US. Department of the Interior
Bureau of Land Management

Pancake Complex

Preliminary Environmental Assessment

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1.0 Introduction

This Environmental Assessment (EA) has been prepared to disclose and analyze the environmental effects of the Proposed Action and alternatives which consists of gathering and removing excess wild horses from within and outside the Pancake and Sand Springs West Wild Horse Herd Management Areas (HMAs), and Jakes Wash Herd Area (HA), referred to as the Pancake Complex. The gather and removal of excess wild horses from the U.S. Forest Service's (USFS) Monte Cristo Wild Horse Territory (WHT) is also included in the Proposed Action and is covered by an existing USFS decision document. The Monte Cristo WHT is managed in accordance with an Interagency Agreement between the BLM and the USFS and is included for informational purposes and cumulative impact analysis. Refer to Map 1, Appendix I which displays the HMAs and WHT included within the Complex.

The wild horse gather plan would allow for an initial gather and follow-up maintenance gathers to be conducted over the next 10 years from the date of the initial gather operation in order to achieve and maintain Appropriate Management Levels (AMLs), and continue fertility control management. This EA will assist the Bureau of Land Management (BLM) Bristlecone and Tonopah Field Offices (FOs) in project planning and ensuring compliance with the National Environmental Policy Act (NEPA), and in making a determination as to whether any significant effects could result from the analyzed actions. Following the requirements of NEPA (40 CFR 1508.9 (a)), this EA describes the potential impacts of a No Action Alternative and the Proposed Action for the Pancake Complex. If the BLM determines that the Proposed Action for the Complex is not expected to have significant impacts a Finding of No Significant Impact (FONSI) would be issued and a Decision Record would be prepared. If significant effects are anticipated, the BLM would prepare an Environmental Impact Statement.

This document is tiered or conforms to the following documents:

- Ely Proposed RMP (2007) (Resource Management Plan) and Final Environmental Impact Statement (*FEIS-RMP/EIS 2008*).
- Ely District Record of Decision and Approved Resource Management Plan (2008) *(Ely RMP),* as amended.
- The Tonopah RMP and subsequent Record of Decision dated October 1997.
- Humboldt National Forest Land and Resource Management Plan (LRMP) and subsequent Record of Decision dated August 1986.

1.1 Background

The Pancake Complex is located approximately 30 miles west, southwest of Ely, Nevada, and 10 miles southeast of Eureka, Nevada, and 80 miles northwest of Tonopah Nevada within White Pine and Nye Counties (Map 1 Appendix I) and lies within the Ely and Battle Mountain BLM Districts as well as the USFS Humboldt-Toiyabe National Forest. Table 1, below, displays the total acreage and established AML for each of the HMAs and WHT.

The 2008 Ely RMP combined two existing HMAs (Monte Cristo and Sand Springs East HMAs) into the Pancake HMA. The decision to combine all or portions of the two HMAs was due to the historical interchange of wild horses between the two HMAs and was also based on an in-depth analysis of habitat suitability and monitoring data as set forth in the Ely Proposed Resource Management Plan/Final Environmental Impact Statement. The 2007 EIS evaluated each HMA for five essential habitat components and herd characteristics: forage, water, cover, space, and reproductive viability. Through this analysis and the subsequent Final RMP and ROD , the boundaries of the Pancake HMA were established

to ensure sufficient habitat for wild horses, and an AML was reviewed and set that would achieve a thriving natural ecological balance and rangeland health.

Jakes Wash Herd Management Area has been returned to Herd Area Status consistent with the ROD and the 2008 Approved Ely District RMP at management action WH-5, which states: "*Remove wild horses and drop herd management area status for those … as listed in Table 13.*" Removal of all excess wild horses from the Jakes Wash HA is needed at this time in order to implement this management direction and to prevent damage to the range resulting from the current overpopulation while achieving and maintaining a multiple-use relationship within the area.

The proposed wild horse gather of the Pancake Complex would be conducted in coordination and in conjunction with the Tonopah Field Office and Humboldt-Toiyabe National Forest, due to historic movement and continuing interchange of wild horses between the Pancake HMA (approximately 855,000 acres of public land), Sand Springs West HMA (approximately 157,436 acres of private/public land) Jakes Wash HA (approximately 153,663 acres of private/public land), and Monte Cristo WHT (approximately 93,640 acres of private/public land).

Since the passage of the *Wild Free-Roaming Horses and Burros Act of 1971*, management knowledge regarding wild horse population levels has increased. For example, it has been determined that wild horses are capable of increasing their numbers by 15% to 25% annually, resulting in the doubling of wild horse populations about every 4 years (NRC 2013). This has resulted in the BLM shifting program emphasis beyond just establishing AML and conducting wild horse gathers to include a variety of management actions that further facilitate the achievement and maintenance of viable and stable wild horse populations and a "thriving natural ecological balance". Management actions resulting from shifting program emphasis include increasing fertility control, adjusting sex ratio and collecting genetic baseline data to support genetic health assessments.

The AML is defined as the number of wild horses that can be sustained within a designated HMA which achieves and maintains a thriving natural ecological balance[1] in keeping with the multiple-use management concept for the area. The Pancake Complex has a cumulative AML range of 361-638 wild horses which has been established through land use plans, Final Multiple Use Decisions, and a Wild Horse Territory Management Plan. The range of AML for the Pancake HMA is 240-493 wild horses. This population range was established at a level that would maintain healthy wild horses and rangelands over the long-term based on monitoring data collected over time as well as an in-depth analysis of habitat suitability. The AML range was established through prior decision-making processes and re-affirmed through the ROD and Approved Ely District RMP(August 2008).

Under the 2008 Ely District RMP, no wild horses are to be managed within the Jakes Wash HA based on analysis of habitat suitability and monitoring data; which indicates insufficient forage, water, space, cover, and reproductive viability to maintain healthy wild horses and rangelands over the long-term.
The Sand Springs West AML of 49 wild horses was established through a stipulated agreement (Consent Decision) between BLM, E. Wayne Hage, Colvin and Son Cattle Co., and Russell Ranches through the

[1] 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 v. Clark, supra at 594, the 'benchmark test' for determining the suitable number of wild horses on the public range is 'thriving ecological balance.' 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 between WH&B populations, wildlife, livestock and vegetation, and to protect the range from the deterioration associated with overpopulation of wild horses and burros.' " (Animal Protection Institute of America v. Nevada BLM, 109 IBLA 115, 1989).

Department of the Interior Office of Hearings and Appeals, Hearings Division, and later confirmed by the Tonopah Resource Management Plan (RMP) approved October 6, 1997. The Tonopah RMP stated that adjustments to AML would be based on monitoring and grazing allotment evaluations. A Rangeland Health Evaluation is currently scheduled for the grazing allotments associated with the Sand Springs West HMA. At present, existing monitoring historical, and monitoring data do not indicate that an increase or decrease of the existing AML is warranted. However, achieving and maintaining AML is critical for the conservation of rangeland resources and healthy wild horses. The wild horses from Sand Springs West HMA travel back and forth across the Pancake HMA boundary lines, mixing with the wild horses from the Pancake HMA. The population within these HMAs can fluctuate depending on the seasonal movement of these wild horses.

The Monte Cristo Wild & Free Roaming Horses Management Plan established a baseline AML of 72–120 wild horses, with an average of 96 head to be maintained. These numbers were based on proper use studies conducted on the natural horse concentration areas. The baseline AML was adjusted to 72–96 through the Humboldt National Forest Land & Resource Management Plan in 1986. Range conditions had not improved with the number of horses occupying the area. The population within this HMA can fluctuate depending on the seasonal movement of the wild horses.

Table 1. Herd Management Area, Acres, AML, Estimated Population, and Estimated Numbers for Removal

Herd	Total Acres Private/Public land	Appropriate Management Level	2020 Estimated Population	Removal to Achieve Low AML
Pancake	855,000	240-493	1,829- 3,004	1,589- 2,764
Sand Springs West	157,436	49	155- 386	106- 337
Jakes Wash	153,663	0	46-242	114-310
Monte Cristo WHT	93,640	72-96	232	160
Total	1,106,076	361-638	2,262- 3,864	1,969- 3,571

The lower end of the 2020 estimated population was determined by the 2020 survey flights direct count. The upper level of the of 2020 estimated population herd size is based on 2016 survey estimate, plus 4 years of compounded 20% annual growth.

An aerial survey of the project area was conducted in March of 2020. During that survey, observers recorded 2,330 adult wild horses. This number was the ‘direct count’ of every horse seen on the flight and does not account for unseen horses that were present in the project area. There are reasons to believe that the 2020 direct count was dramatically lower than the number of horses actually present in the surveyed area at that time. The 2020 flights had to be suspended for two days, due to severe weather. This break in survey operations may have allowed horses to move from the un-surveyed portion of the Complex to the already-surveyed portion, with the result that large numbers would not have been counted by observers. In addition, aerial wildlife surveys almost always undercount the true numbers of animals present in the surveyed areas (Griffin et al. 2020). Therefore, the 2020 direct count number of wild horses seen in each part of the complex is considered the lower level of the possible 2020 adult herd size in the Complex (Table 1). The upper bound of the possible adult herd size (Table 1) is based on results from the February 2016 aerial survey (Lubow 2016), with 20% projected annual growth added for each of the four years between 2016 and 2020. The specific herd size at present in the Complex is not exactly known, but it is clear that even the lower bound of possible adult herd size exceeds the upper end of AML for the complex by 1,692, and exceeds the lower end of AML by at least 1,969. The timing of future aerial surveys would be chosen to avoid storms, which should provide more reliable estimates of herd size.

Based upon all information available at this time, the BLM has determined that approximately 1,969-3,571 excess wild horses above the low end of AML exist within the Pancake Complex. These excess wild horses need to be removed in order to achieve the established AML, restore a thriving natural ecological balance (TNEB) and prevent degradation of rangeland resources. This assessment is based on factors including, but not limited to the following rationale:

- Pancake Complex estimated populations exceed the established AML range for the project area (Table 1).
- Excess wild horses are establishing populations outside of identified HMA and HA boundaries.
- Moderate, heavy and severe utilization is evident on key forage species within Complex.
- Wild horses are contributing to not meeting Rangeland Health Standards throughout most of the Pancake HMA and in some cases are the sole contributor (See Appendix VII).
- Use by wild horses has caused damage to the water development at Young Florio Spring, Moody Spring and has caused water source damage at Martletti Spring.
- An emergency water trap gather was conducted in 2017 and 2018 where 391 wild horses were removed from the Pancake HMA.
- An Emergency water trap gather was conducted in August 2020 in the Jakes Wash HA due to a lack of water.
- Monitoring and historical information indicate that future emergency removals would be necessary due to lack of water and/or forage if gathers are not conducted to reduce the population to AML.

1.2 Purpose and Need

The purpose of the Proposed Action is to gather and remove excess wild horses from within and outside the Pancake Complex and to reduce the wild horse population growth rates to achieve and maintain established AML ranges.

The need for the action is to prevent undue or unnecessary degradation of the public lands associated with excess wild horses, and to restore a thriving natural ecological balance and multiple-use relationship on public lands, consistent with the provisions of Section 1333(b) of the 1971 Wild Free-Roaming Horses and Burros Act (WFRHBA).

1.3 Land Use Plan Conformance and Consistency with Other Authorities

The Proposed Action (Alternative A) and Alternatives B and C are in conformance with the 2008 Ely District ROD and Approved RMP, as amended.

- **Goal:** "Maintain and manage healthy, self-sustaining wild horse herds inside herd management areas within appropriate management levels to ensure a thriving natural ecological balance while preserving a multiple-use relationship with other uses and resources."
- **Objective:** "To maintain wild horse herds at appropriate management levels within herd management areas where sufficient habitat resources exist to sustain healthy populations at those levels."

The Proposed Action is in conformance with the Tonopah Resource Management Plan (RMP) and subsequent Record of Decision dated October 1997.

- **Objective**: "To manage wild horse and/or burro populations within Herd Management Areas at levels which will preserve and maintain a thriving natural ecological balance consistent with other multiple-use objectives."

The Proposed Action (Alternative A) and Alternatives B and C are in conformance with the Humboldt National Forest Land and Resource Management Plan (LRMP) and subsequent Record of Decision dated August 1986.

- **Goal # 20**: "Manage the Cherry Springs, Monte Cristo, and Quinn Wild Horse Territories in accordance with the Wild Horse and Burro Act and the approved territory plans."
- **Standards and Guidelines:** "Manage wild free-roaming horses and burros to population levels compatible with the resource capabilities and needs."

1.4 Relationship to Statutes, Regulations, or other Plans
The Federal Land Policy and Management Act of 1976 (FLPMA) requires that an action under consideration be in conformance with the applicable BLM land use plan(s), and be consistent with other federal, state, and local laws and policies to the maximum extent possible.

The Proposed Action is also consistent with the Wild Free-Roaming Horses and Burros Act of 1971 *(*WFRHBA*)*, which mandates the Bureau to "*prevent the range from deterioration associated with overpopulation*", and "*remove excess horses in order to preserve and maintain a thriving natural ecological balance and multiple use relationships in that area".*

Also the WFRHBA of 1971 sec 1333 (b)(1) states: "*The purpose of such inventory shall be to: make determinations as to whether and where an overpopulation exists and whether action should be taken to remove excess animals; determine appropriate management levels or wild free-roaming horses and burros on these areas of public land; and determine whether appropriate managements should be achieved by the removal or destruction of excess animals, or other options (such as sterilization, or natural control on population levels)*."

The Proposed Action is consistent with all applicable at laws and regulations at Title 43 Code of Federal Regulations (43 CFR) 4700 and policies.

43 CFR 4700.0-6 (a) Wild horses shall be managed as self-sustaining populations of healthy animals in balance with other uses and the productive capacity of their habitat (emphasis added).

43 CFR 4710.4 Management of wild horses and burros shall be undertaken with the objective of limiting the animals' distribution to herd areas. Management shall be at the minimum level necessary to attain the objectives identified in approved land use plans and herd management area plans.

43 CFR 4720.1 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 4720.2 Upon written request from a private landowner……the Authorized Officer shall remove stray wild horses and burros from private lands as soon as practicable.

43 CFR 4740.1 (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.

Title 36 Code of Federal Regulations (36 CFR) 222

36 CFR 222.60 (a) Authority. The Chief, Forest Service, shall protect, manage, and control wild free-roaming horses and burros on lands of the National Forest System and shall maintain vigilance for the welfare of wild free-roaming horses and burros that wander or migrate from the National Forest System. If these animals also use lands administered by the Bureau of Land Management as a part of their habitat, the Chief, Forest Service, shall cooperate to the fullest extent with the Department of the Interior through the Bureau of Land Management in administering the animals.

36 CFR 222.61 (a) (1) Administer wild free-roaming horses and burros and their progeny on the National Forest System in the areas where they now occur (wild horse and burro territory) to maintain a thriving ecological balance considering them an integral component of the multiple use resources, and regulating their population and accompanying need for forage and habitat in correlation with uses recognized under the Multiple-Use Sustained Yield Act of 1960 (70 Stat. 215; 16 U.S.C. 528-531)

36 CFR 222.64 (a) Prior to using helicopters in capture operations and/or using motor vehicles for the purpose of transporting captured animals, a public meeting will be held in the proximity of the territory where the capture operation is proposed. (b) Helicopters may be used in all phases of the administration of the Act including, but not limited to, inventory, observation, surveillance, and capture operations... (c) Fixed-wing aircraft may be used for inventory, observation, and surveillance purposes necessary in administering the Act… (d) Motor vehicles may be used in the administration of the Act except that such vehicles shall not be used for driving or chasing wild horses or burros in capture operations. Motor vehicles may also be used for the purpose of transporting captured animals…

36 CFR 222.66 Owners of land upon which wild free-roaming horses and burros have strayed from the National Forest System may request their removal by calling the nearest office of either the Forest Service or Federal Marshall.

36 CFR 222.69 (a) The Chief, Forest Service, shall, when he determines over-population of wild horses and burros exists and removal is required, take immediate necessary action to remove excess animals from that particular territory. Such action shall be taken until all excess animals have been removed so as to restore a thriving natural ecological balance to the range, and protect the range from deterioration associated with over-population.

The Interior Board of Land Appeals (IBLA) in Animal Protection Institute et al., (118 IBLA 63, 75 (1991)) found that under the Wild Free-Roaming Horses and Burros Act of 1971 (Public Law 92-195) BLM is not required to wait until the range has sustained resource damage to reduce the size of the herd, instead proper range management dictates removal of "excess animals" before range conditions deteriorate in order to preserve and maintain a thriving natural ecological balance and multiple-use relationship in that area.

References to the CEQ regulations throughout this EA are to the regulations in effect prior to September 14, 2020. The revised CEQ regulations effective September 14, 2020 are not referred to in this EA because the NEPA process associated with the proposed action began prior to this date.

2.0 DESCRIPTION OF ALTERNATIVES, INCLUDING PROPOSED ACTION

2.1 Introduction:

This chapter 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:

- **No Action Alternative.** Under the No Action Alternative, a gather to remove excess wild horses would not occur. There would be no active management to control population growth rates, the size of the wild horse population or to bring the wild horse population to AML.

- **Proposed Action (Alternative A).** Over a 10 year period, use gathers to removed excess animals in order to achieve and maintain within AML range, apply fertility control methods (vaccines and/or IUDs) to released mares, maintain a sex ratio adjustments of 60%male and 40% female, and a non-reproducing component of males (geldings)

- **Alternative B.** Alternative B is the same as Alternative A, but would not include a nonreproducing (i.e., gelding) portion of the population.

- **Alternative C.** Under Alternative C, Gather and remove excess animals to within the AML range without fertility control, sex ratio adjustments, or geldings.

- **Alternative D.** The BLM would capture 100% of the current population of wild horses from within and outside the Jakes Wash Herd Area over a ten-year period. No animals would be released under this alternative. All of the animals gathered would be removed and transported to BLM off-range corrals where they would be prepared for adoption and/or sale to qualified individuals, or for off-range pastures. No other HMAs or WHT would be included under Alternative D.

2.2 No Action Alternative

Although the No Action Alternative does not comply with the WFRHBA of 1971 and does not meet the purpose and need for the action in this EA, it is included as a basis for comparison with the Proposed Action.

Under the No Action Alternative, a gather to remove excess wild horses would not occur. There would be no active management to control the size of the wild horse population or to bring the wild horse population to AML. The current wild horse population would continue to increase at a rate of 20-25% per year. Within two years, the wild horse population could exceed 5,000. Wild horses residing outside the HMAs and HA would remain in areas not designated for management of wild horses and population numbers would continue to increase. Increasing numbers of excess wild horses will continue to deteriorate rangelands within the Complex, public safety concerns will increase along heavily traveled road as well as private property issues. As well as an increase in emergency actions necessary to address the overpopulations of wild horses and limited water/forage resources.

2.3 Alternative A: Proposed Action Alternative

2.3.1 Population Management

The Proposed Action (Alternative A) would be to gather and remove approximately 1,969- 3,571 excess wild horses within the Complex to achieve and maintain AML and administer or booster population control measures to gather and released horses over a period of ten years from the initial gather. This would allow BLM to achieve management goals and objectives of attaining a herd size that is at the low range of AML, reducing population growth rates, and obtaining a thriving natural ecological balance on the range as identified within the WFRHBA.

It is expected that gather efficiencies and holding space during the initial gather would not allow for the attainment of the Proposed Action during the initial gather (i.e. not enough horses are successfully captured and removed to reach low AML). The BLM Bristlecone and Tonopah Field Offices as well as

the Humboldt-Toiyabe National Forest Ely Ranger District would return to the Complex to remove excess horses above low AML on a periodic basis. Follow-up gathers would continue over a 10-year period to remove additional excess wild horses necessary to achieve and maintain the low range of AML, and to gather a sufficient number of wild horses as to implement the population control component of the Proposed Action, which includes fertility control vaccines (PZP vaccines, GonaCon, IUDs and gelding) for wild horses remaining in the Complex. Prioritization of excess wild horse removals would be as follows, from areas where public health and safety issue have been identified, private land and non HMA, areas where resource degradation/deficiency has been identified and within HMAs to reach and maintain low AML. Selective removal procedures would prioritize removal of younger excess wild horses after achieving AML within the Complex, and allow older, less adoptable, wild horses, to be released back to the Complex. BLM would begin implementing the population control components (PZP vaccines, GonaCon, IUDs and gelding) of this alternative as part of the initial gather. To help improve the efficacy and duration of fertility control vaccines, mares could be held for an additional 30 days and given a booster shot prior to release. It is expected that the number of fertile mares and stallions will always be at least a relatively large fraction (i.e., ~60% or more) of low AML, including those elusive animals that are never be gathered and their offspring, fertile stallions, and mares whose reversible fertility control vaccines have become ineffective over time, or whose IUDs have fallen out.

Population inventories and routine resource/habitat monitoring would continue to be completed every two to three years to document current population levels, growth rates, and areas of continued resource concerns (horse concentrations, riparian impacts, over-utilization, etc.). Funding limitations and competing national priorities may impact the timing and ability to gather and conduct population control components of the Proposed Action.

The management objective for the Pancake Complex would be to gather and remove excess wild horses within the Complex to achieve and maintain AML. BLM would achieve this through population growth suppression measures to include:

- Administration of fertility control measures (i.e. PZP vaccines, GonaCon or newly developed vaccine formulations, IUDs) to released mares.
- Adjustment of sex ratios to achieve a 60 % male to 40% female ratio.
- Some gelded horses – that would otherwise be excess animals permanently removed from the range and sent to off-range corrals for adoption/sales or off-range pastures – may be returned to the range and managed as a non-breeding population of geldings, so long as the geldings do not result in the population exceeding mid-range AML.

The fertility control component of the Proposed Action would reduce the total number of wild horses that would otherwise be permanently removed from the range. Including some fertility control-treated mares and some geldings in the herd at mid-AML herd size would allow for management of a total wild horse population within the Complex that would be larger than low AML, while still reducing population growth rates compared to those of an untreated herd, and achieving a thriving natural ecological balance. Primary gather methods would include helicopter drive, bait, and water trapping. It is expected that not all horses would be able to be captured, as gather efficiencies rarely exceed 80-85% especially in larger Complexes. As a result, a proportion of wild horses (15-20%+) in the project area would not be captured or treated over the 10-year period of the Proposed Action.

While in the temporary holding corral horses would be identified for removal or release based on age, gender and/or other characteristics. As a part of periodic sampling to monitor wild horses genetic diversity in the complex, hair follicle samples would be collected from a minimum of 25 horses of the released population from an HMA. Samples would be collected for analysis to assess the levels of observed heterozygosity, which is a measure of genetic diversity (BLM 2010), within the Complex and may be

analyzed to determine relatedness to established breeds and other wild horse herds. Mares identified for release would be aged, microchipped and freeze-marked for identification prior to being released to help identify the animals for future treatments/boosters and assess the efficacy of fertility control treatments.

2.3.2. Population Growth Suppression Methods

The Proposed Action would include population growth suppression methods such as fertility control vaccines, IUDs, sex ratio adjustment, and including a non-reproducing component (geldings) in the herd. In cases where a booster vaccine is required, mares could be held for approximately 30 days and given a booster shot prior to release. Over the course of multiple gathers over the 10-year time period, BLM would treat/retreat mares with fertility control to help meet herd management objectives. Since release of the 2013 NRC Report, the BLM has supported field trials of potential sterilization methods that may be used in WHB management, but inclusion of any particular method as a part of management does not depend on completion of any given research project. The use of any new fertility control method would conform to current best management practices at the direction of the National Wild Horse and Burro Program.

All mares that are trapped and selected for release would be treated with fertility control treatments (PZP vaccines [ZonaStat-H, PZP-22], GonaCon or most current formulation, IUDs) to prevent pregnancy in the following year(s). Some number of stallions to be returned may be gelded, depending on herd size as noted above. Detailed analysis on population growth suppression methods are discussed further in Appendix II and XII.

2.3.2.1. PZP

Porcine Zona Pellucida (PZP) Vaccine

Immunocontraceptive Porcine Zona Pellucida (PZP) vaccines are 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 vaccine was one of the preferred available methods for contraception in wild horses and burros (NRC 2013). PZP vaccine 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 vaccine can be 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, Carey et al. 2019). It can easily be remotely administered (dart-delivered) in the field, but only where mares are relatively approachable.

Under the Proposed Action, mares being treated for the first time would receive a liquid primer dose along with time release pellets. 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. Application methods could be by hand in a working chute during gathers, or through field darting if mares in some portions of the Complex prove to be approachable. 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, and not all mares would be treated or receive boosters within the Complex due to the sheer numbers of the population, the large size of the Complex and logistics of wild horse gathers. Once the population is at AML and population growth seems to be stabilized, BLM could use population planning software

(PopEquus, currently in development by USGS Fort Collins Science Center) to determine the required frequency of re-treating mares with PZP or other fertility control methods.

2.3.2.2. Gonadotropin Releasing Hormone (GnRH) Vaccine, GonaCon

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 (Baker et al. 2018) and on a small number of wild horses in the Water Canyon area within the Antelope Complex (DOI-BLM-NV-L020-2015-0014-EA). 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 meters or less (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-Cahill et al. in press).

Under the Proposed Action, the BLM would return to the Complex as needed to re-apply GonaCon-Equine and initiate new treatments in order to maintain contraceptive effectiveness in controlling population growth rates. Booster dose effects may lead to increased effectiveness of contraception, which is generally the intent. 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 would make a determination as to the required frequency of new mare treatments and mare re-treatments with GonaCon or other fertility control methods, to maintain the number of horses within AML.

2.3.2.3. Intrauterine Devices (IUDs)

IUDs are considered a temporary fertility control method that does not generally cause future sterility (Daels and Hughes 1995). It is expected that IUDs would only be inserted in non-pregnant (open) mares.

Wild mares receiving IUDs would be checked for pregnancy prior to insertion of an IUD. Up through the present time (October 2020), 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, Holyoak et al. unpublished data). However, existing literature on the use of IUDs in horses allows for inferences about expected effects of any management alternatives that might include use of IUDs, and support the apparent safety and efficacy of some types of IUDs for use in horses (see section 3.3).

Soft IUDs may cause relatively less discomfort than hard IUDs (Daels and Hughes 1995). The 2013 National Academies of Sciences (NAS) report considered IUDs and suggested that research should test whether IUDs cause uterine inflammation, and should also test how well IUDs stay in mares that live and breed with fertile stallions. Since that report, researchers tested a Y-shaped IUD to determine retention rates and assess effects on uterine health; retention rates were greater than 75% for an 18-month period, and mares returned to good uterine health and reproductive capacity after removal of the IUDs (Holyoak et al., unpublished results). Also, the University of Massachusetts has developed a magnetic IUD that has been effective at preventing estrus in non-breeding domestic mares (Gradil et al. 2019). The overall results are consistent with results from an earlier study (Daels and Hughes 1995), which used O-shaped silicone IUDs.

2.3.2.4. Gelding

In order to reduce the total number of excess wild horses that would otherwise be permanently removed from the Complex, a portion of the male population would be managed as geldings. The procedures to be followed for gelding of stallions are detailed in the Gelding Standard Operating Procedures (SOPs) in Appendix III.

Gelding Procedure

BLM routinely gelds all excess male horses that are captured and removed from the range prior to their adoption, sale, or shipment to Off-Range Pastures (ORPs). The gelding procedure for excess wild horses removed from the range would be conducted at temporary (field) or off range corrals by licensed veterinarians and follows industry standards. Under the Proposed Action, some geldings would be returned to resume their free-roaming behaviors on the public range instead of being permanently removed from the Complex. Geldings have been released on BLM lands as a part of herd management in the Barren Valley complex in Oregon (BLM 2011), the Challis HMA in Idaho (BLM 2012), and the Conger HMA in Utah (BLM 2016). By including some geldings in the population, and having a slightly skewed sex ratio with more males than females overall, the anticipated result would be a reduction in per-capita population growth rates while allowing for management of a larger total wild horse population on the range. Stallions that would otherwise be permanently removed as excess wild horses would be selected for gelding and release. No animals which appear to be distressed, injured, or in poor health or condition would be selected for gelding. Stallions would not be gelded within 72 hours of capture. The surgery would be performed at a BLM-managed holding center by a veterinarian using general anesthesia and appropriate surgical techniques (see Gelding SOPs in Appendix III).

The animal is sedated then placed under general anesthesia. Ropes are placed on one or more limbs to help hold the animal in position and the anesthetized animals are placed in either lateral or dorsal recumbency. The surgical site is scrubbed and prepped aseptically. The surgeon would wear sterile gloves. The scrotum is incised over each testicle, and the testicles are removed using a surgical tool to control bleeding. The incision is left open to drain. Each animal would be given a Tetanus shot, antibiotics, and an analgesic.

Any males that have an inguinal or scrotal hernias would be removed from the population, sent to a BLM prep corral facility and be treated surgically as indicated if possible or euthanized if they have a poor

prognosis for recovery according to BLM policy (WO IM 2015-070). Horses with only one descended testicle may be removed from the population and managed at a BLM prep corral facility according to BLM policy or anesthetized with the intent to locate the undescended testicle for castration. If an undescended testicle cannot be located, the animal may be recovered and removed from the population if no surgical exploration has started. Once surgical exploration has started those that cannot be completely castrated would be euthanized prior to recovering them from anesthesia according to BLM policy. All animals would be rechecked by a veterinarian the day following surgery. Those that have excessive swelling, are reluctant to move or show signs of any other complications would be held in captivity and treated accordingly as they normally would in a BLM facility. Once released to the wild no further veterinary interventions are possible.

Selected stallions would be shipped to an off-range corral, gelded, and returned to the range within 30 days. Gelded animals would be monitored periodically for complications for approximately 7-10 days following release. This monitoring may be completed either through aerial recon if available, or field observations from major roads and trails. The goal of this monitoring is to detect complications if they are occurring and determine if the horses are freely moving about the Complex. All adults would have been freeze-marked at the first gather to facilitate posttreatment and routine field monitoring. Post-gather monitoring would be used to document whether or not geldings form bachelor bands or intermix with the breeding population as expected. Other periodic observations of the long-term outcomes of gelding could be recorded during routine resource monitoring work. Such observations would include but not be limited to band size, social interactions with other geldings and harem bands, distribution within their habitat, forage utilization and activities around key water sources. Periodic population inventories and future gather statistics may contribute to BLM's ongoing considerations about managing a portion of the herd as non-breeding animals, as an effective approach to slowing the annual population growth rate by replacing breeding mares with sterilized animals, when used in conjunction with other population control techniques. Management of a gelding population would allow for management at mid-AML, instead of gathering and removing excess animals to low AML.

By itself, it is unlikely that gelding would allow the BLM to achieve its horse and burro population management objectives since a single fertile stallion is capable of impregnating multiple mares, and stallions other than the dominant harem stallion may also breed with some mares. Adequate reduction of female horse fertility rates would be expected to result only if a large proportion of male horses in the population are sterile, because of their social behavior (Garrott and Siniff 1992). Therefore, to be fully effective, use of gelding (alone) to control population growth requires that either the entire male population be gathered and treated (which is not practical and is not being considered here) or that some percentage of the female wild horses in the population be gathered and treated. If the mare treatment is not of a permanent nature (e.g., application of PZP vaccine, GonaCon, IUDs) the mares may need to be gathered and retreated on a periodic basis.

2.3.2.5 Sex Ratio Adjustment

Sex ratio adjustment, leading to a reduced fraction of mares in the herd, can be considered a form of contraceptive management, insofar as it can reduce the realized per-capita growth rate in a herd. By reducing the proportion of breeding females in a population (as a fraction of the total number of animals present), the technique leads to fewer foals being born, relative to the total herd size. Sex ratio is typically adjusted in such a way that 60 percent of the horses are male. In the absence of other fertility control treatments, this 60:40 sex ratio alone can temporarily reduce population growth rates from approximately 20% to approximately 15% (Bartholow 2004). While such a decrease in growth rate may not appear to be large or long-lasting, the net result can be that fewer foals being born, at least for a few years – this can extend the time between gathers, and reduce impacts on-range, and costs off-range.

2.4 Alternative B
Alternative B is similar to Alternative A except that it does not include a gelding component. This alternative would include selective removal of excess wild horses to low end AML, population growth control using mare fertility control treatments (PZP vaccines, GonaCon or most current vaccine formulation, IUDs) and sex ratio adjustments.

Under Alternative B, BLM would gather and remove excess wild horses within the combined project area to return the population levels to the low end of the AML range. All excess wild horses residing in areas outside of the Complex would be gathered and removed. Under this alternative, the BLM would attempt to gather a sufficient number of wild horses, so as to allow for the application of mare fertility control (PZP vaccines, GonaCon, IUDs) to all mares that are released. The procedures to be followed for implementation of fertility control are detailed in Appendix II. Approximately 60% or more of all released wild horses would likely be stallions, thus achieving a 60:40 male: female sex ratio on the range (including animals not gathered). The combination of these actions should lower the population growth rate within the Complex. Any follow-up gather activities during the subsequent phases of this alternative over the 10 year period would be conducted in a manner consistent with those described under the Proposed Action.

2.5 Alternative C
Under this alternative, BLM would gather and remove excess animals to within AML range without mare fertility control, sex ratio adjustments, or gelding. Impacts from this alternative would be similar to the gathering and handling impacts under the Proposed Action, however there would be no horses released or fertility control administered to released horses. While wild horses would be gathered to the within the low range of AML, the AML would be exceeded sooner than under the Proposed Action or Alternative B since per-capita fertility rates would be higher.

2.6 Management Actions Common to Alternatives A, B, C and D
Gathering of horses and removal of excess wild horses to achieve and maintain the AML would occur as necessary for the next 10 years following the start date of the initial gather (no sooner than January 2021).

The primary gather techniques would be the helicopter-drive and water/bait trapping. The use of roping from horseback could also be used when necessary. Multiple, temporary gather sites (traps) would be used to gather wild horses both from within and outside the Complex. In addition to public lands, private property may be utilized for gather sites and temporary holding facilities (with the landowner's permission) if necessary, to ensure accessibility and/or based on prior disturbance. Use of private land would be subject to Standard Operating Procedures (SOPs) (Appendix IV) and to the written approval/authorization of the landowner.

Any trapping activities would be scheduled in locations and during time periods that would be most effective to gather sufficient numbers of animals to achieve management goals for the areas being gathered. The most efficient gather technique would be chosen as determined by the gather needs of the specific area.

Temporary gather and holding sites would be no larger than 0.5 acres. Bait or water trapping sites could remain in place up to one year. Temporary holding sites could be in place for up to 45 days depending on length of gather. The exact location of the gather sites and holding sites may not be determined until immediately prior to the gather because the location of the animals on the landscape is variable and unpredictable.

The BLM would make every effort to place gather sites in previously disturbed areas, but if a new site needs to be used, a cultural inventory would be completed prior to using the new gather site. If cultural

resources are encountered, the location of the gather/ holding site would be adjusted to avoid all cultural resources.

No gather sites would be set up on Greater sage-grouse leks, known populations of sensitive species, in riparian areas, in cultural resource sites, sacred sites, paleontological sites, Wilderness Study Areas (WSAs) or congressionally designated Wilderness Areas. All gather sites, holding facilities, and camping areas on public lands would be recorded with Global Positioning System equipment, given to the BLM Battle Mountain and Ely District Invasive, Non-native Weed Coordinators, and then assigned for monitoring and any necessary treatment during the next several years for invasive, non-native weeds. All gather and handling activities (including gather site selections) would be conducted in accordance with SOPs in Appendix VI.

Activities in listed species habitat would be subject to Section 7 consultation under the Endangered Species Act with the level of consultation to be determined based upon the project site-specific proposed action. BLM would complete consultation prior to implementation of any specific action which may have an effect on a listed species.

Wildlife Stipulations (Common to all Alternatives, except No Action Alternative)

- If gather operations were to be conducted during the migratory bird breeding season (March 1 – July 31) a nest clearance survey would be conducted by BLM Biologist at trap, corral, and staging areas.
- Trap sites and corrals would not be located in active pygmy rabbit habitat or other sensitive habitat.
- Greater sage-grouse Required Design Features that are identified in Appendix X would be applied in Greater sage-grouse habitat.
- Corrals would not be constructed within 1 mile of an active or pending lek.
- Prior to gathers, BLM would coordinate with NDOW regarding locations of staging areas to address Greater sage-grouse concerns. The following timing restrictions would be adhered to the best of BLM's abilities while not impeding gather operations:
    - Helicopter and water trapping gather would not occur during the lek timing restriction of March 1 – May 15 to protect breeding Greater sage-grouse.
    - Helicopter gathers would not occur during the nesting timing restriction of April 1 – June 30 within 4 miles of an active or pending lek.
    - Water trapping operations would not occur during nesting timing restriction April 1 – June 30 within 1 mile of an active or pending lek.
    - Water trapping operations would not occur at springs and seeps during brood-rearing timing restriction of May 1 – September 15 without a timing waiver.

2.6.1. Helicopter Drive Trapping

The BLM would utilize a contractor to perform the gather activities in cooperation with the BLM. 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, WO.

Per BLM WO IM No. 2013-059 and BLM WO IM No. 2010-164 helicopter landings would not be allowed in wilderness except in the case of an emergency.
Helicopter-drive trapping may be needed to meet management objectives to capture the highest percentage of wild horses possible. The appropriate gather method would be decided by the Wild Horse and Burro Specialist based on the location, accessibility of the animals, local terrain, vegetative cover, and available sources of water and forage. The use of roping from horseback could also be used when necessary. Based on wild horse watering locations in this area, it is estimated that multiple trap sites may

be used during trapping activities.

Helicopter drive trapping involves use of a helicopter to herd wild horses into a temporary trap. The SOPs outlined in Appendix IV would be implemented to ensure that the gather is conducted in a safe and humane manner, and to minimize potential impacts or injury to the wild horses. Utilizing the topography, traps would be set in areas with high probability of horse access. This would assist with capturing excess wild horses residing nearby. 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 fibrous material, not wire, to avoid injury to the horses. The wings form an alley way used to guide the horses into the trap. Trap locations are changed during the gather to reduce the distance that the animals must travel. A helicopter is used to locate and herd wild horses to the trap location. The pilot uses a pressure and release system while guiding them to the trap site, allowing them to travel at their own pace. As the herd approaches the trap the pilot applies pressure and a prada horse is released guiding the wild horses into the trap. Once horses are gathered, they are removed from the trap and transported to a temporary holding facility where they are sorted.

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

2.6.2. Bait/Water Trapping

Bait and/or water trapping would be used as appropriate to gather wild horses efficiently and effectively. Bait and water trapping may be utilized, when wild horses are in an area where there are limited resource (such as food or water). The use of bait and water trapping, though effective in specific areas and circumstances, would not be timely, cost-effective or practical as the primary or sole gather method for the Complex. However, water or bait trapping could be used as a supplementary approach to achieve the desired goals of Alternatives A-C throughout portions of the Complex. Bait and/or water trapping generally require a longer window of time for success than helicopter drive trapping. Although the trap would be set in a high probability area for capturing excess wild horses residing within the area and at the most effective time periods, time is required for the horses to acclimate to the trap and/or decide to access the water/bait.

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

Gathering excess horses using bait/water trapping could occur at any time of the year and traps would remain in place until the target numbers of animals are removed. As the proposed bait and/or water trapping in this area is a lower stress approach to gathering wild horses, such trapping can continue into the foaling season without harming the mares or foals.

2.6.3. Gather-related Temporary Holding Facilities (Corrals)

Wild horses that are gathered would be transported from the gather sites to a temporary holding corral. At the temporary holding corral wild horses would be sorted into different pens. Mares would be identified for fertility control and treated at the corrals. The horses would be provided good quality hay and water. At the temporary holding facility, a veterinarian, when present, would provide recommendations to the

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

Herd health and characteristics data would be collected as part of continued monitoring of the wild horse herds. Genetic baseline data would be collected to monitor the genetic health of the wild horses within the combined project area. Additional samples may be collected to analyze ancestry.

Gathered wild horses would be transported to BLM off-range corrals where they would be prepared for adoption and/or sale to qualified individuals or transfer to off-range pastures or other disposition authorized by the WFRHBA.

2.6.4. Transport, Off-range Corrals, and Adoption Preparation

All gathered wild horses would be removed and transported to BLM off range corrals where they would be inspected by facility staff (and if needed by a contract veterinarian) to observe health conditions and ensure that the animals are being humanely cared for. Wild horses removed from the range would be transported to the receiving Off-Range Corrals (ORC, formerly short-term holding facility) in a goose-neck stock trailer or straight-deck semi-tractor trailers. Trucks and trailers used to haul the wild horses would be inspected prior to use to ensure wild horses can be safely transported. Wild horses would be segregated by age and sex when possible and loaded into separate compartments. Mares and their un-weaned foals may be shipped together. Transportation of recently captured wild horses is limited to a maximum of 10 hours.

Upon arrival, recently captured wild horses are off-loaded by compartment and placed in holding pens where they are provided good quality hay and water. Most wild horses begin to eat and drink immediately and adjust rapidly to their new situation. At the ORC, a veterinarian provides recommendations to the BLM regarding care, treatment, and if necessary, euthanasia of the recently captured wild horses. Any animals affected by a chronic or incurable disease, injury, lameness or serious physical defect (such as severe tooth loss or wear, club foot, and other severe congenital abnormalities) would be humanely euthanized using methods acceptable to the AVMA. Wild horses in very thin condition, or animals with injuries, are sorted and placed in hospital pens, fed separately, and/or treated for their injuries.

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

2.6.5. Adoption

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

2.5.6. Sale with Limitations

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

2.6.7. Off-Range Pastures

When shipping wild horses for adoption, sale or Off-Range Pastures (ORPs), the animals may be transported for up to a maximum of 24 hours. Immediately prior to transportation, and after every 24 hours of transportation, animals are off-loaded and provided a minimum of 8 hours on the-ground rest. During the rest period, each animal is provided access to unlimited amounts of clean water and two pounds of good quality hay per 100 pounds of body weight with adequate space to allow all animals to eat at one time. Mares and sterilized stallions (geldings) are segregated into separate pastures. Although the animals are placed in ORP, they remain available for adoption or sale to qualified individuals; and foals born to pregnant mares in ORP are gathered and weaned when they reach about 8-12 months of age and are also made available for adoption. The ORP contracts specify the care that wild horses must receive to ensure they remain healthy and well-cared for. Handling by humans is minimized to the extent possible although regular on-the-ground observation by the ORP contractor and periodic counts of the wild horses to ascertain their well-being and safety are conducted by BLM personnel and/or veterinarians.

2.6.8. Euthanasia or Sale without Limitations

Under the WFRHBA, healthy excess wild horses can be euthanized or sold without limitation if there is no adoption demand for the animals. However, while euthanasia and sale without limitation are allowed under the statute, for several decades Congress has prohibited the use of appropriated funds for this purpose. If Congress were to lift the current appropriations restrictions, then it is possible that excess horses removed from the Complex over the next 10 years could potentially be euthanized or sold without limitation consistent with the provisions of the WFRHBA.

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

2.6.9. 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 within Nevada (Appendix V). This protocol is intended to establish observation locations that reduce safety risks to the public during helicopter gathers (e.g., from helicopter-related debris or from the rare helicopter crash landing, or from the potential path of gathered wild horses), to the wild horses (e.g., by ensuring observers would not be in the line of vision of wild horses being moved to the gather site), and to contractors and BLM employees who must remain focused on the gather operations and the health and well-being of the wild horses. Observation locations would be located at gather or holding sites and would be subject to the same cultural resource requirements as those sites.

During water/bait trapping operations, spectators and viewers would be prohibited as it would impact the contractor's ability to capture wild horses. Only essential gather operation personnel would be allowed at the trap site during operations.

2.7 Alternatives Considered but Eliminated from further Consideration

The following alternatives to the helicopter drive and bait/water trapping method for the removal of wild horses to reach the established AML were considered but eliminated from detailed analysis for the reasons stated below.

2.7.1. Field Darting Horses with ZonaStat-H (Native PZP) or GonaCon-Equine
This alternative was eliminated from further consideration as the sole method of population reduction and control due to the difficulties inherent in darting wild horses in the project area. Field darting of wild horses works in small areas with good access where animals are acclimated to the presence of people who come to watch and photograph them. The size of the Complex is very large (1,106,076 acres) and many areas do not have access. The presence of water sources on both private and public lands inside and outside the Complex would make it almost impossible to restrict wild horse access to be able to dart horses consistently. Horse behavior limits their approachability/accessibility, so that the number of mares expected to be treatable via darting would be insufficient to control growth. BLM would have difficulties keeping records of animals that have been treated due to common and similar colors and patterns. This formulation of PZP also requires a booster given every year following treatment to maintain the highest level of efficacy. Annual darting of wild horses in large areas can be very difficult to replicate and would be unreliable. For these reasons, this alternative was determined to not be an effective or feasible method applying population controls to wild horses from the Complex. Darting is included as a potential tool for use under the Proposed Action in areas that may be deemed suitable in the future, and to be implemented in concert with the other methods detailed in the Proposed Action.

2.6.2. Control of Wild Horse Numbers by Fertility Control Treatment Only (No Removals)
An alternative to gather a significant portion of the existing population (95%) and implement fertility control treatments only, without removal of excess wild horses was modeled using a three-year gather/treatment interval over an 11-year period, in the WinEquus software. Based on this modeling, this alternative would not result in attainment of the AML range for the Complex and the wild horse population would continue to have an average population growth rate of 13% to 23.9%, adding to the current wild horse overpopulation, albeit at a slower rate of growth. Over the next 11 years an average of 90,930 wild horse captures would need to take place, to allow for injection of vaccines for population control. Of those, 41,446 mare captures would lead to treatment with PZP vaccine or other accepted fertility control vaccines. It is important to understand that in this scenario, each time a wild horse is gathered it is counted, even though the same wild horse may be gathered multiple times during the 11-year period. And each time wild horse is treated with PZP-22, it is counted even though the same wild horse may be treated multiple times over the 11-year period. See Appendix VI for population modeling.

This alternative would not bring the wild horse population to within the established AML range, would allow the wild horse population to continue to grow even further in excess of AML, and would allow resource concerns to further escalate. Implementation of this alternative would result in increased gather and fertility control costs without achieving a thriving natural ecological balance or resource management objectives. This alternative would not meet the purpose and need and therefore was eliminated from further consideration.

2.6.3. Chemical Immobilization
Chemical immobilization as a method of capturing wild horses is not a viable alternative because it is a very specialized technique and is strictly regulated. Currently the BLM does not have sufficient expertise to implement this method and it would be impractical to use given the size of the Complex, access limitations and approachability of the horses.

2.6.4. Use of Wrangler on Horseback Drive-trapping
Use of wranglers on horseback drive-trapping to remove excess wild horses can be somewhat effective on a small scale but due to the number of horses to be gathered, the large geographic size of the Complex, and lack of approachability of the animals, this technique would be ineffective and impractical as a substitute for helicopter trapping. Wild horses often outrun and outlast domestic horses carrying riders. Helicopter assisted roping is typically only used if necessary and when the wild horses are in close proximity to the gather site. For these reasons, this method was eliminated from further consideration.

2.6.5. Designate the HMAs to be Managed Principally for Wild Horse Herds Under 43 C.F.R. 4710.3-2.

The HMAs areas are designated in the Land Use Planning process for the long-term management of wild horses. The (BLM) Bristlecone and Tonopah Field Office and Humboldt-Toiyabe National Forest do not administer any designated Wild Horse or Burro Ranges, which under 43 C.F.R. 4710.3-2 are ”to be managed principally, but not necessarily exclusively, for wild horse or burro herds.” There are currently only four designated Wild Horse or Burro Ranges. This alternative would involve no removal of wild horses and would instead address excess wild horse numbers through removal or reduction of livestock within the HMAs. In essence, this alternative would exchange use by livestock for use by wild horses. Because this alternative would mean converting the HMAs to wild horse Ranges and modifying the existing multiple use relationships established through the land-use planning process, it would first require an amendment to the RMP, which is outside the scope of this EA. This alternative was not brought forward for analysis because it is inconsistent with the 2008 Ely RMP, the 1997 Tonopah RMP and the WFRHBA which directs the Secretary to immediately remove excess wild horses where necessary to ensure a thriving natural ecological balance and multiple use relationship. This alternative is also inconsistent with the BLM’s multiple use management mission under FLPMA. Changes to or the elimination of livestock grazing cannot be made through a wild horse gather decision. Furthermore, even with significantly reduced levels of livestock grazing within the gather area relative to the permitted levels authorized in the 2008 Ely RMP, there is insufficient habitat for the current population of wild horses, as confirmed by monitoring data. As a result, this alternative was not analyzed in detail.

2.6.6. Raising the Appropriate Management Levels for Wild Horses

Delay of a gather until the AMLs can be reevaluated is not consistent with the WFRHBA, Public Rangelands Improvement Act (PRIA) or FLPMA or the existing Ely and Tonopah RMPs
Monitoring and other historical data collected within the Complex does not indicate that an increase in AML is warranted at this time. On the contrary, such monitoring data confirms the need to remove excess wild horses above AML to reverse downward trends, promote improvement of rangeland health and ensure safety and health of wild horses. Delay of a gather until AML can be evaluated and adjusted is not consistent with the WFRHBA, Public Rangelands Improvement Act (PRIA) or FLPMA or the existing Ely and Tonopah RMPs. Severe range degradation would occur in the meantime and large numbers of excess wild horses would ultimately need to be removed from the range in order to achieve the AMLs or to prevent the death of individual animals under emergency conditions. This alternative was eliminated from further consideration because it is contrary to the WFRHBA which requires the BLM to manage the rangelands to prevent the range from deterioration associated with an overpopulation of wild horses. Raising the AML where there are known resource degradation issues associated with an overpopulation of wild horses does not meet the Purpose and Need to Restore a TNEB or meet Rangeland Health Standards.

2.6.7. Remove or Reduce Livestock Within the HMAs

This alternative would involve no removal of wild horses and would instead address excess wild horse numbers through removal or reduction of livestock within the HMAs. In essence, this alternative would simply exchange use by livestock for use by wild horses. This alternative was not brought forward for analysis because it is inconsistent with the Ely and Tonopah RMP, and the WFRHBA which directs the Secretary to immediately remove excess wild horses.
The proposal to reduce livestock would not meet the Purpose and Need for action identified in Section 1.2: “to achieve and maintain the AML through removal of excess wild horses from within and outside of the HMA boundaries, and to reduce the population growth rate prevent undue or unnecessary degradation of the public lands, and protect rangeland resources from deterioration associated with excess wild horses within the HMAs, and to restore a thriving natural ecological balance and multiple use relationship on the public lands consistent with the provisions of Section 1333 (a) of the 1971 WFRHBA.”

Eliminating or reducing grazing in order to shift forage use to wild horses would not be in conformance

with the existing Land Use Plans and is contrary to the BLM's multiple-use mission as outlined in FLPMA and would be inconsistent with the WFRHBA and PRIA. It was Congress' intent to manage wild horses and burros as one of the many uses of the public lands, not a single use. Therefore, the BLM is required to manage wild horses and burros in a manner designed to achieve a thriving natural ecological balance between wild horse and burro populations, wildlife, domestic livestock, vegetation and other uses.

Information about the Congress' intent is found in the Senate Conference Report (92-242) which accompanies the 1971 WFRHBA (Senate Bill 1116): "*The principal goal of this legislation is to provide for the protection of the animals from man and not the single use management of areas for the benefit of wild free-roaming horses and burros. It is the intent of the committee that the wild free-roaming horses and burros be specifically incorporated as a component of the multiple-use plans governing the use of the public lands.*"

Furthermore, simply re-allocating livestock Animal Unit Months (AUMs) to increase the wild horse AMLs would not achieve a thriving natural ecological balance. Wild horses are unlike livestock which can be confined to specific pastures, limited to specific periods of use, and specific seasons-of-use so as to minimize impacts to vegetation during the critical growing season and to riparian zones during the summer months. Wild horses are present year-round and their impacts to rangeland resources cannot be controlled through establishment of a grazing system, such as for livestock. Thus, impacts from wild horses can only be addressed by limiting their numbers to a level that does not adversely impact rangeland resources and other multiple uses.

Livestock grazing can only be reduced or eliminated through provisions identified within regulations at 43 CFR § 4100 and must be consistent with multiple use allocations set forth in LUP/RMPs. Such changes to livestock grazing cannot be made through a wild horse gather decision and are only possible if BLM first revises the LUPs to allocate livestock forage to wild horses and to eliminate or reduce livestock grazing. Because this alternative is inconsistent with the Ely and Tonopah RMPs, it would first require an amendment to the RMP, which is outside the scope of this EA.

2.6.8. Wild Horse Numbers Controlled by Natural Means

This alternative was eliminated from further consideration because it is contrary to the WFRHBA which requires the BLM to prevent range deterioration associated with an overpopulation of wild horses. The alternative of using natural controls to achieve a desirable AML has not been shown to be feasible in the past (NRC 2013).

Survival rates for wild horses on western USA public lands are high (Ransom et al. 2016). None of the significant natural predators from native ranges of the wild equids in Europe, Asia, and Africa — wolves, brown bears, and African lions — exist on the wild horse ranges in the western United States (mountain lions are known to predate on horses, primarily foals, in a few herds, but predation contributes to biologically meaningful population limitation in only a handful of herds). In some cases, adult annual survival rates exceed 95%.

Many horse herds grow at sustained high rates of 15-25% per year and are not a self-regulating species (NRC 2013). The NAS report (NRC 2013) concluded that the primary way that equid populations self-limit is through increased competition for forage at higher densities, which results in smaller quantities of forage available per animal, poorer body condition and decreased natality and survival. It also concluded that the effect of this would be impacts to resource and herd health that are contrary to BLM management objectives and statutory and regulatory mandates. This alternative would result in a steady increase in the wild horse populations which would continue to exceed the carrying capacity of the range resulting in a catastrophic mortality of wild horses in the Complex, and irreparable damage to rangeland resources.

While some members of the public have advocated "letting nature take its course", allowing horses to die of dehydration and starvation would be inhumane treatment and would be contrary to the WFRHBA, which mandates removal of excess wild horses. The damage to rangeland resources that results from excess numbers of wild horses is also contrary to the WFRHBA, which mandates the Bureau to "*protect the range from the deterioration associated with overpopulation*", "*remove excess animals from the range so as to achieve appropriate management levels*", and "*to preserve and maintain a thriving natural ecological balance and multiple-use relationship in that area*".

Title 43 CFR § 4700.0-6 (a) states "*Wild horses shall be managed as self- sustaining populations of healthy animals in balance with other uses and the productive capacity of their habitat*". As the vegetative and water resources are over utilized and degraded to the point of no recovery as a result of the wild horse overpopulation, wild horses would start showing signs of malnutrition and starvation. The weaker animals, generally the older animals, and the mares and foals, would be the first to be impacted. It is likely that a majority of these animals would die from starvation and dehydration which could lead to a catastrophic die off. The resultant population could be heavily skewed towards the stronger stallions which could contribute to social disruption in the Complex. Competition between wildlife and wild horses for forage and water resources would be severe. Wild horses can be aggressive around water sources, and some wildlife may not be able to compete, which could lead to the death of individual animals. Wildlife habitat conditions would deteriorate as wild horse numbers above AML reduce herbaceous vegetative cover, damage springs and increase erosion, and could result in irreversible damage to the range. This degree of resource impact would likely lead to management of wild horses at a greatly reduced level if BLM is able to manage for wild horses at all on the Complex in the future. For these reasons, this alternative was eliminated from further consideration. This alternative would not meet the Purpose and Need for this EA which it is to remove excess wild horses from within and outside the Complex and to reduce the wild horse population growth rates to manage wild horses within established AML ranges.

2.6.9. Gathering the Complex to Upper Range of AML

Under this Alternative, a gather would be conducted to gather and remove enough wild horses to achieve the upper range of the AML (638 in the Pancake Complex). A post-gather population size at the upper range of the AML would result in AML being exceeded following the next foaling season. This would be unacceptable for several reasons.

The AML represents "*that 'optimum number' of wild horses which results in a thriving natural ecological balance and avoids a deterioration of the range*" Animal Protection Institute, 109 IBLA 119 (1989). The Interior Board of Land Appeals 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 for the Pancake Complex represents the maximum population for which thriving natural ecological balance would be maintained. The lower level represents the number of animals that should remain in the complex immediately following a wild horse gather that brings the population back to AML in order to allow for a periodic gather cycle and to prevent the population from exceeding the established AML between gathers.

Additionally, gathering only to the upper range of AML, would result in the need to follow up with another gather by the next year and could result in continued overutilization of vegetation resources and damage to important wildlife habitats. Frequent gathers could increase the stress to wild horses, as individuals and as entire herds.

This alternative would not meet the Purpose and Need for this EA which it is to remove excess wild

horses from within and outside the Pancake Complex, to reduce the wild horse population growth rates to manage wild horses within established AML ranges, and to minimize the frequency of gathers needed to remove excess wild horses.

The need for the action is to prevent undue or unnecessary degradation of the public lands associated with excess wild horses, to restore a thriving natural ecological balance and multiple use relationship on public lands, consistent with the provisions of Section 1333(b) of the 1971 Wild Free-Roaming Horses and Burros Act (WFRHBA). For these reasons, this alternative was eliminated from further consideration.

3.0 AFFECTED ENVIRONMENT/ENVIRONMENTAL EFFECTS

3.1 Identification of Issues:

Internal scoping was conducted by an interdisciplinary (ID) team on April 20, 2020, that analyzed the potential consequences of the Proposed Action. Potential impacts to the following resources/concerns were evaluated in accordance with criteria listed in the NEPA Handbook H-1790-1 (2008) page 41, to determine if detailed analysis was required. Consideration of some of these items is to ensure compliance with laws, statutes or Executive Orders that impose certain requirements upon all Federal actions. Other items are relevant to the management of public lands in general, and to the Ely and Battle Mountain Districts BLM in particular.

Table 2. summarizes which of the supplemental authorities of the human environment and other resources of concern within the project area are present, not present or not affected by the Proposed Action.

Table 2. Summary of Supplemental Authorities and Other Elements of the Human Environment

Resource/Concern	Issue(s) Analyzed? (Y/N)	Rationale for Dismissal from Detailed Analysis or Issue(s) Requiring Detailed Analysis
Air Quality	N	The air quality status for the project analysis area in White Pine and Nye Counties is termed “unclassifiable” by the State of Nevada. No data is collected in White Pine County or in areas outside of Pahrump in southeastern Nye County due to the expectation that annual particulate matter would not exceed national standards. The proposed action or alternatives would not affect air quality in White Pine or Nye Counties.
Areas of Critical Environmental Concern (ACEC)	N	Not present in the designated HMA boundaries.
Cultural Resources	N	In accordance with the SOPs for Gather and Handling Activities in Appendix VI (BLM/SHPO Protocol), gather facilities would be placed in previously disturbed areas. Should new, previously undisturbed gather sites or holding facility locations be required, appropriate Class III cultural resource inventories would be conducted to avoid placing gather facilities in areas with cultural resources and to ensure that measures are taken to avoid any cultural resource impacts.
Forest Health	N	Project has a negligible impact directly, indirectly and cumulatively to forest health. Detailed analysis not required.
Migratory Birds	Y	Effects to resource are analyzed in this EA.
Rangeland Standards and Guidelines	Y	Effects to resource are analyzed in this EA
Native American Religious and other Concerns	N	No potential traditional religious or cultural sites of importance have been identified in the project according to the Ely District RMP Ethnographic Report (2003).

Resource/Concern	Issue(s) Analyzed? (Y/N)	Rationale for Dismissal from Detailed Analysis or Issue(s) Requiring Detailed Analysis
Wastes, Hazardous or Solid	N	No hazardous or solid wastes exist in the designated HMA boundaries, nor would any be introduced.
Water Quality, Drinking/Ground	N	The proposed action or alternatives would not affect drinking or groundwater quality. The project design would avoid surface water and riparian systems and no water wells would be affected.
Environmental Justice and Socioeconomics	N	The Proposed Action would not have disproportionately high or adverse effects on low income or minority populations. Health and environmental statues would not be compromised. The Proposed Action would not disproportionately impact social or economic values.
Floodplains	N	The project analysis area was not included on FEMA flood maps.
Farmlands, Prime and Unique	N	Resource not present.
Species Threatened, Endangered or Proposed for listing under the Endangered Species Act.	N	The Railroad Valley springfish (*Crenichthys nevadae) is a Federally Threatened species and* is found in two springs on the Duckwater Shoshone Reservation. The gather would take place entirely on BLM land and would therefore not affect this species.
Wetlands/Riparian Zones	Y	Effects to resource are analyzed in this EA.
Non-native Invasive and Noxious Species	Y	Impacts under each alternative could result in increasing weed populations. Analysis in EA.
Wilderness/WSA	Y	Effects to resource are analyzed in this EA.
Lands with Wilderness Characteristics	N	6 BLM LWC inventory units (NV-040:131E,131E4, 131F, 148-1, 148-2,158-2) are contiguous with USFS Wilderness. Impacts to Wilderness Character are same as those analyzed under Wilderness and WSA.
Human Health and Safety	N	Risks have been assessed to mitigate any safety hazards in the form of safety plans and risk management worksheets.
Wild and Scenic Rivers	N	Not Present.
Special Status Plant and Animal Species	Y	Effects to resource are analyzed in this EA.
Fish and Wildlife	Y	Effects to resource are analyzed in this EA.
Paleontology	N	There are Mollusks and Brachiopods/corals identified within the Jakes Wash HA. All known Paleontology would be avoided during the gather operations; therefore, no effects are expected from the Proposed Action
Wild Horses	Y	Effects to resource are analyzed in this EA.
Soils Resources	Y	Effects to resource are analyzed in this EA.
Water Resources (Water Rights)	N	The proposed action and alternatives would not affect water resources or water rights. Project design would avoid surface water and riparian systems. Permitted or pending water uses would not be affected.
Mineral Resources	N	There would be no modifications to mineral resources through the Proposed Action.
Vegetation Resources	Y	Impacts under each alternative could result in improving or deteriorating native plant communities. Effects to resource are

Resource/Concern	Issue(s) Analyzed? (Y/N)	Rationale for Dismissal from Detailed Analysis or Issue(s) Requiring Detailed Analysis
		analyzed in this EA.

3.2. General Setting

The Pancake Complex is within the Great Basin physiographic region, characterized by a high, rolling plateau underlain by basalt flows covered with a thin loess and alluvial mantle. On many of the low hills and ridges that are scattered throughout the area, the soils are underlain by bedrock. Elevations within the Complex range from approximately 5,000 feet to 11,000 feet. Annual precipitation ranges from approximately 5 inches or less on some of the valley bottoms to 20 inches on the mountain peaks. Most of this precipitation comes during the winter and spring months in the form of snow, supplemented by localized thunderstorms during the summer months. Temperatures range from greater than 90 degrees to 98 degrees Fahrenheit in the summer months to minus 20 degrees in the winter. The area is also utilized by domestic livestock and numerous wildlife species.

3.3. Wild Horses

Affected Environment

Pancake HMA

The Egan RMP (1987 Ely District) designated the Monte Cristo and Sand Springs East HMAs for the long-term management of wild horses. These HMAs were later combined into the Pancake HMA in the August 2008 Ely District Record of Decision (ROD) and Approved Resource Management Plan (RMP) due to the interchange between the two HMAs. The HMA is nearly identical in size and shape to the original Herd Areas representing where wild horses were located in 1971. Some fences exist within the HMA but do not restrict wild horse movement as they are open ended drift fences. Currently, management of HMAs and wild horse populations within the Ely District is guided by the Ely District RMP. The AML range for the HMA is 240-493 wild horses. The current estimated population is estimated at a range of 1,829-3004.

Water available for use by wild horses within the Pancake HMA is limited to a few perennial sources. Ike Spring, Moody Spring and Indian Spring tend to produce water year-round. As water supplies become depleted at other smaller water sources, wild horses tend to concentrate around these primary water sources causing negative effects to riparian resources. These water sources are monitored throughout the summer to make sure water is available for wild horse. The Young Florio Spring water development has been damaged by excess numbers of wild horses as they search for water. During the summer months this spring only produces a trickle of water. This water development has been fixed several times with repairs to the pipeline. Following each repair, the wild horses have damaged the water development by pawing and breaking the pipeline. Young Florio Well is an ephemeral water source which, depending on the year's precipitation level in the area, may or may not produce water and during summer months helps relieve pressure from Young Florio Spring. However, it is not a reliable source of perennial water. At Martiletti Spring, a development of pipeline and trough system was installed in 2015 has helped contain the water that the spring produces however the flow changes seasonally and all but dries up in the hot summer months. Moody spring had a fence exclosure put around the spring to protect the spring source while allowing the water to seep out and fill a catch pond below it. In 2016 and 2018 an emergency gather took place at Moody and Martilletti springs to reduce the number of horses that were relying on these drying up water sources. Wild horses also rely on springs located on the Forest Service lands within and outside the Monte Cristo Wild Horse Territory. The remaining springs within the Pancake HMA might have water in early spring depending on precipitation but are not reliable perennial water sources.

Rangeland resources have been and are currently being impacted within the Pancake HMA due to the

over-population of wild horses. Rangeland Health Standards have found wild horses are contributing factors for not meeting these Standards. Resource monitoring data for the South Sand Springs Valley Use Area – an area that has not been grazed by cattle for the past 20 years -- has found wild horses and drought as the contributing factor in not meeting the Standards.

Utilization data was collected for Pancake HMA April 2019. The key forage species monitored at that time include: Indian ricegrass (*Achnatherum hymenoides*), winterfat (*Krascheninnikovia lanata*), Squirreltail grass (*Elymus elymoides*) and Needleandthread grass (*Hesperostipa comata*). Current monitoring data collected using Range Utilization Key Forage Plant Method over the last three years has indicated Moderate (41-60%) and Heavy (61-80%) utilization directly attributable to wild horses. Use pattern mapping in April 2019 shows wild horse utilization for 7% of the monitoring locations as light, 30% as moderate (41-60%), 34% as heavy (61-80%), and 28% as severe (81-100%).

Jakes Wash HA

The Egan RMP (1987 Ely District) designated the Jakes Wash Herd Area (HA) for the long-term management of wild horses. The August 2008 Ely District Record of Decision (ROD) and Approved Resource Management Plan (RMP) management action WH-5 states: "remove wild horses and drop herd management area status for those… as listed in Table 13." Jakes Wash was dropped from HMA status and returned to HA status (i.e., to manage "0" wild horses) with this management action. The management action to manage for no wild horses within the Jakes Wash HA reflects the recent evaluation based on multi-tiered analysis from the Ely Proposed Resource Management Plan/Final Environmental Impact Statement (November 2007) table 3.8-2 and page 4.8-2. The components and herd characteristics assessed were forage, water, cover, space, and reproductive viability. If one or more of these components were missing, or there was no potential for a stable shared genetic pool, the HMA was considered unsuitable. The Jakes Wash HA has inadequate forage, water, space, and cover for long-term management of wild horses. The current estimated population in Jakes Wash HA is estimated at a range of 46-242 wild horses.

Water available for use by wild horses within the Jakes Wash HA is very limited. Two springs located in the southern end and three stock watering ponds provide the only available water in the northern and central portions of the HA. These ponds are filled with winter/spring runoff or water released from the nearby Illipah reservoir by the water right holder and tend to go dry in mid- to late summer. As these ponds and reservoirs dry up wild horses leave the HA boundary in search of water. During the summer months wild horses can be found outside HA boundaries on US Forest Service lands which are not managed as a Wild Horse Territory. Water is also available for use by wild horses when livestock operators pump three stock-water wells (with privately held water rights) in the southern end of the HA, but that is only for a few months each year when livestock are present.

Utilization data was collected for Jakes Wash HA in March 2019. The key forage species for which BLM collected utilization data in March 2019 were Indian ricegrass and winterfat. Out of 14 monitoring locations, 5 showed moderate use (1 to 20%), 5 showed heavy use (21 to 40%), and 4 showed severe use (61-80 %).

Sand Springs West HMA

The Sand Springs West HMA is administered by the Battle Mountain District, Tonopah Field Office. It is bordered to the northeast by the Pancake HMA, split only by the Battle Mountain and Ely District boundary. Wild horses in the Sand Springs West HMA commonly move back and forth to the Pancake HMA seeking available forage and water.

The Sand Springs West AML of 49 wild horses was initially established through a stipulated agreement (Consent Decision) between BLM, E. Wayne Hage, Colvin and Son Cattle Co., and Russell Ranches through the Department of the Interior Office of Hearings and Appeals, Hearings Division, and was

affirmed by the Tonopah Resource Management Plan (RMP) approved October 6, 1997. The RMP objectives state "*to manage wild horse and/or burro populations within Herd Management Areas at levels which will preserve and maintain a thriving natural ecological balance consistent with other multiple-use objectives*" and "*to manage wild horses and/or burros at appropriate management levels (AML) or interim herd size (IHS) for each HMA . . . .*" The current estimated population is a range of 155-386 wild horses.

Water in the Sand Springs West HMA is limited to man-made water-haul sites developed for grazing livestock. One site (Etcheverria Well) has a small reservoir that seasonally holds run-off water which is available to wild horses. This water accumulates from winter precipitation and snow melt, only to dry up during the hot summer months. Water is available to wild horses temporarily at water haul sites while domestic livestock are grazing; however, they are not reliable sources. Some water hauls sites have small depressions or tanks that may temporarily hold water from natural precipitation; however, they are not consistent or dependable sources. No known natural springs occur on the HMA except along Nevada State Highway 6, at which horses are rarely observed. Many of the wild horses from the Sand Springs West HMA travel into the Pancake HMA administered by BLM in the Ely District or to areas outside of the Sand Springs West HMA in search of water sources. Concentrations of wild horses and cattle around the limited water sources during the summer months increases competition with wildlife for water resources and negatively affect the associated range resources.

Forage quality and quantity on the Sand Springs HMA is generally poor due to a majority of sandy and volcanic soils and little precipitation. Drought is a common occurrence throughout Nevada and the Great Basin the Sand Springs West HMA is no different. Drought conditions during the period of March through June can substantially reduce annual production of forage, as well as have detrimental effects on vegetative health, especially under heavy or repeated grazing. As water becomes scarcer in the summer months, even less forage would be available as wild horses will travel shorter distances from the available water. With the current excess population of wild horses, severe range degradation may occur. Overall wild horse herd and individual health may also be in at risk if AML is not achieved and maintained.

The general vegetation trend for key species from 1981 to 2020 is declining among Indian ricegrass, Winterfat, and Squirreltail grass at most key areas. There are some areas that have increases in cheatgrass (*Bromus tectorum*) and Yellow rabbitbrush (*Chrysothamnus viscidiflorus*) indicating overgrazed rangelands. Galleta grass (*Pleuraphis jamesii*) generally shows a stable to slight increase in trend. These decreases in key species are due in most part to grazing by cattle and wild horses. 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, King et al. 2019).

Utilization data was collected in April 2020 on key forage species including Indian ricegrass, Winterfat, and Squirreltail at 15 Key Areas (KAs) within the Sand Springs West HMA. Many of these KAs were primarily utilized by wild horses, though signs of cattle utilization were also apparent at many sites. Numerous sites and many roads throughout the HMA showed extensive wild horse trailing and stud piles. Utilization data was documented for the previous year (2019). Utilization data averages for 2019 ranged from slight (6-20%) in the hills and on the benches to heavy (61-80%) and severe (81-100%) in the valley bottoms. In general, utilization was lower on benches, likely due to limited availability of water. Several sites were dominated by Yellow rabbitbrush, an indication of historic overutilization. While some new growth of both grasses and shrubs was observed at most KAs, plant vigor for those individuals exhibiting heavy to severe utilization was lower than would otherwise be expected. Cheatgrass was dominant at five of the KAs. Push outs (shallow water ponds for animal watering) in valley bottoms were all dry or nearly dry.

Body condition scores of horses observed in the Sand Springs West HMA in 2020 ranged from a Henneke body condition score (BCS) of 2 (very thin/emaciated) to 4 (moderately thin).

Monte Cristo WHT

The Monte Cristo Wild & Free Roaming Horses Management Plan established a baseline AML of 72–120 wild horses, with an average of 96 head to be maintained. These numbers were based on proper use studies conducted on the natural horse concentration areas. The baseline AML was adjusted to 72–96 through the Humboldt National Forest Land & Resource Management Plan in 1986. Range conditions have not improved given the number of horses occupying the area. The current estimated population is 232 wild horses. The population within this HMA can fluctuate depending on the seasonal movement of the wild horses.

Pancake Complex

Population inventory flights have been conducted in the Complex every two to three years. These population inventory flights have provided information pertaining to population numbers, foaling rates, distribution, and herd health. A population inventory was conducted March 2020 utilizing a direct count method and 2,330 wild horses were observed throughout the project area. Wild horse body condition scores (BCS) within the Complex currently range from a score of 2-5 (Very thin/emaciated – Moderate) based on the Henneke Body Condition Chart and some animals at time of gather may have a lower BCS of 2-3 (Very thin – Thin). Genetic baseline data would be collected to monitor the genetic diversity of the wild horses within the project area. Samples may also be taken for ancestral analysis.

Standards determination documents and rangeland health evaluations have identified wild horses as a contributing factor for non-achievement of some standards for rangeland health and management objectives. The achievement or non-achievement of standards for rangeland health are summarized in Appendix VII. These standard determination documents, evaluations and write-ups are available at the Bristlecone and Tonopah Field Offices.

Population Modeling

Population modeling was completed for the proposed action and alternatives to analyze how the alternatives would affect the wild horse populations. Analysis included removal of excess wild horses with no fertility control, as compared to alternatives which consider removal of excess wild horses with fertility control and sex ratio adjustments. The No Action (no removal) Alternative was also modeled (Appendix VI). The primary objective of the modeling was to identify if any of the alternatives “crash” the population or cause extremely low population numbers or growth rates. The results of population modeling show that minimum population levels and growth rates would be within reasonable levels and adverse impacts to the population would not be likely under Alternatives A, B, C, and D. Graphic and tabular results are displayed in detail in Appendix VI.

Genetic Diversity

The Sand Springs East HMA, which became part of the Pancake HMA, was sampled for genetic diversity in the past. Results from nearby HMAs are also informative, and indicate that genetic diversity is expected to be high within the Pancake complex. Based on samples from the Sand Springs East HMA, Cothran (2009) noted that, "Genetic variability of this herd is high. The values related to allelic diversity in particular suggest a herd with highly mixed ancestry...No action is needed at this time due to the high variability and relatively high AML." Future genetic sampling and monitoring would be facilitated by gather operations. If necessary, animals would be introduced into the Complex to increase heterozygosity.

Because of history, context, and periodic introductions, wild horses that live in the Pancake Complex should not be considered as truly isolated populations (NAS 2013). Rather, managed herds of wild horses should be considered as components of interacting metapopulations, connected by interchange of

individuals and genes due to both natural and human-facilitated movements. These animals are part of part of a larger metapopulation (NRC 2013) that has demographic and genetic connections with other BLM-managed herds in Nevada, Utah, and beyond. Wild horse herds in the larger metapopulation have a background of diverse domestic breed heritage, probably caused by natural and intentional movements of animals between herds. Even at low AML, the herd size of wild horses in the Pancake complex would be 361; even if half of the mares are infertile at any one point, that number, along with interchange from nearby herds, should allow for a low rate of loss of observed heterozygosity. Under the proposed action, hair samples would be collected during gathers, from at least 25 animals, to assess the genetic diversity of the herds. Analysis would determine whether management is maintaining acceptable genetic diversity (and avoiding excessive risk of inbreeding depression).

Under all action alternatives, wild horse introductions from other HMAs could be used if needed, to augment observed heterozygosity, which is a measure of genetic diversity, the result of which would be to reduce the risk of inbreeding-related health effects. Introducing a small number of 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 other evidence that shows that wild horses in the Pancake HMA (i.e. when it was Sand Springs East HMA) and in herds very close to the Complex are not genetically unusual, with respect to other wild horse herds. Specifically, Appendix F of the 2013 NAS report is a table showing the estimated 'fixation index' (Fst) values between 183 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). Pairwise Fst values for Sand Springs East HA were less than 0.05 with over 120 other sample sets. These results suggest that herds in and near the Pancake complex were extremely similar to a third to two thirds of other BLM-managed herds, supporting the interpretation that Pancake Complex horses are components in a highly connected metapopulation that includes horse herds in many other HMAs.

Environmental Effects

No Action Alternative

Under the No Action Alternative, no population growth suppression action or wild horse removals (gathers) would take place. The population of the wild horses within the Pancake Complex would continue to grow at the national average rate of increase seen in the majority of HMAs of 20 to 25% per year.

The wild horse population levels would not achieve AML or a thriving natural ecological balance, and excess concentrations of wild horses would continue to impact site specific areas throughout the Complex at this time. The animals would not be subject to the individual direct or indirect impacts as a result of a trapping operation. Over the short-term, individual animals in the herd would be subject to increased stress and possible death as a result of increased competition for water and/or forage as the population continues to grow even further in excess of the land's capacity to meet the wild horses' habitat needs. The areas currently experiencing heavy to severe utilization by wild horses would increase over time and degradation could become irreversible in areas where ecological thresholds are passed.

This alternative would be expected to result in increasing damage to rangeland resources throughout the Complex. Trampling and trailing damage by wild horses in/around riparian and impacts to rangeland

resources would also be expected to increase, resulting in larger, more extensive areas of poor range condition, some of which might be unable to recover even after removal of excess horses. Competition for the available water and forage among wild horses, domestic livestock, and native wildlife would continue and further increase.

Wild horses are a long-lived species with survival rates estimated between 80 and 97% and may be the determinant of wild horse population increases (Garrott and Taylor 1990, Ransom et al. 2016). Predation and disease have not substantially regulated wild horse population levels within or outside the project area. Throughout the HMAs few predators exist to control wild horse populations. Some mountain lion predation occurs but does not appear to be substantial, as evidenced by the continued high growth rates in the herds. Coyotes are not prone to prey on wild horses unless the horses are young, or extremely weak. Other predators such as wolf or bear do not inhabit the area in high enough numbers to cause an effect on horse growth rates. Being a non-self-regulating species (NRC 2013), there would be a steady increase in wild horse numbers for the foreseeable future, which would continue to exceed the carrying capacity of the range. Individual wild horses would be at risk of death by starvation and lack of water as the population continues to grow annually. The wild horses would compete for the available water and forage resources, affecting mares and foals most severely. Social stress would increase. Fighting among stud horses would increase as well as injuries and death to all age classes of animals as the studs protect their position at scarce water sources. Significant loss of the wild horses in the Complex due to starvation or lack of water would have obvious consequences to the long-term viability of the herd. Allowing wild horses to die of dehydration and starvation would be inhumane treatment and would be contrary to the WFRHBA, which mandates removal of excess wild horses.

The damage to rangeland resources that results from excess numbers of wild horses is also contrary to the WFRHBA, which mandates the Bureau to "protect the range from the deterioration associated with overpopulation", "remove excess animals from the range so as to achieve appropriate management levels", and "to preserve and maintain a thriving natural ecological balance and multiple-use relationship in that area." Once the vegetative and water resources are at critically low levels due to excessive utilization by an overpopulation of wild horses, the weaker animals, generally the older animals and the mares and foals, are the first to be impacted. It is likely that a majority of these animals would die from starvation and dehydration. The resultant population would be extremely skewed towards the stronger stallions which would lead to significant social disruption in the Complex. By managing the public lands in this way, the vegetative and water resources would be impacted first and to the point that they have limited potential for recovery, as is already occurring in some areas hardest hit by the excess wild horses. As a result, the No Action Alternative, by delaying the removal of excess horses from specific areas that are most impacted at this time, would not ensure healthy rangelands that would allow for the management of a healthy wild horse population, and would not promote a thriving natural ecological balance.

As populations increase beyond the capacity of the habitat, more bands of horses would also leave the boundaries of the Complex in search of forage and water, thereby increasing impacts to rangeland resources outside the HMA boundaries as well. This alternative would result in increasing numbers of wild horses in areas not designated for their use and would not achieve and thriving natural ecological balance.

Proposed Action

The Proposed Action would decrease the existing overpopulation of wild horses in the course of successive helicopter drive trap and bait and water trapping operations over a period of ten years. Stallions would be selected for release with the objective of establishing a 60% male ratio out of the low-range AML herd size on the range. Some gelded horses that would otherwise be excess animals permanently removed from the range and sent to ORC for adoption/sales or ORP, may be returned to the range and managed as a nonbreeding population of geldings so long as the geldings do not result in the

population exceeding mid-range AML. Any mares that would be returned to the range would be treated with fertility control (PZP vaccines, GonaCon, IUDs). The target population when the objectives of this alternative are reached is to manage a total population at approximately mid-range AML, or roughly 500 wild horses. The Proposed Action would not reduce all of the associated impacts to the wild horses and rangeland resources as quickly as the other alternatives because the herd would be maintained near mid-AML as opposed to low AML. Over the short-term, individuals in the herd would still be subject to increased stress and possible death as a result of continued competition for water and forage until the project area's population can be reduced to the AML range. The areas experiencing heavy and severe utilization levels by wild horses would likely still be subject to some excessive use and impacts to rangeland resources, those being concentrated trailing, riparian trampling, increased bare ground, etc. These impacts would be expected to continue until the project area's population can be reduced to the AML range and concentration of horses can be reduced.

Removal of excess wild horses would improve herd health. Decreased competition for forage and water resources would reduce stress and promote healthier animals. This removal of excess animals coupled with anticipated reduced reproduction (population growth rate) as a result of fertility control should result in improved health and condition of mares and foals as the actual population comes into line with the population level that can be sustained with available forage and water resources, and would allow for healthy range conditions (and healthy animals) over the longer-term. Additionally, reduced population growth rates would be expected to extend the time interval between large gathers and reduce disturbance to individual animals as well as to the herd social structure over the foreseeable future.
Bringing the wild horse population size back to mid-range AML and slowing its growth rate once that level has been achieved would reduce damage to the range from the current overpopulation of wild horses and allow vegetation resources to start recovering, without the need for additional gathers in the interim. As a result, there would be fewer disturbances to individual animals and the herd, and a more stable wild horse social structure would be provided. Managing a self-sustaining population that includes some component of geldings would also allow BLM to manage the wild horse population at the mid-range of AML once the AML has been achieved, without adversely impacting rangeland resources as a result of a more rapid population growth in excess of AML.

Impacts to individual animals may occur as a result of handling stress associated with the gathering, processing, and transportation of animals. The intensity of these impacts varies by individual animal and is indicated by behaviors ranging from nervous agitation to physical distress. Mortality to individual animals from these impacts is infrequent but does occur in 0.5% to 1% of wild horses gathered in a given gather (Scasta 2019). Other impacts to individual wild horses include separation of members of individual bands of wild horses and removal of animals from the population.

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

Stallions selected for release would be released to increase the post-gather sex ratio to approximately 60% stallions, out of the low AML overall herd size. Stallions would be selected to maintain a diverse age structure, herd characteristics and body type (conformation). It is expected that releasing additional stallions to reach the targeted sex ratio of 60% males would result in smaller band sizes, larger bachelor groups, and some increased competition for mares. With more stallions involved in breeding it should result in a slightly higher genetic effective population size (Ne) relative to total herd size.

Gelding

Castration (the surgical removal of the testicles, also called gelding or neutering) is a well-established

surgical procedure for the sterilization of domestic and wild horses. The procedure is relatively straight forward, rarely leads to serious complications and seldom requires postoperative veterinary care. Gelding adult male horses results in reduced production of testosterone which directly influences reproductive behaviors. Although 20-30% of domestic horses, whether castrated pre- or post-puberty, continued to show stallion-like behavior (Line et al. 1985), it is assumed that free roaming wild horse geldings would exhibit reduced aggression toward other horses and reduced reproductive behaviors. Gelding of domestic horses most commonly takes place before or shortly after sexual maturity, and age-at-gelding can affect the degree to which stallion-like behavior is expressed later in life.

Though castration (gelding) is a common surgical procedure, minor complications are not uncommon after surgery, and it is not always possible to predict when postoperative complications would occur. fortunately, the most common complications are almost always self-limiting, resolving with time and exercise. Individual impacts to the stallions during and following the gelding process should be minimal and would mostly involve localized swelling and bleeding. A small amount of bleeding is normal and generally subsides quickly, within 2-4 hours following the procedure. Some localized swelling of the prepuce and scrotal area is normal and may begin between one to 5 days after the procedure. Swelling should be minimized through the daily movements (exercise) of the horse during travel to and from foraging and watering areas. Most cases of minor swelling should be back to normal within 5-7 days, more serious cases of moderate to severe swelling are also self-limiting and resolve with exercise after one to 2 weeks. Serious complications (eviscerations, anesthetic reaction, injuries during handling, etc.) that result in euthanasia or mortality during and following surgery are rare and vary according to the population of horses being treated. Normally one would expect serious complications in less than 5% of horses operated under general anesthesia, but in some populations these rates can be as high as 12% (Shoemaker 2004). These complications are generally noted within 3 or 4 hours of surgery but may occur any time within the first 7 days following surgery. If they occur, they would be treated in the same manner as at BLM facilities.

By including some geldings in the population and having a slightly skewed sex ratio with more males than females overall, the result would be that there would be a relatively lower number of breeding females in the population and, hence, a lower per-capita growth rate.

The surgery would be performed by a veterinarian using general anesthesia and appropriate surgical techniques. The final determination of which specific animals would be gelded for release would be based on the professional opinion of the attending veterinarian in consultation with the Authorized Officer (see Gelding SOPs in Appendix III).

When gelding procedures are done in the field, geldings would be released near a water source, when possible, approximately 24 to 48 hours following surgery.

When the procedures are performed at a BLM-managed facility, selected stallions would be shipped to the facility, gelded, held in a separate pen to minimize risk for disease, and returned to the range within 30 days.
Gelded animals would be monitored periodically for complications for approximately 7-10 days post-surgery and release. This monitoring would be completed either through aerial recon if available or field observations from major roads and trails. It is not anticipated that all the geldings would be observed but the goal is to detect complications if they are occurring and determine if the horses are freely moving about the HMA. Once released, anecdotal information suggests that the geldings would form bachelor bands. Periodic observations of the long term outcomes of gelding would be recorded during routine resource monitoring work. Such observations could include but not be limited to band size, social interactions with other geldings and harem bands, distribution within their habitat, forage utilization and activities around key water sources. Periodic population inventories and future gather statistics would

assist BLM to determine if managing a portion of the herd as non-breeding animals is an effective approach to slowing the annual population growth rate and extending the gather cycle when used in conjunction with other population control techniques, while allowing more horses to remain on the range.

Surgical sterilization techniques, while not reversible, may provide reproductive control on horses without the need for any additional handling of the horses as required in the administration of chemical contraception techniques. See Appendix XII for a more detailed analysis on gelding.

Effects Common to the Proposed Action and Alternative B

Fertility Control

BLMs Use of Contraception in Wild Horse Management

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

Effects Common to the Proposed Action and Alternatives B, C and D

Over the past 35 years, various impacts to wild horses as a result of gather activities have been observed. Under the Proposed Action, potential impacts to wild horses would be both direct and indirect, occurring to both individual horses and the population as a whole.

Helicopter Drive Trapping

The BLM has been conducting wild horse gathers since the mid-1970s. and has been using helicopters for such gathers since the late 1970's. During this time, methods and procedures have been identified and refined to minimize stress and impacts to wild horses during gather implementation. Published reviews of agency practice during gathers and subsequent holding operations confirm that BLM follows guidelines to minimize those impacts and ensure humane animal care and high standards of welfare (GAO 2008, AAEP 2011, Greene et al. 2013, Scasta 2019). Refer to Appendix II, III, and IV for information on the methods that are utilized to reduce injury or stress to wild horses and burros during gathers. The Comprehensive Animal Welfare Policy (CAWP) would be implemented to ensure a safe and humane gather occurs and would minimize potential stress and injury to wild horses.

In any given gather, gather-related mortality averages only about one half of one percent (0.5%), which is

very low when handling wild animals. Approximately, another six-tenths of one percent (0.6%) of the captured animals, on average, are humanely euthanized due to pre-existing conditions and in accordance with BLM policy (GAO 2008, Scasta 2019). These data affirm that the use of helicopters and motorized vehicles has proven to be a safe, humane, effective, and practical means for the gather and removal of excess wild horses (and burros) from the public lands. The BLM also avoids gathering wild horses by helicopter during the 6 weeks prior to and following the expected peak of the foaling season (i.e., from March 1 through June 30).

Individual, direct impacts to wild horses include the handling stress associated with the roundup, capture, sorting, handling, and transportation of the animals. The intensity of these impacts varies by individual, and is indicated by behaviors ranging from nervous agitation to physical distress. When being herded to trap site corrals by the helicopter, injuries sustained by wild horses may include bruises, scrapes, or cuts to feet, legs, face, or body from rocks, brush or tree limbs. Rarely, wild horses will encounter barbed wire fences and will receive wire cuts. These injuries are very rarely fatal and are treated on-site until a veterinarian can examine the animal and determine if additional treatment is indicated.

Other injuries may occur after a horse has been captured and is either within the trap site corral, the temporary holding corral, during transport between facilities, or during sorting and handling. Occasionally, horses may sustain a spinal injury or a fractured limb but based on prior gather statistics, serious injuries requiring humane euthanasia occur in less than 1 horse per every 100 captured. Similar injuries could be sustained if wild horses were captured through bait and/or water trapping, as the animals still need to be sorted, aged, transported, and otherwise handled following their capture. These injuries can result from kicks and bites, or from collisions with corral panels or gates.

To minimize the potential for injuries from fighting, the animals are transported from the trap site to the temporary (or short-term) holding facility where they are sorted as quickly and safely as possible, then moved into large holding pens where they are provided with hay and water. Fatalities and injuries due to gathers are few and far between with direct gather related mortality averaging less then 1%. Most injuries are a result of the horse's temperament, meaning they do not remain calm and lash out more frequently.

Gathering wild horses during the summer months can potentially cause heat stress. Gathering wild horses during the fall/winter months reduces risk of heat stress, although this can occur during any gather, especially in older or weaker animals. Adherence to the SOPs and techniques used by the gather contractor or BLM staff will help minimize the risks of heat stress. Heat stress does not occur often, but if it does, death can result. Most temperature related issues during a gather can be mitigated by adjusting daily gather times to avoid the extreme hot or cold periods of the day. The BLM and the contractor would be pro-active in controlling dust in and around the holding facility and the gather corrals to limit the horses' exposure to dust.

Indirect individual impacts are those which occur to individual wild horses after the initial event. These may include miscarriages in mares, increased social displacement, and conflict in studs. These impacts, like direct individual impacts, are known to occur intermittently during wild horse gather operations. An example of an indirect individual impact would be the brief 1-2 minute skirmish between older studs which ends when one stud retreats. Injuries typically involve a bite or kick with bruises which do not break the skin. Like direct individual impacts, the frequency of these impacts varies with the population and the individual. Observations following capture indicate the rate of miscarriage varies but can occur in about 1 to 5% of the captured mares, particularly if the mares are in very thin body condition or in poor health. A few foals may be orphaned during a gather. This can occur if the mare rejects the foal, the foal becomes separated from its mother and cannot be matched up following sorting, the mare dies or must be humanely euthanized during the gather, the foal is ill or weak and needs immediate care that requires removal from the mother, or the mother does not produce enough milk to support the foal. On occasion,

foals are gathered that were previously orphaned on the range (prior to the gather) because the mother rejected it or died. These foals are usually in poor condition. Every effort is made to provide appropriate care to orphan foals. Veterinarians may administer electrolyte solutions or orphan foals may be fed milk replacer as needed to support their nutritional needs. Orphan foals may be placed in a foster home in order to receive additional care. Despite these efforts, some orphan foals may die or be humanely euthanized as an act of mercy if the prognosis for survival is very poor.

Through the capture and sorting process, wild horses are examined for health, injury and other defects. Decisions to humanely euthanize animals in field situations would be made in conformance with BLM policy. BLM Euthanasia Policy IM-2015-070 is used as a guide to determine if animals meet the criteria and should be euthanized (refer to CAWP). Animals that are euthanized for non-gather related reasons include those with old injuries (broken or deformed limbs) that cause lameness or prevent the animal from being able to maintain an acceptable body condition (greater than or equal to BCS 3); old animals that have serious dental abnormalities or severely worn teeth and are not expected to maintain an acceptable body condition, and wild horses that have serious physical defects such as club feet, severe limb deformities, or sway back. Some of these conditions have a causal genetic component such that the animals should not be returned to the range; this prevents suffering and avoids amplifying the incidence of the deleterious gene in the wild population.

Wild horses not captured may be temporarily disturbed and moved into another area during the gather operation. With the exception of changes to herd demographics from removals, direct population impacts have proven to be temporary in nature with most, if not all, impacts disappearing within hours to several days of release. No observable effects associated with these impacts would be expected within one month of release, except for a heightened awareness of human presence.

It is not expected that genetic health would be affected by the Proposed Action. Available indications are that these populations contain high levels of genetic diversity at this time. The AML range of 361-638 in the Complex should provide for acceptable genetic diversity. If at any time in the future the genetic diversity in the Pancake Complex is determined to be relatively low, then a large number of other HMAs could be used as sources for fertile wild horses that could be transported into the area of concern.

By maintaining wild horse population size near the AML, there would be a lower density of wild horses across the Complex, reducing competition for resources and allowing the wild horses that remain to use their preferred habitat. Maintaining population size near the established AML would be expected to improve forage quantity and quality and promote healthy, self-sustaining populations of wild horses in a thriving natural ecological balance and multiple use relationship on the public lands in the area. Deterioration of the range associated with wild horse overpopulation would be reduced. Managing wild horse populations in balance with the available habitat and other multiple uses would lessen the potential for individual animals or the herd to be affected by drought, and would avoid or minimize the need for emergency gathers. All this would reduce stress to the animals and increase the success of these herds over the long-term.

Water/Bait Trapping

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

Trapping involves setting up portable panels around an existing water source or in an active wild horse area, or around a pre-set water or bait source. The portable panels would be set up to allow wild horses to go freely in and out of the corral until they have adjusted to it. When the wild horses fully adapt to the

corral, it is fitted with a gate system. The acclimatization of the wild horses creates a low stress trap. During this acclimation period the horses would experience some stress due to the panels being setup and perceived access restriction to the water/bait source.

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

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

Impacts to individual animals would be similar to those for helicopter gathers and 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 horses 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.

Indirect impacts can occur to horses after the initial stress event and could include increased social displacement or increased conflict between studs. These impacts are known to occur intermittently during wild horse gather operations. Traumatic injuries could occur and typically involve bruises caused by biting and/or kicking. Horses may potentially strike or kick gates, panels or the working chute while in corrals or trap which may cause injuries. These impacts, like direct individual impacts, are known to occur intermittently during wild horse gather operations. Since handling, sorting and transportation of horses would be similar to those activities under Helicopter drive trapping, the direct and indirect impacts would be expected to be similar as well. Past gather data shows that euthanasia, injuries and death rates for both types of gathers are similar.

Transport, Off-range Corrals, Off-range Pastures, and Adoption Preparation
During transport, potential impacts to individual horses can include stress, as well as slipping, falling, kicking, biting, or being stepped on by another animal. Unless wild horses are in extremely poor condition, it is rare for an animal to die during transport.

Recently captured wild horses, generally mares, in very thin condition may have difficulty transitioning to feed. A small percentage of animals can die during this transition; however, some of these animals are in such poor condition that it is unlikely they would have survived if left on the range.

During the preparation process, potential impacts to wild horses are similar to those that can occur during transport. Injury or mortality during the preparation process is low but can occur.

Mortality at off-range corrals (ORCs) facilities averages approximately 5% (GAO-09-77, Page 51), which includes animals euthanized due to a pre-existing condition, animals in extremely poor condition, animals that are injured and would not recover, animals that are unable to transition to feed; and animals that die

accidentally during sorting, handling, or preparation.

Off-Range Pastures(ORPs), known formerly as long-term holding pastures, are designed to provide excess wild horses with humane, and in some cases life-long care in a natural setting off the public rangelands. There, wild horses are maintained in grassland pastures large enough to allow free-roaming behavior and with the forage, water, and shelter necessary to sustain them in good condition. Mares and sterilized stallions (geldings) are segregated into separate pastures except at one facility where geldings and mares coexist. About 37,000 wild horses that are in excess of the current adoption or sale demand (because of age or other factors such as economic recession) are currently located on private land pastures in Oklahoma, Kansas, Iowa, Missouri, Montana, Nebraska, Utah, Wyoming, and South Dakota. The establishment of ORPs is subject to a separate NEPA and decision-making process. Located mainly in mid or tall grass prairie regions of the United States, these ORPs are highly productive grasslands compared to more arid western rangelands. These pastures comprise about 400,000 acres (an average of about 10-11 acres per animal). Of the animals currently located in ORP, less than one percent is age 0-4 years, 49 percent are age 5-10 years, and about 51 percent are age 11+ years.

Potential impacts to wild horses from transport to adoption, sale or off-range pastures (ORP) are similar to those previously described. One difference is when shipping wild horses for adoption, sale or ORPs, 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 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.

A small percentage of the animals may be humanely euthanized if they are in very poor condition due to age or other factors. Horses residing on ORP facilities live longer, on the average, than wild horses residing on public rangelands, and the natural mortality of wild horses in ORP averages approximately 8% per year, but can be higher or lower depending on the average age of the horses pastured there (GAO-09-77, Page 52).

Wild Horses Remaining or Released Back into the Complex following Gather Under the Proposed Action and Alternative B,

The wild horses that are not captured may be temporarily disturbed and may move into another area during the gather operations. With the exception of changes to herd demographics and their direct population- wide impacts from a gather have proven, over the last 20 years, to be temporary in nature with most if not all impacts disappearing within hours to several days of when wild horses are released back into the HMAs.

No observable effects associated with these impacts would be expected within one month of release, except for a heightened awareness of human presence, and possible changes in specific band composition. There is the potential for the horses that have been desensitized to vehicles and human activities to return to areas where they were gathered if released back into HMA's. The wild horses that remain in the Complex following the gather would maintain their social structure and herd demographics (age and sex ratios) as the proposed gathers would mainly be targeting specific individual or bands of horses. No observable effects to the remaining population from the gather would be expected.

Alternative C
Much like the Proposed Action and Alternative B this action would address the need to remove excess wild horses while bringing the population on the range to the low AML. This action would address attainment and maintenance of a thriving natural ecological balance within the first gather. Direct impacts

to the wild horse population would be the decreased population to low AML resulting in reduced competition for scarce resources within the HMA such as water, forage, and space. Improved body condition should be experienced in the short term by the remaining wild horse population in the Complex. There would be increased opportunities for wild horses to utilize higher quality habitat related to a reduction in competition in these areas and to lessened pressure on the habitat itself. Reduced wild horse densities should result in less competition between bands resulting in fewer injuries and a reduced risk of disease outbreak.

This alternative would directly impact the BLM's Wild Horse Program's off range corrals and off-range pasture facilities. Currently the BLM is facing limited funding available to pay for the cost of holding excess wild horses. Due to national WHB program constraints, the available funding and space at these facilities may be needed for other higher priority removals. This action would not address population control on the range by reducing population growth and would not slow population growth over the long term or result in greater intervals between gathers or fewer excess wild horses being removed and sent to short term holding and long-term pasture facilities.

Under Action Alternative C impacts to the population growth rate should be moderately higher under this alternative than with Alternatives A and B and so the population would increase at a higher rate resulting in more frequent gathers and many more animals being removed over time.

Alternative D
This action would address attainment and maintenance of a thriving natural ecological balance within the Jakes Wash HA. Although it may take numerous gathers to remove all the horses from the Jakes Wash HA. It is expected that resources would eventually return from a degraded state as horses are removed. There would be increased opportunities for any remaining wild horses there to utilize higher quality habitat related to a reduction in competition in these areas and to lessened pressure on the habitat itself. Reduced wild horse densities should result in less competition between bands resulting in fewer injuries and a reduced risk of disease outbreak in the short term.

Cumulative Effects

Cumulative Effects of the No Action Alternative
Under the No Action Alternative, the wild horse population within the Pancake Complex combined could exceed 4,718 in two years. Continued and expanded movement outside the HMAs would be expected as greater numbers of horses search for food and water for survival, thus impacting larger areas of public lands and threatening public safety as wild horses cross highways in search of forage. Heavy to Severe utilization of the available forage would continue to be expected and the water available for use would become increasingly limited. Ecological plant communities would continue to be damaged to the extent that they would no longer be sustainable, and the wild horse population would be expected to crash; this result would be expedited under drought conditions. As wild horse populations continue to increase within and outside the Complex, rangeland degradation intensifies on public lands. Also as wild horse populations increase, concerns regarding public safety along highways increase as well as conflicts with private land. Wild horses that reside along highways would continue to come on to the highways in many areas during the evenings or early mornings looking for forage and salt along the pavement, posing a hazard to motorists.

Emergency removals could be expected in order to prevent individual animals from suffering or death as a result of insufficient forage and water. These emergency removals are occurring annually and would be expected to increase as the wild horse population grows. During emergency conditions, competition for the available forage and water increases. This competition generally impacts the oldest and youngest horses as well as lactating mares first. These groups would experience substantial weight loss and

diminished health, which could lead to their prolonged suffering and eventual death. If emergency actions are not taken when emergency conditions arise, the overall population could be affected by severely skewed sex ratios towards stallions as they are generally the strongest and healthiest portion of the population. An altered age structure would also be expected.

Cumulative impacts of the no action alternative would result in foregoing the opportunity to improve rangeland health and to properly manage wild horses in balance with the available forage and water and other multiple uses. Attainment of site-specific vegetation management objectives and Standards for Rangeland Health would not be achieved. AML would not be achieved.

Cumulative Effects of the Proposed Action
In the future, application of population growth suppression techniques (i.e. PZP, PZP-22, GonaCon, and Gelding) and adjustment in sex ratios would be expected to slow total population growth rates, and to result in fewer gathers with less frequent disturbance to individual wild horses and the herd's social structure. However, return of wild horses back into the Complex could lead to decreased ability to effectively gather horses in the future as released horses learn to evade gather operations. The effect may be reduced gather effectiveness and the ability to capture a smaller portion of the population with each consecutive operation.

Cumulative Effects of the Proposed Action and Alternatives B, C, and D
A gather would ultimately benefit wild horses and rangeland resources. During gather operations, wild horses would be provided adequate feed and water at temporary and short-term holding. Removal of excess wild horses would allow for reduced competition for the remaining resources left on the range. Removal of excess wild horses would ensure that individual animals do not perish due to starvation, dehydration, or other health concerns related to insufficient feed and water and extreme dust conditions. Additionally, a gather would remove excess wild horses while they remain in adequate health to transition to feed.

The cumulative effects associated with the capture and removal of excess wild horses include gather-related mortality of less than 1% of the captured animals, about 5% per year associated with transportation, ORCs, adoption or sale with limitations and about 8% per year associated with ORPs. These rates are comparable to natural mortality on the range ranging from about 5-8% per year for foals (animals under age 1), about 5% per year for horses ages 1-15, and 5-100% for animals age 16 and older (Stephen Jenkins, 1996, Garrott and Taylor, 1990). In situations where forage and/or water are limited, mortality rates in the wild increase, with the greatest impact to young foals, nursing mares and older horses. Animals can experience lameness associated with trailing to/from water and forage, foals may be orphaned (left behind) if they cannot keep up with their mare, or animals may become too weak to travel. After suffering, often for an extended period, the animals may die. Before these conditions arise, the BLM generally removes the excess animals to prevent their suffering from dehydration or starvation.

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

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

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

3.4. Riparian/Wetland Areas and Surface Water Quality

Affected Environment

Riparian areas occupy a small but unique position on the landscape in the Complex. Riparian areas are important to water quality, water quantity, and forage. Riparian sites provide habitat needs for many species and support greater numbers and diversity of wildlife than any other habitat type in the western United States. Riparian areas at high elevations support cottonwood and aspen woodlands. Small riparian areas and their associated plant species occur throughout the HMAs near seeps, springs, and along sections of perennial drainages. Many of these areas support limited riparian habitat (forage) and water flows. At the present time, wild horse use of the majority of these areas is averaging heavy to severe use. Trampling and trailing damage by wild horses is evident at most locations; soil compaction and surface and rill erosion are evident. Some of the spring sources within the HMAs are minimally functioning because of factors such as over utilization and trampling effects. The current over population of wild horses is contributing to resource damage and decline in functionality of spring sources.

Environmental Effects

No Action Alternative – With the No Action Alternative, wild horse populations would continue to increase within the HMAs and to expand beyond the HMA boundaries. Increased horse use within and outside the HMAs would present additional adverse impacts to riparian resources and their associated surface waters. Over the longer-term, as native plant health continues to deteriorate and plants are lost, soil erosion would increase. An opportunity to make progress toward achieving and maintaining riparian areas in properly functioning condition would be foregone as ever increasing numbers of wild horses continue to trample and degrade other riparian areas, springs and associated water sources. Riparian areas that are currently in a Functional at Risk with a Downward Trend state would be expected to decline to a Non-Functional state over time.

Proposed Action – To avoid the direct impacts potentially associated with the gather operation, temporary gather sites and holding/processing facilities would not be located within riparian areas. The amount of trampling/trailing would be reduced. Utilization of the available forage within the riparian areas would also be expected to be reduced to within allowable levels. Over the longer-term, continued management of wild horses within the established AML would be expected to result in healthier, more vigorous vegetative communities. Hoof action on the soil around unimproved springs and stream banks would be lessened which should lead to increased stream bank stability and decreased compaction and erosion. Improved vegetation around riparian areas would dissipate stream energy associated with high flows and filter sediment that would result in some associated improvements in water quality. The alternative would make progress towards achieving and maintaining proper functioning condition at riparian areas. There would also be reduced competition among wildlife, wild horses, and domestic livestock for the available water. An opportunity to make progress toward achieving and maintain riparian areas in properly functioning condition would be foregone until reaching the mid-range of AML.

Alternative B – Initial impacts would be similar to the Proposed Action.

Alternative C – Initial impacts would be similar to the Proposed Action.

Alternative D- Initial impacts would be similar to the Proposed Action, except that continued gathering

efforts over the 10-year period aimed at capturing 100% of the current wild horse population would improve the rate and extent of damaged riparian recovery for the Jakes Wash HA.

Cumulative Impacts

Cumulative Impacts of the Proposed Action and Alternatives B, C and D

Impacts to riparian/wetland areas and surface water quality within the Pancake Complex have resulted from past and present actions such as grazing, road construction and maintenance, agriculture, off-highway vehicle (OHV) use and recreation, mining and processing activities, aggregate operations, public land management activities, and wildland fire.

Impacts to riparian/wetland areas and surface water quality from Reasonably Foreseeable Future Actions (RFFAs) would be similar to those described above for past and present actions, as these activities are expected to continue into the future. Direct cumulative impacts to riparian/wetland areas and surface water quality would be marginal because part of the Proposed Action is to avoid riparian/wetland areas during the present and future horse gathers. However, the long-term incremental impact to these resources from the proposed action would be positive as the number of horses are decreased with this gather and over time with subsequent gathers. This would result in improved surface water quality and reestablishment of riparian areas exhibiting increased stability and vigor.

Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, no incremental gather-associated impacts would occur to riparian/wetland areas and surface water quality, thus declining conditions would continue as horse populations increase.

3.5. . Wildlife, Including Migratory Birds

Affected Environment

The Pancake Complex provides habitat for many species of wildlife, including large mammals like mule deer, pronghorn antelope, Rocky Mountain elk, and desert bighorn sheep. Yearlong habitat for mule deer occurs throughout the Complex. A large area of crucial summer range occurs in the upper elevations of the Monte Cristo Territory, and small areas of crucial winter range occur in the Pancake HMA. The majority of the complex outside of the White Pine Range is yearlong pronghorn antelope habitat. The White Pine Range in the Monte Cristo Territory is Rocky Mountain elk yearlong habitat. There is occupied desert bighorn sheep habitat in the south end of the Monte Cristo Territory, the Duckwater Hills and Pancake Range in the Pancake HMA.

Predominant habitat types within the Complex which are likely to support migratory birds include: aspen, mountain riparian, mountain shrub, sagebrush, pinyon/juniper, salt desert scrub, playa and cliffs/talus habitat types. There are small inclusions of coniferous forest and mountain mahogany habitat types included in the upper elevations of the Pancake Range.

The migratory bird nesting season is from March 1 through July 31 (including raptors). No surface disturbing activity (staging, trapping, or corrals) can be conducted during this time period without a nesting bird survey of the proposed project area.

Environmental Effects

No Action Alternative – Wildlife would not be disturbed or displaced by gather operations under the no action alternative. However, competition between wildlife and wild horses for forage and water resources would continue and may get worse as wild horse numbers continue to increase above AML. As competition increases, some wildlife species may not be able to compete successfully, potentially leading

to increased stress and possible dislocation or death of native wildlife species over the long-term.

Proposed Action – Individual animals of all species may be disturbed or displaced during gather operations. Large mammals and some birds may run or fly (flush from the nest) during helicopter operations, but animals should return to normal activities post disturbance. Small mammals, birds, and reptiles would be displaced at staging areas and slower moving animals may be adherently killed. Overall, there would be no impact to animal populations as a result of gather operations.

The use of previously disturbed areas would reduce impacts to migratory birds. Any new staging, corral, and trap sites with vegetation would be surveyed for nesting birds, if gather operations were to occur during the migratory bird breeding season.

Removing wild horses would result in decreased competition between wild horses and wildlife for available forage and water resources as soon as the gather is completed. Over the long-term, both riparian and upland habitat conditions (forage quantity and quality) for wildlife would improve.

Alternative B – Impacts from this alternative would be similar to the Proposed Action, however it does not include management of nonreproducing portion of the population. This Alterative would be less effective at improving wildlife habitat than Alternative D, and slightly less effective than Alternative A.

Alternative C – Impacts from this alternative would be the similar to the Proposed Action. Overall, this alternative would be the least effective at improving habitat conditions for wildlife because there would be no fertility control, sex ratio adjustments, or gelding management. This Alternative would be less effective at improving wildlife habitat conditions than Alternative D, and slightly less effective than Alternatives A and B.

Alternative D – Impacts from this alternative would be similar to the Proposed Action. This alternative would be the most effective at improving habitat conditions for wildlife, with the capturing of all horses and zero release within the Jakes Wash HA. This alternative provides the best opportunity for breeding, nesting and foraging habitat to recover over the long-term within the Jakes Wash HA.

Cumulative Impacts

Cumulative Impacts of the Proposed Action and Alternatives B, C and D
Impacts to wildlife habitat within the Pancake Herd Area have resulted from past and present actions such as livestock grazing, road construction and maintenance, agriculture, OHV use and recreation, Powerlines and other right-of-way actions, and wild horses. The cumulative impacts from the Proposed Action, in addition to past, present and reasonably foreseeable future actions would be beneficial for all wildlife and their habitat. With a reduction of horse numbers, habitat within the HA and surrounding area would have the opportunity to improve. Impacts to vegetation at riparian areas would be reduced, allowing them to slowly recover with time. Breeding, forage, nesting, and security habitat for all species would improve over time.

Cumulative Impacts of the No Action Alternative
The cumulative impacts from the No Action Alternative, in addition to past, present and reasonably foreseeable future actions would result in continual degradation of habitat for all wildlife. Horses would continue to be above AML and compete for resources with other wildlife and livestock. Breeding, foraging, nesting and security habitat for all species would continue to degrade.

3.6. Special Status Plant and Animal Species

Affected Environment
Appendix IX identifies numerous BLM special status species that may potentially occur within the Pancake Complex, including several bat, reptile, raptor and other bird species.

According to both the 2015 and 2019 Greater sage-grouse Land Use Plan Amendments (LUPA), portions of the Pancake Complex contains Other Habitat (OHMA), General Habitat (GHMA), and Priority Habitat Management Areas (PHMA; Appendix X). Greater sage-grouse use the majority of the Pancake HMA throughout the year for all of their seasonal habitat needs. These needs include breeding (i.e., strutting grounds or leks), nesting and early brood-rearing, late brood-rearing or summer, winter and crucial winter. Greater sage-grouse require a herbaceous understory of forbs and grass to provide nest concealment, as well as to provide a diet of forbs and insects for the adults and their chicks. Riparian areas are frequently used by greater sage-grouse for late brood-rearing habitat. The Complex contains large portions of the Butte/Buck/White Pine greater sage-grouse population management unit (PMU), with minor portions of the Monitor and Quinn PMUs. There are approximately 20 known greater sage-grouse leks within the Complex. 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 2020).

Areas within the Complex provide aquatic and riparian habitat for three aquatic BLM Sensitive Species, the Railroad Valley springfish, which is found in Big and Little Warm Springs adjacent to the Pancake HMA, on Duckwater Shoshone Reservation lands. The Railroad Valley tui chub (*Gila bicolor* ssp. 7), grated tyronia *(Tryonia clathrata)*, Duckwater pyrg *(Pyrgulopsis aloba)*, southern Duckwater pyrg *(Pyrgulopsis anatina)*, Big Warm Springs pyrg *(Pyrgulopsis papillata)* and Warm Springs pyrg *(Pyrgulopsis villacampae)* can also be found within the Pancake Complex.

There is potential pygmy rabbit habitat within the Complex as well as documented sightings within the Pancake and Sand Springs West HMAs and Jakes Wash HA. Pygmy rabbits predominately inhabit tall sagebrush with deep friable soils for burrowing.

Other terrestrial species include the Railroad Valley skipper *(Hesperia uncas fulvapalla)*,

There are several BLM sensitive plant species that have been found within or adjacent to the Pancake Complex. These are the Blaine pincushion *(Sclerocactus blainei)*, rock violet *(Viola lithion)*, Eastwood milkweed *(Asclepias eastwoodiana)*, Currant milkvetch *(Astragalus uncialis)*, Needle Mountains milkvetch *(Astragalus eurylobus)*, and Railroad Valley globemallow *(Sphaeralcea caespitosa var. williamsiae)*.

Environmental Effects
No Action Alternative – Individual animals would not be disturbed or displaced because gather operations would not occur under the No Action Alternative. However, habitat conditions for all special status animal species would continue to deteriorate as wild horse numbers above the established AMLs further reduce herbaceous vegetative cover and trample riparian areas, springs, and stream banks. Sensitive plant species would be more likely to be grazed and trampled under the no action alternative because there would be more wild horses in the HMAs.

Proposed Action – Individual raptors and birds may be disturbed during helicopter gather operations; however, birds should return to normal activities. Staging, corral and trapping locations would be surveyed for nests if operations take place during the breeding season, minimizing impacts to species.

Because gather sites and holding corrals would not be located where sensitive animal and plant species are known to occur, there would be no impact from the placement of facilities.

Important habitat used for Greater sage-grouse strutting grounds and pygmy rabbit habitat would not be used for trap sites or staging areas. Additionally, greater sage-grouse timing restrictions identified in the Proposed Action would be applied to the greatest extent possible to minimize impacts to breeding, nesting and brood-rearing birds. Water bait trapping sites that occurred on natural water sources during the late brood-rearing season would be reviewed for use by Greater sage-grouse prior to use as a trapping location to minimize impacts to birds. BLM would coordinate with NDOW if the gather could not meet any of these stipulations. Greater sage-grouse may be disturbed during the winter if gather operations were to occur during that timeframe.

Under the Proposed Action habitat conditions would improve for all special status species; however this alternative does not remove all horses and the gather would accomplish a low to mid-AML. This alternative would be the effective at improving special status species' habitat than Alternative D.

Alternative B – Impacts from this alternative would be similar to the Proposed Action, however it does not include management of nonreproducing portion of the population. This Alterative would be less effective at improving special status species' habitat than Alternative D, and slightly less effective than Alternative A.

Alternative C – Impacts from this alternative would be the similar to the Proposed Action. Overall, this alternative would be the least effective at improving habitat conditions for special status species because there would be no fertility control, sex ratio adjustments, or gelding management. This Alternative would be less effective at improving habitat conditions than Alternative D, and slightly less effective than Alternatives A and B.

Alternative D – Impacts from this alternative would be similar to the Proposed Action. This alternative would be the most effective at improving habitat conditions for special status species, with the capturing of all horses and zero release. This alternative provides the best opportunity for breeding, nesting and foraging habitat to recover over the long-term within the Jakes Wash HA.

Cumulative Impacts

Cumulative Impacts of the Proposed Action and Alternatives B, C and D
Impacts to special status species' habitat within the Pancake Herd Area have resulted from past and present actions such as livestock grazing, road construction and maintenance, agriculture, OHV use and recreation, Powerlines and other right-of-way actions, and wild horses. The cumulative impacts from the Proposed Action, in addition to past, present and reasonably foreseeable future actions would be beneficial for all wildlife and their habitat. With a reduction of horse numbers, habitat within the Complex and surrounding area would have the opportunity to improve. Impacts to vegetation at riparian areas would be reduced, allowing them to slowly recover with time. Breeding, forage, nesting, and security habitat for all species would improve over time.

Cumulative Impacts of the No Action Alternative
The cumulative impacts from the No Action Alternative, in addition to past, present and reasonably foreseeable future actions would result in continual degradation of habitat for all special status species. Horses would continue to be above AML and compete for resources with other wildlife and livestock. Breeding, foraging, nesting and security habitat for all species would continue to degrade.

3.7. Livestock Grazing

Affected Environment

The Pancake Complex includes portions of several livestock grazing allotments. Permitted livestock grazing use in the HMAs and WHT include both cattle and sheep. Some livestock grazing occurs during all seasons. Livestock grazing also occurs in areas immediately adjacent to the Complex.

Table 3. Pancake Herd Management Area

Allotment	Season of Use	% of Allotment in HMA	Permitted Use (AUM)	Ten Year Average AUM Use	Percent Actual Use of Permit
Duckwater*	Cattle and Sheep 3/1 to 2/28	100%	18,667	9,692	52%
Monte Cristo**	Cattle 6/21 to 9/18	100%	1,129	**	N/A
Pancake Black Point	Cattle 6/01 to 2/28	17%	609	583	96%
Six Mile	Cattle 4/15 to 10/31 Sheep 11/1 to 4/15	96%	1,209	667	55%
South Pancake	Sheep 11/1 to 4/15	100%	1,155	859	74%
Newark	Cattle and Sheep 3/1 to 2/28	15%	9,645	3,437	36%

*Duckwater Allotment; South Sand Springs Valley Use Area has been closed to cattle grazing since 2000.
**Monte Cristo Allotment only had active AUMs in 2016, 2017, 2018, and 2019.

Table 4. Jakes Wash Herd Area

Allotment	Season of Use	% of Allotment in HMA	Permitted Use (AUM)**	Ten Year Average AUM Use	Percent Actual Use of Permit
Badger Spring	Sheep 4/15 to 11/30	90%	1,411	274	19.5%
Giroux Wash	Cattle 4/01 to 12/15; Sheep 4/01 to 11/01	61%	5,326	634	12%
Indian Jake	Cattle 3/15 to 6/15; 10/15 to 1/15	100%	1,968	1274	65%
Tom Plain	Cattle 3/1 to 6/15; 10/01 to 2/28	42%	3595	2173	60%

Table 5. Sand Springs West Herd Management Area

Allotment	Season of Use	% of Allotment in HMA	Permitted Use (AUM)**	Ten Year Average AUM Use	Percent Actual Use of Permit
Sand Spring	Cattle 3/1 to 2/28; Sheep 11/1 to 3/31	100%	7,839	4,468	56%
Morey	11/1 to 3/31 Sheep	100%	2,117	3,766	68%

**Animal Unit Month (AUM) means the amount of forage necessary for the sustenance of one cow or its equivalent for a period of 1 month. (4100.0-5 of the CFRs)

Table 6. Monte Cristo Wild Horse Territory

Allotment	Season of Use	% of Allotment in HMA	Permitted Use (AUM)**	Ten Year Average AUM Use	Percent Actual Use of Permit
Blackrock	Cattle 6/21 to 9/30	73%	409	368	90%

Treasure Hill	Cattle 6/16 to 10/15	63%	1,665	1,545	93%
Illipah	Cattle 6/16 to 10/15	2%	678	668	99%
Tom Plain	Cattle 6/11 to 10/10	17%	2,005	1,610	80%

Permitted livestock grazing use has generally been reduced from historical grazing levels over the past decades in a majority of the allotments. Allotments continue to be evaluated for achievement of the rangeland health standards, and adjustments to livestock grazing are implemented as appropriate, as grazing term permits are renewed or through annual coordination between BLM and grazing permit holders. (A summary of the Standards Determination Documents can be found in Appendix VII). Adjustments can include livestock stocking levels, seasons of use, grazing rotations, utilization standards, and other management practices to better control livestock distribution.

The Standard Determination Documents (SDDs) evaluate and assess livestock grazing management practices to determine whether those practices are conforming to the standards and guidelines for rangeland health, as required by 43 C.F.R. Subpart 4180. These SDDs do not evaluate or assess achievement of the wild horse and burros standards, but do provide insights into whether wild horses are contributing to non-attainment of overall standards during the livestock permit renewal process (Appendix VII)

Over the past ten years, actual livestock use has generally been less than permitted use for each of the grazing allotments (Tables 3 through 5). This has been in part due to persistent drought, competition with wild horses for forage, and the needs of the livestock operations.

Environmental Effects

No Action Alternative – Livestock would not be displaced or disturbed as a result of gather operations under the No Action Alternative, however, there would be continued competition with excess numbers of wild horses for limited water and forage resources. As wild horse numbers continue to increase, livestock grazing within the HMAs may be further reduced in an effort to slow the deterioration of the range to the greatest extent possible.

Proposed Action – Past experience has shown that wild horse gather operations have few direct impacts to cattle and sheep grazing. Livestock located near gather activities would be temporarily disturbed or displaced by the helicopter and the increased vehicle traffic during the gather operation. Typically, livestock would move back into the area once gather operations cease. Under the Proposed Action, competition between livestock and wild horses for water and forage resources would be reduced over time. Forage availability and quality would improve over time as the wild horse population is incrementally brought to low or mid AML. These effects would be extended by population growth control measures.

Alternative B –Impacts would be similar to those of the Proposed Action.

Alternative C – Impacts would be similar to those of the Proposed Action.

Alternative D - Impacts from a 100% gather and removal of horses within the Jakes Wash Herd Area would be similar to those in the Proposed Action.

Cumulative Impacts

The incremental cumulative effects of different population levels and different reproductive rates of wild horse populations over time would have varying effects on livestock grazing and their shared use of resources.

Cumulative Impacts of the Proposed Action and Alternatives B, C and D
Under the Proposed Action, wild horse populations would be maintained at or near AML for the longest amount of time, compared to the alternatives. This would reduce excess pressure from wild horses on the over utilized and shared resources of forage and water. Over time this would likely aid in the achieving of the Standards of Rangeland Health and allow for the perpetuity of livestock grazing. The cumulative effects of Alternatives B and C would be similar to the Proposed Action, but they would not be as long lasting because the reproductive rates of the wild horse would not be reduced or controlled indefinitely. Under Alternative D, all unallocated horse use and competition with livestock for resources would cease. Site conditions should experience a short-term period of improvement and a long-term attainment of achieving the Standards for Rangeland Health. It is possible for horses to emigrate from adjacent areas and reestablish populations in the future.

Cumulative Impacts of the No Action Alternative
Under the no action alternative, wild horse populations would continue to increase. This continually increasing competition for available forage and water resources would lead to increased resource utilization. Where site-specific vegetation management objectives and Standards for Rangeland Health are not being achieved, they would likely continue to not achieve the standard. Where standards are being achieved, it is possible they would change to not achieving the standard. Opportunities to improve rangeland health, by bringing the wild horse population to AML and reducing resource competition and utilization, would be lost.

3.8. Wilderness

Affected Environment
The Pancake HMA contains a portion of the Park Range Wilderness Study Area (WSA). The Park Range WSA is a jumbled mass of volcanic rock covered by a thin layer of soil which supports a surprisingly dense forest. There are dozens of wetland meadows above 8,000 feet that support a rich and diverse mixture of wildlife. Pockets of aspen attract deer, foxes and rabbits. At lower elevations, in the sagebrush semi-desert you may encounter antelope, coyote and jackrabbits.

The White Pine Peak Research Natural Area (RNA) is also located in the southwest portion of this wilderness. Research natural areas are part of a nationwide network of ecological areas set aside for both research and education. The Forest Service and other agencies establish these areas to typify certain types of important forest, shrubland, grassland, aquatic, geological, alpine, or similar environments with unique characteristics of scientific interest. These areas contain important ecological and scientific values and are managed for minimum human disturbance.

Currant Mountain Wilderness encompasses 47,357 acres in the western half of the Ely Ranger District in the White Pine Range and includes portions of the Blackrock and Currant Creek allotments. The Currant Mountain Wilderness is readily accessible on the eastern side via the White River and Currant Creek roads. Access to the western slope is much more difficult, requiring high clearance 4x4 vehicles or ATV's. This area is dominated by the limestone massif (mountainous mass) that comprises the mountain range and is home to desert bighorn sheep, elk, mule deer, cougar, and bobcats. There are no formal trails in existence any longer in this wilderness due to flood events washing out the drainages where trails once occurred.

The White Pine Range Wilderness (40,013 acres) is located on the western side of the White Pine Range south of Highway 50, approximately 55 miles west of Ely, Nevada. This area is on the west edge of the White Pine Range, just north of the Currant Mountain Wilderness. Access is difficult from the west slope as the area is divided into three sections by rough roads open to motorized vehicles. There are no trails within the area, but a non-motorized route goes through Cathedral Canyon on the north edge of the area.

Rocky ridges, rolling hills, and varied vegetation can be experienced throughout the wilderness. Many springs attract wildlife and mixed conifers can be found on the higher ridges.

Environmental Effects

No Action Alternative – No direct impacts to wilderness values would occur. However, impacts to wilderness values of naturalness could be threatened through the continued population growth of wild horses. The Wilderness/WSA currently receives slight-moderate use by wild horses during certain times of the year. Increasing wild horse populations would be expected to further degrade the condition of vegetation and soil resources. The sight of heavy horse trails, trampled vegetation and areas of high erosion would continue to detract from the wilderness experience within the WSA.

Proposed Action – Impacts to opportunities for solitude could occur during gather operations due to the possible noise of the helicopter and increased vehicle traffic around the Wilderness/WSA.

Those impacts would cease when the gather was completed. No surface impacts within the Wilderness/WSA are anticipated to occur during the gather since all gather sites and holding facilities would be placed outside wilderness. However, wilderness values of naturalness would remain at or near the current condition. Under the Proposed Action wilderness values would likely see more improvement over time since wild horse population would be gathered in increments and growth rates would be less under this alternative.

Alternative B – Impacts would be similar to the Proposed Action, however, wilderness values of naturalness after the gather would be enhanced by a reduction in wild horse numbers as a result of an improved ecological condition of the plant communities and other natural resources.

Alternative C – Impacts would be the same as described for the Proposed Action.

Alternative D – Over the ten year period, impacts to solitude would be slightly greater than all alternatives due to time needed for gather operations to gather 100% of population. Over the ten-year period and beyond, this alternative would have the greatest beneficial impact to naturalness in the Jakes Wash HA.

Cumulative Impacts

Impacts to Wilderness/WSA from past actions such as road development/improvement, grazing, range improvements, recreation and OHV use have been accounted for within the designation of the Wilderness its boundary and USFS and BLM Wilderness management plans and WSA interim management plan. Impacts from present and future actions are similar and should be limited to outside of the Wilderness/WSA boundary. Horse gather operations have occurred in the past and would likely continue into the reasonably foreseeable future. Impacts of these operations usually have temporary negative impacts to solitude during operations but have long term beneficial effects to naturalness.

The cumulative impacts from the No Action Alternative, in addition to past, present and reasonably foreseeable future actions would have no temporary negative impacts to solitude during operations but would have negative impacts to naturalness.

Impacts of Alternative A - Proposed Action - The cumulative impacts from the Proposed Action, in addition to past, present and reasonably foreseeable future actions would have temporary negative impacts to solitude during operations but would have beneficial impacts to naturalness.

Impacts of Alternative B – Cumulative impacts are similar to those described in the Proposed Action.

Impacts of Alternative C - Cumulative impacts are similar to those described in the Proposed Action.

Impacts of Alternative D - Cumulative impacts are similar to those described in the Proposed Action.

3.9. Noxious Weeds and Invasive Non-Native Species

Affected Environment

Noxious and invasive species introduction and proliferation are a growing concern among local and regional interests. Noxious and invasive weeds are known to exist on public lands within the administrative boundaries of the Tonopah and Bristlecone FO's (Appendix VIII). Noxious and invasive weed species are aggressive, typically nonnative, ecologically damaging, undesirable plants, which severely threaten native rangeland, biodiversity, decrease forage quality, wildlife habitat, and ecosystems. Because of their aggressive nature, noxious and invasive weeds can readily spread into established plant communities primarily through ground disturbing activities. In addition, new populations can become established when the seeds hitchhike on equipment, vehicles, and people. The following noxious and invasive weed species are known to exist within the Complex or along drainages and roadways leading to the project area:

Scientific Name	Common Name
Acroptilon repens	Russian knapweed
Carduus nutans	Musk thistle
Centaurea stoebe	Spotted knapweed
Centaurea squarrosa	Squarrose knapweed
Cirsium vulgare	Bull thistle
Conium maculatum	Poison hemlock
Hyoscyamus niger	Black henbane
Lepidium draba	Hoary cress
Lepidium latifolium	Tall whitetop
Onopordum acanthium	Scotch thistle
Tamarix spp.	Salt cedar
Bromus tectorum	Cheatgrass
Salsola iberica	Russian thistle

These species occur in a variety of habitats including roadside areas, rights-of-way, wetland meadows, and as well as undisturbed upland rangelands.

Environmental Effects

No Action Alternative – No impacts from the gather would occur. However, the wild horse populations would remain over AMLs and the impacts to native vegetation from wild horse over-grazing and/or trampling especially around water sources would increase exponentially and impacts to the present plant communities could lead to an expansion of noxious and invasive species

Proposed Action and Alternatives B-C and D

The proposed gather may spread existing noxious and/or invasive species. This could occur if vehicles drive through infestations and spread seed into previously weed-free areas or arrives already carrying seeds attached to the vehicle or equipment. This is especially a concern as the gather crew moves from valley to valley. The contractor, together with the contracting officer's representative or project inspector (COR/PI), would examine proposed gather sites and holding corrals for noxious and invasive weed populations prior to construction. If noxious weeds are found, the location of the facilities would be

moved. Any equipment or vehicles exposed to weed infestations or arriving on site carrying dirt, mud, or plant debris would be cleaned before moving into or within the project area. All gather sites, holding facilities, and camping areas on public lands would be monitored for weeds during the next several years. Despite short-term risks, over the long term the reduction in wild horse numbers and the subsequent recovery of the native vegetation would result in fewer disturbed sites that would be susceptible for non-native plant species to invade.

Cumulative Impacts

Cumulative Impacts of the Proposed Action and Alternatives B, C and D
The cumulative impacts of the proposed gather could increase the existing noxious and invasive weed populations through vehicle traffic, foot traffic, gather sites, camp sites, and temporary holding and processing sites, however through awareness and location scouting the risks of spreading the populations can be reduced. New weed species could be introduced without proper inspection and washing, if necessary, of equipment and vehicles. Best Management Practices should be followed to reduce the risks.

Cumulative Impacts of the No Action Alternative
Under the No Action Alternative, the cumulative impacts are reduced but still exist. By not gathering to AML the overall rangeland health would decrease thus allowing the opportunity for established noxious and invasive weed populations to expand and establish. Seeds can be carried on the horse's lower legs among their hair and fall off in other locations and establish as seedlings. There is a direct correlation to rangeland health and noxious and invasive weed population percentage.

3.10. Vegetation

Affected Environment
The vegetative plant communities within the Complex have developed on many different soil types with several kinds of parent materials. The vegetation is diverse with desert shrub/sagebrush/grass plant communities dominating the lower elevations while sagebrush/mountain shrub/grass/pinyon-juniper/mountain mahogany plant communities dominate the benches and higher elevation sites.

The Pancake Complex is dominated by Inter-Mountain Basins Big Sagebrush Shrubland, Great Basin Pinyon-Juniper Woodland, and Inter-Mountain Basins Mixed Salt Desert Scrub with Great Basin Xeric Mixed Sagebrush Shrubland and Inter-Mountain Basins Greasewood Flat. These include Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), pinyon-juniper (*Pinus monophylla - Juniperus osteosperma*), winterfat (*Krascheninnikovia lanata*), shadscale (*Atriplex confertifolia*), black sagebrush (*Artemisia nova*), and greasewood (*Sarcobatus vermiculatus*) plant communities. This HMA also has small areas of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), mixed conifers, mountain mahogany (*Cercocarpus ledifolius*), playas, and rock outcrops.

Based on Rangeland Health Standards, the majority of the Pancake HMA is not meeting the uplands standard for vegetation (Appendix VII). Due to shrub dominance, lack of native vegetation cover, the risk of invasive species spread, and heavy or severe utilization at times from grazers, the soil resources lack much resiliency or capability to maintain or improve. The risk of erosion and loss of soil structure in this use area after repeated disturbance without rest is greater than other use areas without horse presence

The Jakes Wash Herd Area primarily has four vegetative types. Salt desert shrub and winterfat plant communities occur in the lower valley and wash, while sagebrush/perennial grass communities and pinyon/juniper woodlands dominate the benches and higher elevation sites. A unique ecological site is present in the valley bottom. This is a Silty Clay 8-10" ecological site (028BY071NV) with western wheatgrass (*Elymus trachycaulus*) or thickspike wheatgrass (*Elymus lanceolatus*) and nuttall saltbush

(*Atriplex nuttallii*). The extensive areas of winterfat occur throughout the valley bottom, in fragile silty soils, where native perennial grasses are lacking do to historical overgrazing by livestock and wild horses (Appendix VII).

The Sand Springs West HMA is dominated by Inter-Mountain Basins Big Sagebrush Shrubland with Great Basin Pinyon-Juniper, Great Basin Xeric Mixed Sagebrush Shrubland, and Inter-Mountain Basins Mixed Salt Desert Scrub. These include Wyoming big sagebrush, basin big sagebrush (Artemisia tridentata ssp. tridentata), pinyon-juniper, black sagebrush, and winterfat plant communities. This HMA also has small areas of greasewood, playas, and rock outcrops.

Environmental Effects

No Action Alternative – No impacts from the gather would occur. Wild horse populations would remain over appropriate management levels. The impacts to vegetation by grazing or trampling would increase more exponentially and would result in deterioration in plant health, reproduction, diversity, and composition. As plants deteriorate they would not be able to reproduce or recover. By reducing opportunities for photosynthetic processes the plants would be susceptible to over grazing and other stressors, such as drought, and entire plant communities could die out, allowing less desired species to increase. Over time forage resources would become less available, impacting wild horse herd health, and wild horses would be more susceptible to disease and drought.

Proposed Action- The proposed action is expected to have an effect on vegetative resources including trampling of vegetation by wild horses at gather sites and holding locations; and crushing of vegetation by vehicles, temporary corrals and holding facilities. These disturbed areas would be less than one acre in size. Gather corrals and holding facility locations are usually placed in areas easily accessible to livestock trailers and standard equipment, utilizing roads, gravel pits or other previously disturbed sites and accessible by existing roads. No new roads would be created. These impacts are temporary and vegetation is expected to recover within the next growing season.

Achieving and maintaining the established AML would benefit the vegetation by reducing the grazing pressure on the forage resources. Forage utilization would be reduced. Defoliation that occurs more than once in a growing season reduces a plant's ability to maintain plant health and reproduce (Herbel 2004). The impacts to vegetation by grazing or trampling based on the reduction in wild horse numbers to AML would result in maintaining or improving plant health, reproduction, diversity, and composition by allowing the plants to maintain and continue photosynthetic processes to initiate regrowth for recovery and grow adequately for reproduction. Achieving and maintaining the established AMLs throughout the Complex would be expected to result in upward trends in vegetation health, increased vigor, production and frequency of key forage species, and attainment of Rangeland Health Standards.

Alternative B- Impacts would be similar to those of the Proposed Action.

Alternative C- Impacts would be similar to those of the Proposed Action.

Alternative D – Impacts would be similar to those of the proposed Action. However, if all horses were removed from Jakes Wash HA. the recovery of vegetation would be faster and future wild horse impacts to vegetation would be absent.

Cumulative Impacts

The incremental cumulative effects of different population levels and different reproductive rates of wild horse populations over time would have varying effects on the vegetative communities they rely on for forage, the vegetative communities they travel through and seasonally occupy, and the vegetative communities around areas of water.

Cumulative Impacts of the Proposed Action and Alternatives B, C and D
Under the Proposed Action, wild horse populations would be maintained at or near AML for the longest amount of time, compared to the alternatives. This would reduce excess pressure on the over utilized vegetative resources. Over time this would likely improve plant health, reproduction, diversity, and composition. The cumulative effects of Alternatives B and C would be similar to the Proposed Action, but they would not be as long lasting because the reproductive rates of the wild horse would not be reduced or controlled to the same extent. Under Alternative D, impacts to vegetation from horses in Jakes Wash HA would cease. This could lead to achieving Standards of Rangeland Health that are not currently achieved. It is possible for horses to emigrate from adjacent areas and reestablish populations in the future.

Cumulative Impacts of the No Action Alternative
Under the no action alternative, wild horse populations would continue to increase leading to greater resource use and consumption. Where site-specific vegetation management objectives and Standards for Rangeland Health are not being achieved, they would likely continue not being achieved. Where standards are being achieved, it is possible they would transition to not being achieved. Opportunities to improve rangeland health and that of the vegetation, by bringing the wild horse population to AML and reducing vegetation utilization and trampling, would be lost.

3.11. Soils/Watershed

Affected Environment
Soils within the Complex are typical of the Great Basin and vary with elevation. Soils range in depth from very shallow (below 20 inches to bedrock) to deep (greater than 60 inches to bedrock) and are typically gravelly, sandy and/or silt loams. Soils that are located on low hill slopes, upland terraces, and fan piedmont remnants are typically shallow to deep over bedrock or indurated lime hardpan. They are highly calcareous and medium textured with gravel. Soils on mountain slopes are also calcareous and range from shallow to deep over limestone. Some of the mountain soils have high rock fragment content, and support pinyon and juniper trees. Mountain soils typically have gravelly to very gravelly loam textures. Soils on floodplains and fan skirts are deep, have silt textures, and are highly calcareous.

Environmental Effects
No Action Alternative- Soils and watersheds would continue to have horse use and as horse populations increase heavy trailing and trampling around water sources and to foraging areas would occur. Watershed objectives would not be met due to increased horse populations over time.

Proposed Action- Project implementation would stay on existing roads, washes and horse trail areas, and would disturb relatively small areas used for gathering and holding operations. Horses may be concentrated for a limited period of time in traps. Potential for soil compaction would occur but would be minimal and temporary and is not expected to adversely impact soil or hydrologic function. Soils and watersheds would remain at or near the current condition. However soils and watersheds would likely see more improvement over time since wild horse population would be gathered in increments and growth rates would be less under this alternative.
Alternative B- Impacts would be similar to the Proposed Action; however, long term impacts may improve the area due to less soil compaction from trailing.

Alternative C- Impacts would be similar to those described for the Proposed Action.

Alternative D - Initial impacts would be similar to the Proposed Action, except that continued gathering efforts over the 10-year period aimed at capturing 100% of the current wild horse population would reduce to a greater extent the compaction effects from trailing over Alternatives A, B and C. This would

promote the return of soil structure and water holding capacity in a shorter time period which in turn would increase plant community vitality and stability over time.

Cumulative Impacts

Cumulative Impacts of the Proposed Action and Alternatives B, C and D
Impacts to soils/watersheds within the Pancake Complex have resulted from past and present actions such as grazing, road construction and maintenance, OHV use and recreation, mining and processing activities, aggregate operations, public land management activities, and wildland fire.

Impacts to soils/watersheds from RFFAs would be similar to those described above for past and present actions, as these activities are expected to continue into the future. Direct cumulative impacts from the Proposed Action would include the short-term incremental impact of disturbance and compaction from hoof action around horse corrals. However, the long-term incremental impact to soil resources/watersheds would be positive as the number of horses are decreased with this gather and over time with subsequent gathers. This would result in restored soil structure, increased stability, and improved biological function of soils resulting in increased water-holding capacity, reduced erosion and enhanced vegetation community support.

Cumulative Impacts of the No Action Alternative
Under the No Action Alternative, no incremental gather-associated impacts would occur to soils/watersheds, thus the declining conditions from compaction, erosion, and consequent poor vegetation support would continue to increase as horse populations increase.

4.0 Cumulative Effects

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 significant actions taking place over a period of time. The area of cumulative impact analysis is the Pancake Complex. (Map 1).

According to the 1994 BLM *Guidelines for Assessing and Documenting Cumulative Impacts*, the cumulative analysis should be focused on those issues and resource values identified during scoping that are of major importance. Accordingly, the issues of major importance that are analyzed are maintaining rangeland health and achieving and maintaining AMLs.

Past, Present, and Reasonably Foreseeable Actions
The past, present, and reasonably foreseeable future actions applicable to the assessment area are identified as the following:

Project -- Name or Description	Status (x)		
	Past	Present	Future
Issuance of multiple use decisions and grazing permits for ranching operations through the allotment evaluation process and the reassessment of the associated allotments.	x	x	X
Livestock grazing	x	x	X
Wild horse and burro gathers	x	x	X
Mineral exploration / geothermal exploration/abandoned mine land	x	x	X

reclamation			
Recreation	x	x	X
Range Improvements (including fencing, wells, and water developments)	x	x	X
Wildlife guzzler construction	x	x	X
Invasive weed inventory/treatments	x	x	X
Wild horse and burro management: issuance of multiple use decisions, AML adjustments and planning	x	x	X

Any future proposed projects within the Pancake Complex would be analyzed in an appropriate environmental document following site specific planning. Future project planning would also include public involvement.

Past Actions

In 1971 Congress passed the Wild Free-Roaming Horses and Burros Act which placed wild and free-roaming horses and burros, that were not claimed for individual ownership, under the protection of the Secretaries of Interior and Agriculture. In 1976 the Federal Land Policy and Management Act (FLPMA) gave the Secretary the authority to use motorized equipment in the capture of wild free-roaming horses as well as continued authority to inventory the public lands. In 1978, the Public Range Improvement Act (PRIA) was passed which amended the WFRHBA to provide additional directives for BLM's management of wild free-roaming horses on public lands.

Past actions include establishment of wild horse HMAs and WHTs, establishment of AML for wild horses, wild horse gathers, vegetation treatment, mineral extraction, oil and gas exploration, livestock grazing and recreational activities throughout the area. Some of these activities have increased infestations of invasive plants, noxious weeds, and pests and their associated treatments.

Pancake HMA

The Egan (1987) MFP (Ely District) designated the Monte Cristo and Sand Springs East HMAs for the long-term management of wild horses. These HMAs were later combined into the Pancake HMA in the Ely District Record of Decision (ROD) and Approved Resource Management Plan (RMP) in August 2008 due to the interchange between the two HMAs. The HMA is nearly identical in size and shape to the original Herd Areas representing where wild horses were located in 1971. Currently, management of HMA and wild horse population is guided by the 2008 Ely District ROD and RMP. The AML range for the HMA is 240-493 wild horses. The Land Use Plan analyzed impacts of management's direction for grazing and wild horses, as updated through Bureau policies, Rangeland Program direction, and Wild Horse Program direction. Forage was allocated within the allotments for livestock use and range monitoring studies were initiated to determine if allotment objectives were being achieved, or that progress toward the allotment objectives was being made.

Jakes Wash HA

The Egan RMP (1987 Ely District) designated the Jakes Wash Herd Area (HA) for the long-term management of wild horses. The August 2008 Ely District Record of Decision (ROD) and Approved Resource Management Plan (RMP) management action WH-5 states: "remove wild horses and drop herd management area status for those… as listed in Table 13." Jakes Wash was dropped from HMA status and returned to HA status (manage "0" wild horses) with this management action. The management action to achieve 0 wild horses within the Jakes Wash HA reflects the recent evaluation based on multi-tiered analysis from the Ely Proposed Resource Management Plan/Final Environmental Impact Statement (November 2007) table 3.8-2 and page 4.8-2, of the components and herd characteristics: forage, water, cover, space, and reproductive viability. If one or more of these components were missing, the herd

management area was considered unsuitable. The Jakes Wash HA has inadequate forage, water, space, and cover.

Sand Springs West HMAs

Herd Areas were identified in 1971 as areas occupied by wild horses. The HMA was established in the late 1980s through the land use planning process as areas where wild horse management was a designated land use. Since the mid-1980s, AMLs have been established on the Battle Mountain BLM District HMAs.

The Sand Springs West AML of 49 wild horses was established through a stipulated agreement (Consent Decision) between BLM, E. Wayne Hage, Colvin and Son Cattle Co., and Russell Ranches through the Department of the Interior Office of Hearings and Appeals, Hearings Division, and later confirmed by the Tonopah Resource Management Plan (RMP) approved October 6, 1997

Monte Cristo WHT

Wild Horse Territories were identified in 1971 as lands that were territorial habitat of wild horses. The WHTs were established in the late 1980s through the land use planning process as areas where wild horse management was a designated land use. Since the mid-1980s, AMLs have been established in the Forest Service Territories.

The Monte Cristo Wild & Free Roaming Horses Management Plan established a baseline AML of 72–120 wild horses, with an average of 96 head being maintained. These numbers were based on proper use studies conducted on the natural horse concentration areas. The baseline AML was adjusted to 72–96 through the Humboldt National Forest Land & Resource Management Plan in 1986 since range conditions had not improved with the number of horses occupying the area. The population within this HMA can fluctuate depending on the seasonal movement of the wild horses.

Pancake Complex

Integrated wild horse management has occurred in the Pancake and Sand Spring HMAs, Jakes Wash HA, and Monte Cristo WHT. Six gathers have been completed in the past on part or all of the HMAs/WHT, and future gathers would be scheduled on a 4- or 5- year gather cycle. Approximately 6,749 wild horses have been removed from the HMAs/WHT in the last 25 years; populations are thriving and have not been negatively impacted.

Adjustments in livestock season of use, livestock numbers, and grazing systems were made through the allotment evaluation/multiple use decision process. In addition, temporary closures to livestock grazing in areas burned by wildfires, or due to extreme drought conditions, were implemented to improve range condition.

The Mojave and Northeastern Great Basin RAC developed standards and guidelines for rangeland health that have been the basis for assessing rangeland health in relation to management of wild horse and livestock grazing within the Ely and Battle Mountain Districts. Adjustments in numbers, season of use, grazing season, and allowable use have been based on the evaluation of progress made toward reaching the standards.

Several oil and gas exploration wells have been drilled across the CESA however none of these wells have gone into production. The Ely RMP/EIS summarized the history of oil and gas exploration on pages 3.18-7 to 3.18-9.

Historical mining activities have occurred throughout the CESA.

Present Actions
Today the Pancake Complex has an estimated population is a range of 1,969- 3,571 wild horses. Resource damage is occurring in portions of the Complex due to excess animals. Current BLM policy is to conduct removals targeting portions of the wild horse population based upon age, and allowing the correction of any sex ratio problems that may occur. Further, the BLM's policy is to conduct gathers in order to facilitate a four-year gather cycle and to reduce population growth rates where possible. Program goals have expanded beyond establishing a "*thriving natural ecological balance*" by setting AML for individual herds to now include achieving and maintaining healthy and stable populations and controlling population growth rates. If any alternative other than the No Action is selected, the Humboldt-Toiyabe National Forest would conduct a wild horse gather on their Monte Cristo Wild Horse Territory concurrently with the BLM.

Though authorized by the WFRHBA, current appropriations and policy prohibit the destruction of healthy animals that are removed or deemed to be excess. Only sick, lame, or dangerous animals can be euthanized, and destruction is no longer used as a population control method. A recent amendment to the WFRHBA allows the sale of excess wild horses that are over 10 years in age or have been offered unsuccessfully for adoption three times. BLM is adding additional long-term grassland pastures in the Midwest and West to care for excess wild horses for which there is no adoption or sale demand.

The BLM is continuing to administer grazing permits and authorize grazing within the CESA. Within the proposed gather area sheep and cattle grazing occurs on a yearly basis. Wildlife use by large ungulates such as elk, deer, and antelope is also currently common in the CESA.

The focus of wild horse management has also expanded to place more emphasis on achieving rangeland health as measured against the RAC Standards. The Mojave-Southern Great Basin and Northeastern Great Basin RAC standards and guidelines for rangeland health are the current basis for assessing rangeland health in relation to management of wild horse and livestock grazing within the Ely and Battle Mountain Districts. Adjustments to numbers, season of use, grazing season, and allowable use are based on evaluating achievement of or making progress toward achieving the standards.

Gold exploration and mining is on-going in the CESA, occurring primarily in Pancake Mountain Range.

Active oil and gas leases occur throughout the CESA. Many oil and gas lease sales have taken place and currently are ongoing.

Ely Gold Royalties Inc. is the Operator of the approved Green Springs Plan of Operations which is a multi-year mineral exploration project that allows up to 75 acres of earthwork disturbance in the White Pine Range on National Forest System Lands. Exploration drilling commenced in 2015 and has continued in 2017 and 2019. The next phase of drilling is anticipated in the summer/fall of 2020.

The Pancake HMA is within the Duckwater Shoshone Tribe Reservation. In 2016 the BLM transferred 31,123.85 acres to the BIA for the expansion of the reservation.

Reasonably Foreseeable Future Actions
In the future, the BLM would manage wild horses within HMAs that have suitable habitat for an AML range that maintains genetic diversity, age structure, and targeted sex ratios. Current policy is to express all future wild horse AMLs as a range, to allow for regular population growth, as well as better management of populations rather than individual HMAs. The Ely BLM District completed the *Ely Proposed Resource Management Plan/Final Environmental Impact Statement* (RMP/EIS, 2007) released in November 2007 which analyzed AMLs expressed as a range and addressed wild horse management on

a programmatic basis. Future wild horse management in the BLM's Ely and Battle Mountain Districts as well as the USFS's Humboldt-Toiyabe National Forest would focus on an integrated ecosystem approach with the basic unit of analysis being the watershed. In 2014 the Bristlecone Field Office completed the Newark and Huntington Watersheds Implementation and Restoration Plan. This plan identifies actions associated with habitat improvement within the complex. The BLM would continue to conduct monitoring to assess progress toward meeting rangeland health standards. Wild horses would continue to be a component of the public lands, managed within a multiple use concept.

As the BLM and USFS achieve AML on a national basis, gathers should become more predictable due to facility space. Fertility control should also become more readily available as a management tool, with treatments that last between gather cycles reducing the need to remove as many wild horses and possibly extending the time between gathers. The combination of these factors should result in an increase in stability of gather schedules and longer periods of time between gathers.

The proposed gather area contains a variety of resources and supports a variety of uses. Any alternative course of wild horse management has the opportunity to affect and be affected by other authorized activities ongoing in and adjacent to the area. Future activities which would be expected to contribute to the cumulative impacts of implementing the Proposed Action include: future wild horse gathers, continuing livestock grazing in the allotments within the area, mineral exploration, new or continuing infestations of invasive plants, noxious weeds, and pests and their associated treatments, and continued native wildlife populations and recreational activities historically associated with them. The significance of cumulative effects based on past, present, proposed, and reasonably foreseeable future actions are determined based on context and intensity.

Midway Gold Company has moved from exploration into production in the Pancake Range (Pan Project). Construction of this mining facility may occur after the proper environmental analysis is completed over the next few years.

Waterton Global Resource Management Inc. /Elko Mining Group is the Operator of the approved Centennial-Seligman Mine Plan of Operations located on National Forest System Lands in the White Pine Range. The project consists of mining and exploration activities within a project area of approximately 1,454 acres. Approximately 365 acres of the project area have previously been disturbed during past mining operations at the Mt Hamilton Mine. The plan also describes operations on approximately 33.7 acres of private lands for milling and processing of ore material. It is anticipated that additional exploration work would occur prior to mining operations.

Impacts Conclusion
Past actions regarding the management of wild horses have resulted in the current wild horse population within the Pancake and Sand Spring West HMAs, and the Monte Cristo WHT. Wild horse management has contributed to the present resource condition and wild horse herd structure within the gather area.

The combination of the past, present, and reasonably foreseeable future actions, along with the Proposed Action, should result in more stable and healthier wild horse populations, healthier rangelands (vegetation, riparian areas and wildlife habitat), and fewer multiple-use conflicts within the HMAs and WHT.

Most past and all present and reasonably foreseeable future actions have noxious and invasive weed prevention stipulations and required weed treatment requirements associated with each project. This in combination with the active BLM Ely District Weed Management Program would minimize the spread of weeds throughout the watershed.

5.0 Mitigation Measures and Suggested Monitoring

Proven mitigation and monitoring are incorporated into the Proposed Action through SOPs, which have been developed over time. These SOPs (Appendix II, III, and IV) represent the "best methods" for reducing impacts associated with gathering, handling, and transporting wild horses and collecting herd data. Hair follicle samples would be collected to establish a genetic baseline for the wild horses from the Pancake and Sand Springs West HMAs, and Monte Cristo WHT; additional samples would be collected during future gathers (in 10-15 years) to determine trend. If monitoring indicates that genetic diversity (as measured in terms of observed heterozygosity) is not being adequately maintained, 5-10 young mares from HMAs in similar environments may be added every generation (every 8-10 years) to avoid inbreeding depression and to maintain acceptable genetic diversity. Samples may also be collected for genetic ancestry analysis or curly gene characteristics. Ongoing resource monitoring, including climate (weather), and forage utilization, population inventory, and distribution data would continue to be collected.

6.0 Consultation and Coordination

Public hearings are held annually on a state-wide basis regarding the use of motorized vehicles, including helicopters and fixed-wing aircraft, in the management of wild horses and burros. During these meetings, the public is given the opportunity to present new information and to voice any concerns regarding the use of the motorized vehicles. Battle Mountain District held the state-wide Battle Mountain District held the state-wide meeting on June 25, 2020. One public participant attended, written comments were excepted until July 2, 2020. Specific concerns included: (1) Ensure humane treatment during gather operations (2) Transparency.

Most were not in support of the use of helicopters and the gathering of excess wild horses. Their comments were entered into the record for this hearing. Standard Operating Procedures were reviewed in response to these concerns and no changes to the SOPs were indicated based on this review.

The use of helicopters and motorized vehicles has proven to be a safe, effective and practical means for the gather and removal of excess wild horses and burros from the range. Since 2006, Nevada has gathered over 40,000 animals with a total mortality of 1.1% (of which .5% was gather related), which is very low when handling wild animals. BLM also avoids gathering wild horses prior to or during the peak of foaling and does not conduct helicopter removals of wild horses during March 1 through June 30.

The Ely and Battle Mountain District BLM have coordinated with Nevada Department of Wildlife (NDOW) during the yearly coordination meeting on this gather. Additionally, as required by the GRSG Land Use Plan Amendment (2015), NDOW has reviewed the Greater sage-grouse form, RDF’s and has granted seasonal waivers for the Moriah Horse Gather. BLM would continue to coordinate with NDOW in regard to staging, trapping, and corral locations to minimize impacts to wildlife.

7.0 List of Preparers

Ely District Office		
Name	**Title**	**Responsible for the Following Section(s) of this Document**
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Nancy Herms	Wildlife Biologist	Wildlife, Migratory Birds, Special Status Species
Concetta Brown	Forester	NEPA, Environmental Justice
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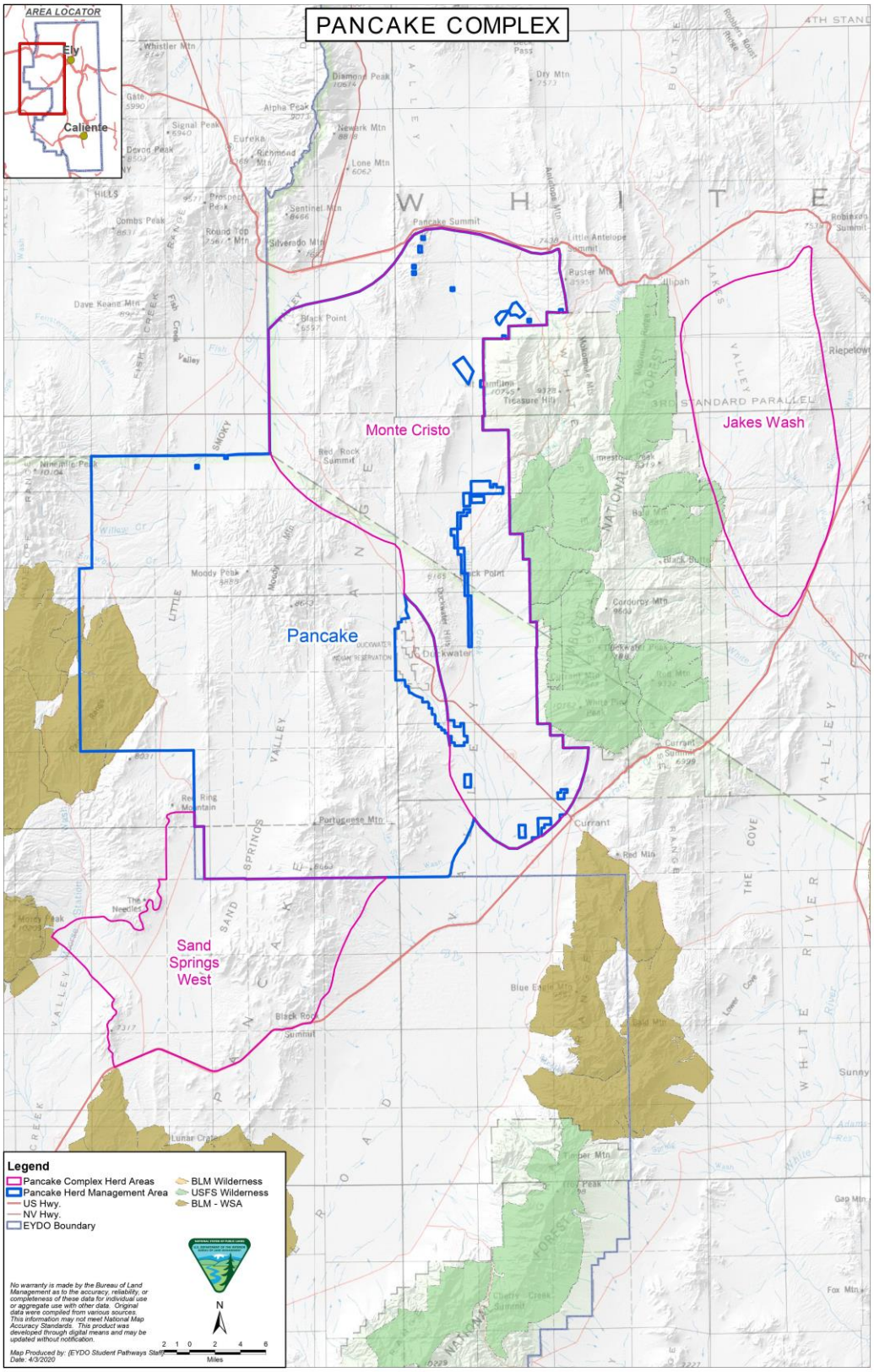
8.2 Acronyms

BLM-Bureau of Land Management
BIA- Bureau of Indian Affairs
CFR-Code of Federal Regulations
DR-Decision Record
EA-Environmental Assessment
EIS-Environmental Impact Statement
FLPMA-Federal Land Policy and Management Act
FONSI-Finding of No Significant Impact
HA – Herd Area
HMA – Herd Management Area
ID-Interdisciplinary
IM-Instructional Memorandum
NEPA-National Environmental Policy Act
RFS-Reasonably Foreseeable Future Action
RMP-Resource Management Plan

APPENDIX I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NV Hwy.
EYDO Boundary
BLM Wilderness
USFS Wilderness
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No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.
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APPENDIX II

Standard Operating Procedures for Mare Fertility Control Treatments

Mare Fertility Control Treatment (SOPs)

The following management and monitoring requirements are part of the Proposed Action and Alternative 1:

PZP Vaccine SOPs

1. PZP vaccine would be administered by trained BLM personnel.

2. The fertility control drug is administered with two separate injections: (1) a liquid dose of PZP is administered using an 18-gauge needle primarily by hand injection; (2) the pellets are preloaded into a 14-gauge needle. These are loaded on the end of a trocar (dry syringe with a metal rod) which is loaded into the jab-stick which then pushes the pellets into the breeding mares being returned to the range. The pellets and liquid are designed to release the PZP over time similar to a time-release cold capsule.

3. Delivery of the vaccine would be as an intramuscular injection while the mares are restrained in a working chute. Half a cubic centimeter (cc) of the PZP vaccine would be emulsified with half a cc of adjuvant (a compound that stimulates antibody production) and loaded into the delivery system. The pellets would be loaded into the jab-stick for the second injection. With each injection, the liquid and pellets would be propelled into the left hindquarters of the mare, just below the imaginary line that connects the point of the hip and the point of the buttocks.

4. All treated mares would be freezemarked on the neck (or location as approved by Nevada State Department of Agriculture) and / or chipped to enable researchers to positively identify the animals during the research project as part of the data collection phase.

5. At a minimum, monitoring of reproductive rates using helicopter flyovers will be conducted in years two through four by checking for the presence or absence of foals. The flight scheduled for year four will also assist in determining the percentage of mares that have returned to fertility. In addition, field monitoring will be routinely conducted as part of other regular ground-based monitoring activities.

6. A field data sheet will be used by the field applicators to record all the pertinent data relating to identification of the mare including a photograph when possible, date of treatment, type of treatment (1- or 2-year vaccine, adjuvant used) and HMA. The original form with the data sheets will be forwarded to the Authorized Officer at the National Program Office (NPO) in Reno, Nevada. A copy of the form and data sheets and any photos taken will be maintained at the district office.

7. A tracking system will be maintained by NPO detailing the quantity of PZP issued, the quantity used, and disposition of any unused PZP, the number of treated mares by HMA, district office, and state along with the freeze-mark and / or chip applied by HMA.

8. The field office will assure that treated mares do not enter the adoption market for 3 years following treatment. In the rare instance, due to unforeseen circumstances, that treated mare(s) are removed from an HMA before 3 years have lapsed, they will be maintained in either a BLM facility or BLM-contracted Long-Term Pastures (LTPs) until expiration of the 3-year holding period. In the event it is necessary to remove treated mares, their removal and disposition will be coordinated through NPO. After expiration of the 3-year holding period, the animal may be placed in the adoption program or sent to long-term pastures.

PZP Remote Darting SOPs

1. PZP vaccine would be administered through darting by trained BLM personnel or collaborating partners only. For any darting operation, the designated personnel must have successfully completed a nationally recognized wildlife darting course and who have documented and successful experience darting wildlife under field conditions.

2. All mares targeted for treatment will be clearly identifiable through photographs to enable darters and HMA managers to positively identify the animals during the project and at the time of removal during subsequent gathers.

3. Mares that have never been treated would receive 0.5 cc of PZP vaccine emulsified with 0.5 cc of Freund's Modified Adjuvant (FMA) and loaded into darts at the time a decision has been made to dart a specific mare. Mares identified for re-treatment receive 0.5 cc of the PZP vaccine emulsified with 0.5 cc of Freund's Incomplete Adjuvant (FIA).

4. The liquid dose of PZP vaccine is administered using 1.0 cc Pneu-Darts with 1.25" or 1.5" barbless needles fired from either Dan Inject®, Pneu-Dart® X-Caliber or Palmer® Cap-Chur rifle.

5. Only designated darters would mix the vaccine/adjuvant and prepare the emulsion. Vaccine-adjuvant emulsion would be loaded into darts at the darting site and delivered by means of an appropriate CO_2 powered or cartridge darting delivery system.

6. Delivery of the vaccine would be by intramuscular injection into the left or right hip/gluteal muscles while the mare is standing still.

7. Safety for both humans and the horse is the foremost consideration in deciding to dart a mare. Safe darting distances would depend on the skill and ability of the darter, and the particular model of dart gun being utilized. No attempt would be taken when other persons are within a 30-m radius of the target animal.

8. No attempts would be taken in high wind or when the horse is standing at an angle where the dart could miss the hip/gluteal region and hit the rib cage. The ideal is when the dart would strike the skin of the horse at a perfect 90° angle.

9. If a loaded dart is not used within two hours of the time of loading, the contents would be transferred to a new dart before attempting another horse. If the dart is not used before the end of the day, it would be stored under refrigeration and the contents transferred to another dart the next day. Refrigerated darts would not be used in the field.

10. No more than two people should be present at the time of a darting. The second person is responsible for locating fired darts. The second person should also be responsible for identifying the horse and keeping onlookers at a safe distance.

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

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

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

GonaCon SOPs

Orders for GonaCon–Equine should be placed with the Unites States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (WS), Pocatello Supply Depot (PSD). The PSD requires all orders to be placed in writing. Orders can be emailed to ws.psd@usda.gov and should include the name of the product being ordered, the quantity being ordered, a physical shipping address for UPS shipping and contact information for the person that should receive the billing invoice. Once the PSD receives the order and determines the shipping charges, an invoice and payment instructions will be emailed to the designated person. Payment can be made via credit card on the pay.gov webpage. Orders for Gona-Con-Equine will be shipped once payment confirmation has been received at the PSD. Any questions regarding the ordering process can be sent to ws.psd@usda.gov or call 208-236-6920.

Delivering GonaCon by Hand-Injection of GonaCon

1. GonaCon-Equine vaccine is administered by hand-injection to mares that are appropriately immobilized or restrained. Important: label instructions must be followed for this product. Females identified for treatment application are hand-injected with an intramuscular injection of Gona-Equine vaccine (2 ml) in the lower gluteal musculature using a hand-held, luer-lock syringe (18-gauge, 3.8 cm needle). The syringe is made of transparent plastic with the barrel showing graduated marks indicating the volume of the vaccine in the syringe. This facilitates the visual assessment of the quantity of vaccine injected into the animal without the need to weigh the syringes. Pre-loaded syringes should be kept refrigerated overnight and then set out the morning of application at room temperature. They should not be allowed to get too warm or cold during the day.

2. 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.

3. Although infrequent, hand-injections to immobilized or restrained horses can result in partial delivery of the vaccine due to inexperienced personnel and/or unexpected movement of the horse. As a precaution, order extra doses of the vaccine. For hand-injection application, assume a 10% failure rate and increase the original quantity accordingly.

4. Examine each syringe before and after injection and visually determine approximately how much vaccine was injected. A full dose is considered 90% (1.8 ml) or greater of the original 2 ml dose. Ensure a full dose is administered.

5. It is recommended that all treated mares be photographed to facilitate identification by individual markings, RFID chip, and/or freeze-marked on the hip or neck to positively identify the animals as a Gona-Con-Equine vaccinated mare during field observations or subsequent gathers.

Preparation of Darts for GonaCon 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.

Administering the GonaCon Vaccine Remotely (via Darting):

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.

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.

SOPs for Intrauterine Devices

Insertion of an IUD can be a rapid procedure, but it requires the mare to be temporarily restrained, such as in a squeeze chute.

IUDs would only be inserted in non-pregnant (open) mares. Wild mares receiving IUDs would be checked for pregnancy prior to insertion of an IUD. This can be accomplished by transrectal palpation and/or ultrasound performed by a veterinarian. Pregnant mares would not receive an IUD.

After cleaning of the perineal area, the sterile IUD is inserted by a veterinarian into the uterus using a sterilized, thin, tubular applicator similar to a shielded culture tube, and would be inserted in a manner similar to that routinely used to obtain uterine cultures in domestic mares.

Wild mares with IUDs would be individually marked and identified, so that they can be monitored occasionally and examined, if necessary, in the future, consistent with other BLM management activities.

APPENDIX III

Field Castration (Gelding) SOPs

Gelding will be performed with general anesthesia and by a veterinarian. The combination of pharmaceutical compounds used for anesthesia, method of physical restraint, and the specific surgical technique used will be at the discretion of the attending veterinarian with the approval of the authorized officer (IM 2009-063).

Pre-Surgery Animal Selection, Handling, and Care

1. Stallions selected for gelding will be greater than 6 months of age and less than 20 years of age.
2. All stallions selected for gelding will have a Henneke body condition score of 3 or greater. No animals which appear distressed, injured or in failing health or condition will be selected for gelding.
3. Stallions will not be gelded within 36 hours of capture and no animals that were roped during capture will be gelded at the temporary holding corrals for rerelease.
4. Whenever possible, a separate holding corral system will be constructed on site to accommodate the stallions that will be gelded. These gelding pens will include a minimum of 3 pens to serve as a working pen, recovery pen(s), and holding pen(s). An alley and squeeze chute built to the same specifications as the alley and squeeze chutes used in temporary holding corrals (solid sides in alley, minimum 30 feet in length, squeeze chute with non-slip floor) will be connected to the gelding pens.
5. When possible, stallions selected for gelding will be separated from the general population in the temporary holding corral into the gelding pens, prior to castration.
6. When it is not possible or practical to build a separate set of pens for gelding, the gelding operation will only proceed when adequate space is available to allow segregation of gelded animals from the general population of stallions following surgery. At no time will recently anesthetized animals be returned to the general population in a holding corral before they are fully recovered from anesthesia.
7. All animals in holding pens will have free access to water at all times. Water troughs will be removed from working and recovery pens prior to use.
8. Prior to surgery, animals in holding pens may be held off feed for a period of time (typically 12-24 hours) at the recommendation and direction of the attending veterinarian.
9. The final determination of which specific animals will be gelded will be based on the professional opinion of the attending veterinarian in consultation with the Authorized Officer.
10. Whether the procedure will proceed on a given day will be based on the discretion of the attending veterinarian in consultation with the Authorized Officer taking into consideration the prevailing weather, temperature, ground conditions and pen set up. If these field situations cannot be remedied, the procedure will be delayed until they can be, the stallions will be transferred to a prep facility, gelded, and later returned, or they will be released to back to the range as intact stallions.

Gelding Procedure

1. All gelding operations will be performed under a general anesthetic administered by a qualified and experienced veterinarian. Stallions will be restrained in a portable squeeze chute to allow the veterinarian to administer the anesthesia.
2. The anesthetics used will be based on a Xylazine/ketamine combination protocol. Drug dosages and combinations of additional drugs will be at the discretion of the attending veterinarian.
3. Animals may be held in the squeeze chute until the anesthetic takes effect or may be released into the working pen to allow the anesthesia to take effect. If recumbency and adequate anesthesia is

not achieved following the initial dose of anesthetics, the animal will either be re-dosed or the surgery will not be performed on that animal at the discretion of the attending veterinarian.
4. Once recumbent, rope restraints or hobbles will be applied for the safety of the animal, the handlers and the veterinarian.
5. The specific surgical technique used will be at the discretion of the attending veterinarian.
6. Flunixin meglumine or an alternative analgesic medication will be administered prior to recovery from anesthesia at the professional discretion of the attending veterinarian.
7. Tetanus prophylaxis will be administered at the time of surgery.

The animal would be sedated then placed under general anesthesia. Ropes are placed on one or more limbs to help hold the animal in position and the anesthetized animals are placed in either lateral or dorsal recumbency. The surgical site is scrubbed and prepped aseptically. The scrotum is incised over each testicle, and the testicles are removed using a surgical tool to control bleeding. The incision is left open to drain. Each animal would be given a tetanus shot, antibiotics, and an analgesic.

Any males that have inguinal or scrotal hernias would be removed from the population, sent to a regular BLM facility, and be treated surgically as indicated, if possible, or euthanized if they have a poor prognosis for recovery (IM 2009-041, IM 2009-063). Horses with only one descended testicle may be removed from the population and managed at a regular BLM facility according to BLM policy or anesthetized with the intent to locate the undescended testicle for castration. If an undescended testicle cannot be located, the animal may be recovered and removed from the population if no surgical exploration has started. Once surgical exploration has started, those that cannot be completely castrated would be euthanized prior to recovering them from anesthesia according to BLM policy (IM 2009-041, IM 2009-063). All animals would be rechecked by a veterinarian the day following surgery. Those that have excessive swelling, are reluctant to move or show signs of any other complications would be held in captivity and treated accordingly. Once released no further veterinary interventions would be possible.

Selected stallions would be shipped to the facility, gelded, and returned to the range within 30 days. Before release back to the range, they may be marked for visibility with a freeze brand or other method of marking. Gelded animals could be monitored periodically for complications for approximately 7-10 days following release. In the proposed alternatives, gelding is not part of a research study, but additional monitoring on the range could be completed either through aerial reconnaissance, if available, or field observations from major roads and trails. It is not anticipated that all the geldings would be observed but if the goal is to detect complications on the range, then this level of casual observation may help BLM determine if those are occurring. Periodic observations of the long-term outcomes of gelding could be recorded during routine resource monitoring work. Such observations could include but not be limited to band size, social interactions with other geldings and harem bands, distribution within their habitat, forage utilization, and activities around key water sources. Periodic population inventories and future gather statistics could provide additional anecdotal information about how logistically effective it is to manage a portion of the herd as non-breeding animals.

APPENDIX IV

GATHER OPERATIONS STANDARD OPERATING PROCEDURES

Gathers would be conducted by utilizing contractors from the Wild Horse Gathers-Western States Contract, or BLM personnel. The following procedures for gathering and handling wild horses would apply whether a contractor or BLM personnel conduct a gather. For helicopter gathers conducted by BLM personnel, gather operations will be conducted in conformance with the *Wild Horse Aviation Management Handbook* (January 2009).

Prior to any gathering operation, the BLM will provide for a pre-gather evaluation of existing conditions in the gather area(s). The evaluation will include animal conditions, prevailing temperatures, drought conditions, soil conditions, road conditions, and a topographic map with wilderness boundaries, the location of fences, other physical barriers, and acceptable trap locations in relation to animal distribution. The evaluation will determine whether the proposed activities will necessitate the presence of a veterinarian during operations. If it is determined that a large number of animals may need to be euthanized or gather operations could be facilitated by a veterinarian, these services would be arranged before the gather would proceed. The contractor will be apprised of all conditions and will be given instructions regarding the gather and handling of animals to ensure their health and welfare is protected.

Trap sites and temporary holding sites will be located to reduce the likelihood of injury and stress to the animals, and to minimize potential damage to the natural resources of the area. These sites would be located on or near existing roads whenever possible.

The primary gather methods used in the performance of gather operations include:

1. Helicopter Drive Trapping. This gather method involves utilizing a helicopter to herd wild horses into a temporary trap.
2. Helicopter Assisted Roping. This gather method involves utilizing a helicopter to herd wild horses or burros to ropers.
3. Bait Trapping. This gather method involves utilizing bait (e.g., water or feed) to lure wild horses into a temporary trap.

The following procedures and stipulations will be followed to ensure the welfare, safety and humane treatment of wild horses in accordance with the provisions of 43 CFR 4700.

A. Gather Methods used in the Performance of Gather Contract Operations

1. The primary concern of the contractor is the safe and humane handling of all animals gathered. All gather attempts shall incorporate the following:

   All trap and holding facilities locations must be approved by the Contracting Officer's Representative (COR) and/or the Project Inspector (PI) prior to construction. The Contractor may also be required to change or move trap locations as determined by the COR/PI. All traps and holding facilities not located on public land must have prior written approval of the landowner.

2. The rate of movement and distance the animals travel shall not exceed limitations set by the COR who will consider terrain, physical barriers, access limitations, weather, extreme temperature (high and low), condition of the animals, urgency of the operation (animals facing drought, starvation, fire rehabilitation, etc.) and other factors. In consultation with the contractor the distance the animals travel will account for the different factors listed above and concerns with

each HMA.

3. All traps, wings, and holding facilities shall be constructed, maintained and operated to handle the animals in a safe and humane manner and be in accordance with the following:

    a. Traps and holding facilities shall be constructed of portable panels, the top of which shall not be less than 72 inches high for horses and 60 inches for burros, and the bottom rail of which shall not be more than 12 inches from ground level. All traps and holding facilities shall be oval or round in design.

    b. All loading chute sides shall be a minimum of 6 feet high and shall be fully covered, plywood, metal without holes larger than 2"x4".

    c. All runways shall be a minimum of 30 feet long and a minimum of 6 feet high for horses, and 5 feet high for burros, and shall be covered with plywood, burlap, plastic snow fence or like material a minimum of 1 foot to 5 feet above ground level for burros and 1 foot to 6 feet for horses. The location of the government furnished portable fly chute to restrain, age, or provide additional care for the animals shall be placed in the runway in a manner as instructed by or in concurrence with the COR/PI.

    d. All crowding pens including the gates leading to the runways shall be covered with a material which prevents the animals from seeing out (plywood, burlap, plastic snow fence, etc.) and shall be covered a minimum of 1 foot to 5 feet above ground level for burros and 2 feet to 6 feet for horses

    e. All pens and runways used for the movement and handling of animals shall be connected with hinged self-locking or sliding gates.

4. No modification of existing fences will be made without authorization from the COR/PI. The Contractor shall be responsible for restoration of any fence modification which he has made.

5. When dust conditions occur within or adjacent to the trap or holding facility, the Contractor shall be required to wet down the ground with water.

6. Alternate pens, within the holding facility shall be furnished by the Contractor to separate mares or jennies with small foals, sick and injured animals, estrays or other animals the COR determines need to be housed in a separate pen from the other animals. Animals shall be sorted as to age, number, size, temperament, sex, and condition when in the holding facility so as to minimize, to the extent possible, injury due to fighting and trampling. Under normal conditions, the government will require that animals be restrained for the purpose of determining an animal's age, sex, or other necessary procedures. In these instances, a portable restraining chute may be necessary and will be provided by the government. Alternate pens shall be furnished by the Contractor to hold animals if the specific gathering requires that animals be released back into the gather area(s). In areas requiring one or more satellite traps, and where a centralized holding facility is utilized, the contractor may be required to provide additional holding pens to segregate animals transported from remote locations so they may be returned to their traditional ranges. Either segregation or temporary marking and later segregation will be at the discretion of the COR.

7. The Contractor shall provide animals held in the traps and/or holding facilities with a continuous supply of fresh clean water at a minimum rate of 10 gallons per animal per day. Animals held for

10 hours or more in the traps or holding facilities shall be provided good quality hay at the rate of not less than two pounds of hay per 100 pounds of estimated body weight per day. The contractor will supply certified weed free hay if required by State, County, and Federal regulation.

a. An animal that is held at a temporary holding facility through the night is defined as a horse/burro feed day. An animal that is held for only a portion of a day and is shipped or released does not constitute a feed day.

8. It is the responsibility of the Contractor to provide security to prevent loss, injury or death of gathered animals until delivery to final destination.

9. The Contractor shall restrain sick or injured animals if treatment is necessary. The COR/PI will determine if animals must be euthanized and provide for the destruction of such animals. The Contractor may be required to humanely euthanize animals in the field and to dispose of the carcasses as directed by the COR/PI.

10. Animals shall be transported to their final destination from temporary holding facilities as quickly as possible after gather unless prior approval is granted by the COR for unusual circumstances. Animals to be released back into the HMA following gather operations may be held up to 21 days or as directed by the COR. Animals shall not be held in traps and/or temporary holding facilities on days when there is no work being conducted except as specified by the COR. The Contractor shall schedule shipments of animals to arrive at final destination between 7:00 a.m. and 4:00 p.m. No shipments shall be scheduled to arrive at final destination on Sunday and Federal holidays, unless prior approval has been obtained by the COR. Animals shall not be allowed to remain standing on trucks while not in transport for a combined period of greater than three (3) hours in any 24 hour period. Animals that are to be released back into the gather area may need to be transported back to the original trap site. This determination will be at the discretion of the COR/PI or Field Office horse specialist.

B. Gather Methods That May Be Used in the Performance of a Gather

1. Gather attempts may be accomplished by utilizing bait (feed, water, mineral licks) to lure animals into a temporary trap. If this gather method is selected, the following applies:

   a. Finger gates shall not be constructed of materials such as "T" posts, sharpened willows, etc., that may be injurious to animals.

   b. All trigger and/or trip gate devices must be approved by the COR/PI prior to gather of animals.

   c. Traps shall be checked a minimum of once every 10 hours.

2. Gather attempts may be accomplished by utilizing a helicopter to drive animals into a temporary trap. If the contractor selects this method the following applies:

   a. A minimum of two saddle-horses shall be immediately available at the trap site to accomplish roping if necessary. Roping shall be done as determined by the COR/PI. Under no circumstances shall animals be tied down for more than one half hour.

   b. The contractor shall assure that foals shall not be left behind, and orphaned.

3. Gather attempts may be accomplished by utilizing a helicopter to drive animals to ropers. If the contractor, with the approval of the COR/PI, selects this method the following applies:

    a. Under no circumstances shall animals be tied down for more than one hour.

    b. The contractor shall assure that foals shall not be left behind, or orphaned.

    c. The rate of movement and distance the animals travel shall not exceed limitations set by the COR/PI who will consider terrain, physical barriers, weather, condition of the animals and other factors.

C. Use of Motorized Equipment

1. All motorized equipment employed in the transportation of gathered animals shall be in compliance with appropriate State and Federal laws and regulations applicable to the humane transportation of animals. The Contractor shall provide the COR/PI, if requested, with a current safety inspection (less than one year old) for all motorized equipment and tractor-trailers used to transport animals to final destination.

2. All motorized equipment, tractor-trailers, and stock trailers shall be in good repair, of adequate rated capacity, and operated so as to ensure that gathered animals are transported without undue risk or injury.

3. Only tractor-trailers or stock trailers with a covered top shall be allowed for transporting animals from trap site(s) to temporary holding facilities, and from temporary holding facilities to final destination(s). Sides or stock racks of all trailers used for transporting animals shall be a minimum height of 6 feet 6 inches from the floor. Single deck tractor-trailers 40 feet or longer shall have at least two (2) partition gates providing at least three (3) compartments within the trailer to separate animals. Tractor-trailers less than 40 feet shall have at least one partition gate providing at least two (2) compartments within the trailer to separate the animals. Compartments in all tractor-trailers shall be of equal size plus or minus 10 percent. Each partition shall be a minimum of 6 feet high and shall have a minimum 5 foot wide swinging gate. The use of double deck tractor-trailers is unacceptable and shall not be allowed.

4. All tractor-trailers used to transport animals to final destination(s) shall be equipped with at least one (1) door at the rear end of the trailer which is capable of sliding either horizontally or vertically. The rear door(s) of tractor-trailers and stock trailers must be capable of opening the full width of the trailer. Panels facing the inside of all trailers must be free of sharp edges or holes that could cause injury to the animals. The material facing the inside of all trailers must be strong enough so that the animals cannot push their hooves through the side. Final approval of tractor-trailers and stock trailers used to transport animals shall be held by the COR/PI.

5. Floors of tractor-trailers, stock trailers and loading chutes shall be covered and maintained with wood shavings to prevent the animals from slipping as much as possible during transport.

6. Animals to be loaded and transported in any trailer shall be as directed by the COR/PI and may include limitations on numbers according to age, size, sex, temperament and animal condition. The following minimum square feet per animal shall be allowed in all trailers:

    11 square feet per adult horse (1.4 linear foot in an 8 foot wide trailer);
    8 square feet per adult burro (1.0 linear foot in an 8 foot wide trailer);
    6 square feet per horse foal (.75 linear foot in an 8 foot wide trailer);

4 square feet per burro foal (.50 linear feet in an 8 foot wide trailer).

7. The COR/PI shall consider the condition and size of the animals, weather conditions, distance to be transported, or other factors when planning for the movement of gathered animals. The COR/PI shall provide for any brand and/or inspection services required for the gathered animals.

8. If the COR/PI determines that dust conditions are such that the animals could be endangered during transportation, the Contractor will be instructed to adjust speed.

D. Safety and Communications

1. The Contractor shall have the means to communicate with the COR/PI and all contractor personnel engaged in the gather of wild horses utilizing a VHF/FM Transceiver or VHF/FM portable Two-Way radio. If communications are ineffective the government will take steps necessary to protect the welfare of the animals.

    a. The proper operation, service and maintenance of all contractor furnished property is the responsibility of the Contractor. The BLM reserves the right to remove from service any contractor personnel or contractor furnished equipment which, in the opinion of the contracting officer or COR/PI violate contract rules, are unsafe or otherwise unsatisfactory. In this event, the Contractor will be notified in writing to furnish replacement personnel or equipment within 48 hours of notification. All such replacements must be approved in advance of operation by the Contracting Officer or his/her representative.

    b. The Contractor shall obtain the necessary FCC licenses for the radio system

    c. All accidents occurring during the performance of any task order shall be immediately reported to the COR/PI.

2. Should the contractor choose to utilize a helicopter the following will apply:

    a. The Contractor must operate in compliance with Federal Aviation Regulations, Part 91. Pilots provided by the Contractor shall comply with the Contractor's Federal Aviation Certificates, applicable regulations of the State in which the gather is located.

    b. Fueling operations shall not take place within 1,000 feet of animals.

E. Site Clearances

No personnel working at gather sites may excavate, remove, damage, or otherwise alter or deface or attempt to excavate, remove, damage or otherwise alter or deface any archaeological resource located on public lands or Indian lands.

Prior to setting up a trap or temporary holding facility, BLM will conduct all necessary clearances (archaeological, T&E, etc). All proposed site(s) must be inspected by a government archaeologist. Once archaeological clearance has been obtained, the trap or temporary holding facility may be set up. Said clearance shall be arranged for by the COR, PI, or other BLM employees.

Gather sites and temporary holding facilities would not be constructed on wetlands or riparian zones.

F. Animal Characteristics and Behavior

Releases of wild horses would be near available water when possible. If the area is new to them, a short-term adjustment period may be required while the wild horses become familiar with the new area.

G. Public Participation

Opportunities for public viewing (i.e. media, interested public) of gather operations will be made available to the extent possible; however, the primary considerations will be to protect the health, safety and welfare of the animals being gathered and the personnel involved. The public must adhere to guidance from the on-site BLM representative. It is BLM policy that the public will not be allowed to come into direct contact with wild horses or burros being held in BLM facilities. Only authorized BLM personnel or contractors may enter the corrals or directly handle the animals. The general public may not enter the corrals or directly handle the animals at anytime or for any reason during BLM operations.

H. Responsibility and Lines of Communication

Contracting Officer's Representative/Project Inspector

Ben Noyes, Wild Horse and Burro Specialist, Ely District
Tyler Reese, Wild Horse and Burro Specialist, Ely District
Shawna Richardson, Wild Horse and Burro Specialist, Battle Mountain District
Ruth Thompson, NV WH&B Program Lead
Amery Sifre, Homboldt Toiyabe National Forrest

The Contracting Officer's Representatives (CORs) and the project inspectors (PIs) have the direct responsibility to ensure the Contractor's compliance with the contract stipulations. The Schell Supervisory Natural Resource Specialist and the Schell Field Managers will take an active role to ensure the appropriate lines of communication are established between the field, Field Office, State Office, National Program Office, and BLM Holding Facility offices. All employees involved in the gathering operations will keep the best interests of the animals at the forefront at all times.

All publicity, formal public contact and inquiries will be handled through the Field Manager and/or the Supervisory Natural Resource Specialist and Field Office Public Affairs. These individuals will be the primary contact and will coordinate with the COR/PI on any inquiries.

The COR will coordinate with the contractor and the BLM Corrals to ensure animals are being transported from the gather site in a safe and humane manner and are arriving in good condition.

The contract specifications require humane treatment and care of the animals during removal operations. These specifications are designed to minimize the risk of injury and death during and after gather of the animals. The specifications will be vigorously enforced.

Should the Contractor show negligence and/or not perform according to contract stipulations, he will be issued written instructions, stop work orders, or defaulted.

APPENDIX V

Wild Horse Gather Observation Protocol

BLM recognizes and respects the right of interested members of the public and the press to observe wild horse gather operations. At the same time, BLM must ensure the health and safety of the public, BLM's employees and contractors, and America's wild horses. Accordingly, the BLM developed these rules to maximize the opportunity for reasonable public access to the gather while ensuring that BLM's health and safety responsibilities are fulfilled. Failure to maintain safe distances from operations at the gather and temporary holding sites could result in members of the public inadvertently getting in the path of the wild horses or gather personnel, thereby placing themselves and others at risk, or causing stress and potential injury to the wild horses. The BLM and the contractor's helicopter pilot must comply with 14 CFR Part 91 of the Federal Aviation Regulations, which determines the minimum safe altitudes and distance people must be from the aircraft. To be in compliance with these regulations, the viewing location at the gather site and holding corrals must be approximately 500 feet from the operating location of the helicopter at all times. The viewing locations may vary depending on topography, terrain and other factors.

Daily Visitor Protocol

- A Wild Horse Gather Information Phone Line would be set up prior to the gather so the public can call for daily updates on gather information and statistics. Visitors are strongly encouraged to check the phone line the evening before they plan to attend the gather to confirm the gather and their tour of it is indeed taking place the next day as scheduled (weather, mechanical issues or other things may affect this) and to confirm the meeting location.

- Visitors must direct their questions/comments to either their designated BLM representative or the BLM spokesperson on site, and not engage other BLM/contractor staff and disrupt their gather duties/responsibilities - professional and respectful behavior is expected of all. BLM may make the BLM staff available during down times for a Q&A session on public outreach and education days. However, the contractor and its staff would not be available to answer questions or interact with visitors.

- Observers must provide their own 4-wheel drive high clearance vehicle, appropriate shoes, winter clothing, food and water. Observers are prohibited from riding in government and contractor vehicles and equipment.

- Gather operations may be suspended if bad weather conditions create unsafe flying conditions.

- BLM would establish one or more observation areas, in the immediate area of the gather and holding sites, to which individuals would be directed. These areas would be placed so as to maximize the opportunity for public observation while providing for a safe and effective wild horse gather. The utilization of such observation areas is necessary due to the use and presence of heavy equipment and aircraft in the gather operation and the critical need to allow BLM personnel and contractors to fully focus on attending to the needs of the wild horses while maintaining a safe environment for all involved. In addition, observation areas would be sited so as to protect the wild horses from being spooked, startled or impacted in a manner that results in increased stress.

- BLM would delineate observation areas with yellow caution tape (or a similar type of tape or ribbon).
- Visitors would be assigned to a specific BLM representative on public outreach and education days and must stay with that person at all times.

- Visitors are NOT permitted to walk around the gather site or temporary holding facility unaccompanied by their BLM representative.

- Observers are prohibited from climbing/trespassing onto or in the trucks, equipment or corrals, which is the private property of the contractor.

- When BLM is using a helicopter or other heavy equipment in close proximity to a designated observation area, members of the public may be asked to stay by their vehicle for some time before being directed to an observation area once the use of the helicopter or the heavy machinery is complete.

- When given the signal that the helicopter is close to the gather site bringing wild horses in, visitors must sit down in areas specified by BLM representatives and must not move or talk as the wild horses are guided into the corral.

- Individuals attempting to move outside a designated observation area would be requested to move back to the designated area or to leave the site. Failure to do so may result in citation or arrest. It is important to stay within the designated observation area to safely observe the wild horse gather.

- Observers would be polite, professional and respectful to BLM managers and staff and the contractor/employees. Visitors who do not cooperate and follow the rules would be escorted off the gather site by BLM law enforcement personnel and would be prohibited from participating in any subsequent observation days.

- BLM reserves the right to alter these rules based on changes in circumstances that may pose a risk to health, public safety or the safety of wild horses (such as weather, lightening, wildfire, etc.).

Public Outreach and Education Day

- The media and public are welcome to attend the gather any day and are encouraged to attend on public outreach and education days. On this day, BLM would have additional interpretive opportunities and staff available to answer questions.

- The number of public outreach and education days per week, and which days they are, would be determined prior to the gather and would be announced through a press release and on the website. Interested observers should RSVP ahead through the BLM-Ely District Office number (TBD). A meeting place would be set for each public outreach and education day and the RSVP list notified. BLM representatives would escort observers on public outreach and education days to and from the gather site and temporary holding facility.

APPENDIX VI

Pancake Complex Population Modeling

To complete the population modeling for the Triple Pancake Complex, version 3.2 of the WinEquus program, created April 2, 2002, was utilized.

Objectives of Population Modeling

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

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

Population Data, Criteria, and Parameters utilized for Population Modeling

All simulations used the survival probabilities, foaling rates, and sex ratio at birth that was supplied with the WinEquus population for the Garfield HMA 1997.

Sex ratio at Birth:
43% Females
57% Males

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

Year 1: 77%, Year 2: 42%, Year 3: 42%, Year4: 42%

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

Contraception Criteria
(Alternative I)

Age	Percentages for Fertility Treatment
1	100%
2	100%
3	100%
4	100%
5	100%
6	100%
7	100%
8	100%
9	100%
10-14	100%
15-19	100%
20+	100%

Population Modeling Criteria

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

- Starting Year: 2020
- Initial Gather Year: 2020
- Gather interval: regular interval of three years
- Gather for fertility treatment regardless of population size: No
- Continue to gather after reduction to treat females: Yes
- Sex ratio at birth: 58% males
- Percent of the population that can be gathered: 80%
- Minimum age for long term holding facility horses: Not Applicable (Gate Cut)
- Foals are included in the AML
- Simulations were run for 10 years with 100 trials each

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

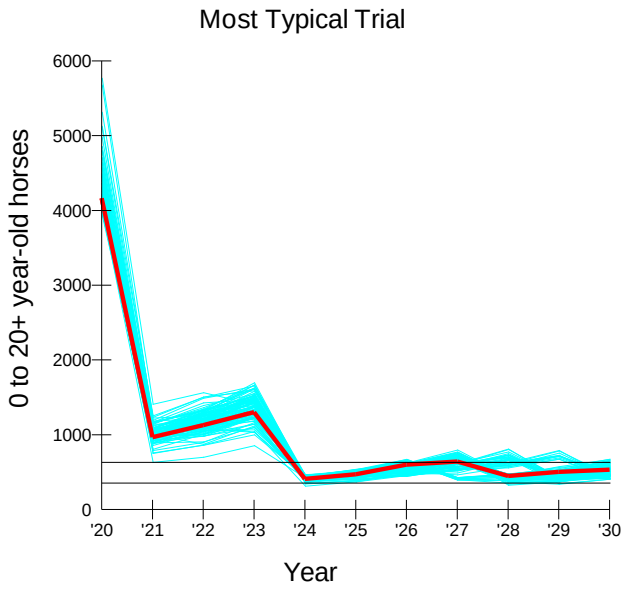
Modeling Parameter	Alternative A Proposed Action Gather to Low AML Population Growth Control Sex Ratio (60:40) Non-Reproducing (Gelding)	Alternative B Gather to Low AML Population Growth Control Sex Ratio (60:40)	Alternative C Gather and Remove excess animals to Low AML without Fertility Control	Alternative D Remove Excess Animals From Jakes Wash HA Only	No Action Alternative (No Removal & No Fertility Control)
Management by removal only	No	No	Yes	Yes	N/A
Threshold Population Size Following Gathers	361	361	361	0	N/A
Target Population Size Following Gathers	361	361	361	0	N/A

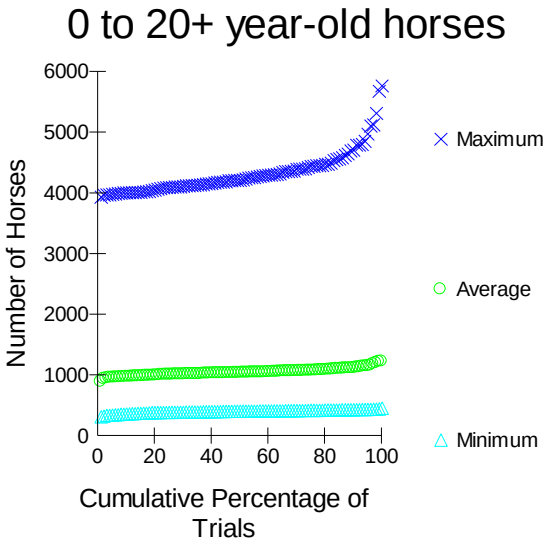
Gather for fertility control regardless of population size	No	No	No	No	N/A
Gathers continue after removals to treat additional females	Yes	Yes	No	No	N/A

Alternatives A & B

Estimated Population 3,932

Population Size





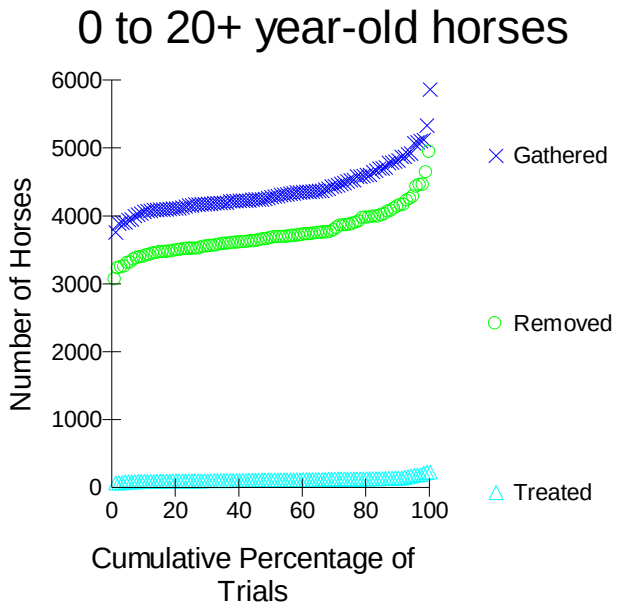
Population Sizes in 11 Years*

	Minimum	Average	Maximum
Lowest Trial	321	892	3943
10th Percentile	368	976	4013
25th Percentile	393	1012	4102
Median Trial	414	1042	4222
75th Percentile	426	1078	4448
90th Percentile	438	1123	4758
Highest Trial	464	1228	5774

* 0 to 20+ year-old horses

In 11 years and 100 trials, the lowest number of 0 to 20+ year-old horses ever obtained was 321 and the highest was 5,774. In half the trials, the minimum population size in 11 years was less than 414 and the maximum was less than 4,222. The average population size across 11 years ranged from 892 to 1,228.

Total Gathered

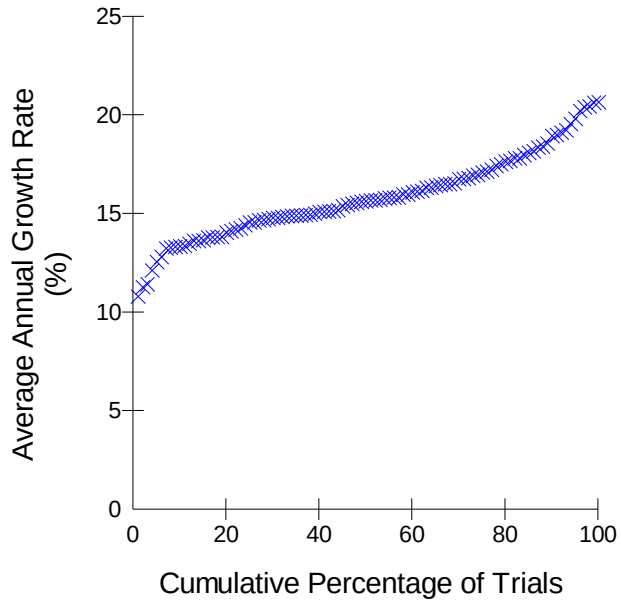


Totals in 11 Years*

	Gathered	Removed	Treated
Lowest Trial	3768	3065	82
10th Percentile	4078	3406	100
25th Percentile	4173	3514	110
Median Trial	4294	3674	122
75th Percentile	4538	3873	138
90th Percentile	4855	4146	152
Highest Trial	5872	4940	238

* 0 to 20+ year-old horses

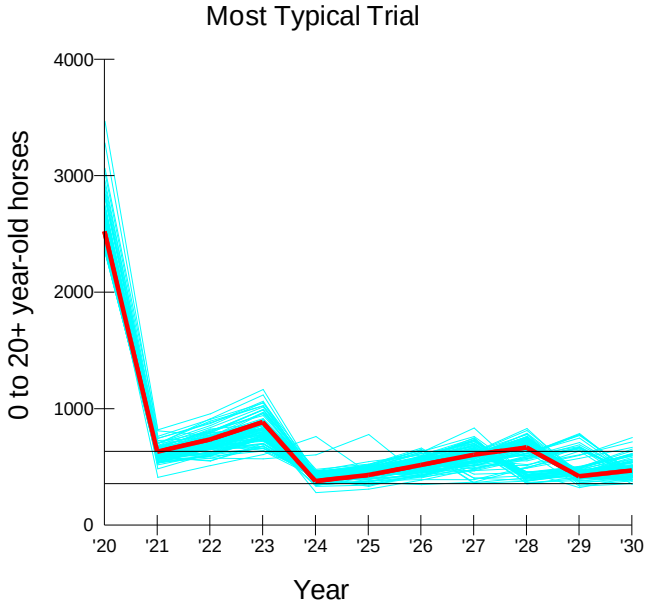
Population Growth Rate

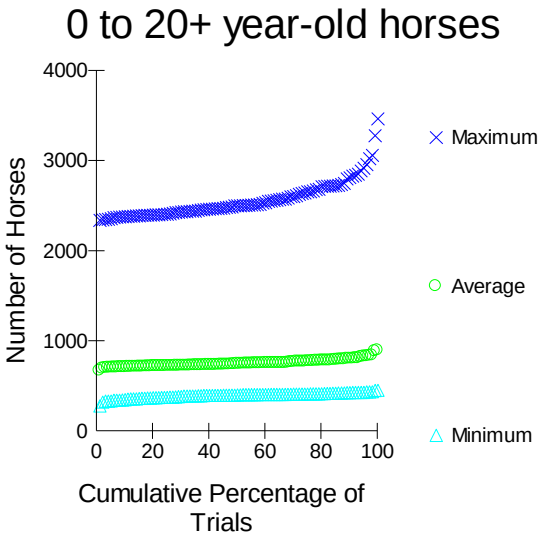


Average Growth Rate in 10 Years	
Lowest Trial	10.8
10th Percentile	13.4
25th Percentile	14.6
Median Trial	15.7
75th Percentile	17.1
90th Percentile	19.0
Highest Trial	20.7

Estimated Population 2,330

Population Size





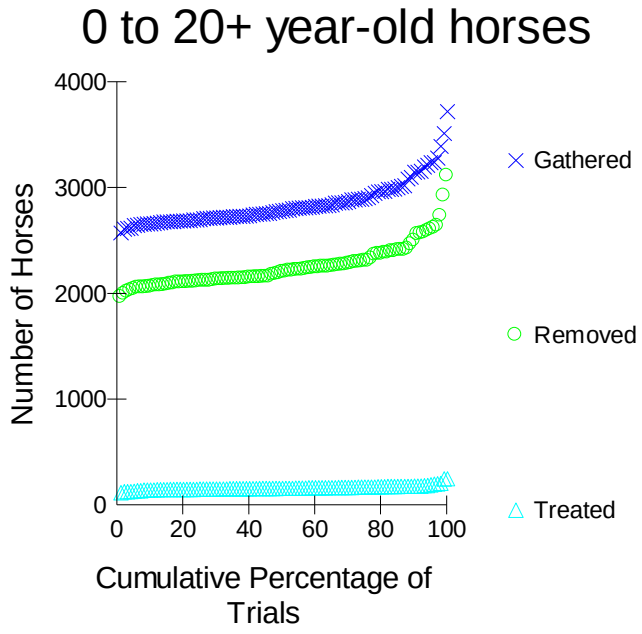
Population Sizes in 11 Years*

	Minimum	Average	Maximum
Lowest Trial	285	672	2345
10th Percentile	356	712	2388
25th Percentile	380	725	2415
Median Trial	406	748	2506
75th Percentile	418	778	2662
90th Percentile	432	806	2828
Highest Trial	457	898	3472

* 0 to 20+ year-old horses

In 11 years and 100 trials, the lowest number of 0 to 20+ year-old horses ever obtained was 285 and the highest was 3,472. In half the trials, the minimum population size in 11 years was less than 406 and the maximum was less than 2,506. The average population size across 11 years ranged from 672 to 898.

Total Gathered

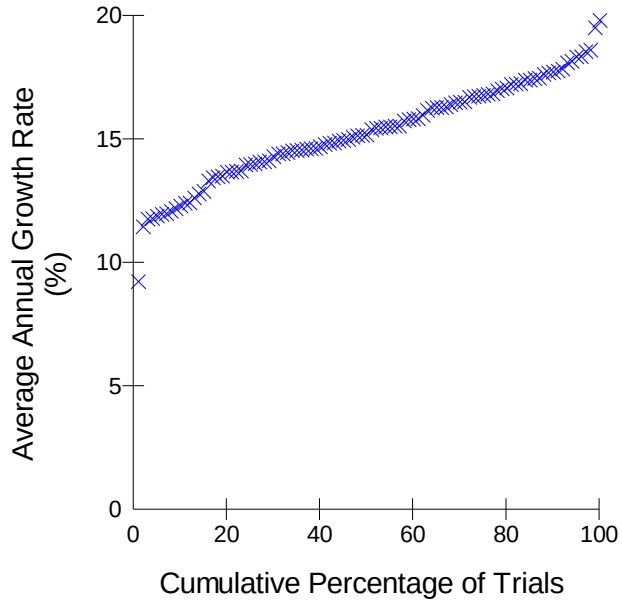


Totals in 11 Years*

	Gathered	Removed	Treated
Lowest Trial	2580	1969	122
10th Percentile	2666	2068	149
25th Percentile	2709	2120	156
Median Trial	2790	2206	165
75th Percentile	2908	2310	177
90th Percentile	3154	2532	185
Highest Trial	3726	3115	255

* 0 to 20+ year-old horses

Population Growth Rate

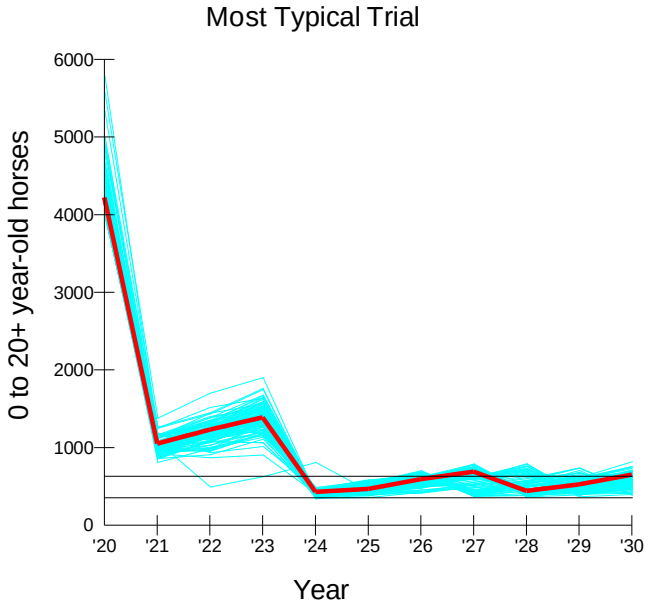


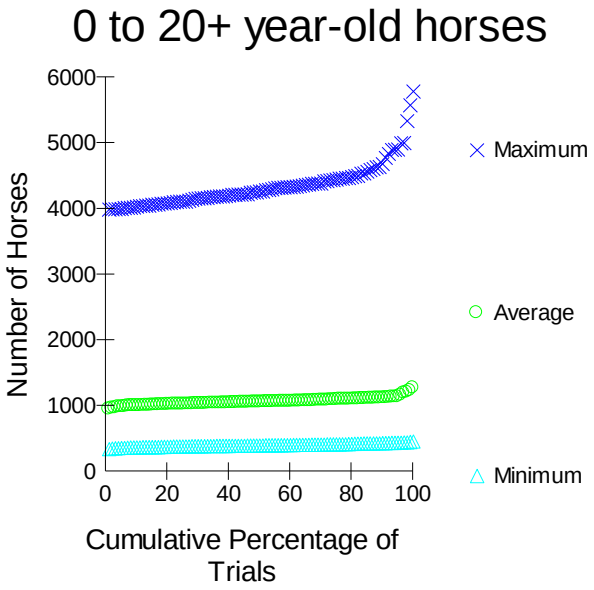
Average Growth Rate in 10 Years	
Lowest Trial	9.2
10th Percentile	12.4
25th Percentile	14.0
Median Trial	15.3
75th Percentile	16.8
90th Percentile	17.8
Highest Trial	19.8

Alternative C

Estimated Population 3,932

Population Size





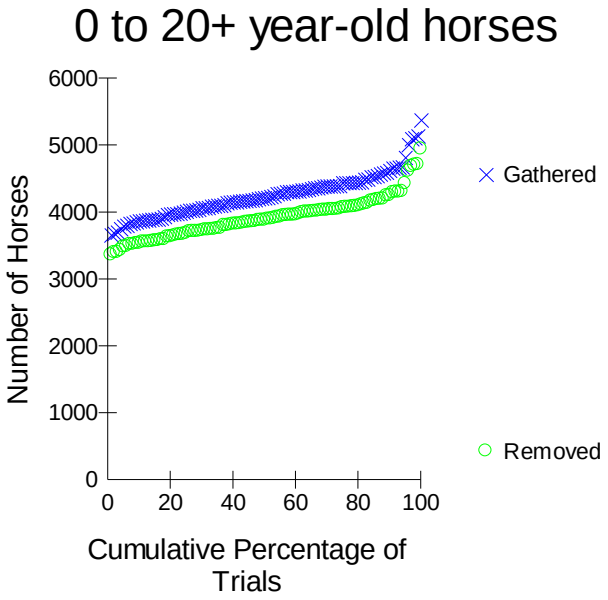
Population Sizes in 11 Years*

	Minimum	Average	Maximum
Lowest Trial	345	948	3994
10th Percentile	372	1002	4042
25th Percentile	386	1026	4115
Median Trial	401	1058	4268
75th Percentile	418	1096	4458
90th Percentile	436	1121	4733
Highest Trial	462	1272	5789

* 0 to 20+ year-old horses

In 11 years and 100 trials, the lowest number of 0 to 20+ year-old horses ever obtained was 345 and the highest was 5,789. In half the trials, the minimum population size in 11 years was less than 401 and the maximum was less than 4,268. The average population size across 11 years ranged from 948 to 1272.

Total Gathered

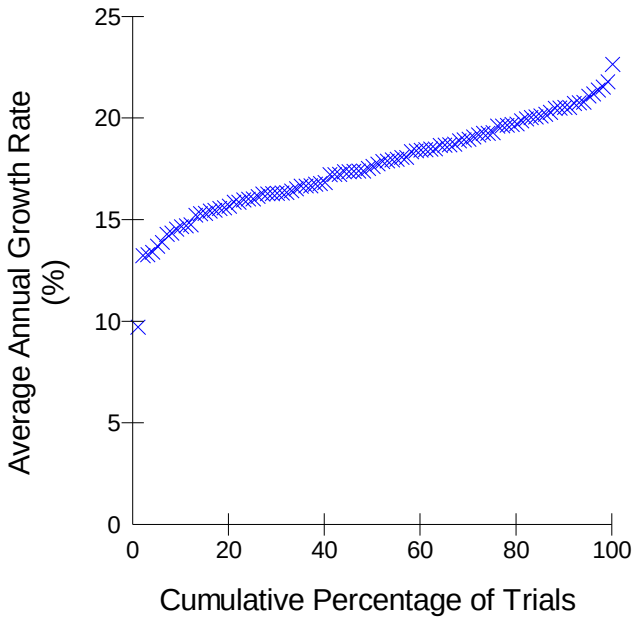


Totals in 11 Years*

	Gathered	Removed
Lowest Trial	3661	3364
10th Percentile	3872	3546
25th Percentile	4022	3698
Median Trial	4220	3890
75th Percentile	4442	4070
90th Percentile	4643	4271
Highest Trial	5379	4946

* 0 to 20+ year-old horses

Population Growth Rate

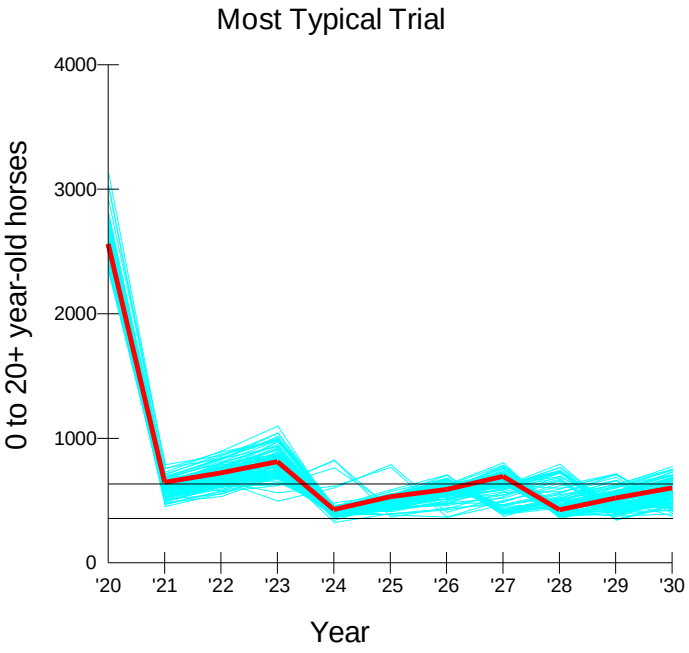


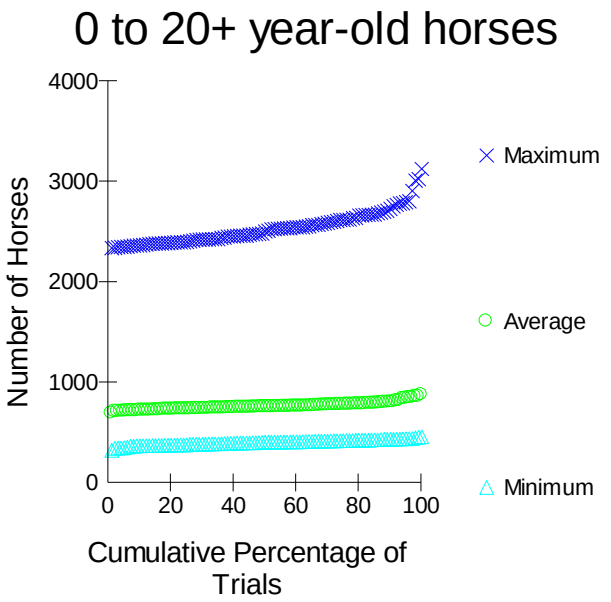
Average Growth Rate in 10 Years

Lowest Trial	9.8
10th Percentile	14.7
25th Percentile	16.1
Median Trial	17.7
75th Percentile	19.5
90th Percentile	20.6
Highest Trial	22.7

Estimated Population 2,330

Population Size





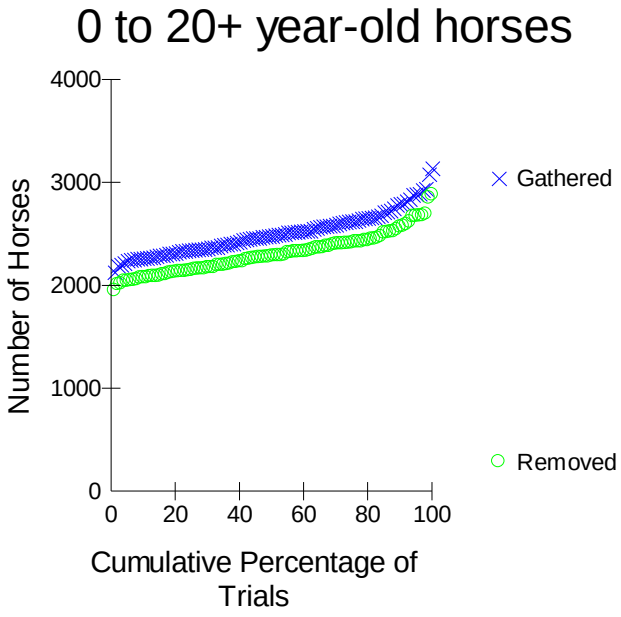
Population Sizes in 11 Years*

	Minimum	Average	Maximum
Lowest Trial	328	694	2341
10th Percentile	372	723	2372
25th Percentile	384	737	2407
Median Trial	408	757	2512
75th Percentile	424	782	2624
90th Percentile	438	806	2746
Highest Trial	463	877	3130

* 0 to 20+ year-old horses

In 11 years and 100 trials, the lowest number of 0 to 20+ year-old horses ever obtained was 328 and the highest was 3,130. In half the trials, the minimum population size in 11 years was less than 408 and the maximum was less than 2,512. The average population size across 11 years ranged from 694 to 877.

Total Gathered

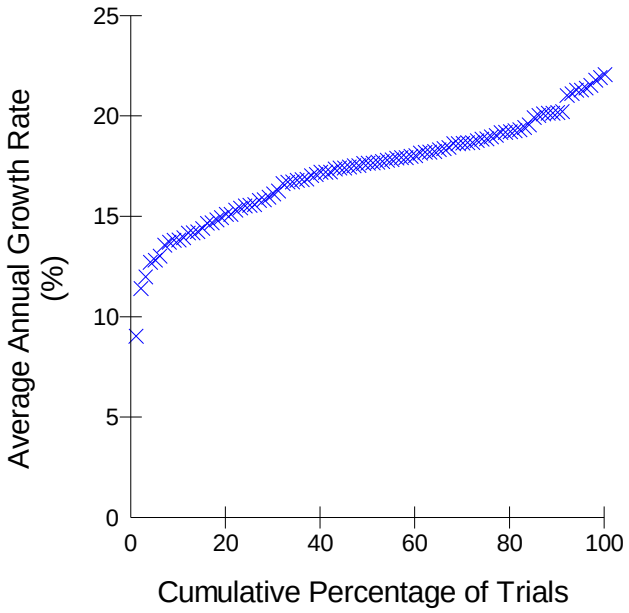


Totals in 11 Years*

	Gathered	Removed
Lowest Trial	2131	1953
10th Percentile	2270	2076
25th Percentile	2348	2152
Median Trial	2488	2288
75th Percentile	2628	2420
90th Percentile	2798	2574
Highest Trial	3142	2884

* 0 to 20+ year-old horses

Population Growth Rate

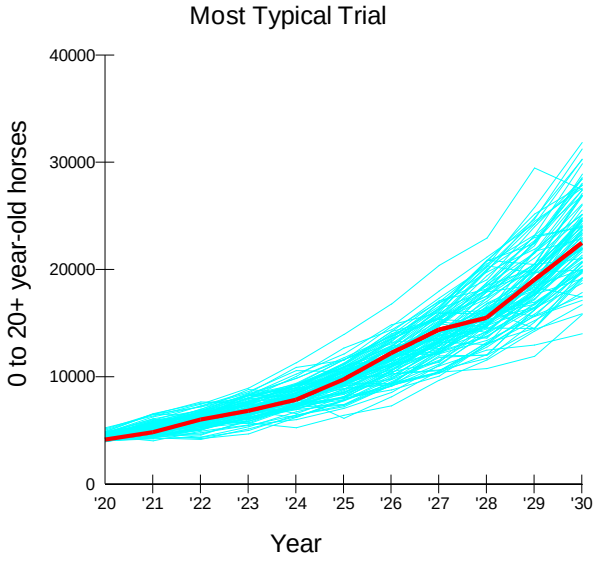


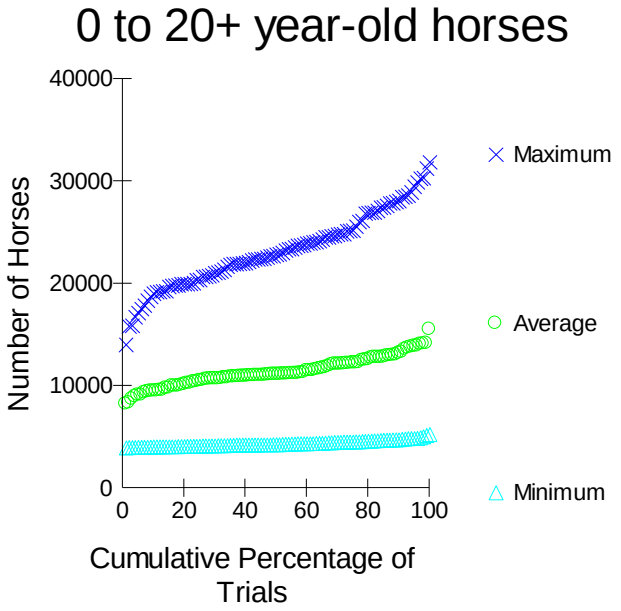
Average Growth Rate in 10 Years	
Lowest Trial	9.1
10th Percentile	13.9
25th Percentile	15.6
Median Trial	17.7
75th Percentile	19.0
90th Percentile	20.2
Highest Trial	22.1

No Action Alternative

Estimated Population 3,932

Population Size





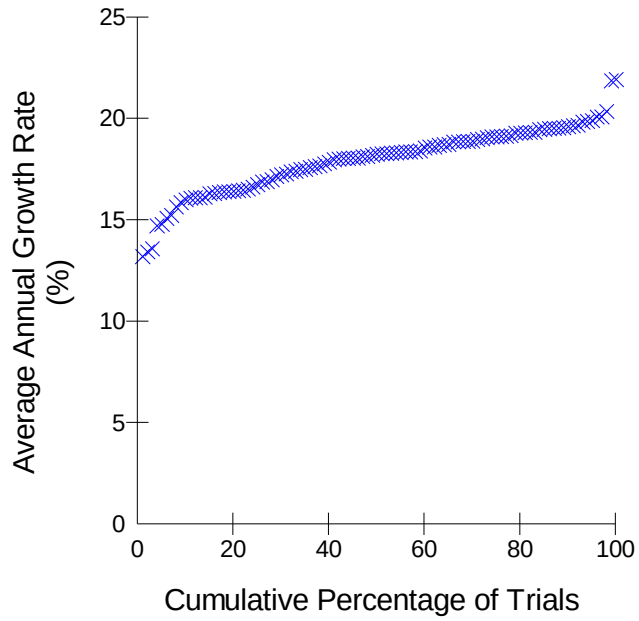
Population Sizes in 11 Years*

	Minimum	Average	Maximum
Lowest Trial	3969	8217	14059
10th Percentile	4059	9493	19123
25th Percentile	4143	10505	20545
Median Trial	4272	11128	22883
75th Percentile	4550	12239	25413
90th Percentile	4785	13226	28296
Highest Trial	5282	15514	31899

* 0 to 20+ year-old horses

In 11 years and 100 trials, the lowest number of 0 to 20+ year-old horses ever obtained was 3,969 and the highest was 31,899. In half the trials, the minimum population size in 11 years was less than 4,272 and the maximum was less than 22,883. The average population size across 11 years ranged from 8,217 to 15,514.

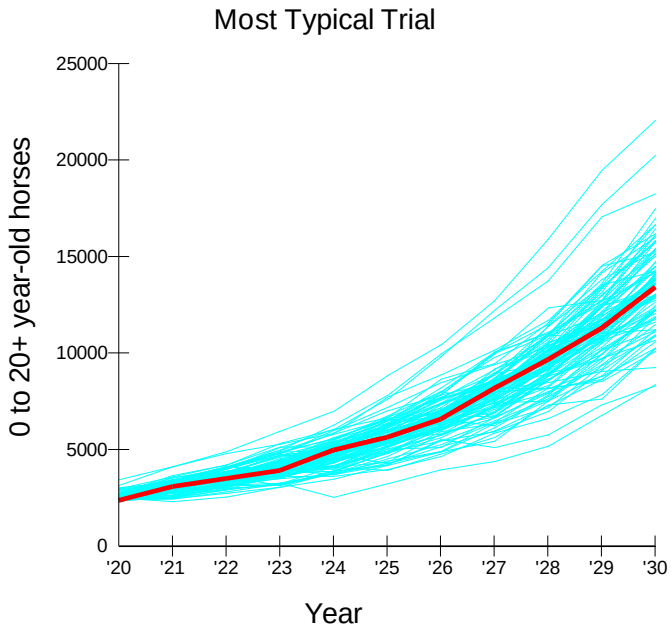
Population Growth Rate

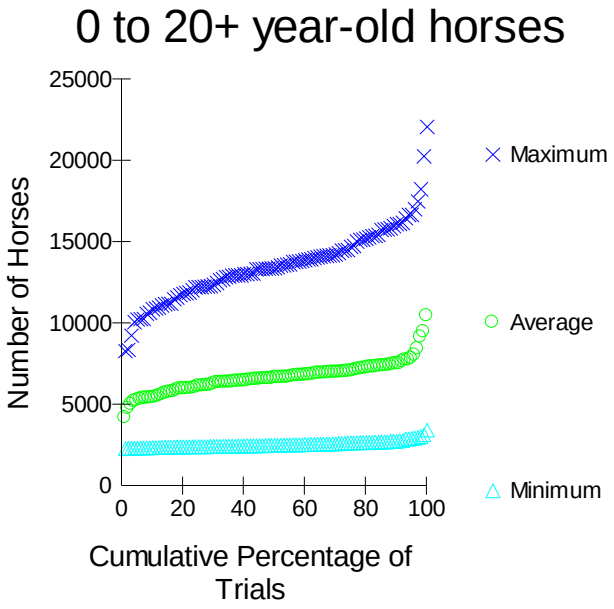


Average Growth Rate in 10 Years	
Lowest Trial	13.2
10th Percentile	16.1
25th Percentile	16.8
Median Trial	18.3
75th Percentile	19.1
90th Percentile	19.7
Highest Trial	22.0

Estimated Population 2,330

Population Size





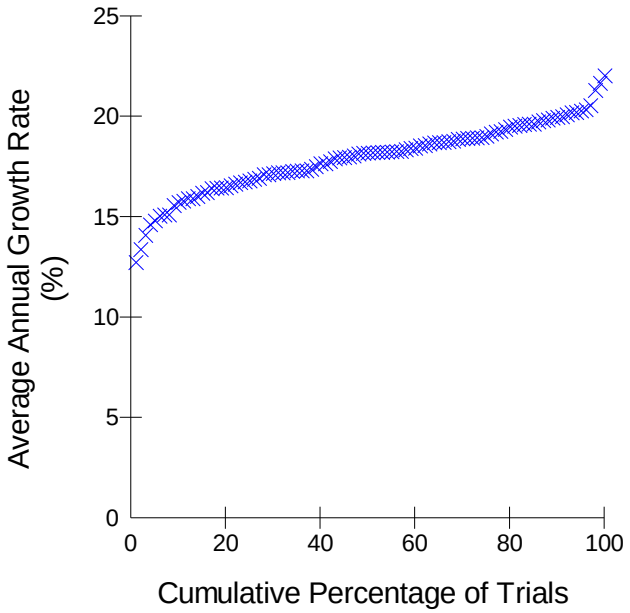
Population Sizes in 11 Years*

	Minimum	Average	Maximum
Lowest Trial	2321	4202	8322
10th Percentile	2389	5446	10926
25th Percentile	2438	6140	12260
Median Trial	2522	6659	13450
75th Percentile	2671	7081	14758
90th Percentile	2792	7516	16137
Highest Trial	3462	10464	22105

* 0 to 20+ year-old horses

In 11 years and 100 trials, the lowest number of 0 to 20+ year-old horses ever obtained was 2,321 and the highest was 22,105. In half the trials, the minimum population size in 11 years was less than 2,522 and the maximum was less than 13,450. The average population size across 11 years ranged from 4,202 to 10,464.

Population Growth Rate



Average Growth Rate in 10 Years	
Lowest Trial	12.8
10th Percentile	15.8
25th Percentile	16.9
Median Trial	18.2
75th Percentile	19.1
90th Percentile	20.0
Highest Trial	22.1

Highest Trial

APPENDIX VII

Rangeland Health Standards Summary

The Standard Determination Documents evaluate and assess livestock grazing management practices, to determine whether those practices are conforming to the standards and guidelines for rangeland health, as required by 43 C.F.R. Subpart 4180. These SDDs do not evaluate or assess achievement of the wild horse and burros standards, but do provide insights into whether wild horses are contributing to non-attainment of overall standards during the livestock permit renewal process.

HMA/HA	Allotment	Use Area	Rangeland Health Standards	Completion
Pancake HMA	Duckwater	Bull Creek/North Railroad Valley	**Standard 1: Upland Sites;** Not achieving the Standard, not making significant progress towards. Livestock are a contributing factor to not achieving the Standard. Failure to achieve the Standard is also related to other issues or condition. Both livestock and wild horses are contributing factors. Due to shrub dominance, lack of native vegetation cover, the risk of invasive species spread, risk of erosion and loss of soil structure, and heavy or severe utilization at times, the soil resources lack much resiliency or capability to maintain or improve in this use area.	2009
			Standard 2: Riparian and Wetland Sites; Not Applicable	
			Standard 3: Habitat; Not achieving the Standard, not making significant progress towards. Livestock are a contributing factor to not achieving the Standard. Failure to achieve the Standard is also related to other issues or conditions. Both livestock and wild horses are contributing factors. Due to shrub dominance, lack of vegetation production, lack of appropriate cover, lack of appropriate structure, and the risk of invasive species spread, the vegetative resources lack much resiliency or capability to maintain or improve in the term permit renewal area.	
		Bull Corner/Poison Patch	**Standard 1: Upland Sites;** Not Achieving the Standard, Not making significant progress towards. Livestock are a contributing factor to not achieving the Standard. Failure to achieve the Standard is also related to other issues or conditions. Both livestock and wild horses are contributing factors. Due to shrub dominance, lack of native vegetation cover, lack of appropriate vegetation structure, the risk of invasive species spread, risk or erosion and loss of soil structure, and severe utilization at times, the soil resources lack much resiliency or capability to maintain or improve in this use area.	
			Standard 2: Riparian and Wetland Sites; This Standard was not evaluated since there are no public land riparian systems present in the Bull Corner/Poison Patch Use Area.	
			Standard 3: Habitat; Not achieving the Standard, not making significant progress towards. Livestock are a contributing factor to not achieving the Standard. Failure to achieve the Standard is also related to other issues or conditions. Both livestock and wild horses are contributing factors. Due to shrub dominance, lack or vegetation production, lack of cover,	

HMA/HA	Allotment	Use Area	Rangeland Health Standards	Completion
			lack of appropriate structure, and the risk of invasive species spread, the vegetative resources lack much resiliency or capability to maintain or improve in the term permit renewal area.	
		Duckwater Hills	**Standard 1: Upland Sites;** Achieving the Standard	
			Standard 2: Riparian and Wetland Sites; Not Applicable	
			Standard 3: Habitat; Not Achieving the Standard, not making significant progress towards. Livestock are not a contributing factor to not achieving the Standard. Failure to achieve the Standard is related to other issues or conditions. This is attributable to drought, historic heavy livestock grazing from 1870-1994, and possibly lack of natural wildfire.	
		Green Spring	**Standard 1: Upland Sites;** Not achieving the Standard, But making significant progress towards. Livestock are not a contributing factor to not achieving the Standard. Failure to achieve the Standard is related to other issues or conditions.	
			Standard 2: Riparian and Wetland Sites; This Standard was not evaluated since there are no public land riparian systems present in the Green Springs Use Area	
			Standard 3: Habitat; Not achieving the Standard, not making significant progress towards. Livestock are not a contributing factor to not achieving the Standard. Failure to achieve the Standard is related to other issues or conditions. The BLM interdisciplinary team determined that significant progress is not being made towards achievement of Habitat Standard because movement towards achieving the Habitat Standards is not occurring at an acceptable level of rate and that wild horses populations above the AML are a contributing factor. A livestock grazing system is in place that defers cattle use until June each year in Green Springs Valley. Thus there is no livestock use during the critical growing period.	
		Little Smoky Valley	**Standard 1: Upland Sites;** Not achieving the Standard, not making significant progress towards. Livestock are a contributing factor to not achieving the Standard. Failure to achieve the Standard is also related to other issues or conditions. Both livestock and wild horses are contributing factors. Due to shrub dominance, lack of native vegetation cover, the risk of invasive species spread, and severe utilization at times, the soil resources lack much resiliency or capability to maintain or improve in this use area.	
			Standard 2: Riparian and Wetland; This Standard was not evaluated since there are no public land riparian systems present in that portion of the Little Smoky Valley Use Area grazed by cattle or sheep.	
			Standard 3: Habitat; Not achieving the Standard, Not making significant progress towards. Livestock are a contributing factor to not achieving the Standard. Failure to achieve the Standard is also related to other issues or conditions. Both livestock and wild horses are contributing factors. Due to shrub dominance, lack or production, and the risk of invasive species spread, the vegetative resources lack much capability to maintain or improve in the use area. The native plant communities here are not sustainable.	
		North Sand Springs Valley	**Standard 1: Upland Sites;** Not achieving the Standard, not making significant progress towards. Livestock are a contributing factor to not achieving the Standard. Failure to achieve	

HMA/HA	Allotment	Use Area	Rangeland Health Standards	Completion
			the Standard is also related to other issues or conditions. Both livestock and wild horses are contributing factors. Due to shrub dominance, lack of an herbaceous understory, and the risk of invasive species spread at Key Area DW-61, the soil resources lack capability to maintain or improve in this use area.	
			Standard 2: Riparian and Wetland; This Standard was not evaluated since there are no public land riparian systems present in the North Sand Springs Use Area.	
			Standard 3: Habitat; Not achieving the Standard, not making significant progress towards. Livestock are a contributing factor to not achieving the Standard. Failure to achieve the Standard is also related to other issues or conditions. Both livestock and wild horses are contributing factors. Due to shrub dominance, lack of herbaceous production, and the risk of invasive species spread, the vegetative resources lack much resiliency or capability to maintain or improve in this use area. Based on professional judgment, the native plant communities here are in better shape than other use areas of the Duckwater Allotment, yet not sustainable in the long term.	
		Pancake East Bench/Duckwater valley	**Standard 1: Upland Site;** North Pancake Area-North of McClure Spring Pipeline: Not achieving the Standard, not making significant progress towards. Livestock are not a contributing factor to not achieving the Standard. Failure to achieve the Standard is related to other issues or conditions. Wild Horses are a contributing factor. Due to shrub dominance, lack of native vegetation cover, the risk of invasive species spread, risk of erosion and loss of soil structure. And heavy or severe utilization at times, the soil resources lack much resiliency or capability to maintain or improve in this use are. Duckwater Corner Area: Achieving the Standard	
			Standard 2: Riparian and Wetland; Not achieving the Standard, not making significant progress towards. Livestock are a contributing factor to not achieving the Standard. Failure to achieve the Standard is also related to other issues or conditions. Both livestock and wild horses are contributing factors. Due to lack of riparian species cover, heavy or severe utilization, trampling, drought, the risk of invasive species spread, and other factors, the riparian areas lack much resiliency or capability to maintain or improve in this use area.	
			Standard3: Habitat; North Pancake Area: Not achieving the Standard, not making significant progress towards. Livestock are not a contributing factor to not achieving the Standard. Failure to achieve the Standard is related to other issues or conditions. Both livestock and wild horses are contributing factors. Due to shrub dominance (inappropriate composition), inappropriate vegetation production, inappropriate vegetation structure, and the moderate risk of invasive species spread, the vegetative resources lack much capability to maintain or improve in the use area. The native plant communities here are not sustainable.	

HMA/HA	Allotment	Use Area	Rangeland Health Standards	Completion
			Duckwater Corner: Not Achieving the Standard, But Making significant progress towards. Livestock are not a contributing factor to not achieving the Standard. Failure to achieve the Standard is related to other issues or conditions. Inappropriate plant composition and structure at four study sites. These sites have transitioned somewhat to shrub dominance, although a healthy diversity of shrubs are present for winter grazing, including four wing saltbush and spiny hopsage. Black sagebrush and rabbitbrush are dominated over much of the area.	
		Pogues Station	**Standard 1: Upland Sites;** Not achieving the Standard, not making significant progress towards. Livestock are a contributing factor to not achieving the Standard. Failure to achieve the Standard is also related to other issues or conditions. Both livestock and wild horses are contributing factors. Due to inappropriate plant composition, lack of vegetative cover, and the risk of invasive species spread, the soil resources lack much resiliency or capability to maintain or improve in this use area.	
			Standard 2: Riparian and Wetland Sites; This Standard was not evaluated since there are no public land riparian systems present in the pogues station use area.	
			Standard 3: Habitat; Not achieving the Standard, not making significant progress towards. Livestock are a contributing factor to not achieving the Standard. Failure to achieve the Standard is also related to other issues or conditions. Due to shrub dominance, lack of production, and the risk of invasive species spread, the vegetative resources lack much resiliency or capability to maintain to maintain or improve in this use area.	
		South Sand Springs Valley*	**Standard 1: Upland Sites;** Not achieving the Standard, not making significant progress towards. Livestock are not a contributing factor to not achieving the Standard. Failure to achieve the Standard is related to other issues or conditions. Wild horses are a contributing factor. Due to inappropriate plant composition, lack of vegetative cover and production, a history of heavy and severe use, and the risk of invasive species spread, the soil resources lack much resiliency or capability to maintain or improve in this use area.	
			Standard 2: Riparian and Wetland; Not achieving the Standard, not making significant progress towards. Livestock are not a contributing factor to not achieving the Standard. Failure to achieve the Standard is also related to other issues or conditions. Wild horses are a contributing factor. Martiletti Spring has been monitored many times since 1991 and has always been in a very degraded state.	
			Standard 3: Habitat Not achieving the Standard, not making significant progress towards. Livestock are not a contributing factor to not achieving the Standard. Failure to achieve the Standard is also related to other issues or conditions. Wild horses are a contributing factor. Due to shrub dominance, lack of production, inappropriate plant community structure, and the risk of invasive species spread, the vegetative resources lack much resiliency or capability to maintain or improve in this use area.	
	Monte Cristo		**Standard 1: Upland Site;** Achieving the Standard	2009
			Standard 2: Riparian and Wetland Sites; Not Applicable	

HMA/HA	Allotment	Use Area	Rangeland Health Standards	Completion
			Standard 3: Habitat; Not achieving the Standard, but making significant progress towards. Livestock are not a causal factor to not achieving the Standard. Failure to achieve the Standard is related to other issues or conditions. No livestock use occurred since 2002. Wild horse populations above the appropriate management level (AML) are a contributing factor to non-achievement of the Habitat Standard.	
	Pancake Black Point			On going
	Six Mile		**Standard 1: Upland Site;** Achieving the Standard **Standard 2: Riparian and Wetland Sites;** Not applicable **Standard 3: Habitat;** The Habitat Standard is achieved in the Fernando Seeding, but not achieved in native range. Current sheep management practices (2000-2010) at a level of 314 active AUMs average actual use in native range annually is not a contributing factor to not achieving the Standard in native range. Failure to achieve the standard is related to other issues or conditions, including wild horses, drought, historical heavy livestock grazing prior to 1990, and lack of natural wildfire.	2010
	South Pancake		**Standard 1: Upland Site;** The Standard is being achieved **Standard 2: Riparian and Wetland Sites;** The Standard is not applicable **Standard 3: Habitat;** The Standard is not being achieved. Livestock are not a significant factor to not achieving the Standard; failure to meet the standard is related to other issues or conditions. In addition to livestock grazing, wild horses and wildlife use, variable precipitation, and altered natural disturbance regimes occur on the South Pancake Allotment. Non-attainment of this Standard is largely due to grasses being in poor vigor, declining, or absent. Sheep grazing is not a significant contributing factor to these conditions because of the forage preference of sheep, which primarily forage on shrubs and especially black sagebrush. Also, as a result of this forage preference, sheep grazing will not harm the grasses but will allow for grass conditions to improve while sheep grazing occurs. Furthermore, licensed sheep use has been lower than allowable levels over the past ten years and utilization has been slight to moderate which is within proper use levels across the allotment. This is a winter, sheep grazing allotment where grazing does not occur during most of the critical growing season. This further supports the conclusion that sheep grazing is not a significant contributing factor to not meeting Standard 3.	2009
	Newark		**Standard 1: Upland Standards;** The standard is being achieved. **Standard 2: Riparian and Wetland Sites;** Not achieving the Standard, and not making significant progress towards. Livestock are contributing factor to not achieving the Standard, failure to meet the standard is related to other issues or concerns. In addition to livestock grazing, wild horse and wildlife use, variable precipitation, and altered natural disturbance regimes occur on the Newark Allotment.	2009

HMA/HA	Allotment	Use Area	Rangeland Health Standards	Completion
			Standard 3: Habitat; Not achieving the Standard but making significant progress towards. Livestock are not a contributing factor to not achieving the Standard, failure to meet the standard is related to other issues or conditions. Utilization has been within proper levels of use across the allotment and permitted use is lower than allowed over the past ten years. The causal factor for the loss of herbaceous understory and low production has not been determined.	
Jakes Wash HA	Badger Spring		**Standard 1: Upland Standards;** Not achieving the Standard, but making significant progress towards. Livestock are not a significant contributing factor. Failure to meet the standard is related to other issues or conditions 1.e. past wild horse use, lack of precipitation, drought conditions, livestock drift from adjacent areas and changes in climate.	2009
			Standard 2: Riparian and Wetland Sites; Not Applicable	
			Standard 3: Habitat; Not achieving the Standard, but making significant progress towards . Livestock are not a significant contributing factor. Failure to meet the standard is related to other issues or conditions i.e. past wild horse use, lack of precipitation, drought conditions, livestock drift from adjacent areas and changes in climate and fire suppression.	
	Giroux Wash			In progress
	Indian Jake		**Standard 1: Upland Site:** Achieving the Standard	2010
			Standard 2: Riparian and Wetland Sites; Not applicable	
			Standard 3: Habitat; Not achieving the Standard, not making significant progress towards. Cattle grazing is a contributing factor to not achieving the Standard. Failure to achieve the Standard is also related to other issues or conditions including wild horses, drought, historical heavy livestock grazing, and lack of natural wildfire.	
	Tom Plain		**Standard 1: Upland Site:** Achieving the Standard	2007
			Standard 2: Riparian and Wetland Sites; Not Achieved, but making significant progress towards.	
			Standard 3: Habitat; Not achieved, but making significant progress towards.	

*Duckwater Allotment; South Sand Springs Valley Use Area has been closed to cattle grazing since 2000.

APPENDIX VIII

Risk Assessment For Noxious & Invasive Weeds

PANCAKE COMPLEX
WILD HORSE GATHER

Nye and White Pine Counties, Nevada

On May 11, 2020 a Noxious & Invasive Weed Risk Assessment was completed for the Pancake Complex wild horse gather. This weed risk assessment includes the Ely District portion of the Pancake, and Sand Springs West Wild Horse Herd Management Areas (HMAs), and the Jakes Wash Wild Horse Herd Area (HA). The Ely District also has a Memorandum of Understanding with the Battle Mountain District to inventory and treat weeds in a portion of the Sand Springs West HMA.

Alternatives analyzed include the following:

Proposed Action (Alternative A). Over a ten year period, gather and remove excess wild horses, selective removal of excess wild horses to low end AML, population growth control using fertility control treatments (ZonaStat-H, Porcine Zona Pellucida (PZP, PZP-22, GonaCon), sex ratio adjustments and management of a portion of the male population as geldings that brings the total population to mid-AML.

Alternative B. Alternative B is the same as Alternative A, but would not include a nonreproducing (i.e., gelding) portion of the population.

Alternative C. Under Alternative C, Gather and remove excess animals to within AML range without fertility control, sex ratio adjustments, or geldings.

Alternative D. The BLM would capture 100% of the current population of wild horses from the Jakes Wash Herd Area over a ten-year period. No animals would be released under this alternative. All of the animals gathered would be removed and transported to BLM holding facilities where they would be prepared for adoption and/or sale to qualified individuals for long term holding.

No Action Alternative
Although the No Action Alternative does not comply with the WFRHBA of 1971 and does not meet the purpose and need for the action in this EA, it is included as a basis for comparison with the Proposed Action.

Under the No Action Alternative, a gather to remove excess wild horses would not occur. There would be no active management to control the size of the wild horse population or to bring the wild horse population to AML. The current wild horse population would continue to increase at a rate of 20-25% per year. Within two years, the wild horse population could exceed 5000. Wild horses residing outside the HMAs and H.A. would remain in areas not designated for management of wild horses and population numbers would continue to increase. Increasing numbers of excess wild horses crossing highways would create a Wild Horse/Public Safety situation.

No field weed surveys were completed for this project. Instead the Ely District weed inventory data was consulted. Currently, the following weed species are found within the Pancake Complex project area or along roads and drainages leading to the project area:

Acroptilon repens	Russian knapweed
Carduus nutans	Musk thistle
Centaurea stoebe	Spotted knapweed
Centaurea squarrosa	Squarrose knapweed
Cirsium vulgare	Bull thistle
Conium maculatum	Poison hemlock
Hyoscyamus niger	Black henbane
Lepidium draba	Hoary cress
Lepidium latifolium	Tall whitetop
Onopordum acanthium	Scotch thistle
Tamarix spp.	Salt cedar
Bromus tectorum	Cheatgrass
Salsola iberica	Russian thistle

The project area was last inventoried for noxious weeds in 2017. The following noxious and invasive weeds occur in and/or around the project area:

Bromus tectorum	Cheatgrass	*Marrubium vulgare*	Horehound
Ceratocephala testiculata	Bur buttercup	*Salsola kali*	Russian thistle
Convolvulus arvensis	Field bindweed	*Sysimbrium altissimum*	Tumble mustard
Halogeton glomeratus	Halogeton	*Verbascum thapsus*	Common mullein

Factor 1 assesses the likelihood of noxious/invasive weed species spreading to the project area.

None (0)	Noxious/invasive weed species are not located within or adjacent to the project area. Project activity is not likely to result in the establishment of noxious/invasive weed species in the project area.
Low (1-3)	Noxious/invasive weed species are present in the areas adjacent to but not within the project area. Project activities can be implemented and prevent the spread of noxious/invasive weeds into the project area.
Moderate (4-7)	Noxious/invasive weed species located immediately adjacent to or within the project area. Project activities are likely to result in some areas becoming infested with noxious/invasive weed species even when preventative management actions are followed. Control measures are essential to prevent the spread of noxious/invasive weeds within the project area.
High (8-10)	Heavy infestations of noxious/invasive weeds are located within or immediately adjacent to the project area. Project activities, even with preventative management actions, are likely to result in the establishment and spread of noxious/invasive weeds on disturbed sites throughout much of the project area.

For Alternative A, B, C, and D, the factors rate as Moderate (6) at the present time. The concentrated use around capture sites could result in new infestations, specifically at the capture sites and holding pens. Also, a large infestation of tall whitetop occurs in Railroad Valley that the district is currently treating. There is a potential for the gather operation to spread this weed into the other valleys during the gather of the complex. However, by removing excess horses, native plant communities should have increased vigor and out compete weed species. Those alternatives that reach AML faster and offer solutions to slow population growth would have the most benefit to native vegetation recovery and preventing weeds from establishing and spreading. For the no action alternative, the factor rates as High (8). No gather operation would occur to spread weeds, and excess horses would remain on the range. This would have detrimental

impact on native plant populations by decreased vigor due to overgrazing and weeds would be more competitive.

Factor 2 assesses the consequences of noxious/invasive weed establishment in the project area.

Low to Nonexistent (1-3)	None. No cumulative effects expected.
Moderate (4-7)	Possible adverse effects on site and possible expansion of infestation within the project area. Cumulative effects on native plant communities are likely but limited.
High (8-10)	Obvious adverse effects within the project area and probable expansion of noxious/invasive weed infestations to areas outside the project area. Adverse cumulative effects on native plant communities are probable.

For alternatives A, B C, and D, this project rates as Moderate (5) at the present time. The project area has several noxious and invasive weed infestations, especially along the main roads and in old fires. New weed infestations could spread to the area during gather operations which would have an adverse effect on the surrounding native vegetation, as well as an increase in cheatgrass populations which could alter the fire regime in the area. The potential to spread weeds would be limited primarily to identified areas making follow up monitoring and treatment, if necessary, more manageable. Following the gather operations native plant populations should have increased vigor and reproduction, slowing weed infestations from spreading outside the gather sites. For the no action alternative this project rates as High (8). By not gathering horses down to AML native plant communities could continue to be stressed due to over grazing allowing the expansion of invasive plants such as cheat grass, Russian thistle and halogeton. Overtime native plant communities would be not be able to recover and would be lost to monocultures of invasive species. Another concern is that as wild horse population increases, wild horses would need to seek alternative forage sources and consume noxious and invasive weeds found within the HMA. Russian knapweed is prevalent throughout the HMA and if consumed causes “chewing disease” in horses by damaging the area of the brain that controls fine motor movements, particularly of the mouth resulting in starvation or dehydration.

The Risk Rating is obtained by multiplying Factor 1 by Factor 2.

None (0)	Proceed as planned.
Low (1-10)	Proceed as planned. Initiate control treatment on noxious/invasive weed populations that get established in the area.
Moderate (11-49)	Develop preventative management measures for the proposed project to reduce the risk of introduction of spread of noxious/invasive weeds into the area. Preventative management measures should include modifying the project to include seeding the area to occupy disturbed sites with desirable species. Monitor the area for at least 3 consecutive years and provide for control of newly established populations of noxious/invasive weeds and follow-up treatment for previously treated infestations.
High (50-100)	Project must be modified to reduce risk level through preventative management measures, including seeding with desirable species to occupy disturbed site and controlling existing infestations of noxious/invasive weeds prior to project activity. Project must provide at least 5 consecutive years of monitoring. Projects must also provide for control of newly established populations of

	noxious/invasive weeds and follow-up treatment for previously treated infestations.

For all alternatives, this project Risk Rating is Moderate.

- Gather capture sites will be chosen in previously disturbed areas which are free from noxious weed infestations, to the greatest extent possible.
- Where appropriate, vehicles and heavy equipment used for the completion, maintenance, inspection, or monitoring of ground disturbing activities; or for authorized off-road driving will be free of soil and debris capable of transporting weed propagules. Vehicles and equipment will be cleaned with power or high-pressure equipment prior to entering or leaving the work site or **moving to another valley.** Cleaning efforts will concentrate on tracks, feet and tires, and on the undercarriage. Special emphasis will be applied to axels, frames, cross members, motor mounts, on and underneath steps, running boards, and front bumper/brush guard assemblies. Vehicle cabs will be swept out and refuse will be disposed of in waste receptacles. Cleaning sites will be recorded using global positioning systems or other mutually acceptable equipment and provided to the Ely District Office Weed Coordinator or designated contact person.
- Prior to entry of vehicles and equipment to a planned disturbance area, a weed scientist or qualified biologist will identify and flag areas of concern. The flagging will alert personnel or participants to avoid areas of concern.
- Removal and disturbance of vegetation would be kept to a minimum through site management (e.g. using previously disturbed areas and existing easements, limiting equipment/materials storage and staging area sites, etc.)
- Monitoring of the capture sites and holding pens on public lands will be conducted for at least three years and will include weed detection. Any newly established populations of noxious/invasive weeds discovered will be communicated to the Ely District Noxious and Invasive Weeds Coordinator for treatment.

The Ely District normally requires that all hay, straw, and hay/straw products used in project be free of plant species listed on the Nevada noxious weed list. However, this gather is being implemented through the National Wild Horse & Burro Gather Contract and would follow the stipulations in this national contract regarding certified weed-free forage.

If certified weed free hay is not required, the Ely District encourages the contractor to acquire locally produced hay from the valleys nearest to the project area. By using locally produced hay it would prevent the introduction of weeds from other areas.

Reviewed by: Sheryl Post — May 13, 2020

Sheryl Post
Natural Resource Specialist

Date

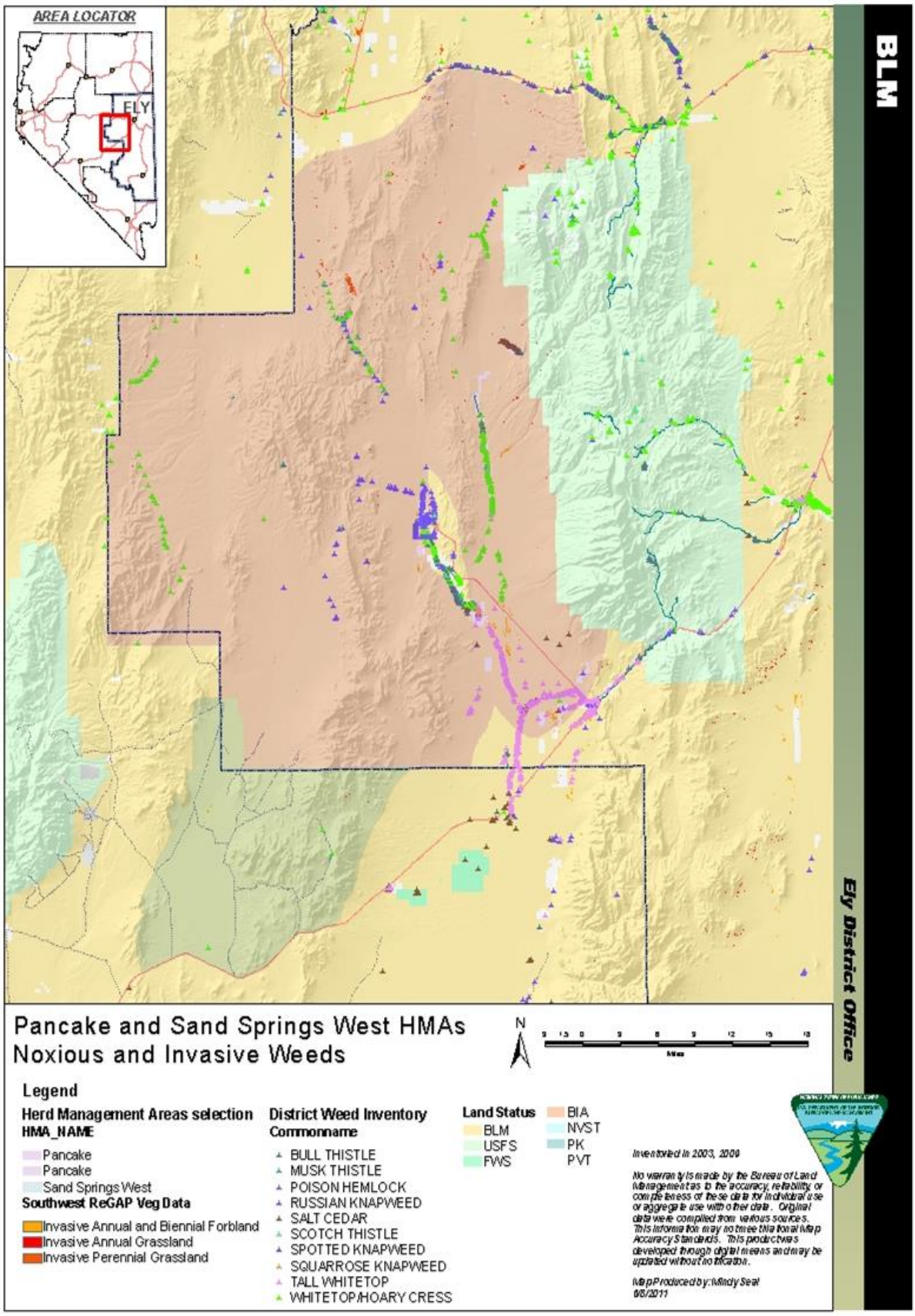
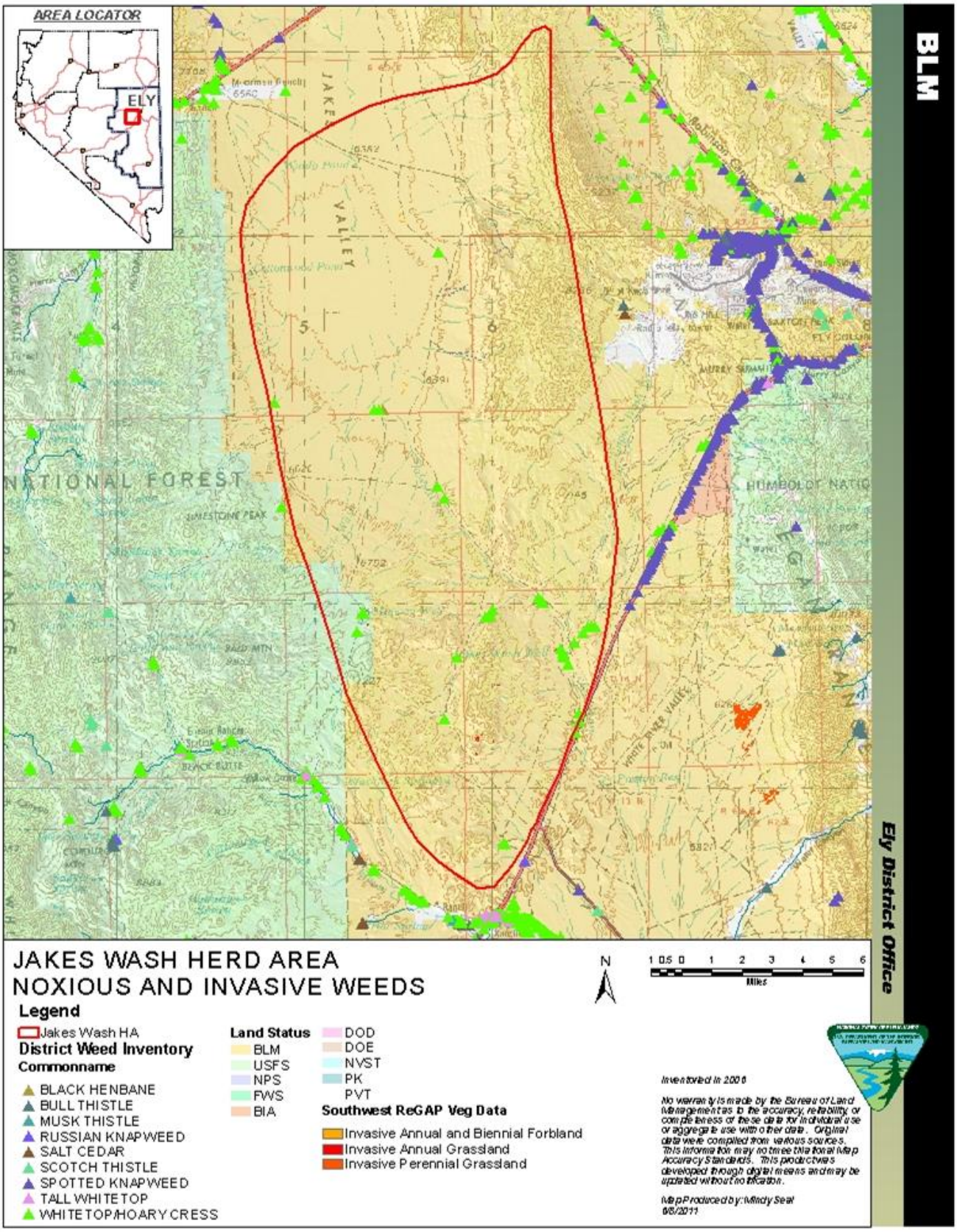


Figure 1. Map of documented noxious and invasive weeds in Pancake and Sand Springs West HMAs

Figure 2. Map of documented noxious and invasive weeds in Jakes Wash HA



APPENDIX IX

Table 3. Special Status Species that may occur within or near the Complex (2017)

Common Name	Scientific Name
Birds	
Bald Eagle	*Haliaeetus leucocephalus*
Black Rosy-finch	*Leucosticte atrata*
Brewer's Sparrow	*Spizella breweri*
Ferruginous Hawk	*Buteo regalis*
Flammulated Owl	*Otus flammeolus*
Golden Eagle	*Aquila chrysaetos*
Gray-crowned Rosy Finch	*Leucosticte tephrocotis*
Gray Vireo	*Vireo vicinior*
Great Basin Willow Flycatcher	*Empidonax traillii adastus*
Greater Sage-grouse	*Centrocercus urophasianus*
Juniper Titmouse	*Baeolophus griseus*
Lewis's Woodpecker	*Melanerpes lewis*
Loggerhead Shrike	*Lanius ludovicianus*
Long-billed Curlew	*Numenius americanus*
Long-eared Owl	*Asio otus*
Northern Goshawk	*Accipiter gentilis*
Peregrine Falcon	*Falco peregrinus*
Pinyon Jay	*Gymnorhinus cyanocephalus*
Prairie Falcon	*Falco mexicanus*
Sage Thrasher	*Oreoscoptes montanus*
Short-eared Owl	*Asio flammeus*
Swainson's Hawk	*Buteo swainsoni*
Vesper Sparrow	*Pooecetes graminueus*
Western Burrowing Owl	*Athene cunicularia hypugaea*
Yellow-breasted Chat	*Icteria virens*
Mammals	
Big Brown Bat	*Eptesicus fuscus*
California Myotis	*Myotis californicus*
Dark kangaroo mouse	*Mycrodipodops megacephalus*
Fringed Myotis	*Myotis thysanodes*
Hoary Bat	*Lasiurus cinereus*
Little Brown Myotis	*Myotis lucifugus*
Long-eared Myotis	*Myotis evotis*
Long-legged Myotis	*Myotis volans*
Pale kangaroo mouse	*Mycrodipodops pallidus*
Pallid Bat	*Antrozous pallidus*
Pygmy Rabbit	*Brachylagus idahoensis*
Silver-Haired Bat	*Lasionycteris noctivagans*
Spotted Bat	*Euderma maculatum*

Townsend's Big-eared Bat	*Corynorhinus townsendii*
Western Small-footed Bat	*Myotis ciliolabrum*

Reptiles

Desert Horned Lizard	*Phrynosoma platyrhinos*
Great Basin Collared Lizard	*Crotaphytus bicinctores*
Greater Short-horned Lizard	*Phyrnosoma hernandesi*
Long-nosed Leopard Lizard	*Gambelia wislizenii*
Sonoran Mountain Kingsnake	*Lampropeltis pyromelana*

Plants

Blaine Pincushion	*Sclerocactus blainei*
Currant Milkvetch	*Astragalus uncialis*
Eastwood Milkweed	*Asclepias eastwoodiana*
Needle Mountains Milkvetch	*Astragalus eurylobus*
Railroad Valley Globemallow	*Sphaeralcea caespitosa var. williamsiae*
Rock Violet	*Viola lithion*

Insects

Railroad Valley Skipper	*Hesperia uncas fulvapalla*

Fish

Railroad Valley Springfish	*Crenichthys nevadae**
Railroad Valley tui chub	*Gila bicolor ssp. 7*

Molluscs

Big Warm Spring Pyrg	*Pyrgulopsis papillata*
Carinate Duckwater Pyrg	*Pyrgulopsis carinata*
Duckwater Pyrg	*Purgulopsis abola*
Duckwater Warm Springs Pyrg	*Purgulopsis villacompae*
Southern Duckwater Pyrg	*Purgulopsis anatina*
Grated Tryonia	*Tryonia clathrata*

*Federally Threatened Species

APPENDIX X

Greater Sage-Grouse Required Design Features

GRSG Proposed Activities Form IM 2016-038, Attachment 3: Required Design Features (RDF) identified in the Nevada and Northeastern California Greater Sage-Grouse Approved Resource Management Plan Amendment (SGPA) Appendix C

Project Name: Pancake Herd Area Horse Gather **NEPA #:**

General RDFs		Applied	If RDF not applied, select reason:
RDF Gen 1:	Locate new roads outside of GRSG habitat to the extent practical.	☐ Yes ☑ No	☑ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____ ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
			Rationale if RDF is not applied: No roads proposed.
RDF Gen 2:	Avoid constructing roads within riparian areas and ephemeral drainages. Construct lowwater crossings at right angles to ephemeral drainages and stream crossings (note that such construction may require permitting under Sections 401 and 404 of the Clean Water Act).	☐ Yes ☑ No	☑ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____ ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
			Rationale if RDF is not applied: No roads proposed.
RDF Gen 3:	Limit construction of new roads where roads are already in existence and could be used or upgraded to meet the needs of the project or operation. Design roads to an appropriate standard, no higher than necessary, to accommodate intended purpose and level of use.	☐ Yes ☑ No	☑ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____ ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
			Rationale if RDF is not applied: No roads proposed
RDF Gen 4:	Coordinate road construction and use with ROW holders to minimize disturbance to the extent possible.	☐ Yes ☑ No	☑ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____ ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
			Rationale if RDF is not applied: No new roads proposed.
RDF Gen 5:	During project construction and operation, establish and post speed limits in GRSG habitat to reduce vehicle/wildlife collisions or design roads to be driven at slower speeds.	☑ Yes ☐ No	☐ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____ ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
			Rationale if RDF is not applied: BLM and contractors will drive slower in GRSG habitat.

RDF Gen 6:	Newly constructed project roads that access valid existing rights would not be managed as public access roads. Proponents will restrict access by employing traffic control devices such as signage, gates, and fencing.	☐ Yes ☑ No	☑ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____ ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied: No new roads proposed.	
RDF Gen 7:	Require dust abatement practices when authorizing use on roads.	☐ Yes ☑ No	☐ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☑ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # Gen 5 ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied: Driving at reduced speeds in GRSG habitat.	
NO RDF 8 Identified			
RDF Gen 9:	Upon project completion, reclaim roads developed for project access on public lands unless, based on site-specific analysis, the route provides specific benefits for public access and does not contribute to resource conflicts.	☐ Yes ☑ No	☑ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____ ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied: No reclamation required.	
RDF Gen 10:	Design or site permanent structures that create movement (e.g., pump jack/ windmill) to minimize impacts on GRSG habitat.	☐ Yes ☑ No	☑ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____ ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied: No permanent structures	
RDF Gen 11:	Equip temporary and permanent aboveground facilities with structures or devices that discourage nesting and perching of raptors, corvids, and other predators.	☐ Yes ☑ No	☑ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____ ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied: No facilities	

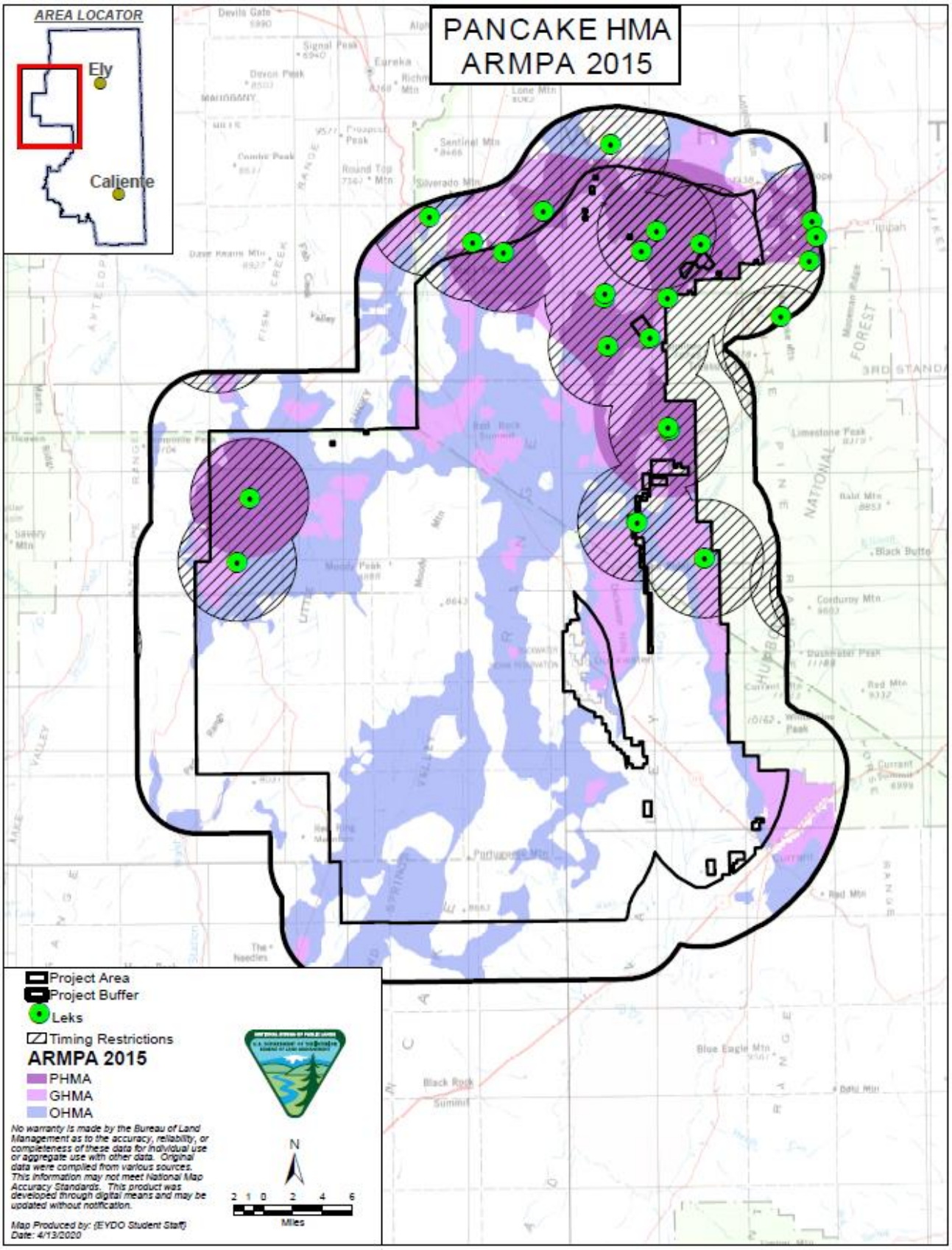
RDF Gen 12:	Control the spread and effects of nonnative, invasive plant species (e.g., by washing vehicles and equipment, minimize unnecessary surface disturbance; Evangelista et al. 2011). All projects would be required to have a noxious weed management plan in place prior to construction and operations.	☑ Yes ☐ No	☐	A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable.
			☐	An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____
			☐	A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied: Weed risk assessment prepared.		
RDF Gen 13:	Implement project site-cleaning practices to preclude the accumulation of debris, solid waste, putrescible wastes, and other potential anthropogenic subsidies for predators of GRSG.	☑ Yes ☐ No	☐	A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable.
			☐	An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____
			☐	A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied:		
RDF Gen 14:	Locate project related temporary housing sites outside of GRSG habitat.	☐ Yes ☑ No	☑	A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable.
			☐	An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____
			☐	A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied: No temporary housing		
RDF Gen 15:	When interim reclamation is required, irrigate site to establish seedlings more quickly if the site requires it.	☐ Yes ☑ No	☑	A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable.
			☐	An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____
			☐	A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied: No reclamation		
RDF Gen 16:	Utilize mulching techniques to expedite reclamation and to protect soils if the site requires it.	☐ Yes ☑ No	☑	A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable.
			☐	An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____
			☐	A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied: No reclamation		

RDF Gen 17:	Restore disturbed areas at final reclamation to the pre-disturbance landforms and desired plant community.	☐ Yes ☑ No	☑ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____ ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied: No reclamation	
RDF Gen 18:	When authorizing ground-disturbing activities, require the use of vegetation and soil reclamation standards suitable for the site type prior to construction.	☐ Yes ☑ No	☑ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____ ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied: Gathers used previously disturbed areas.	
RDF Gen 19:	Instruct all construction employees to avoid harassment and disturbance of wildlife, especially during the GRSG breeding (e.g., courtship and nesting) season. In addition, pets shall not be permitted on site during construction (BLM 2005b).	☑ Yes ☐ No	☐ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____ ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied:	
RDF Gen 20:	To reduce predator perching in GRSG habitat, limit the construction of vertical facilities and fences to the minimum number and amount needed and install anti-perch devices where applicable.	☐ Yes ☑ No	☑ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____ ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied: No facilities or fences constructed.	
RDF Gen 21:	Outfit all reservoirs, pits, tanks, troughs or similar features with appropriate type and number of wildlife escape ramps (BLM 1990; Taylor and Tuttle 2007).	☑ Yes ☐ No	☐ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable. ☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____ ☐ A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied:	

RDF Gen 22:	Load and unload all equipment on existing roads to minimize disturbance to vegetation and soil.	☑ Yes	☐ A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable.
		☐ No	☐ An alternative RDF is determined to provide equal or better protection for GRSG or its habitat. Alternative RDF # _____
			☐ A specific RDF will provide no additional protection to GRSG or its habitat.
		Rationale if RDF is not applied:	

APPENDIX XI

Greater Sage-grouse Habitat Management Areas (2015).
Lek locations provided by NDOW.


AREA LOCATOR
Ely
Caliente
PANCAKE HMA
ARMPA 2015
Project Area
Project Buffer
Leks
Timing Restrictions
ARMPA 2015
PHMA
GHMA
OHMA
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.
Map Produced by: (EYDO Student Staff)
Date: 4/13/2020
N
2 1 0 2 4 6
Miles

APPENDIX XII

Environmental Effects of Geldings
and
Contraception use in Wild Horse Management.

Geldings

Gelded animals would be monitored periodically for complications for approximately 7-10 days post-surgery and release. This monitoring would be completed either through aerial recon if available or field observations from major roads and trails. It is not anticipated that all the geldings would be observed but the goal is to detect complications if they are occurring and determine if the horses are freely moving about the HMA. Once released, anecdotal information suggests that the geldings would form bachelor bands. Periodic observations of the long term outcomes of gelding would be recorded during routine resource monitoring work. Such observations could include but not be limited to band size, social interactions with other geldings and harem bands, distribution within their habitat, forage utilization and activities around key water sources. Periodic population inventories and future gather statistics would assist BLM to determine if managing a portion of the herd as non-breeding animals is an effective approach to slowing the annual population growth rate and extending the gather cycle when used in conjunction with other population control techniques, while allowing more horses to remain on the range.

Surgical sterilization techniques, while not reversible, may provide reproductive control on horses without the need for any additional handling of the horses as required in the administration of chemical contraception techniques.

Recent research on non-lethal methods for managing population growth of free-roaming wild horses has focused largely on suppressing female fertility through contraception (Ballou et al. 2008, Killian et al. 2008, Turner et al. 2008, Gray et al. 2010, Ransom et al. 2011). Very few studies have been conducted on techniques for reducing male fertility. Nelson (1980) and Garrott and Siniff (1992) modeled potential efficacy of male-oriented contraception as a population management tool, and both studies agreed that while slowing growth, sterilizing only dominant males (i.e., harem-holding stallions) would result in only marginal reduction in female fertility rates. Eagle et al. (1993) and Asa (1999) tested this hypothesis on herd management areas (HMAs) where dominant males were vasectomized. Their findings agreed with modeling results from previous studies, and they also concluded that sterilizing only dominant males would not provide the desired reduction in population growth rate, assuming that the numbers of fertile females is not changed. While bands with vasectomized harem stallions tended to have fewer foals, breeding by bachelors and subordinate stallions meant that population growth still occurred. Collins and Kasbohm (2016) demonstrated reduced population growth rates in a feral horse herd with both spayed and vasectomized horses. Garrott and Siniff (1992) concluded from their modeling that male sterilization would effectively suppress population growth to the point where births roughly equal deaths only if a large proportion of males (>85%) could be sterilized, regardless of social order. However, sterilization of >85% of males in a population may have genetic consequences, reducing heterozygosity and increasing inbreeding coefficients, as it would potentially allow a very small group of males to dominate the breeding (as seen in equid reintroductions: Saltz et al. (2000), King unpublished data). Although such genetic consequences could be mitigated, the question of how >85% gelded males in a population would interact with intact stallions and mares and with their habitat is unknown. Garrott and Siniff's (1992) model predicts that gelding 50-80% of mature males in the population would result in reduced, but not halted, population growth. However, it is predicted that within 2 years of this treatment an entire foal crop of fertile males would become sexually mature, so the 85% treatment would have to be repeated until foaling was suppressed. Even then after just a few years there would be an accumulation of fertile males

coming to maturity. BLM is not considering treating such a large fraction of geldings in this complex. There is an ongoing BLM study in Utah focused on the individual or population-level effects of gelding males in a free-roaming horse population (BLM 2016) but results from that study are not available at this time. Inclusion of any particular method as a part of management does not depend on completion of any given research project.

Despite livestock being managed by castrating males for centuries, there has been remarkably little research on castrates (Hart and Jones 1975, Jewell 1997). Stallion behaviors are better understood, but it is not clear how the behaviors of geldings would change, how quickly any change would occur after surgery, or exactly what effect gelding an adult stallion and releasing him back in to a wild horse population would have on his behavior and that of the wider population. These can be hypothesized from the limited existing literature.

Feral horses typically form bands composed of an adult male with 1 to 3 adult females and their immature offspring (Feist and McCullough 1976, Berger 1986, Roelle et al. 2010). In many populations subordinate 'satellite' stallions have been observed associating with the band, although the function of these males continues to be debated (see Feh 1999, and Linklater and Cameron 2000). Juvenile offspring of both sexes leave the natal band at sexual maturity (normally around two or three years of age (Berger 1986), but adult females may remain with the same band over a span of years. Group stability and cohesion is maintained through positive social interactions and agonistic behaviors among all members and herding and reproductive behaviors from the stallion (Ransom and Cade 2009). Group movements and consortship of a stallion with mares is advertised to other males through the group stallion marking dung piles as they are encountered, and over-marking mare eliminations as they occur (King and Gurnell 2006).

In horses, males play a variety of roles during their lives (Deniston 1979): after dispersal from their natal band they generally live as bachelors with other young males, before associating with mares and developing their own breeding group as a harem stallion or satellite stallion. In any population of horses not all males will achieve harem stallion status, so all males do not have an equal chance of breeding (Asa 1999). Stallion behavior is thought to be related to androgen levels, with breeding stallions having higher androgen concentrations than bachelors (Angle et al. 1979, Chaudhuri and Ginsberg 1990). A bachelor with low libido had lower levels of androgens, and two-year-old bachelors had higher testosterone levels than two-year olds with undescended testicles who remained with their natal band (Angle et al. 1979). Although libido and the ability to ejaculate tends to be gradually lost after castration (Thompson et al. 1980) some geldings continue to intromit (Rios and Houpt 1995, Schumacher 2006). Stallion-like behavior in domestic horse geldings is relatively common (Smith 1974), being shown in 20-33% of cases whether the horse was castrated pre- or post-puberty (Line et al. 1985, Rios and Houpt 1995, Schumacher 2006). While some of these cases may be due to cryptorchidism or incomplete surgery, it appears that horses are less dependent on hormones than other mechanisms for the maintenance of sexual behavior (Smith 1974). Domestic geldings exhibiting masculine behavior had no difference in testosterone concentrations than other geldings (Line et al. 1985, Schumacher 2006), and in some instances the behavior appeared context dependent (Borsberry 1980, Pearce 1980). Domestic geldings had a significant prolactin response to sexual stimulation but lacked the cortisol response present in stallions (Colborn et al. 1991).

Dogs and cats are commonly neutered, and it is also common for them to continue to exhibit reproductive behaviors several years after castration (Dunbar 1975). Dogs, ferrets, hamsters, and marmosets continued to show sexually motivated behaviors after castration, regardless of whether they had previous experience or not, although in beagles and ferrets there was a reduction in motivation post-operatively (Hart 1968, Dunbar 1975, Dixson 1993, Costantini et al. 2007, Vinke et al. 2008). Ungulates continued to show reproductive behaviors after castration, with goats and llamas continuing to respond to females even a

year later in the case of goats, although mating time and the ejaculatory response was reduced (Hart and Jones 1975, Nickolmann et al. 2008).

No study has quantified the effect of castration on aggression in horses, with only one report noting that aggression was a problem in domestic horse geldings who also exhibited sexual behaviors (Rios and Houpt 1995). Castration is thought to increase survival as males are released from the cost of reproduction (Jewell 1997). In Soay sheep castrates survived longer than rams in the same cohort (Jewell 1997), and Misaki horse geldings lived longer than intact males (Kaseda et al. 1997, Khalil and Murakami 1999).

The 2013 NAS report found that the three 'most promising' fertility control methods at that time were PZP vaccines, GonaCon vaccine, and "chemical vasectomy." BLM is not pursuing the chemical vasectomy method in any alternative here. The NAS panel noted that, even though chemical vasectomy had been used in dogs and cats up to that time, "There are no published reports on chemical vasectomy in horses..." and that "Only surgical vasectomy has been studied in horses, so side effects of the chemical agent are unknown." The only known use of chemical vasectomy in horses was published by Scully et al. (2015); this was part of a study cited in the EA (Collins and Kasbohm 2016). They injected chlorhexidine into the stallions' epididymis. That is the same chemical agent as had been used to chemically vasectomize dogs. Scully et al. (2015) found that the chemical vasectomy method failed to prevent fertile sperm from being located in the vas deferens seminal fluid. Stallions treated with the chemical vasectomy method still had viable sperm and were still potentially as fertile as untreated 'control' stallions in that study.

Wild horses are rarely gelded and released back into the wild, resulting in few studies that have investigated their behavior in free-roaming populations. In a pasture study of domestic horses, Van Dierendonk et al. (1995) found that social rank among geldings was directly correlated to the age at which the horse was castrated, suggesting that social experiences prior to sterilization may influence behavior afterward. Of the two geldings present in a study of semi-feral horses in England, one was dominant over the mares whereas a younger gelding was subordinate to older mares; stallions were only present in this population during a short breeding season (Tyler 1972). A study of domestic geldings in Iceland held in a large pasture with mares and sub-adults of both sexes, but no mature stallions, found that geldings and sub-adults formed associations amongst each other that included interactions such as allo-grooming and play, and were defined by close proximity (Sigurjónsdóttir et al. 2003). These geldings and sub-adults tended to remain in a separate group from mares with foals, similar to castrated Soay sheep rams (Ovis aries) behaving like bachelors and grouping together or remaining in their mother's group (Jewell 1997). In Japan, Kaseda and Khalil (1996) reported that young males dispersing from their natal harem and geldings moved to a different area than stallions and mares during the non-breeding season. Although the situation in Japan may be the equivalent of a bachelor group in natural populations, in Iceland this division between mares and the rest of the horses in the herd contradicts the dynamics typically observed in a population containing mature stallions. Sigurjónsdóttir et al. (2003) also noted that in the absence of a stallion, allo-grooming between adult females increased drastically. Other findings included increased social interaction among yearlings, display of stallion-like behaviors such as mounting by the adult females, and decreased association between females and their yearling offspring (Sigurjónsdóttir et al. 2003). In the same population in Iceland Van Dierendonck et al. (2004) concluded that the presence of geldings did not appear to affect the social behavior of mares or negatively influence parturition, mare-foal bonding, or subsequent maternal activities. Additionally, the welfare of broodmares and their foals was not affected by the presence of geldings in the herd. These findings are important because treated males in our study would be returned to the range in the presence of pregnant mares and mares with foals of the year.

These few studies may not reflect behavior of free-roaming wild horses in the western US, where ranges

are much larger, intact stallions are present year-round, and population size and density may be highly variable. Additionally, no study exists on the behavior of wild stallions pre- and post-castration, and what effects this would have on their group membership, home range, and habitat use. Studies on sterilization of harem stallions to control population growth all acknowledge that success is dependent on a stable group structure, as strong bonds between a stallion and mares reduce the probability of a mare mating an extra-group stallion (Nelson 1980, Garrott and Siniff 1992, Eagle et al. 1993, Asa 1999).
Bands of horses tend to have distinct home ranges, varying in size depending on the habitat and varying by season, but always including a water source, forage, and places where horses can shelter from inclement weather or insects (King and Gurnell 2005). By comparison, bachelor groups tend to be more transient, and can potentially use areas of good forage further from water sources, as they are not constrained by the needs of lactating mares in a group. It is unknown whether gelded stallions will behave like group stallions, bachelors, or form a group of their own concentrating in prime habitat or in the vicinity of water sources due to reduced desire for mare acquisition, maintenance, and reproductive behaviors.

Gelding wild horses does not change their status as wild horses under the WFRHBA. In terms of whether geldings will continue to exhibit the free-roaming behavior that defines wild horses, BLM does expect that geldings would continue to roam unhindered in the Complex where this action would take place. Wild horse movements may be motivated by a number of biological impulses, including the search for forage, water, and social companionship that is not of a sexual nature. As such, a gelded animal would still be expected to have a number of internal reasons for moving across a landscape and, therefore, exhibiting 'free-roaming' behavior. Despite marginal uncertainty about subtle aspects of potential changes in habitat preference, there is no expectation that gelding wild horses will cause them to lose their free-roaming nature. It is worth noting that individual choices in wild horse group membership, home range, and habitat use are not protected under the WFRHBA. BLM acknowledges that geldings may exhibit some behavioral differences after surgery, compared to intact stallions, but those differences are not be expected to remove the geldings' rebellious and feisty nature, or their defiance of man. While it may be that a gelded horse could have a different set of behavioral priorities than an intact stallion, the expectation is that geldings will choose to act upon their behavioral priorities in an unhindered way, just as is the case for an intact stallion. In this sense, a gelded male would be just as much 'wild' as defined by the WFRHBA as any intact stallion, even if his patterns of movement differ from those of an intact stallion. Congress specified that sterilization is an acceptable management action (16 USC §1333.b.1). Sterilization is not one of the clearly defined events that cause an animal to lose its status as a wild free-roaming horse (16 USC §1333.2.C.d). Several academics have offered their opinions about whether gelding a given stallion would lead to that individual effectively losing its status as a wild horse (Rutberg 2011, Kirkpatrick 2012, Nock 2017). Those opinions are based on a semantic and subjective definition of 'wild,' while BLM must adhere to the legal definition of what constitutes a wild horse, based on the WFRHBA (as amended). Those individuals have not conducted any studies that would test the speculative opinion that gelding wild stallions will cause them to become docile. BLM is not obliged to base management decisions on such opinions, which do not meet the BLM's principle and practice to "Use the best available scientific knowledge relevant to the problem or decision being addressed, relying on peer reviewed literature when it exists" (Kitchell et al. 2015).

The BLM anticipates that gelded individuals may exhibit some behavioral differences, when compared to their own pre-treatment behaviors, or when compared to other intact stallions. However, there is absolutely no evidence based on available research or observations that would suggest that a gelded wild horse would have its movements hindered or would become docile or obedient simply as a result of castration. While it may be that a gelded horse could have a different set of behavioral priorities than an intact stallion, the expectation is that geldings will choose to act upon their behavioral priorities in an unhindered way, just as is the case for an intact stallion. In this sense, a gelded male would be just as

much ‘wild’ as defined by the act as any intact stallion, even if his patterns of movement differ from those of an intact stallion.

Wild horse movements may be motivated by a number of biological impulses, including the search for forage, water, and social companionship that is not of a sexual nature. As such, a gelded animal would still be expected to have a number of internal reasons for moving across a landscape and, therefore, exhibiting ‘free-roaming’ behavior. BLM fully expects that geldings would remain feisty and unruly with respect to humans.

Under the Proposed Action, reproductive stallions would still be a component of the population’s age and sex structure. The question of whether or not a given gelding would or would not attempt to maintain a harem is not germane to population-level management. Gelding a subset of stallions in the proposed action would not prevent other stallions and mares from continuing with the typical range of social behaviors for sexually active adults. The primary effect of including a gelding component under the Proposed Action would be to bring the population to mid-AML instead of low-AML by allowing geldings that would otherwise be permanently removed from the range (for adoption, sale or other disposition) to be released back onto the range where they can engage in free-roaming behaviors.

BLM would expect that family structures will continue to be exhibited under the Proposed Action within wild horse population. The BLM also is not required to manage populations of wild horses in order to ensure that any given individual maintains its social standing within any given harem or band. Because the fraction of males gelded is not expected to come anywhere close to the ~85% threshold suggested by Garrott and Siniff (1992) as being necessary to substantially reduce population growth rates, is not expected that gelding a subset of stallions will significantly change the social structure or herd demographics (age and sex ratios) of fertile wild horses.

It is true that geldings are unable to contribute to the genetic diversity of the herd, but that does not lead to an expectation that the Complex would experience inbreeding because there would be a relatively large number of fertile stallions, even when the herd is at the low end AML herd size. At least half the herd would be fertile males, and geldings returned to the range would no more than bring the herd to the mid-point of AML. Existing levels of genetic diversity were high when last measured, and expectations are that heterozygosity levels are even higher now that the population has continued to grow exponentially. In addition, many of the stallions that are gelded would have already had a chance to breed, passing on genetic material to their offspring. BLM is not obligated to ensure that all stallions born within a population have the chance to sire a foal and pass on genetic material. The herds in which the Proposed Action is to take place are not at immediate or future risk of catastrophic loss of genetic diversity, nor does the genetic diversity in this band represent unique genetic information. This action does not prevent BLM from augmenting genetic diversity in the treated herd in the future, if future genetic monitoring indicates that would be necessary.

It is not expected that genetic health would be affected by the Proposed Action. Available indications are that these populations contain high levels of genetic diversity at this time. More information about the genetic diversity in these populations will become available as a result of genetic sampling under Alternatives A or B. The AML range of 361-638 on the Pancake Complex should provide for acceptable genetic diversity. If at any time in the future the genetic diversity in either HMA is determined to be relatively low, then many other HMAs could be used as sources for fertile wild horses that could be transported into the HMA of concern.

The Pancake Complex is located such that a small number of horses can enter the population from neighboring areas (adjacent HMAs). As such, there is the potential for some additional genetic information to continually enter this population. The BLM allows for the possibility that if future genetic

testing indicates that there is a critically low genetic diversity in the Complex population and other populations that interact with it genetically, then future management of the Complex population could include genetic augmentation, by bringing in additional stallions, mares, or both.

In terms of fertility control options that are effective on male horses, other available methods such as the injection of GonaCon-Equine immunocontraceptive vaccine apparently require multiple handling occasions to achieve long-term infertility. Insofar as the law indicates that management should be at the minimum level necessary to achieve management objectives (CFR 4710.4), and if gelding some fraction of a managed population can reduce population growth rates by replacing breeding mares, it then follows that gelding some individuals can lead to a reduced number of handling occasions and removals of excess horses from the range, which is consistent with legal guidelines. Similarly, PZP immunocontraception that is currently available for use in mares requires handling or darting every year. Any such management activities that require multiple capture operations represent management that will be more intrusive for wild horses and potentially less sustainable than an activity that requires only one period of handling.

Treating stallions alone may lead to an adequate reduction of population growth only if a large proportion of male horses in the population are sterile because of their social behavior (Garrott and Siniff 1992). By itself, it is unlikely that sterilization (gelding) would allow the BLM to achieve its wild horse population management objectives since a single stallion is capable of impregnating multiple mares. Therefore, to be effective, use of sterilization to control population growth requires that either all the male or all the female wild horses/burros in the population be gathered and treated; that is not being considered here. If the treatment is not of a permanent nature (e.g., application of the PZP-22 vaccine to mares), the animals would need to be gathered and treated on a cyclical basis. This would also require marking of individual animals and extensive record keeping to ensure that all animals were regularly treated and individual animals were not treated more frequently than required. Here, sterilization (gelding) of a portion of the population would be used to determine whether a higher number of animals can be left on the range while still achieving overall goals of reducing population growth rates, not as a mechanism that in itself controls population growth.

Fertility Control

BLMs Use of Contraception in Wild Horse Management

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

Successful contraception would be expected to reduce the frequency of horse gather activities on the environment, as well as wild horse management costs to taxpayers. Bartholow (2007) concluded that the application of 2 or 3-year contraceptives to wild mares could reduce operational costs in a project area by 12-20%, or up to 30% in carefully planned population management programs. He also concluded that contraceptive treatment would likely reduce the number of horses that must be removed in total, with associated cost reductions in the number of adoptions and total holding costs. If applying contraception to horses requires capturing and handling horses, the risks and costs associated with capture and handling of horses may be comparable to those of gathering excess horses for removal, but with expectedly lower adoption and long-term holding costs. 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). Although contraceptive treatments are 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).

Porcine Zona Pellucida (PZP) Vaccine PZP vaccines have been used on dozens of horse herds by the National Park Service, US Forest Service, Bureau of Land Management, and Native American tribes and its use is approved 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 feral burros on Caribbean islands (Turner et al. 1996, French et al. 2017). 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). 'Native' PZP proteins can be purified from pig ovaries (Liu et al. 1989). Recombinant ZP proteins may be produced with molecular techniques (Gupta and Minhas 2017, Joonè et al. 2017a, Nolan et al. 2018a). It can easily be remotely administered in the field in cases where mares are relatively approachable. Use of remotely delivered (dart-delivered) vaccine is generally limited to populations where individual animals can be accurately identified and repeatedly approached within 50 meters (BLM 2010).

Under the Proposed Action and Alternative B, the BLM would return to the HMA as needed to apply and re-apply PZP-22 and/or ZonaStat-H or GonaCon 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, though some mares treated repeatedly may not (see PZP Direct Effects, below). 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

The historically accepted hypothesis explaining PZP vaccine effectiveness posits that 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. More recent observations support a complementary hypothesis, which posits that PZP vaccination causes reductions in ovary size and function (Mask et al. 2015, Joonè et al. 2017b, Joone` et al. 2017c, Nolan et al. 2018b, 2018c). Antibodies specific to PZP protein do not crossreact with tissues outside of the reproductive system (Barber and Fayrer-Hosken 2000).

Research has demonstrated that contraceptive efficacy of an injected PZP vaccine, such as ZonaStat-H, is approximately 90% for mares treated twice in one year (Turner and Kirkpatrick 2002, Turner et al. 2008). High contraceptive rates of 90% or more can be maintained in horses that are 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). Application of PZP for fertility control would reduce fertility in a large percentage of mares for at least one year (Ransom et al. 2011). Horses treated with PZP-22 vaccine pellets at the same time as a primer dose may experience one years of ~35% - 75% reduced foaling rates, compared to untreated animals, followed by one year of ~20%-50% reduced foaling rates (Rutberg et al. 2017). If mares that have been treated with PZP-22 vaccine pellets subsequently receive a booster dose of either the liquid PZP vaccine or the PZP-22 vaccine pellets, the subsequent contraceptive effect is apparently more pronounced and long-lasting. The approximate efficacy following a booster dose can be expected to be ~50-90% in year 1, 5-75% in year 2, and 40-75% in year 3 (Rutberg et al. 2017; figure 3). The efficacies noted above, which are based on results in Rutberg et al. (2017), call into question population and economic models that assume PZP-22 can have an 85 percent efficacy in years 2 and 3 after immunization, such as Fonner and Bohara (2017).

The highest success for PZP vaccination has been obtained when applied during the timeframe of November through February. Rates for summer application are expected to be lower, because the time between application and breeding is more prolonged.

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 per dose. 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 following the intial treatment (J. Turner, University of Toledo, Personal Communication).

Following a gather, application of PZP for fertility control would be expected to 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. The fraction of mares treated in a herd can have a large effect on the realized change in growth rate due to PZP contraception, with an extremely high portion of mares required to be treated to lead prevent population-level growth (e.g., Turner and Kirkpatrick 2002). 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.

The purposes of applying PZP treatment is to prevent mares from conceiving foals, but BLM acknowledges that long-term infertility, or permanent sterility, could be a result for some number of wild horses receiving PZP vaccinations. The rate of long-term or permanent sterility following vaccinations with PZP is hard to predict for individual horses, but that outcome appears to increase in likelihood as the number of doses increases (Kirkpatrick and Turner 2002). Permanent sterility for mares treated consecutively 5-7 years was observed by Nuñez 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. Repeated treatment with PZP led long-term infertility in Przewalski's horses receiving as few as one PZP booster dose (Feh 2012). If some number of mares become sterile as a result of PZP treatment, that potential result would be consistent with the contraceptive purpose of applying the vaccine.

In some mares, PZP vaccination may cause direct effects on ovaries (Gray and Cameron 2010, Joonè et al. 2017b, Joonè et al. 2017c). Joonè et al. (2017a) noted reversible effects on ovaries in mares treated with one primer dose and booster dose. Joonè et al. (2017c) documented decreased anti-Mullerian hormone (AMH) levels in mares treated with native or recombinant PZP vaccines; AMH levels are thought to be an indicator of ovarian function. 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. It is possible that result is specific to the immune response to SpayVac, which may have lower PZP purity than ZonaStat or PZP-22 (Hall et al. 2016). However, in studies with native ZP proteins and recombinant ZP proteins, Joonè et al. (2017a) found transient effects on ovaries after PZP vaccination in some treated mares; 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 eventually 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 Nuñez et al. (2010, 2017). Bagavant et al. (2003) demonstrated T-cell clusters on ovaries, but no loss of ovarian function after ZP protein immunization in macaques. Skinner et al. (1984) raised concerns about PZP effects on ovaries, based on their study in laboratory rabbits, as did Kaur and Prabha (2014), though neither paper was a study of PZP effects in equids

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 (Kirkpatrick and Turner 2003). It is possible that there may be transitory effects on foals born to mares or jennies treated with PZP. 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 mouse pups was compromised, nor is BLM aware of any such results in horses or burros. Unsubstantiated speculative connections between PZP treatment and foal stealing has not been published in a peer-reviewed study and thus cannot be verified. Similarly, although Nettles (1997) noted reported stillbirths after PZP treatments in cynomolgus monkeys, those results have not been observed in equids despite extensive use.

On-range observations from 20 years of application to wild horses indicate that PZP application in wild mares does not generally cause mares to give birth to foals out of season or late in the year (Kirkpatrick and Turner 2003). Nuñez'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. Results from Ransom et al. (2013), 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 managed by BLM do not generally occur in isolated refugia, nor are they 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. Furthermore, Ransom et al. (2013) found no negative impacts on foal survival even with an extended birthing season. If there are shifts in birth phenology, though, it is reasonable to assume that some negative effects on foal survival might result from particularly severe weather events.

BLM requires individually identifiable marks for immunocontraceptive treatment (BLM 2010); this may require handling and marking. Mares that receive any marking or vaccine as part of a gather operation may undergo some level of transient stress. BLM has instituted guidelines to reduce the sources of handling stress in captured animals (BLM 2015). It is difficult to compare that level of temporary stress with long-term stress that can result from food and water limitation on the range (e.g., Creel et al. 2013). Handling may include freeze-marking, for the purpose of identifying that mare and identifying her PZP vaccine treatment history. Under past management practices, captured mares experienced increased stress levels from handling (Ashley and Holcombe 2001). Markings may also be used into the future to determine the approximate fraction of mares in a herd that have been 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, French et al. 2017), 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. (2017a) 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.

Indirect Effects of Fertility Control Vaccination

One expected long-term, indirect effect on wild horses treated with fertility control would be an improvement in their overall health (Turner and Kirkpatrick 2002). 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 (Nuñez 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 (Turner and Kirkpatrick 2002), 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 (Turner and Kirkpatrick 2002, 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. 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 in PZP-treated herds. If repeated contraceptive treatment leads to a prolonged contraceptive effect, then that may minimize or delay the hypothesized rebound effect. 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 may reduce the compensatory reproduction that often follows removals (Kirkpatrick and Turner 1991).

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

Reduced population growth rates and smaller population sizes would also allow for continued and increased environmental improvements to range conditions within the project area, which would have long-term benefits to wild horse habitat quality. As the population nears or is maintained at the level necessary to achieve a thriving natural ecological balance, vegetation resources would be expected to recover, improving the forage available to wild horses and wildlife throughout the project area. With rangeland conditions more closely approaching a thriving natural ecological balance, and with a less concentrated distribution of wild horses across the HMA, there should also be less trailing and concentrated use of water sources, which would have many benefits to the wild horses still on the range. Lower population density would be expected to lead to reduced competition among wild horses using the water sources, , and less fighting among horses accessing water sources. Water quality and quantity would continue to improve to the benefit of all rangeland users including wild horses. Wild horses would also have to travel less distance back and forth between water and desirable foraging areas. Should PZP booster treatment and repeated fertility control treatment continue into the future, the chronic cycle of overpopulation and large gathers and removals would no longer occur, but instead a consistent cycle of balance and stability would ensue, resulting in continued improvement of overall habitat conditions and animal health. While it is conceivable that widespread and continued treatment with PZP 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 in almost every year.

Behavioral Effects of PZP Vaccination

The NRC report (2013) noted that all fertility suppression has effects on mare behavior, mostly as a result of the lack of pregnancy and foaling and concluded that PZP 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 (as discussed below), 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). Nuñez'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 Nuñez 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 Nuñez 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 Nuñez 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. Nuñez (2018) cautioned that PZP use may limit the ability of mares to return to fertility, but also noted that, "such aggressive treatments may be necessary when rapid reductions in animal numbers are of paramount importance…If the primary management goal is to reduce population size, it is unlikely (and perhaps less important) that managers achieve a balance between population control and the maintenance of more typical feral horse 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 hypothalamicpituitary-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*."

Nuñez (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."*

The NRC report (2013) provides a comprehensive review of the literature on the behavioral effects of contraception that put research up to that date by Nuñez et al. (2009, 2010) 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 PZP Vaccination

In HMAs where large numbers of wild horses have recent and/or an ongoing influx of breeding animals from other areas with wild or feral horses, contraception is not expected to cause an unacceptable loss of genetic diversity or an unacceptable increase in the inbreeding coefficient. In any diploid population, the loss of genetic diversity through inbreeding or drift can be prevented by large effective breeding population sizes (Wright 1931) or by introducing new potential breeding animals (Mills and Allendorf 1996). The NRC report (2013) recommended that managed herds of wild horses would be better viewed as components of interacting metapopulations, with the potential for interchange of individuals and genes taking place as a result of both natural and human-facilitated movements. Introducing 1-2 mares every generation (about every 10 years) is a standard management technique that can alleviated potential inbreeding concerns (BLM 2010). In the last 10 years, there has been a high realized growth rate of wild horses in most areas administered by the BLM, such that most alleles that are present in any given mare are likely to already be well represented in her siblings, cousins, and more distant relatives. With the exception of horses in a small number of well-known HMAs that contain a relatively high fraction of alleles associated with old Spanish horse breeds (NRC 2013), the genetic composition of wild horses in lands administered by the BLM is consistent with admixtures from domestic breeds. As a result, in most HMAs, applying fertility control to a subset of mares is not expected to cause irreparable loss of genetic diversity. Improved longevity and an aging population are expected results of contraceptive treatment that can provide for lengthening generation time; this result 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 a strategy to preferentially treat young animals with a

contraceptive led to more genetic diversity being retained than either a strategy that preferentially treats older animals, or a strategy with periodic gathers and removals.

Even if it is the case that repeated treatment with PZP 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 all of the following conditions are met: starting levels of genetic diversity are low, initial population size is 100 or less, the intrinsic population growth rate is low (5% per year), and very large fractions of the female population are permanently sterilized. It is worth noting that, although maintenance of genetic diversity at the scale of the overall population of wild horses is an intuitive management goal, there are no existing laws or policies that require BLM to maintain genetic diversity at the scale of the individual herd management area or complex. Also, there is no Bureau-wide policy that requires BLM to allow each female in a herd to reproduce before she is treated with contraceptives.

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).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). 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). However, Magiafolou et al. (2013) 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 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 are speculative at this point, with results likely to depend on several factors, including: the strength of the genetic predisposition to not respond to PZP; 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 PZP (which generally has a short-acting effect); the number of mares treated with multiple booster doses of PZP; and the actual size of the genetically-interacting metapopulation of horses within which the

PZP treatment takes place.

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

GnRH Vaccine (GonaCon) Formulation

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), 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. GonaCon-Equine has been used on feral horses in Theodore Roosevelt National Park and on wild horses by BLM (BLM 2015). GonaCon-Equine can be remotely administered in the field in cases where mares are relatively approachable, using a customized pneumatic dart (McCann et al. 2017). Use of remotely delivered (dart-delivered) vaccine is generally limited to populations where individual animals can be accurately identified and repeatedly approached within 50 m (BLM 2010).

GonaCon is an immunocontraceptive vaccine which has been shown to provide multiple years of infertility in several wild ungulate species, including horses (Killian et al., 2008; Gray et al., 2010). GonaCon uses the gonadotropin-releasing hormone (GnRH), a small neuropeptide that performs an obligatory role in mammalian reproduction, as the vaccine antigen. When combined with an adjuvant, the GnRH vaccine stimulates a persistent immune response resulting in prolonged antibody production against GnRH, the carrier protein, and the adjuvant (Miller et al., 2008). 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 luteinizing hormone levels, and a cessation of ovulation. The lack of estrus cycling that results from successful GonaCon vaccination has been compared to typical winter period of anoestrus in open mares. As anti-GnRH antibodies decline over time, concentrations of available endogenous GnRH increase and treated animals usually regain fertility (Power et al., 2011).

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. 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-Cahill et al., *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; booster dose effects may lead to increased effectiveness of contraception, which is generally the intent. 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. Although it is unknown what would be the expected rate for the return to fertility rate in mares boosted more than once with GonaCon-Equine, a prolonged return to fertility would be consistent with the desired effect of using GonaCon (e.g., effective contraception). 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. 2009, 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 [GonaConKHL], 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 Complex 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 lueinizing 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. 2009, 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. 2009, Powers et al. 2011, Donovan et al. 2013). In studies where the vaccine required a booster, hormonal and associated results were 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 GonaConEquine 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 will 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 2018 would not show the contraceptive effect (i.e., no new foal) until spring of 2020.

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 will 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 antiGnRH 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 GonaCon-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 antiGnRH 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 be consistent with the text of the WFRHBA of 1971, as amended, which allows for sterilization to achieve population goals.

In summary, based on the above results related to fertility effects of GonaCon and other antiGnRH vaccines, application of a single dose of GonaCon-Equine to gathered or remotely-darted 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 previouslytreated 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.

GnRH Vaccine Effects on Other Organ Systems

BLM requires individually identifiable marks for immunocontraceptive treatment; this may require handling and marking. Mares that receive any vaccine as part of a gather operation 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, and the timing of treatments required into the future. 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 antiGnRH 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 immunizeed 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 animals 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, with some does regain 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: the same considerations could be advised for use of GonaCon, but 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 GnRH Vaccination

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. 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 can remain improved even after fertility resumes. Anecdotal, subjective observations of mares treated with a different immunocontraceptive, PZP, in past

gathers showed that many of the treated mares were larger, maintained better body condition, and had larger healthy foals than untreated mares.

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. If repeated contraceptive treatment leads to a prolonged contraceptive effect, then that may minimize or delay the hypothesized rebound effect. 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 negate the compensatory reproduction that can follow removals (Kirkpatrick and Turner 1991).

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. Contraception would be expected to lead to a relative increase in the fraction of older animals in the herd. Reducing the numbers of wild horses that would have to be removed in future gathers could allow for removal of younger, more easily adoptable excess wild horses, and thereby could eliminate the need to send additional excess horses from this area to off-range holding corrals or pastures for long-term holding. Among mares in the herd that remain fertile, a high level of physical health and future reproductive success would be expected because reduced population sizes should lead to more availability of water and forage per capita.

Reduced population growth rates and smaller population sizes could also allow for continued and increased environmental improvements to range conditions within the project area, which would have long-term benefits to wild horse habitat quality. As the local horse abundance nears or is maintained at the level necessary to achieve a thriving natural ecological balance, vegetation resources would be expected to recover, improving the forage available to wild horses and wildlife throughout the Complex. With rangeland conditions more closely approaching a thriving natural ecological balance, and with a less concentrated distribution of wild horses across the Complex, there should also be less trailing and concentrated use of water sources. Lower population density would be expected to lead to reduced competition among wild horses using the water sources, and less fighting among horses accessing water sources. Water quality and quantity would continue to improve to the benefit of all rangeland users including wild horses. Wild horses would also have to travel less distance back and forth between water and desirable foraging areas. Should GonaCon-Equine treatment, including booster doses, continue into the future, with treatments given on a schedule to maintain a lowered level of fertility in the herd, the chronic cycle of overpopulation and large gathers and removals might no longer occur, but instead a consistent abundance of wild horses could be maintained, resulting in continued improvement of overall habitat conditions and animal health. While it is conceivable that widespread and continued treatment with GonaCon-Equine 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 GnRH Vaccination

Behavioral differences should be considered as potential consequences of contraception with GonaCon.

The NRC (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 GonaCon was a good choice for use in the program. 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 antiGnRH 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 in this study 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*."

The NRC Report (2013) provides a comprehensive review of the literature on the behavioral effects of contraception that puts Dr. Nuñez's (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)*."

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.

Genetic Effects of GnRH Vaccination

Genetic effects of GonaCon application in the complex would be expected to be comparable to those that would be possible from PZP application.

Intrauterine Devices (IUDs)

Up through the present time (October 2020), 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, Holyoak et al. unpublished data). However, existing literature on the use of IUDs in horses allows for inferences about expected effects of any management alternatives that might include use of IUDs, and support the apparent safety and efficacy of some types of IUDs for use in horses. Overall, as with other methods of population growth suppression, use of IUDs and other fertility control measures are expected to help reduce population growth rates, extend the time interval between gathers, and reduce the total number of excess animals that will need to be removed from the range. The genetic effects of use of IUDs are expected to be comparable to those expected from fertility control vaccine use, insofar as reversible fertility control treatments can temporarily reduce the fraction of fertile mares in a herd.

The 2013 National Academies of Sciences (NAS) report considered IUDs, and suggested that research should test whether IUDs cause uterine inflammation, and should also test how well IUDs stay in mares that live and breed with fertile stallions. Since that report, a recent study by Holyoak et al. (unpublished data) indicate that a flexible, inert, y-shaped, medical-grade silicone IUD design prevented pregnancies in all the domestic mares that retained the device, even when exposed to fertile stallions. Domestic mares in that study lived in large pastures, mating with fertile stallions. Biweekly ultrasound examinations showed that IUDs stayed in 75% of treated mares over the course of two breeding seasons. The IUDs were then removed so the researchers could monitor the mares' return to fertility. Uterine health, as measured in terms of inflammation, was not seriously affected by the IUDs, and most mares became pregnant within months after IUD removal. The overall results are consistent with results from an earlier study (Daels and Hughes 1995), which used O-shaped silicone IUDs.

IUDs are considered a temporary fertility control method that does not generally cause future sterility (Daels and Hughes 1995). Use of IUDs is an effective fertility control method in women, and IUDs have historically been used in livestock management, including in domestic horses. Insertion of an IUD can be a very rapid procedure, but it does require the mare to be temporarily restrained, such as in a squeeze chute. IUDs in mares may cause physiological effects including discomfort, infection, perforation of the uterus if the IUD is hard and angular, 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 (Daels 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 estrus (Turner et al. 2015). However, some domestic mares did exhibit repeated estrus cycles during the time when they had IUDs (Killian et al. 2008, Gradil et al. 2019). The main cause for an IUD to not be effective at contraception is its failure to stay in the uterus (Daels and Hughes 1995). As a result, one of the major challenges to using IUDs to control fertility in mares on the range is preventing the IUD from being dislodged or otherwise ejected over the course of daily activities, which could include, at times, frequent breeding.

At this time, it is thought that any IUD inserted into a pregnant mare may cause the pregnancy to terminate, which may also cause the IUD to be expelled. For that reason, it is expected that IUDs would only be inserted in non-pregnant (open) mares. Wild mares receiving IUDs would be checked for pregnancy prior to insertion of an IUD. This can be accomplished by transrectal palpation and/or ultrasound performed by a veterinarian. Pregnant mares would not receive an IUD. The IUD is inserted into the uterus using a thin, tubular applicator similar to a shielded culture tube, and would be inserted in a manner similar to that routinely used to obtain uterine cultures in domestic mares. If a mare has a zygote or very small, early phase embryo, it is possible that it will fail to be detected in screening, and may develop further, but without causing the expulsion of the IUD. Wild mares with IUDs would be individually marked and identified, so that they can be monitored occasionally and examined, if necessary, in the future, consistent with other BLM management activities.

Using metallic or glass marbles as IUDs may prevent pregnancy in horses (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 (Freeman and Lyle 2015). Metallic IUDs may cause severe infection (Klabnik-Bradford et al. 2013).

In domestic ponies, Killian et al. (2008) explored the use of three different IUD configurations, including a silastic polymer O-ring with copper clamps, and the “380 Copper T” and “GyneFix” IUDs designed for women. The longest retention time for the three IUD models was seen in the “T” device, which stayed in the uterus of several mares for 3-5 years. Reported contraception rates for IUD-treated mares were 80%, 29%, 14%, and 0% in years 1-4, respectively. They surmised that pregnancy resulted after IUD fell out of the uterus. Killian et al. (2008) reported high levels of progesterone in non-pregnant, IUD-treated ponies. Soft IUDs may cause relatively less discomfort than hard IUDs (Daels 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.

More recently, several types of IUDs have been 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 tested a Y-shaped IUD to determine retention rates and assess effects on uterine health; retention rates were greater than 75% for an 18-month period, and mares returned to good uterine health and reproductive capacity after removal of the IUDs (Holyoak et al., unpublished results). It is possible that some individual mares may become permanently infertile as a result of IUD use, even after IUD removal or expulsion; however, available evidence indicates that flexible IUDs should be considered a reversible fertility control method for most mares. The University of Massachusetts has developed a magnetic IUD that has been effective at preventing estrus, or prolonging the period of time between estrus, in non-breeding domestic mares (Gradil et al. 2019). After insertion in the uterus, the three subunits of the device are held together by magnetic forces as a flexible triangle. A metal detector can be used to determine whether the device is still present in the mare. In an early trial, two sizes of those magnetic IUDs fell out of breeding domestic mares at high rates (Holyoak et al., unpublished results). In 2019, the magnetic IUD was used in two trials where mares were exposed to stallions, and in one where mares were artificially inseminated; in all cases, the IUDs were reported to stay in the mares without any pregnancy (Gradil 2019). Because IUDs may prolong the time between estrus, but still allow for some degree of estrus behavior, it could be surmised that treated mares would continue to engage in behaviors consistent with estrus, though perhaps at somewhat reduced frequency. The effects of temporary infertility due to IUDs use would also be comparable to those expected from PZP or GonaCon vaccination.

Sex Ratio Manipulation

Skewing the sex ratio of a herd so that there are more males than females is an established BLM management technique for reducing population growth rates. As part of a wild horse and burro gather process, the number of animals returned to the range may include more males, the number removed from the range may include more females, or both. By reducing the proportion of breeding females in a population (as a fraction of the total number of animals present), the technique leads to fewer foals being born, relative to the total herd size.

Sex ratio is typically adjusted in such a way that 60 percent of the horses are male. In the absence of other fertility control treatments, this 60:40 sex ratio can temporarily reduce population growth rates from approximately 20% to approximately 15% (Bartholow 2004). While such a decrease in growth rate may not appear to be large or long-lasting, the net result can be that fewer foals being born, at least for a few years – this can extend the time between gathers, and reduce impacts on-range, and costs off-range. Any impacts of sex ratio manipulation are expected to be temporary because the sex ratio of wild horse and burro foals at birth is approximately equal between males and females (NAS 2013), and it is common for female foals to reproduce by their second year (NAS 2013). Thus, within a few years after a gather and selective removal that leads to more males than females, the sex ratio of reproducing wild horses and burros will be returning toward a 50:50 ratio.

Having a larger number of males than females is expected to lead to several demographic and behavioral changes as noted in the NAS report (2013), including the following. Having more fertile males than females should not alter the fecundity of fertile females. Wild mares may be distributed in a larger number of smaller harems. Competition and aggression between males may cause a decline in male body condition. Female foraging may be somewhat disrupted by elevated male-male aggression. With a greater number of males available to choose from, females may have opportunities to select more genetically fit sires. There would also be an increase the genetic effective population size because more stallions would be breeding and existing females would be distributed among many more small harems. This last beneficial impact is one reason that skewing the sex ratio to favor males is listed in the BLM wild horse

and burro handbook (BLM 2010) as a method to consider in herds where there may be concern about the loss of genetic diversity; having more males fosters a greater retention of genetic diversity.

Infanticide is a natural behavior that has been observed in wild equids (Feh and Munktuya 2008, Gray 2009), but there are no published accounts of infanticide rates increasing as a result of having a skewed sex ratio in wild horse or wild burro herds. Any comment that implies such an impact would be speculative.

The BLM wild horse and burro management handbook (BLM 2010) discusses this method. The handbook acknowledges that there may be some behavioral impacts of having more males than females. The handbook includes guidelines for when the method should be applied, specifying that this method should be considered where the low end of the AML is 150 animals or greater, and with the result that males comprise 60-70 percent of the herd. Having more than 70 percent males may result in unacceptable impacts in terms of elevated male-male aggression. In NEPA analyses, BLM has chosen to follow these guidelines in some cases, for example:

- In the 2015 Cold Springs HMA Population Management Plan EA (DOI-BLM-V040-2015-022), the low end of AML was 75. Under the preferred alternative, 37 mares and 38 stallions would remain on the HMA. This is well below the 150 head threshold noted above.
- In the 2017 Hog Creek HMA Population Management Plan EA (DOI-BLM-ORWA-V000-2017-0026-EA), BLM clearly identified that maintaining a 50:50 sex ratio was appropriate because the herd size at the low end of AML was only 30 animals.

It is relatively straightforward to speed the return of skewed sex ratios back to a 50:50 ratio. The BLM wild horse and burro handbook (BLM 2010) specifies that, if post-treatment monitoring reveals negative impacts to breeding harems due to sex ratio manipulation, then mitigation measures could include removing males, not introducing additional males, or releasing a larger proportion of females during the next gather.