10.1071/WR16123

Sacco, A.G., Subramanian, M.G. and Yurewicz, E.C. 1981. Passage of zona antibodies via placenta and milk following active immunization of female mice with porcine zonae pellucidae. Journal of Reproductive Immunology 3:313-322.

Sarker, N., M. Tsudzuki, M. Nishibori, and Y. Yamamoto. 1999. Direct and correlated response to divergent selection for serum immunoglobulin M and G levels in chickens. Poultry Science 78:1-7

Schulman, M.L., A.E. Botha, S.B. Muenscher, C.H. Annandale, A.J. Guthrie, and H.J. Bertschinger. 2013. Reversibility of the effects of GnRH-vaccination used to suppress reproductive function in mares. Equine Veterinary Journal 45:111-113.

Science and Conservation Center (SCC). 2015. Materials Safety Data Sheet, ZonaStat-H. Billings, Montana.

Schumake, Stephen A. and Killian, Gary , "WHITE-TAILED DEER ACTIVITY, CONTRACEPTION, AND ESTROUS CYCLING" (1997).Great Plains Wildlife Damage Control Workshop Proceedings.Paper 376. http://digitalcommons.unl.edu/gpwdcwp/376

Stout, T.A.E., J.A. Turkstra, R.H. Meloen, and B. Colenbrander. 2003. The efficacy of GnRH vaccines in controlling reproductive function in horses. Abstract of presentation from symposium, "Managing African elephants: act or let die? Utrecht University, Utrecht, Netherlands.

Turner, J.W., Liu, I.K.M. and Kirkpatrick, J.F, 1996. Remotely delivered immunocontraception in free-roaming feral burros (Equus asinus). Journal of Reproduction and Fertility 107:31-35.

Turner Jr , J.W., I.K.M. Lui, Rutberg, A., J.W., Kirkpatrick. 1997. Immunocontraception Limits Foal Production in Free Roaming Feral Horses in Wyoming, J. Wildl. Manage. 61 (3):873-880.

Turner Jr, J.W., Liu, I.K., Flanagan, D.R., Bynum, K.S. and Rutberg, A.T., 2002. Porcine zona pellucida (PZP) immunocontraception of wild horses (Equus caballus) in Nevada: a 10 year study. Reproduction (Cambridge, England) Supplement, 60:177-186.

Turner Jr., J.W., Liu, I.K.M., Flanagan, D.R., Rutberg, A.T., Kirkatrick J.F., 2007. Immunocontraception in Wild Horses: One Inoculation Provides Two Years of Infertility, J. Wildl. Manage. 71(2):662-667.

Turner, R.M., D.K. Vanderwall, and R. Stawecki. 2015. Complications associated with the presence of two intrauterine glass balls used for oestrus suppression in a mare. Equine Veterinary Education 27: 340-343.

University of Massachusetts. 2019. 2016 UMass Amherst start-up company PearlPod LLC. Information sheet from University of Massachusetts Amherst Technology Transfer

Office. https://www.umass.edu/tto/sites/default/files/Pearl_Pod_LLC.pdf Accessed June 27, 2019.

Wang-Cahill, F., J. Warren, T. Hall, J. O'Hare, A. Lemay, E. Ruell, and R. Wimberly. In press. 2017. Use of GonaCon in wildlife management. Chapter 24 in USDA-APHIS, Human health and ecological risk assessment for the use of wildlife damage management methods by APHIS-Wildlife Services. USDA APHIS, Fort Collins, Colorado.

Wright, S. 1931. Evolution in Mendelian populations. Genetics 16:97-159.

Yoder, C.A. and L.A. Miller. 2010. Effect of GonaCon™ vaccine on black-tailed prairie dogs: immune response and health effects. Vaccine 29:233-239.

Zoo Montana. 2000. Wildlife Fertility Control: Fact and Fancy. Zoo Montana Science and Conservation Biology Program, Billings, Montana

EFFECTS OF WILD HORSES AND BURROS ON RANGELAND ECOSYSTEMS

The presence of wild horses and wild burros can have substantial effects on rangeland ecosystems, and on the capacity for habitat restoration efforts to achieve landscape conservation and restoration goals. While wild horses and burros may have some beneficial ecological effects, such benefits are outweighed by ecological dam age they cause when herds are at levels greater than supportable by allocated, available natural resources (i.e., when herds are greater than AML).

In the biological sense, all free-roaming horses and burros in North America are feral, meaning that they are descendants of domesticated animals brought to the Americas by European colonists. Horses went extinct in the Americas by the end of the Pleistocene, about 10,000 years ago (Webb 1984; MacFadden 2005). Burros evolved in Eurasia (Geigl et al. 2016). The published literature refers to free-roaming horses and burros as either feral or wild. In the ecological context the terms are interchangeable, but the terms ‘wild horse’ and ‘wild burro’ are associated with a specific legal status. The following literature review on the effects of wild horses and burros on rangeland ecosystems draws on scientific studies of feral horses and burros, some of which also have wild horse or wild burro legal status. The following literature review draws on Parts 1 and 2 of the ‘Science framework for conservation and restoration of the sagebrush biome’ interagency report (Chambers et al. 2017, Crist et al. 2019).

Because of the known damage that overpopulated wild horse and burro herds can cause in rangeland ecosystems, the presence of wild horses and burros is considered a threat to Greater sage-grouse habitat quality, particularly in the bird species’ western range (Beever and Aldridge 2011, USFWS 2013). Wild horse population sizes on federal lands have more than doubled in the five years since the USFWS report (2013) was published (BLM 2018). On lands administered by the BLM, there were over 95,000 BLM-administered wild horses and burros as of March 1, 2020, which does not include foals born in 2020. Lands with wild horses and burros are managed for multiple uses, so it can be difficult to parse out their ecological effects. Despite this, scientific studies designed to separate out those effects, which are summarized below, point to conclusions that landscapes with greater wild horse and burro abundance will tend to have lower resilience to disturbance and lower resistance to invasive plants than similar landscapes with herds at or below target AML levels.

In contrast to managed livestock grazing, neither the seasonal timing nor the intensity of wild horse and burro grazing can be managed, except through efforts to manage their numbers and distribution. Wild horses live on the range year round, they roam freely, and wild horse populations have the potential to grow 15-20% per year (Wolfe 1980; Eberhardt et al. 1982; Garrott et al 1991; Dawson 2005; Roelle et al. 2010; Scorolli et al. 2010). Although this annual growth rate may be lower in some areas where mountain lions can take foals (Turner and Morrison 2001, Turner 2015), horses tend to favor use of more open habitats (Schoenecker 2016) that are dominated by grasses and shrubs and where ambush is less likely. Horses can compete with managed livestock in forage selected (Scasta et al. 2016). For the majority of wild horse herds, there is little overall evidence that population growth is significantly affected by predation. As a result of the potential for wild horse populations to grow rapidly, impacts from wild horses on water, soil, vegetation, and native wildlife resources (Davies and Boyd 2019) can increase exponentially unless there is active management to limit their population sizes.

The USFWS (2008), Beever and Aldridge (2011), and Chambers et al (2017) summarize much of the literature that quantifies direct ecosystem effects of wild horse presence. Beever and Aldridge (2011) present a conceptual model that illustrates the effects of wild horses on sagebrush ecosystems. In the Great Basin, areas without wild horses had greater shrub cover, plant cover, species richness, native plant cover, and overall plant biomass, and less cover percentage of grazing-tolerant, unpalatable, and invasive plant species, including cheatgrass, compared to areas with horses (Smith 1986; Beever et al. 2008; Davies et al. 2014; Zeigenfuss et al. 2014; Boyd et al. 2017). There were also measurable increases in soil penetration resistance and erosion, decreases in ant mound and granivorous small mammal densities, and changes in reptile communities (Beever et al. 2003; Beever and Brussard 2004; Beever and Herrick 2006; Ostermann-Kelm et al. 2009). Intensive grazing by horses and other ungulates can damage biological crusts (Belnap et al. 2001). In contrast to domestic livestock grazing, where post-fire grazing rest and deferment can foster recovery, wild horse grazing occurs year round. These effects imply that horse presence can have broad effects on ecosystem function that could influence conservation and restoration actions.

Many studies corroborate the general conclusion that wild horses can lead to biologically significant changes in rangeland ecosystems, particularly when their populations are overabundant relative to water and forage resources, and other wildlife living on the landscape (Eldridge et al. 2020). The presence of wild horses is associated with a reduced degree of greater sage-grouse lekking behavior (Muñoz et al. 2020). Moreover, increasing densities of wild horses, measured as a percentage above AML, are associated with decreasing greater sage-grouse population sizes, measured by lek counts (Coates et al. 2021). Horses are primarily grazers (Hanley and Hanley 1982), but shrubs – including sagebrush – can represent a large part of a horse's diet, at least in summer in the Great Basin (Nordquist 2011). Grazing by wild horses can have severe impacts on water source quality, aquatic ecosystems and riparian communities as well (Beever and Brussard 2000; Barnett 2002; Nordquist 2011; USFWS 2008; Earnst et al. 2012; USFWS 2012, Kaweck et al. 2018), sometimes excluding native ungulates from water sources (Ostermann-Kelm et al. 2008; USFWS 2008; Perry et al. 2015; Hall et al. 2016; Gooch et al. 2017; Hall et al. 2018). Impacts to riparian vegetation per individual wild horse can exceed impacts per individual domestic cow (Kaweck et al. 2018). Bird nest survival may be lower in areas with wild horses (Zalba and Cozzani 2004), and bird populations have recovered substantially after livestock and / or wild horses have been removed (Earnst et al. 2005; Earnst et al. 2012; Batchelor et al. 2015). Wild horses can spread nonnative plant species, including cheatgrass, and may limit the effectiveness of habitat restoration projects (Beever et al. 2003; Couvreur et al. 2004; Jessop and Anderson 2007; Loydi and Zalba 2009). Riparian and wildlife habitat improvement projects intended to increase the availability of

grasses, forbs, riparian habitats, and water will likely attract and be subject to heavy grazing and trampling by wild horses that live in the vicinity of the project. Even after domestic livestock are removed, continued wild horse grazing can cause ongoing detrimental ecosystem effects (USFWS 2008; Davies et al. 2014) which may require several decades for recovery (e.g., Anderson and Inouye 2001).

Wild horses and burros may have beneficial effects, but those benefits do not typically outweigh damage caused when herd sizes are high, relative to available natural resources. Under some conditions, there may not be observable competition with other ungulate species for water (e.g., Meeker 1979), but recent studies that used remote cameras have found wild horses excluding native wildlife from water sources under conditions of relative water scarcity (Perry et al. 2015, Hall et al. 2016, Hall et al. 2018). Wild burros (and, less frequently, wild horses) have been observed digging 'wells;' such digging may improve habitat conditions for some vertebrate species and, in one site, may improve tree seedling survival (Lundgren et al. 2021). This behavior has been observed in intermittent stream beds where subsurface water is within 2 meters of the surface (Lundgren et al. 2021). The BLM is not aware of published studies that document wild horses or burros in the western United States causing similar or widespread habitat amelioration on drier upland habitats such as sagebrush, grasslands, or pinyon-juniper woodlands. Lundgren et al. (2021) suggested that, due to well-digging in ephemeral streambeds, wild burros (and horses) could be considered 'ecosystem engineers;' a term for species that modify resource availability for other species (Jones et al. 1994). In HMAs where wild horse and burro biomass is very large relative to the biomass of native ungulates (Boyce and McLoughlin 2021), they should probably also be considered 'dominant species' (Power and Mills 1995) whose ecological influences result from their prevalence on the landscape. Wild horse densities could be maintained at high levels in part because artificial selection for early or extended reproduction may mean that wild horse population dynamics are not constrained in the same way as large herbivores that were never domesticated (Boyce and McLoughlin 2021). Equids redistribute organic matter and nutrients in dung piles (i.e., King and Gurnell 2007), which could disperse and improve germination of undigested seeds. This could be beneficial if the animals spread viable native plant seeds, but could have negative consequences if the animals spread viable seeds of invasive plants such as cheatgrass (i.e,, Loydi and Zalba 2009, King et al. 2019). Increased wild horse and burro density would be expected to increase the spatial extent and frequency of seed dispersal, whether the seeds distributed are desirable or undesirable. As is true of herbivory by any grazing animals, light grazing can increase rates of nutrient cycling (Manley et al. 1995) and foster compensatory growth in grazed plants which may stimulate root growth (Osterheld and McNaughton 1991, Schuman et al. 1999) and, potentially, an increase in carbon sequestration in the soil (i.e., Derner and Schuman 2007, He et al. 2011). However, when grazer density is high relative to available forage resources, overgrazing by any species can lead to long-term reductions in plant productivity, including decreased root biomass (Herbel 1982, Williams et al. 1968) and potential reduction of stored carbon in soil horizons. Recognizing the potential beneficial effects of low-density wild horse and burro herds, but also recognizing the totality of available published studies documented ecological effects of wild horse and burro herds, especially when above AML (see preceding paragraphs), it is prudent to conclude that horse and burro herd sizes above AML may cause levels of disturbance that reduce landscapes' capacity for resilience in the face of further disturbance, such as is posed by extreme weather events and other consequences of climate change.

Most analyses of wild horse effects have contrasted areas with wild horses to areas without, which is a study design that should control for effects of other grazers, but historical or ongoing effects of livestock grazing may be difficult to separate from horse effects in some cases (Davies et al. 2014). Analyses have generally not included horse density as a continuous covariate; therefore, ecosystem

effects have not been quantified as a linear function of increasing wild horse density. One exception is an analysis of satellite imagery confirming that varied levels of feral horse biomass were negatively correlated with average plant biomass growth (Ziegenfuss et al. 2014).

Horses require access to large amounts of water; an individual can drink an average of 7.4 gallons of water per day (Groenendyk et al. 1988). Despite a general preference for habitats near water (e.g., Crane et al. 1997), wild horses will routinely commute long distances (e.g., 10+ miles per day) between water sources and palatable vegetation (Hampson et al. 2010). Wild burros can also substantially affect riparian habitats (e.g., Tiller 1997), native wildlife (e.g., Seegmiller and Ohmart 1981), and have grazing and trampling impacts that are similar to wild horses (Carothers et al. 1976; Hanley and Brady 1977; Douglas and Hurst 1983). Where wild burros and Greater sage-grouse co-occur, burros' year-round use of low-elevation habitats may lead to a high degree of overlap between burros and Greater sage-grouse (Beever and Aldridge 2011).

LITERATURE CITED; IMPACTS TO RANGELAND ECOSYSTEMS

Anderson, J.E., and R.S. Inouye. 2001. Landscape-scale changes in plant species abundance and biodiversity of a sagebrush steppe over 45 years. Ecological Monographs 71:531-556.

Barnett, J. 2002. Monitoring feral horse and burro impacts on habitat, Sheldon National Wildlife Refuge. Unpublished report, Sheldon NWR, Lakeview, Oregon.

Batchelor, J.L., W.J. Ripple, T.M. Wilson, and L.E. Painter. 2015. Restoration of riparian areas following the removal of cattle in the northwestern Great Basin. Environmental Management 55:930-942.

Beever, E.A. and C.L. Aldridge. 2011. Influences of free-roaming equids on sagebrush ecosystems, with focus on greater sage-grouse. Studies in Avian Biology 38:273-290.

Beever, E.A. and P.F. Brussard. 2000. Examining ecological consequences of feral horse grazing using exclosures. Western North American Naturalist 63:236-254.

Beever, E.A. and J.E. Herrick. 2006. Effects of feral horses in Great Basin landscapes on soils and ants: direct and indirect mechanisms. Journal of Arid Environments 66:96-112.

Beever, E.A., R.J. Tausch, and P.F. Brussard. 2003. Characterizing grazing disturbance in semiarid ecosystems across broad scales, using diverse indices. Ecological Applications 13:119-136.

Beever, E.A., and P.F. Brussard. 2004. Community- and landscape-level responses of reptiles and small mammals to feral-horse grazing in the Great Basin. Journal of Arid Environments, 59:271-297.

Beever, E.A., R.J. Tausch, and W.E. Thogmartin. 2008. Multi-scale responses of vegetation to removal of horse grazing from Great Basin (USA) mountain ranges. Plant Ecology 196:163-184.

Belnap, J., J.H. Kaltenecker, R. Rosentreter, J. Williams, S. Leonard, and D. Eldridge. 2001. Biological soil crusts: ecology and management. USDI-BLM Technical Reference 1730-2, 119 pp.

BLM. 2018. Herd Area and Herd Management Area Statistics. https://www.blm.gov/programs/wild-horse-and-burro/about-the-program/program-data.

Boyce, P.N., and P.D. McLoughlin. 2021. Ecological interactions involving feral horses and predators: review with implications for biodiversity conservation. Journal of Wildlife Management. DOI: 10.1002/jwmg.21995

Boyd, C.S., K.W. Davies, and G.H. Collins. 2017. Impacts of feral horse use on herbaceous riparian vegetation within a sagebrush steppe ecosystem. Rangeland Ecology and Management 70:411-417.

Carothers, S.W., M.E. Stitt, and R.R. Johnson. 1976. Feral asses on public lands: an analysis of biotic impact, legal considerations and management alternatives. North American Wildlife Conference 41:396-405.

Chambers, J.C., et al. 2017. Science Framework for Conservation and Restoration of the Sagebrush Biome: Linking the Department of the Interior Secretarial Order 3336 to Long-Term Strategic Conservation Actions. Part 1. Science Basis and Applications. RMRS-GTR-360. Fort Collins, CO: U.S Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Crist, M., et al. 2019. Science Framework for Conservation and Restoration of the Sagebrush Biome: Linking the Department of the Interior Secretarial Order 3336 to Long-Term Strategic Conservation Actions. Part 2. Management applications. Gen. Tech. Rep. RMRS-GTR-389. Fort Collins, CO: U.S Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Coates, P.S., O'Neil, S.T., Muñoz, D.A., Dwight, I.A., and Tull, J.C. 2021, In press. Sage-grouse population dynamics are adversely impacted by overabundant free-roaming horses. The Journal of Wildlife Management..

Couvreur, M., B. Christian, K. Verheyen and M. Hermy. 2004. Large herbivores as mobile links between isolated nature reserves through adhesive seed dispersal. Applied Vegetation Science 7:229-236.

Crane, K.K., M.A. Smith, and D. Reynolds. 1997. Habitat selection patterns of feral horses in south central Wyoming. Journal of Range Management 50:374-380.

Davies, K.W., G. Collins, and C.S. Boyd. 2014. Effects of free-roaming horses on semi-arid rangeland ecosystems: an example from the sagebrush steppe. Ecosphere 5:1-14.

Davies, K.W. and C.S. Boyd. 2019. Ecological effects of free-roaming horses in North American rangelands. Bioscience 69:558-565.

Dawson, M. 2005. The Population Ecology of Feral Horses in the Australian Alps, Management Summary. Unpublished report. Australian Alps Liaison Committee, Canberra.

Derner, J.D. and G.E. Schuman. 2007. Carbon sequestration and rangelands: a synthesis of land management and precipitation effects. Journal of Soil and Water Conservation 62:77-85.

Douglas, C.L. and T.L. Hurst.1993. Review and annotated bibliography of feral burro literature. CPSU/UNLV 044/02, 132 pp.

Earnst, S.L., J.A. Ballard, and D.S. Dobkin. 2005. Riparian songbird abundance a decade after cattle removal on Hart Mountain and Sheldon National Wildlife Refuges. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191. 550-558 pp.

Earnst, S.L., D.S. Dobkin, and J.A. Ballard. 2012. Changes in avian and plant communities of aspen woodlands over 12 years after livestock removal in the northwest Great Basin. Conservation Biology 26: 862-872.

Eberhardt, L.L., A.K. Majorowicz and J.A. Wilcox, 1982. Apparent rates of increase for two feral horse herds. The Journal of Wildlife Management, pp.367-374.

Eldridge, D.J., J. Ding, and S. K. Travers. 2020. Feral horse activity reduces environmental quality in ecosystems globally. Biological Conservation 241:108367.

Garrott, R.A., D.B. Siniff, and L.L. Eberhardt. 1991. Growth Rates of Feral Horse Populations. Journal of Wildlife Management 55: 641-48.

Geigl, E.M., S. Bar-David, A. Beja-Pereira, E. Cothran, E. Giulotto, H. Hrabar, T. Toyunsuren, and M. Pruvost. 2016. Genetics and Paleogenetics of Equids. Pages 87-104 in Ransom, J.I. and P. Kaczensky, eds. Wild Equids: Ecology, Management, and Conservation.

Gooch, A.M., S.L. Petersen, G.H. Collins, T.S. Smith, B.R. McMillan, and D.L. Eggett. 2017. The impacts of feral horses on the use of water by pronghorn in the Great Basin. Journal of Arid Environments 168:38-43.

Groenendyk, P., B. English, and I. Abetz. 1988. External balance of water and electrolytes in the horse. Equine Veterinary Journal 20:189-193.

Hall, L.K., R.T. Larsen, M.D. Westover, C.C. Day, R.N. Knight, and B.R. McMillan. 2016. Influence of exotic horses on the use of water by communities of native wildlife in a semi-arid environment. Journal of Arid Environments 127:100-105.

Hall, L.K., R.T. Larsen, R.N. Knight, and B.R. McMillan. 2018. Feral horses influence both spatial and temporal patterns of water use by native ungulates in a semi-arid environment. Ecosphere 9(1):e02096

Hampson, B.A., M.A. de Laat, P.C. Mills and C.C. Pollitt. 2010. Distances travelled by feral horses in 'outback' Australia. Equine Veterinary Journal 42(s38):582-586.

Hanley, T.A. and W.W. Brady. 1977. Feral burro impact on a Sonoran Desert range. Journal of Range Management 30:374-377.

Hanley, T. A., and K. A. Hanley. 1982. Food resource partitioning by sympatric ungulates on Great Basin rangeland. Journal of Range Management 35(2):152-158.

Herbel, C.H. 1982. Grazing management on rangelands. Journal of Soil and Water Conservation 37:77-79.

Jessop, B.D. and V.J. Anderson. 2007. Cheatgrass invasion in salt desert shrublands: benefits of postfire reclamation. Rangeland Ecology & Management 60:235-243.

Jones, C.G., J.H. Lawton and M. Shachak. 1994. Organisms as ecosystem engineers. Oikos 69:373-386.

Kaweck, M.M., J.P. Severson, and K.L. Launchbaugh. 2018. Impacts of wild horses, cattle, and wildlife on riparian areas in Idaho. Rangelands 40:45-52.

King, S.R.B., and J. Gurnell. 2007. Scent-marking behaviour by stallions: an assessment of function in a reintroduced population of Przewalski horses (Equus ferus przewalskii). Journal of Zoology 272:30-36.

King, S.R.B., K.A. Schoenecker, and D.J. Manier. 2019. Potential Spread of Cheatgrass (Bromus tectorum) and Other Invasive Species by Feral Horses (Equus ferus caballus) in Western Colorado. Rangeland Ecology and Management 72:706-710.

Loydi, A. and S.M. Zalba. 2009. Feral horses dung piles as potential invasion windows for alien plant species in natural grasslands. Plant Ecology 201:471-480.

Lundgren, E.J., D. Ramp, J.C. Stromberg, J. Wu, N.C. Nieto, M. Sluk, K.T. Moeller, and A.D. Wallach. 2021. Equids engineer desert water availability. Science 372:491-495.

MacFadden, B.J. 2005. Fossil horses – evidence of evolution. Science 307: 1728-1730.

National Research Council. 2013. Using science to improve the BLM wild horse and burro program: a way forward. National Academies Press, Washington, D.C.

Nordquist, M. K. 2011. Stable isotope diet reconstruction of feral horses (Equus caballas) on the Sheldon National Wildlife Refuge, Nevada, USA. Thesis, Brigham Young University, Provo, Utah.

Osterheld, M. and S.J. McNaughton. 1991. Effect of stress and time for recovery on the amount of compensatory growth after grazing. Oecologica 85:305-313.

Ostermann-Kelm, S., E.R. Atwill, E.S. Rubin, M.C. Jorgensen, and W.M. Boyce. 2008. Interactions between feral horses and desert bighorn sheep at water. Journal of Mammalogy 89:459-466.

Ostermann-Kelm, S.D., E.A. Atwill, E.S. Rubin, L.E. Hendrickson, and W.M. Boyce. 2009. Impacts of feral horses on a desert environment. BMC Ecology 9:1-10.

Perry, N.D., P. Morey and G.S. Miguel. 2015. Dominance of a Natural Water Source by Feral Horses. The Southwestern Naturalist 60:390-393.

Power, M.E., and L.S. Mills. 1995. The keystone cops meet in Hilo. Trends in Ecology and Evolution 10: 182-184.

Roelle, J.E., F.J. Singer, L.C. Zeigenfuss, J.I. Ransom, L. Coates-Markle, and K.A. Schoenecker. 2010. Demography of the Pryor Mountain wild horses 1993–2007. US Geological Survey Scientific Investigations Report 2010–5125. 31p.

Scasta, J.D., J.L. Beck and C.J. Angwin. 2016. Meta-Analysis of Diet Composition and Potential Conflict of Wild Horses with Livestock and Wild Ungulates on Western Rangelands of North America. Rangeland Ecology & Management.

Schoenecker, K.A., S.R.B. King, M.K. Nordquist, D. Nandintseseg, and Q. Cao. 2016. Habitat and diet of equids. In: Wild equids: ecology, management, and conservation, J. I. Ransom and P. Kaczensky, eds. Johns Hopkins University Press. Baltimore, Maryland.

Schuman, G.E., J.D. Reeder, J.T. Manley, R.H. Hart, and W.A. Manley. 1999. Impact of grazing management on the carbon and nitrogen balance of a mixed-grass rangeland. Ecological Applications 9:65-71.

Scorolli, A.L. and A.C.L. Cazorla. 2010. Demography of feral horses (Equus caballus): a long-term study in Tornquist Park, Argentina. Wildlife Research 37:207-214.

Seegmiller, R.F., and R.D. Ohmart. 1981. Ecological relationships of feral burros and desert bighorn sheep. Wildlife Monographs 78:3-58.

Smith, M.A. 1986. Impacts of feral horse grazing on rangelands: an overview. Journal of Equine Science 6:236-238.

Tiller, B.L. 1997. Feral burro populations: distribution and damage assessment. Pacific Northwest National Laboratory 11879. U.S. Army, Department of Public Works, Fort Irwin, California.

Turner, J.W. and M.L. Morrison. 2001. Influence of predation by mountain lions on numbers and survivorship of a feral horse population. The Southwestern Naturalist 46:183-190.

Turner, J.W. 2015. Environmental influences on movements and distribution of a wild horse (Equus caballus) population in western Nevada, USA: a 25-year study. Journal of Natural History 49 (39-40):2437-2464.

USFWS. 2008. Revised, Final Environmental Assessment for Horse and Burro Management at Sheldon National Wildlife Refuge. April 2008. U.S. Fish and Wildlife Service, Lake County, Oregon.

USFWS. 2012. Sheldon National Wildlife Refuge Comprehensive Conservation Plan. USFWS, Lakeview, Oregon.

USFWS. 2013. Greater Sage-grouse conservation objectives: final report. U.S. Fish and Wildlife Service, Denver, Colorado. February 2013.

Webb, S.D. 1989. Ten million years of mammal extinction in North America. In Martin, P.S. and Klein, R.G. eds., Quaternary extinctions: a prehistoric revolution. University of Arizona Press.

Williams, R. E., Allred, B. W., Denio, R. M., & H.A. Paulsen. 1968. Conservation, development, and use of the world's rangelands. Journal of Range Management. 21:355-360.

Wolfe, M.L. 1980. Feral horse demography: a preliminary report. Journal of Range Management 33:354-360.

Zalba, S.M., and N.C. Cozzani. 2004. The impact of feral horses on grassland bird communities in Argentina. Animal Conservation, 7:35-44.

Ziegenfuss, L.C., K.A. Schoenecker, J.I. Ransom, D.A. Ignizio, and T. Mask. 2014. Influence of nonnative and native ungulate biomass and seasonal precipitation on vegetation production in a great basin ecosystem. Western North American Naturalist 74:286-298.

APPENDIX J: PUBLIC COMMENTS

This appendix will be completed after the close of the public comment period scheduled for July 21, 2021 through August 20, 2021.

APPENDIX K: MAPS

APPENDIX L: GENETICS REPORT

Genetic Analysis of
the Sinbad, UT Feral
burro herd

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A total of 30 blood samples were received at the University of Kentucky on June 15, 2001. Each sample was tested for variation at nine equine microsatellite systems by use of PCR and fragment separation by an automated DNA sequencer. The systems were *AHT4, AHT5, ASBl* 7, *ASB23, HMS3, HMS6, HMS7, HTGlO,* and *LEX33.* Measures of genetic variability calculated were observed heterozygosity *(Ho),* expected heterozygosity *(He),* estimated inbreeding level *(Fis=l-Ho/He),* effective number of alleles *(Ae),* total number of variants *(TNV)* and percentage of rare alleles *(Ar).* Data from this herd were compared to that of other feral herds and to four domestic donkey breeds. Genetic similarity of the Sinbad herd to domestic breeds and other feral herds also was calculated.

Values for measures of genetic variation for the Sinbad herd are shown in Table 1. Also given are data from four domestic donkey breeds and mean values for the domestic donkey and for other feral burro populations.

Genetic variability of the Sinbad herd is relatively high. All measures were higher than the average values for feral burros and only two other feral herds tested had higher values. The Sinbad population is the only feral burro herd yet tested where *Ho* is higher than *He* which yields a negative *Fis* value. This negative *Fis* indicates there is no evidence of inbreeding within this population. However, *Fis* calculated from microsatellite data can be misleading as the Poutou donkey also shows a negative *Fis* and this rare breed is known to be highly inbred.

Allelic diversity in the Sinbad herd is relatively low. *Ae* and TNVvalues are below the feral mean. However, the proportion of rare variants is fairly low so that the risk of loss of alleles in the near future is not high.

Population size of the Sinbad herd is quite low as is the maximum AML. Both are below the minimum number of individuals required to maintain genetic variability. Even though the

estimates of variation in this herd are among the highest for a feral her they are low compared to e domestic populations, including the inbred Poutou breed.

The Sinbad burro population had its greatest similarity with the Poutou donkey among the domestic breeds. The Poutou is a very rare French breed that was used for draft mule production mainly prior to the 20th century. It is unlikely that this breed has any direct relationship to the Sinbad population. Second highest S was with the Standard donkey. This is probably the type of donkey that Sinbad population is derived from. All similarity values are low. This is probably due to a loss of variability due to founder effect and small population size.

Similarity to other feral burro populations also was low. Highest S was to California populations, especially the Picacho herd. However, all feral herds tested to date are geographically distant from the Sinbad population and are only related by similar ancestry to the common domestic donkey of the American West.

RECOMMENDATIONS

Little is known about genetic variation in donkey populations. Genetic variation in the Sinbad burros is lower than that of the Poutou donkey which is a breed that has experienced a drastic population reductio11 and therefore has relatively high inbreeding and low genetic variation. Population size of this herd is well below the minimum viable population level. Based upon population size and variability level it is recommended that this herd be closely monitored. It would probably be advisable to introduce female burros from other feral populations at some point. One young sexually mature female every two years for the next 10 years should be sufficient to prevent severe inbreeding for the next 20 to 50 years.

Table 1. Genetic variation measures.

Population	*Ho*	*He*	*Fis*	*Ae*	*TNV*	*Ar*
Sinbad, UT	.466	.430	-.084	2.066	27	.14
Poutou Donkey	.533	.515	-.036	2.501	42	.38
Mammoth Jack	.58ji	.602	.028	2.602	35	.37
Miniature Donkey	.546	.566	.019	3.015	51	.33
Standard Donkey	.562	.623	.099	3.483	57	.40
Domestic Mean	.539	.656	.046	2.900	40.6	.30
Feral Mean	.398	.445	.104	2.190	30.6	.20

Table 2. Genetic similarity of the Sinbad feral burro herd to domestic donkey breeds.

	S
Poutou Donkey	.723
Mammoth Jack	.593
Miniature Donkey	.613
Standard Donkey	.676

Figure 1. Dendrogram of genetic similarity among domestic andferal burro populations.