U.S. Department of the Interior
Bureau of Land Management

Antelope and Triple B Complexes Gather Plan

Environmental Assessment

DOI-BLM-NV-E030-2017-0010-EA

Environmental Assessment

DOI-BLM-NV-E030-2017-0010-EA

Antelope and Triple B Complexes Gather Plan

Prepared by
U.S. Department of the Interior
Bureau of Land Management
Elko District, Wells Field Office
3900 E. Idaho St.
Elko, NV 89801
(775) 753-0200

Table of Contents

1. INTRODUCTION

This Environmental Assessment (EA) has been prepared to disclose and analyze the environmental effects of the Proposed Action, which consists of gathering and removing excess wild horses from the Antelope and Triple B Complexes (hereafter referred to as the Complexes) along with fertility control management. 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 to achieve and maintain appropriate management levels. This EA will assist the Bureau of Land Management (BLM) Wells Field Office (WFO) and Bristlecone Field Office (BFO) 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 Antelope and Triple B Complexes. If the BLM determines that the Proposed Action for the Complexes is not expected to have significant impacts a Finding of No Significant Impact (FONSI) will be issued and a Decision Record will be prepared. If significant effects are anticipated, the BLM will 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),*
- Proposed Wells Resource Management Plan and FEIS US DOI 1983 (Wells RMP), approved July 16, 1985,
- Nevada and Northeastern California Greater Sage-Grouse Approved Resource Management Plan Amendment (BLM 2015),
- Wells RMP Wild Horse Amendment and Decision Record, approved August 1993 (US DOI 1993) (*Wells RMPWHA*).

1.1. Background

Since the passage of the Wild Free-Roaming Horses and Burros Act (WFRHBA) of 1971, BLM has refined its understanding of how to manage wild horse population levels. By law, BLM is required to control any overpopulation, by removing excess animals, once a determination has been made that excess animals are present and removal is necessary. Program goals have always been to establish and maintain a “thriving natural ecological balance” (TNEB), which requires identifying the Appropriate Management Level (AML) for individual herds. The AML is defined as the number of wild horses that can be sustained within a designated Herd Management Area (HMA) which achieves and maintains a thriving natural ecological balance[1] in keeping with the multiple-use management concept for the area. In the past two decades, goals have also explicitly included the application of contraceptive treatments and adjusting sex ratios to achieve and maintain wild horse populations within the established AML. Both of these management actions can reduce total population growth rates in the short-term and increase gather intervals necessary to remove excess animals. Other management efforts include improving the accuracy of population inventories and collecting genetic baseline data to support genetic health assessments. Decreasing the numbers of excess wild horses removed while also reducing population growth rates and ensuring the welfare of wild horses on the range are all consistent with findings and recommendations from the National Academy of Sciences (NAS), American Horse Protection Association (AHPA), the American Association of Equine Practitioners (AAEP), Humane Society of the United States (HSUS), Government Accountability Office (GAO), Office of Inspector General (OIG) and current BLM policy. BLM's management of wild horses must also be consistent with Standards and Guidelines for Rangeland Health and for Healthy Wild Horse Populations developed by the Northeastern Great Basin Resource Advisory Council (RAC).

At the national level, annual gather removals are based on national priorities (such as risks to public safety, wild horse health and resource protection) and budget for gather operations. The national program also needs to consider the costs and budget constraints involving long-term care of excess un-adopted wild horses that have been moved to off range pastures so long as Congressional appropriations bills prohibit the euthanization or sale without limitation of excess unadopted wild horses removed from the range.

Population controls, such as the use of chemical fertility control or permanent sterilization, need to be pursued as an alternative to removal of excess horses. This would help control the population of wild horses in HMAs and bring down the number of excess wild horses in the long-term. If used as the sole approach to controlling population numbers, contraception would not allow the BLM to achieve population objectives. However, in conjunction with other techniques (e.g., removals of excess animals and adoption/sale) and through incorporation of other population control techniques (e.g., sex ratio adjustments, sterilization), it provides a valuable tool in a larger, more adaptive approach to wild horse and burro management.

[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).

The Antelope Complex includes the HMAs as listed in Table 1. The Antelope HMA is managed by the Ely District's Bristlecone FO and the Antelope Valley, Goshute, and Spruce-Pequop HMAs are managed by the Elko District's Wells FO. Refer to Figure 1 in Section 1.2.

Table 1. Antelope Complex Herd Management Areas, acres, AML, estimated population, and estimated numbers for removal.

Herd Management Area	Total Acres Private/Public land[1]	AML Range	Current Pop. Estimate (March 1, 2017)	Estimated Pop. (2017 Inventory)	Pop. Estimate with 2017 foal crop[2]	Current Estimated Wild Horse Use (AUMs)	Removal Estimate to Achieve Low AML[5]	Removal Estimate to Achieve High AML[5]
Antelope	331,000	150-324	1,033	855	1,026	12,312	876	702
Antelope Valley	463, 540	155-259	1,320	1,517	1,705[4]	20,460	1,550	1,446
Goshute[3]	250,800	73-124	1,015	1,191	1,429	17,148	1,356	1,305
Spruce-Pequop[3]	138,000	49-82	1,170	1,269	1,523	18,276	1,474	1,441
Total	1,183,340	427-789	4,538	4,832	5,683[3]	68,196	5,256	4,894

[1] Total acres as outlined in the 1993 Wells Wild Horse RMP Amendment. See Appendix X for a discussion of HMA acre discrepancies corrected in this document.
[2] Estimated Population of wild horses includes the 2017 foal crop, which is based on a 20% annual growth rate. Wild horse population numbers can fluctuate among the HMAs due to seasonal movement.).
[3] Total estimated population includes areas outside HMA Boundary.
[4] Emergency gather in May 2017 removed 96 excess wild horses.
[5] Removal estimates are based on July 2017 population estimate.

The Triple B HMA is managed by the Ely District's Bristlecone FO and the Antelope Valley and Maverick Medicine HMAs are managed by the Elko District"s Wells FO. Refer to Figure 1 in Section 1.2. The Cherry Springs WHT is managed in accordance with an Interagency Agreement between the BLM and USFS.

Table 2. Triple B Complex Herd Management Areas, acres, AML, estimated population, and estimated numbers for removal.

Herd Management Area	Total Acres Private/Public land[1]	AML Range	Current Pop. Estimate (March 1, 2017)	Pop. Estimate with 2017 foal crop[2]	Current Estimated Wild Horse Use (AUMs)	Removal Estimate to Achieve Low AML	Removal Estimate to Achieve High AML
Triple B	1,225,000	250-518	1,770	2,124	25,488	1,874	1,606
Maverick-Medicine	286,460	166-276	1,309	1,571	18,852	1,405	1,295

Herd Management Area	Total Acres Private/Public land[1]	AML Range	Current Pop. Estimate (March 1, 2017)	Pop. Estimate with 2017 foal crop[2]	Current Estimated Wild Horse Use (AUMs)	Removal Estimate to Achieve Low AML	Removal Estimate to Achieve High AML
Antelope Valley West of U.S. Highway 93[3]	97,070	16-27	59	71	852	55	44
Cherry Springs WHT	23,794	40-68	63	76	912	36	13
Total	1,632,324	472-889	3,201	3,842	46,104	3,370	2,958

[1] Total acres as outlined in the 1993 Wells Wild Horse RMP Amendment. See Appendix X for a discussion of HMA acre discrepancies corrected in this document.
[2] Estimated Population of wild horses includes the 2017 foal crop, which is based on a 20% annual growth rate. Wild horse population numbers can fluctuate among the HMAs due to seasonal movement.).
[3] Acres only represent the portion of Antelope Valley HMA west of U.S. Highway 93. Wild horses in this portion of the Antelope Valley HMA move back and forth mixing with wild horses from the Maverick-Medicine and Triple B HMAs.

The Antelope Complex has an AML range of 427-789 wild horses and the Triple B Complex has an AML range of 472-889. The combined project area (Antelope and Triple B Complexes) has an AML range of 899-1,678. Portions of the Complexes located in the Ely District were established through Final Multiple Use Decisions and reaffirmed through the 2008 Ely District Resource Management Plan (RMP) and Record of Decision (ROD). Portions of the complexes located in the Elko District were established through Final Multiple Use Decisions and the Wells Resource Management Plan Wild Horse Amendment (WRMPWHA). The Cherry Springs WHT was established on the Humboldt-Toiyabe National Forest through the Cherry Spring Wild Horse Territory Management Plan. These decisions established AMLs designed to maintain healthy wild horse populations and rangelands over the long-term based on monitoring data and in-depth analysis of habitat suitability.

The 2008 Ely RMP combined three existing HMAs (Buck and Bald, Butte, and Cherry Creek HMAs) into the Triple B HMA. The decision to combine all or portions of the three HMAs was due to the historical interchange of wild horses between the three 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, Table 3.8-2 and Page 4.8-2. The 2007 EIS evaluated each herd management area for five essential habitat components and herd characteristics: forage, water, cover, space, and reproductive viability. Through this analysis and the subsequent Final RMP and Record of Decision (ROD), the boundaries of the Triple B HMA were established to ensure sufficient habitat for wild horses, and an AML of 250-518 wild horses was established to achieve a thriving natural ecological balance and rangeland health.

The 2008 Ely RMP re-affirmed long-term management of wild horses within the Antelope HMA through the Ely Proposed Resource Management Plan/Final Environmental Impact Statement, Table 3.8-2 and Page 4.8-2. The 2007 EIS evaluated the herd management area for five essential habitat components and herd characteristics: forage, water, cover, space, and reproductive viability. Through this analysis and the subsequent Final RMP and Record of Decision (ROD), the boundaries of the Antelope HMA were reaffirmed to ensure sufficient habitat for wild horses, and an AML of 150-324 wild horses was reviewed and set to achieve a thriving natural ecological balance and rangeland health.

The WRMPWHA established the baseline AMLs of 240 wild horses for the Antelope Valley HMA, 160 wild horses for the Goshute HMA, 389 wild horses for the Maverick-Medicine HMA and 82 wild horses for the Spruce-Pquop HMA. The WRMPWHA stated that adjustments would be based on monitoring and grazing allotment evaluations. The baseline AML for the Antelope Valley, Goshute and Spruce-Pequop HMAs was established at 155-259 wild horses through a combination of the 1994 Antelope Valley Final Mutiple Use Decision (FMUD), the 1998 Badlands FMUD, the 1998 Spruce FMUD, the 2001 Maverick-Medicine Complex FMUD, the 2001 Sheep Allotment Complex FMUD and the 2002 Big Springs FMUD.

In the Maverick-Medicine HMA the WRMPWHA established a baseline AML of 389 wild horses, which was adjusted to 166-276 wild horses through a combination of the 1998 Spruce FMUD, the 1994 West Cherry Creek Allotment FMUD, and the 2001 Maverick-Medicine Complex FMUD. The wild horses from this HMA travel back and forth across the Elko and White Pine County line, mixing with the wild horses from the Triple B HMA. They also move back and forth mixing with wild horses from the western portion of the Antelope Valley HMA west of U.S. Highway 93. The population within this HMA can fluctuate depending on the seasonal movement of the wild horses.

The WRMPWHA established wild horse pre-livestock allowable use levels at 10% in winter use areas. ("Utilization of key forage species by wild horses in areas used in common will not exceed an average of 10 percent prior to entry by livestock"). The WRMPWHA established that utilization by all grazing animals will not exceed 55% on key species by March 31 on winter range.

The WRMPWHA stated that "the availability of forage in winter use areas is considered the most limiting factor for wild horses". However, as wild horse numbers increase wild horses spend more and more time grazing winter use areas.

Cherry Springs WHT established an AML of 40-68 wild horses through the Cherry Springs WHT Management Plan approved in July 1993. This population range was established based on monitoring data and wild horse seasonal movement within the Cherry Springs WHT. The population within the WHT fluctuates due to seasonal movement of the wild horses between the Triple B HMA and Cherry Springs WHT.

In the 2013 National Academy of Sciences' (NAS) report "Using Science to Improve the BLM Wild Horse and Burro Program: A Way Forward", the science review committee reported that annual population statistics at that time were probably substantial underestimates of the actual number of horses occupying public lands, inasmuch as most of the individual HMA population estimates are based on the assumption that all animals are detected and counted in population surveys—that is, perfect detection. A large body of scientific literature focused on inventory techniques for horses and other large mammals clearly refutes that assumption. The literature shows estimates of the proportion of animals missed on surveys ranges from 10 to 50 percent, depending on terrain ruggedness and tree cover (Caughley, 1974a; Siniff et al., 1982; Pollock and Kendall, 1987; Garrott et al. 1991a; Walter and Hone, 2003; Lubow and Ransom, 2009). The committee had little knowledge of the distribution of HMAs with respect to terrain ruggedness and tree cover, but stated that a reasonable approximation of the average proportion of horses undetected in surveys throughout western rangelands was 20% to 30%.

The Antelope Complex was most recently aerially inventoried in March 2017 using the Double Simultaneous Count method, in which observers independently observe and record groups of wild horses (Lubow and Ransom 2016). Sighting rates are estimated by comparing sighting records of the observers. Sighting probabilities for the observers are then estimated from the information collected and a population estimate is generated. The estimated population based on the 2017 Inventory was 4,832 wild horses in the Antelope Complex. At the time of implementation of the proposed gather operation, it is estimated that the population within the Antelope Complex) would be approximately 5,683 wild horses (which includes the 2017 foal crop).

The Triple B Complex was most recently aerially inventoried in February 2016 and had an estimated population of 2,729 adult wild horses, which has grown to approximately 3,842 wild horses with the 2017 foal crop.

As is true for any estimates of wildlife abundance or herd size, there is always some level of uncertainty about the exact numbers of wild horses or wild burros in any HA/HMA or non-HMA area. The estimates shown here reflect the most likely number of wild horses and burros, based on the best information available to the BLM and may not account for every animal within the HA/HMA. BLM strives to conduct aerial surveys in each HMA once every three years. These surveys result in estimates that statistically account for animals that are not detected by any observer on the flights. In years without surveys, herd size estimates rely on additional information, including known numbers of animals removed and estimated annual population growth rates.

Wild horse numbers have increased an average of 20-25% annually since the HMAs were last gathered. With the projected 2017 foal crop the Antelope Complex is anticipated to be at least twelve times over low range AML and about seven times over the high range AML; while the Triple B Complex is anticipated to be about eight times over low range AML and four times over the high range of AML[2]. By comparison, livestock use has remained at or below active use levels. Livestock use is consistent with the grazing systems outlined in Final Multiple Use Decisions, Grazing Term Permit Renewals, Agreements, and Term Permit conditions which provide for periodic rest and deferment of key range sites.

Based upon current information, the BLM has determined that there are currently approximately 8,626 excess wild horses above low range AML within the Project Area. These excess wild horses need to be removed in order to achieve the established AMLs, restore a thriving natural ecological balance and prevent further degradation of rangeland resources. This assessment is based on factors including, but not limited to the following:

- Antelope and Triple B Complexes estimated populations exceed the established AML ranges for the project area (Tables 1 and 2).
- Heavy to severe utilization on key forage species within HMAs and severe degradation of water sources due to overpopulation of wild horses.
- Use by wild horses is exceeding the forage allocated for them by approximately 6.2 times for the Antelope Complex and approximately 3.6 times for the Triple B Complex (measured against the high end of the AML range).

[2] If a gather is not initiated prior to July 2018, the Antelope Complex and Triple B Complex wild horse populations would be expected to further increase by another 20% as a result of the 2018 foal crops.

1.2. Location of Project Area

The Project Area is located in southeastern Elko County and northern White Pine County, comprised of 3,870,919 acres (Figure 1 below). It contains wild horse management units consisting of the Antelope HMA, Antelope Valley HMA, Goshute HMA, Spruce-Pequop HMA (collectively called the Antelope Complex (approximately 1,183,340acres) and the Triple B HMA, Maverick-Medicine HMA, and Cherry Springs Wild Horse Territory (collectively called the Triple B Complex (approximately 1,632,324 acres). The County boundary is also the boundary dividing the Elko and Ely BLM Districts within the Project Area.

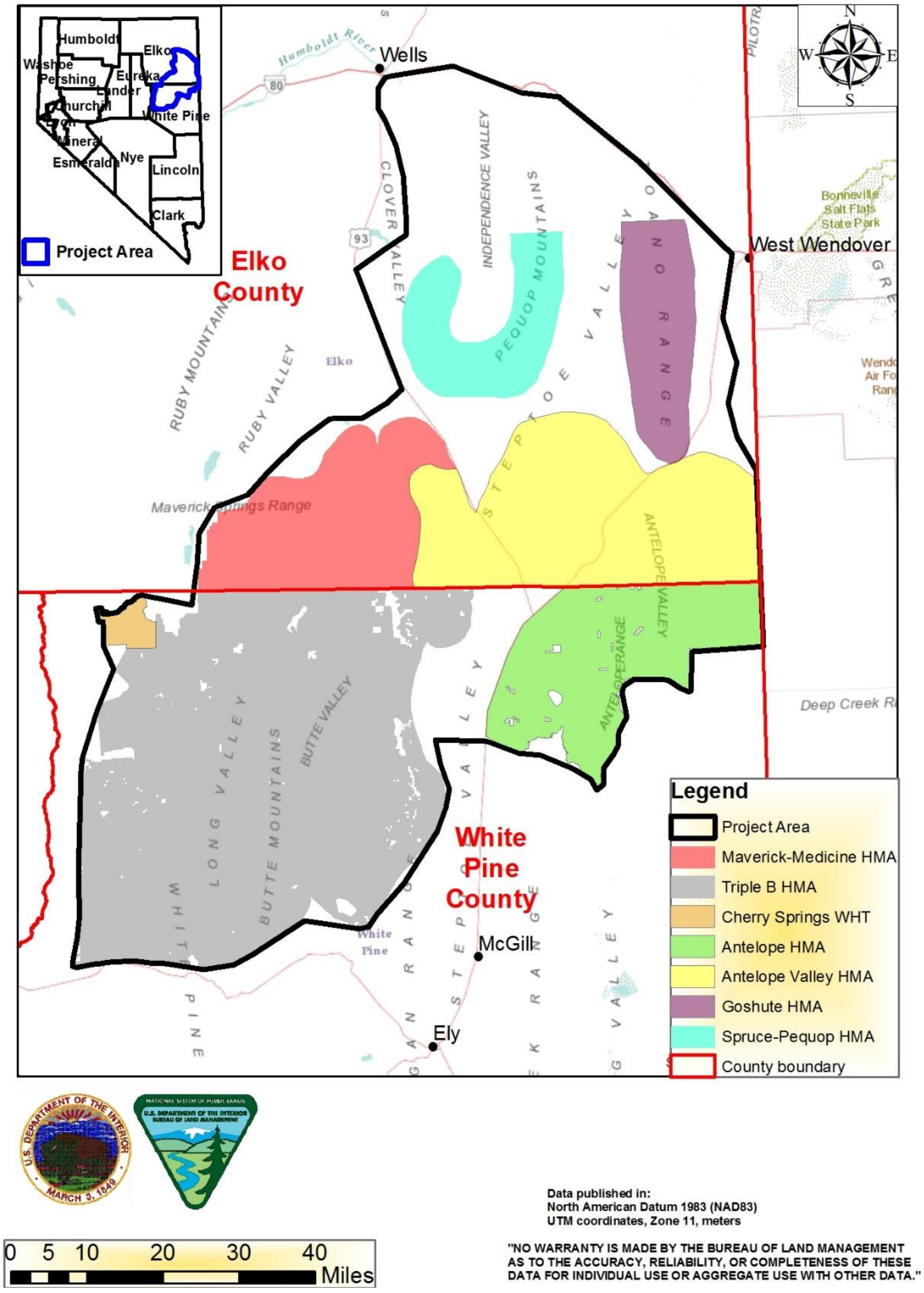


Figure 1. Project Area Map

1.3. Purpose and Need for Action

The purpose of the Proposed Action is to gather and remove excess wild horses from within and outside the Triple B and Antelope Complexes and to reduce the wild horse population growth rates to achieve and maitain 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).

1.4. Land Use Plan Conformance and Consistency with Other Authorities

The Proposed Action (Alternative A) and Alternatives B and C are in conformance with the Wells Resource Management Plan which was approved July 16, 1985 and the Wells Resource Management Plan Wild Horses Amendment approved in August 1993. The Wells RMP Issue 7 states: Wild Horses, Management Actions 1) Continue to monitor wild horse populations and habitat conditions, 2) Conduct gatherings, of excess wild horses as necessary to maintain population within a range of 555 to 700 animals, 3) Construct six water developments projects (catchment type) with a storage tank and trough and 4), Remove wild horses from private lands if required. The Wild Horse Amendment further outlines the level of management for wild horses within the planning area including the Antelope Valley, Goshute and Spruce-Pequop HMAs as follows.

- Established initial herd size 871 animals and stated that adjustments will be based on monitoring and grazing allotment evaluations.
- The Wild Horse amendment further outlined the level of management for wild horses within the planning area including the Antelope Valley, Goshute and Spruce-Pequop HMAs. The Amendment established wild horse pre-livestock allowable use levels at 10%. (“Utilization of key forage species by wild horses in areas used in common will not exceed an average of 10 percent prior to entry by livestock”). The availability of forage in the winter use areas is considered the most limiting factor for wild horses.

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

- 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 uses and resources.”
- Objective: “To maintain wild horse herds at appropriate management levels within the herd management areas where sufficient habitat resources exist to sustain healthy populations at those levels.”

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

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.

2. Proposed Action and Alternatives

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 ten year period, gather and remove excess wild horses, selective removal of excess wild horses to low end AML for a core breeding population, 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 non-reproducing (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.

2.1. 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 13,716. Wild horses residing outside the HMAs 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.

2.2. Alternative A: Proposed Action Alternative

2.2.1. Population Management

The Proposed Action (Alternative A) would be to gather and remove approximately 9,053 excess wild horses within the Complexes 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 low range AML for a core breeding population, 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 Elko and Ely Districts would return to the complexes to remove excess horses above low AML. Follow-up gathers over a 10 year period to remove any additional wild horses necessary in order to achieve and maintain the low range of AML, andto gather a sufficient number of wild horses as to implement the population control component of the Proposed Action (PZP, Gonacon, or Gelding) for wild horses remaining in the complexes. Prioritization of excess wild horse removals would be as follows, from areas where public health and safety issus have been identified, private land and non-HMA, areas were resource degreation 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 Complexes, and allow older less adoptable wild horses, to be released back to the Complexes.

BLM would begin implementing the population control components (PZP, Gonacon, and gelding) of this alternative as part of the initial gather or follow up gathers. To help improve the efficacy and duration of the fertility control vaccine, mares could be held for an additional 30 days and given a booster shot prior to release.

Population inventories and routine resource/habitat monitoring would countiue to be completed every two to three years to document current population levels, growth rates, and areas of continued resource concerns (horses concentrations, riparian impacts, over-utiliziation, 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 Antelope and Triple B Complex would be to gather and remove excess wild horses within the Complexes to achieve and maintain AML. BLM would achieve this through grow suppression measures to include:

- Administration of population control measures (i.e. PZP, PZP 22, GonaCon or newly developed formulations) to released horses.

- Adjustment of sex ratios to achieve a 60 % male ratio within the core breeding population of 899 wild horses.
- Some gelded horses that would otherwise be excess animals permanently removed from the range and sent to holding facilities for adoption/sales or long-term holding, 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.
- To help reduce population growth rates, the Complexes would be managed to achieve a 60% male 40% female sex ratio; and all mares released back to the Complexes would be treated with fertility control (i.e. PZP, GonaCon or newly developed formulations). The combination of these actions would lower the population growth rate within the Complexes.

This component of the Proposed Action, would reduce the total number of wild horses that would otherwise be permanently removed from the range. This would allow for management of a larger total wild horse population within the Complexes while still managing population growth and achieving a thriving natural ecological balance. Primary gather methods would include helicopter, bait, and water trapping. It is expected that not all horses can be trapped; a proportion of wild horses in the project area would not be trapped or treated over the 10-year period of the Proposed Action.

While in the temporary holding corralhorses would be identified for removal or release based on age, gender and/or other characteristics. A hair sample would be collected from a minimum of 25 horses or 25% of the released population from an HMA. No more than 100 hair samples would be collected per HMA. Samples would be collected for analysis to assess the current genetic health within the Complexes. Mares identified for release would be aged, 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 treatment.

2.2.2. Population Growth Suppression Methods

The Proposed Action would include population growth suppression methods such as fertility control vaccines, sex ratio adjustment, and a non-reproducing component (gelding). In cases where a booster vaccine is required the released mares could be held for 30 days and given a booster shot. Over the course of the gathers, BLM would treat/retreat mares with fertility control and obtain herd management objectives. The use of any new fertility control would conform to current best management practices at the direction of the National Wild Horse and Burro Program.

2.2.3. Population Growth Suppression Methods

All mares that are trapped and selected for release would be treated with the fertility control treatments GonaCon and/or Porcine Zona Pellucida -22 (PZP-22) or most current formulations to prevent pregnancy in the following year(s). The procedures to be followed for implementing fertility control are detailed in Appendix I.

2.2.3.1. PZP

Porcine Zona Pellucida (PZP) Vaccine

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

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

2.2.3.2. 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 and on a small number of wild horses in the Water Canyon area within the Antelope Complex (BLM 2015). GonaCon-Equine can be remotely administered in the field in cases where mares are relatively approachable, using a customized pneumatic dart (McCann et al. 2017). Use of remotely delivered (dart-delivered) vaccine is generally limited to populations where individual animals can be accurately identified and repeatedly approached within 50 m (BLM 2010).

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

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

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; 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 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.

2.2.3.3. Gelding

In order to reduce the total number of excess wild horses that would otherwise be permanently removed from the Complexes, 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 SOPs in Appendix II.

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 holding facilities. The gelding procedure for excess wild horses removed from the range would be conducted at temporary (field) or short-term holding facilities 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 and remove them from the Complexes.

By including some geldings in the population, and having a slightly skewed sex ratio with more males than females overall in the core breeding population, the anticipated result would be a reduction in 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 II).

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 regular BLM 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 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. 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 the facility, 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 Complexes. All adults would have been freeze-marked at the first gather to facilitate post-treatment 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 would 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 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 by replacing breeding mares with sterilized animals, and thereby extending the gather cycle 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.

It should be noted that adequate reduction of female horse fertility rates is expected to result only if a large proportion of male horses in the population are sterile, because of their social behavior (Garrott and Siniff 1993). By itself, it is unlikely that sterilization (gelding) would allow the BLM to achieve its horse and burro population management objectives since a single stallion is capable of impregnating multiple mares, and stallions other than the dominant harem stallion may also breed with some mares. Therefore, to be fully effective, use of sterilization 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/burros in the population be gathered and treated. If the treatment is not of a permanent nature (e.g., application of PZP vaccine to mares) the animals would need to be gathered and treated on a cyclical basis.

2.3. Alternative B

Alternative B is similar to Alternative A, but would not include a gelding component. Selective removal of excess wild horses to low end AML, population growth control using fertility control treatments (PZP, PZP-22, GonaCon, or most current formula) 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 Complexes 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 fertility control (PZP, GonaCon) to all mares that are released. The procedures to be followed for implementation of fertility control are detailed in Appendix I. Approximately 65% 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 Complexes.

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.

2.4. Alternative C

Gather and remove excess animals to within AML range without fertility control, sex ratio adjustments, or geldings. Impacts from this alternative would be similar to the gathering and handling impacts under 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 soner than under the Proposed Action or Alternative B since feriltiy rates would be higher

2.5. Management Actions Common to Alternatives A, B and C

The primary gather techniques would be the helicopter-drive and water/bait trapping methods. The use of roping from horseback could also be used when necessary. Multiple gather sites (traps) would be used to gather wild horses both from within and outside the Complexes. 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. No gather sites would be set up on Greater sage-grouse leks, known populations of sensitive species, or in riparian areas, cultural resource 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 Elko 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 Standard Operating Procedures (SOPs) in Appendix III.

2.5.1. 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

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 involves use of a helicopter to herd wild horses into a temporary trap. The SOPs outlined in Appendix I 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 should 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 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.

Gathering of horses to meet the goals of the proposed action would occur as necessary for the next 10 years following the start date of the initial gather (no sooner than January 2018).

The most efficient gather technique would be chosen as determined by the gather needs of the specific area. Helicopter and bait or water trapping by contractor would be the primary methods used to gather wild horses. 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.

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. Temporary trap (gather) sites, including helicopter drive and water/bait trapping sites, as well as temporary holding sites, may be used to accomplish the goals of the Proposed Action. 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 III) and to the written approval/authorization of the landowner.

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 temporary gather and holding sites in previously disturbed areas and in areas that have been inventoried and have no cultural resources, sacred sites or paleontological sites. If a new gather or holding site is needed, a cultural inventory would be completed prior to using the new site. If cultural resources are encountered, the location of the gather/ holding site would be adjusted to avoid all cultural resources. All gather (helicopter drive or water/bait trapping) and handling activities (including gather site selections) would be conducted in accordance with SOPs in Appendix III.

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.

2.5.2. Bait/Water Trapping

Bait and/or water trapping would be used as appropriate to gather wild horses efficiently and effectively. When dealing with an extremely large area (like these Complexes), bait and water trapping may be utilized, i.e., 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 these Complexes. 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 Complexes. 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 III

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 low stress approach to gathering wild horses, such trapping can continue into the foaling season without harming the mares or foals.

2.5.3. 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.

Gathered wild horses would be transported to BLM holding facilities where they would be prepared for adoption and/or sale to qualified individuals or transfer to long-term grassland pastures or other disposistion authorized by the WFRHBA.

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

All gathered wild horses would be removed and transported to BLM holding facilities where they would be inspected by facility staff (and if needed 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 12 hours.

Upon arrival, recently captured wild horses are off-loaded by compartment and placed in holding pens where they are provided good quality hay and water. Most wild horses begin to eat and drink immediately and adjust rapidly to their new situation. At the off-range corral, a veterinarian provides recommendations to the BLM regarding care, treatment, and if necessary, euthanasia of the recently captured wild horses. 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 long-term grassland pastures. Preparation involves freeze marking the animals with a unique identification number, vaccination against common diseases, castration, and de-worming. At ORC facilities, a minimum of 700 square feet of space is provided per animal.

2.5.5. 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.

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

2.5.8. 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 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 HMA over the next 10 years could potentially be euthanized or sold without limitation consistent with the provisions of the WFRHBA.

Any old, sick or lame horses unable to maintain an acceptable body condition (greater than or equal to a Henneke BCS of 3) or with serious physical defects would be humanely euthanized either before gather activities begin or during the gather operations as well as within off-range holding facilities.. 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.

2.5.9. 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 IV). 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.

2.6. **Alternatives Considered but Eliminated**

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.

2.6.1. Field Darting Horses with ZonaStat-H (Native PZP)

This alternative was eliminated from further consideration 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 Complexes is very large (3,870,919 acres) and many areas do not have access. The presence of water sources on both private and public lands inside and outside the HMA 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 pattersn. 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 Complexes.

2.6.2. Control of Wild Horse Numbers by Fertility Control Treatment Only Exclusively

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 Complexes 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 rat of growth. Over the next 11 years an average of 90,930 wild horses would need to be gathered for population controls. Of those 41,446 mares would have been treated with PZP-22 or other accepted fertility control vaccines, and the resulting populations would be 31,740 which is still 30,062 wild horses over (and more than 19 times) high AML. It is important to understand that in this secenario, 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.

This alternative would not bring the wild horse population back to AML, 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 HMAs, 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 Complexes, 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 Elko and Ely Districts administer 14 HMAs but do not administer any designated Wild Horse or Burro Ranges, which under 43 C.F.R. 4710.3-2 are "t**o 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 1985 Wells RMP, the 1993 Wells RMP Wild Horse Amendment, the 2008 Ely 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 elemination 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 1985 Wells RMP and 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 Elko, Ely and Wells RMPs

Monitoring data collected within the Complexes 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 and promote improvement of rangeland health. 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 Elko, Ely and Wells 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 1985 Wells RMP, the 1993 Wells RMP Wild Horse Amendment, the 2008 Ely 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 also 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*** (emphasis added). *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. Unlike livestock which can be confined to specific pastures, limited 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 Wells and Ely 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. Wild horses in the Antelope and Triple B Complexes are not substantially regulated by predators or other natural factors. In addition, wild horses are a long-lived species with documented foal survival rates exceeding 95%, and they do not self-regulate their population growth rate.

Survival rates for wild horses on western public lands are high. None of the significant natural predators from native ranges of the wild horses in Europe and Asia — wolves, brown bears, and possibly one or more of the larger cat species — exist on the wild horse ranges in the western United States (mountain lions take foals in a few herds, but predation contributes to 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. The NAS report 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 regaltory 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 Complexes, 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"* (emphasis added). 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 Complexes. 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 Complexes 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 Triple B and Antelope Complexes and to reduce the wild horse population growth rates to manage wild horses within established AML ranges.

2.6.9. Gathering the Complexes 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 (789 in the Antelope Complex and 889 in the Triple B Complex). A post-gather population size at the upper range of the AML would result in AML being exceeded following the next foaling season (spring 2018). 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 AMLs established for the Antelope and Triple B Complexes 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 Antelope and Triple B Complexes 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. 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 Triple B and Antelope Complexes, 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).

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

3.1. Introduction

This chapter characterizes the resources that may be affected by the Proposed Action and the alternatives including the No Action alternative, followed by a comparative analysis of the direct, indirect and cumulative impacts of the alternatives. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable.

3.1.1. General Description

The Antelope and Triple B Complexes are within the Great Basin physiographic region, which is one of the largest deserts in the world. The Great Basin is effectively cut off from the westerly flow of Pacific moisture. Orographic uplift of crossing air masses by the Sierra and the Cascades provides cooling and precipitates much of the moisture out. The result is a Dry Steppe cold climate classification for most of the Great Basin. The climate is typical of middle latitude, semi-arid lands where evaporation potential exceeds precipitation throughout the year. Precipitation normally ranges from approximately five to seven inches on the valley bottoms to 16 to 18 inches on the mountain peaks. Most of this precipitation comes during the winter months in the form of snow occurring primarily in the winter and spring with the summers being quite dry. Temperatures range from greater than 90 degrees Fahrenheit in the summer months to minus 15 degrees or colder in the mountains in the winter. The Complexes are characterized by long wide valleys and long narrow steep mountain peaks covered with heavy pinyon juniper woodlands. On many of the low hills and ridges that are scattered throughout the area, the soils are underlain by bedrock. Elevations within the Antelope Complex range from approximately 5,000 feet to over 10,200 feet.

In general, the vegetation consists of big sagebrush-grass and low sagebrush-grass, montane shrub, salt desert shrub, black sagebrush, winterfat, pinyon-juniper, and montane riparian communities.

The foothills and mountain areas are dominated by big sagebrush-grass and low sagebrush-grass types. Primary shrubs are big sagebrush, low sagebrush, and rabbitbrush. Major grass species include bluebunch wheatgrass, Indian ricegrass, Sandberg’s bluegrass, needlegrass, and bottlebrush squirreltail. Forbs include milkvetch, arrowleaf balsamroot, lupine, phlox, and aster. The higher mountainous areas support mountain browse species that include serviceberry, snowberry, and antelope bitterbrush. Riparian areas at high elevations support cottonwood and wild rose.

The valleys are dominated by salt desert shrub and black sagebrush communities which consist of winterfat, shadscale, bud sagebrush, black sagebrush, and rabbitbrush. Major grass species in the valleys include Indian ricegrass, Sandberg’s bluegrass, needlegrass, and bottlebrush squirreltail. Forbs include milkvetch, lupine, phlox, and aster. Transition benches between valley bottoms and mountains are characterized by Wyoming sagebrush communities consisting of perennial bunchgrasses and native forbs. Invasive species, particularly cheatgrass, are present in various densities but are particularly abundant in disturbed sites at lower elevations (e.g., recent fires, road edges, and livestock/wild horse concentration sites).

3.1.2. Supplemental Authorities

Table 3 Critical Element and Resource Review for Analysis

Resource	**Not Present**	**Present, Not Affected**	**Present, Possibly Affected**	**Rationale for Determination**
Critical Elements				
Air Quality *(The Clean Air Act of 1955, as amended)*	NO	X	NO	The affected area is not within an area of non-attainment or areas where total suspended particulates or other criteria pollutants exceed Nevada air quality standards. Any increased particulate matter (dust) resulting from the Proposed Action would be short term (temporary) and minimal.
Areas of Critical Environmental Concern *(Federal Land Policy and Management Act of 1976)*	YES		NO	There are no ACECs located within the proposed project area
Cultural Resources *(National Historic Preservation Act of 1966, as amended 54 U.S.C. § 300101 et seq.)*	NO		YES	In accordance with the State Protocol between BLM and the State Historic Preservation Office (2014) this action is exempt from cultural inventory under Appendix III. This exemption states that temporary corrals may be installed “in previously disturbed areas outside of known historic properties.” Undisturbed areas require a class III cultural resource inventory. If resources are identified then the area will be avoided, resulting in a no adverse effect.* adverse effect. Potential impacts are analyzed in Section 3.2.1. of this EA.
Environmental Justice *(Executive Order 12898)*	YES		NO	The proposed action would have no disproportionately high or adverse human health or environmental effects on minority and/or low-income populations.

Resource	**Not Present**	**Present, Not Affected**	**Present, Possibly Affected**	**Rationale for Determination**
Farmlands (Prime & Unique) *(Surface Mining Control and Reclamation Act of 1977)*	NO	X	NO	Some soils within the Complexes have been designated by the Natural Resource Conservation Service as meeting the requirements for prime farmlands. Localized trampling of these soils may occur at the gather Sites. The Proposed Action would not contribute either directly or indirectly to loss of potential farmlands. The effects would be minimal and no further analysis is necessary.
Floodplains *(Executive Order 11988)*	YES		NO	No floodplains have been identified by HUD or FEMA within the project area. Floodplains as defined in Executive Order 11988 may exist in the area but would not be affected by the Proposed Action.
Invasive, Non-native Species *(Federal Noxious Weed Act of 1974, as amended)*	NO		YES	Potential impacts are analyzed in Section 3.2.8 of this EA
Native American Religious Concerns *(Executive Order 13007)*	YES		NO	No Native American Religious Concerns are known in the area, and none have been noted by Tribal authorities. Should recommended inventories or future consultations with Tribal authorities reveal the existence of such sensitive properties, appropriate mitigation and/or protection measures may be undertaken.
Threatened, Endangered, or Candidate Plant Species (Terrestrial) *(Endangered Species Act of 1973, as amended)*	YES		NO	Not known to be present

Resource	**Not Present**	**Present, Not Affected**	**Present, Possibly Affected**	**Rationale for Determination**
Threatened, Endangered, or Candidate Plant Species (Aquatic) *(Endangered Species Act of 1973, as amended)*	NO		YES	Potential impacts are analyzed in Section 3.2.2 of this EA.
Wastes (hazardous or solid) *(Resource Conservation and Recovery Act of 1976, and Comprehensive Environmental Response, Compensation, and Liability Act of 1980)*	YES		NO	There are no known hazardous or solid wastes located in the proposed project area.
Water Quality (drinking/ground) *(Safe Drinking Water Act of 1974, as amended and Clean Water Act of 1977)*	NO	X	NO	The Proposed Action would have a negligible direct, indirect or cumulative impact to Water Quality. Detailed analysis not required.
Wetlands / Riparian Zones *(Executive Order 11990)*	NO		YES	Potential impacts are analyzed in Section 3.2.11 of this EA
Wild and Scenic Rivers *(Wild and Scenic Rivers Act of 1968, as*	YES		NO	There are no designated wild and scenic rivers within the lands managed by the Wells and Bristlecone Field Offices.

Resource	Not Present	Present, Not Affected	Present, Possibly Affected	Rationale for Determination
amended)				
Wilderness and Wilderness Study Areas *(Federal Land Policy and Management Act of 1976 and Wilderness Act of 1964)*	NO		YES	Potential impacts analyzed in Section 3.2.13 of this EA.
Resources				
Fuels / Fire Management	NO	X	NO	The Proposed Action would have a negligible direct, indirect or cumulative impact to Fuels / Fire Management. Detailed analysis not required.
Fish and Wildlife including Special Status Species other than FWS candidate or listed species e.g. Migratory birds *(E.O. 13186)*	NO		YES	Potential impacts for Special Status Animal Species, other than those listed or proposed by the FWS as Threatened or Endangered are analyzed in Sections 3.2.2 of this EA.
Geology / Mineral Resources/Energy Production	NO	X	NO	The Proposed Action would have a negligible direct, indirect or cumulative impact to Geology / Mineral Resources. Detailed analysis not required.
Lands / Access	NO	X	NO	The Proposed Action would have a negligible direct, indirect or cumulative impact to Lands / Access. Detailed analysis not required.
Livestock Grazing *(Taylor Grazing Act*	NO		YES	Potential impacts are analyzed in Section 3.2.4 of this EA.

Resource	**Not Present**	**Present, Not Affected**	**Present, Possibly Affected**	**Rationale for Determination**
of 1934, National Environmental Policy Act of 1969 Endangered Species Act of 1973, Federal Land Policy and Management Act of 1976, and the Public Rangelands Improvement Act of 1978)				
Paleontology *(Paleontological Resources Protection Act P.L. 111-011, HR 146)*	NO	X	NO	There are no formalized inventories within the project area. Paleontological resources would be avoided by project re-design to avoid potential impacts.
Recreation	NO	X	NO	The Proposed Action would have a negligible direct, indirect or cumulative impact to recreation. Detailed analysis not required.
Soils	NO		YES	Potential impacts are analyzed in Section 3.2.7 of this EA
Vegetation (including Special Status Plant Species other than FWS candidate or listed species)	NO		YES	Potential impacts for are analyzed in Section 3.2.10 of this EA
Visual Resource Management *(FLPMA 1976, NEPA 1969)*	NO	X	NO	The Proposed Action would have a negligible direct, indirect or cumulative impact to Visual Resource Management. Detailed analysis not required.
Wild Horses and Burros	NO		YES	Potential impacts for Wild Horses analyzed in Section 3.2.12 of this EA

Resource	Not Present	Present, Not Affected	Present, Possibly Affected	Rationale for Determination
(Wild and Free Roaming Horses and Burros Act of 1971, as amended)				
Wilderness Characteristics	NO	X	NO	The Proposed Action would have a negligible direct, indirect or cumulative impact to Lands with Wilderness Characteristics. Detailed analysis not required.
Woodland / Forestry	NO	X	NO	The Proposed Action would have a negligible direct, indirect or cumulative impact to forest health. Detailed analysis not required.
GRSG General Habitat Management Area (GHMA)	NO		YES	Potential impacts for GRSG General Habitat Management Area (GHMA) are analyzed in Section 3.2.8 of this EA.
GRSG Priority Habitat Management Area (PHMA)	NO		YES	Potential impacts for GRSG Priority Habitat Management Area (PHMA) are analyzed in Section 3.2.8 of this EA.
GRSG Other Habitat Management Area (OHMA)	NO		YES	Potential impacts for GRSG Other Habitat Management Area (OHMA) are analyzed in Section 3.2.8 of this EA.
Public Health and Safety	NO		YES	Analyses in Section 3.2.6 of this EA.

3.1.3. Past, Present, and Reasonably Foreseeable Future Actions (PPRFFAs)

Table 4 CESA Summary

CESA Boundary	Critical Element, Resource	Selection Rationale
1. Grazing	Livestock and	Livestock are managed at the allotment

CESA Boundary	Critical Element, Resource	Selection Rationale
Allotments overlapping the project area	Vegetation	level.
2. Project Area	Wild Horses, Wetlands /Riparian Zones, Soils, Cultural Resources, Public Health and Safety, Fisheries and Aquatic Species, and Invasive, Non-native Species	Resources are contained within the Project Area (e.g. wild horses) or interact weakly with elements outside the Allotment boundaries (e.g. soils, vegetation, etc.).
3.Project Area + four mile buffer	Terrestrial Wildlife, Special Status Species, and Migratory Birds	The 4 mile buffer around project area that is used for GRSG seasonal habitat delineations.
4.Wilderness and WSA	Wilderness and WSA	Wilderness and WSA Boundaries

Table 5 Timeframes for Cumulative Effects Analysis

Resource	Short-Term Definition and Rationale	Long-Term Definition and Rationale
Wild Horses	One to two months per gather, extending the life of the project The majority of these impacts would be short-lived and temporary in nature.	Ten years - Wild horse population is expected to continue to increase. The rate of increase would be dependent on the alternative chosen and would be lowest under Alternatives A and B and highest under Alternatives C.
Wetlands/Riparian Zones	One to two months per gather, extending the life of the project impacts to water resources and wetland and riparian zones related to gather action come primarily from recreational use of transportation routes. Where roads cross streams or meadows, degradation of vegetation and soil/ hydrologic function can occur. These impacts can be of short or long duration depending on the frequency of the impact. Additionally, introduction of excess sediment and pollution can occur where road cross surface water sources even when the sources only flow for a portion of the year. These effects are generally short lived and of low severity which allows the impacts to dilute or recover soon after the impact occurs.	Ten years - Impacts would begin to diminish as wild horse numbers decrease annually. Within approximately ten years, however, if excess wild horses have not been gathered, the impacts from wild horses would be roughly identical or they could be more substantial to those currently observed as a result of excess wild horses.
Cultural	One year - No effects from gather activities proposed under Common to Alternatives A-C	Ten year - In the 10 year period, the population growth suppression

Resource	Short-Term Definition and Rationale	Long-Term Definition and Rationale
	are expected	measures proposed in the Action Alternatives would extend the reduction of impacts to cultural resources over a longer period of time.
Soils	One to two months per gather, extending the life of the project impacts to soils related to gather action come primarily from recreational use of transportation routes and temporary holding facilities. Where roads cross streams or meadows, degradation of soil stability can occur. These effects are generally short lived and of low severity which allows the impacts to dilute or recover soon after the impact occurs.	Ten years – In the 10 year period the population control measures proposed in Alternative A lead to the slowest growth rate, extending the reduction of impacts to soil and vegetation resources.
Vegetation	One to two months per gather, extending the life of the project – Direct and indirect, concentrated impacts to vegetation related to gather activities would occur throughout the proposed gather period, and would extend slightly beyond due to post-gather clean up and project completion.	Ten to forty years – The direct and indirect diffuse impacts to vegetation associated with overgrazing would persist for extended periods of time. Arid vegetation communities can change quickly with disturbance, but take a great deal of time to recover.
Livestock Grazing	One to two months per gather, extending the life of the project. Gathers would reduce impacts to resources over the next two growing seasons. Livestock grazing is expected to continue at similar stocking rates.	Ten years - Less impacts to livestock grazing with wild horse numbers at AML.
Wilderness and WSA	One to two months per gather, extending the life of the project. Gathers would reduce impacts to WSAs. Gathers activities would be restricted to the Shafter Well Gather site in the Bluebell WSA. Impacts to opportunities for solitude would be short term during gather operations. These effects are generally short term in nature.	Ten years – Wilderness values would be positively affected by the Action Alternatives. The lower number of wild horses over a greater period of time would result in an improved ecological condition of the plant communities that are aesthetically pleasing to the public.
Invasive, Non-native Species	One year - Establishing trap sites leading to wild horses congregating in specific locale, the impacts associated with helicopter landing zones, transportation, and observation in the gather area would exacerbate soil and vegetative stresses that resulted from past grazing pressures and on degraded soils. However, these stresses would be short-term.	Ten years - The cumulative impacts of Alternatives A-C would positively affect long term management goals to maintain rangeland health and healthy wild horse populations, which would reduce trailing; this would reduce the probability of invasive species being transported to new locations. The reduction would also reduce the

Resource	Short-Term Definition and Rationale	Long-Term Definition and Rationale
		amount of herbivory of native perennial species which compete with invasive species.
Terrestrial Wildlife, Special Status Species, Migratory Birds	Over the 10 year period of the proposed action, cumulative effects of the Action Alternatives would impact wildlife, including SS Species and migratory birds.	Ten years - After the 10-year period of the Action Alternatives, management of wild horse populations as described in those alternatives would cease. Wild horse populations would then increase at 15-25% per year until once again exceeding AML within about 4 years. Therefore the long-term time period is 14 years
Aquatic species	Over the 10 year period of the proposed action, cumulative effects of the Action Alternatives could impact aquatic species.	After the 10-year period of the Action Alternatives, management of wild horse populations as described in those alternatives would cease. Wild horse populations would then increase at 15-25% per year until once again exceeding AML within about 4 years. Therefore the long-term time period is 14 years
Public Health and Safety	Short term during gather operations. Public safety and contractor safety is addressed through Observation Protocols to ensure that the public remains at a safe distance and does not hinder gather operations.	Ten years – During any gather operations.

Table 6 Past, Present, Reasonably Foreseeable Future Actions Summary

Action Type	Past	Present	Reasonably Foreseeable	Applicable CESAs
Livestock Grazing	X	X	X	1-4
Issuance of decisions and grazing permits for ranching operations through the allotment evaluation process/standards and guidelines assessment and the reassessment of the associated allotments	X	X	X	1-4
Rights-of-way (ROWs)	X	X	X	1-3
Recreation (including hunting/permitted races)	X	X	X	1-4
Mineral exploration/geothermal	X	X	X	1-3

Action Type	Past	Present	Reasonably Foreseeable	Applicable CESAs
exploration/abandoned mine land reclamation/mineral extraction				
Spring development (including fencing water sources)	X	X	X	1-4
Non-native, Invasive and noxious weed inventory/treatments; pesticide application (Mormon cricket & grasshopper)	X	X	X	1-4
Wild horse management: issuance of multiple use decisions, AML adjustments, gathers and planning	X	X	X	1-4
Wildfire and Emergency stabilization and rehabilitation	X	X	X	1-4
South West Intertie Project (SWIP)			X	2

3.2. Analysis of Affected Resources

3.2.1. Cultural Resources

3.2.1.1. Affected Environment

Various cultural resource inventories have been completed and several historic properties recorded within the Antelope and Triple B Complexes. However, most of the public lands within these HMAs remain un-inventoried (less than 10% of the entire proposed project area) and only a fraction of the cultural resources recorded. Some of the known or expected cultural resources within the HMAs have historical or architectural significance, but most of the resources are archaeological in nature and their primary significance is the potential to provide insight into history and prehistory. These archaeological resources often consist of artifact scatters marking the locations of former habitation sites, camps, resource processing, management or procurement locations, transportation features, refuse disposal areas, etc. Historic and prehistoric archaeological sites are commonly located near springs, seeps, and creeks; therefore, it is anticipated that cultural resources will be identified at water sources within the proposed project area.

Prehistoric sites (i.e., sites dating prior to Euro-American contact) commonly include artifacts such as projectile points (e.g. spear points and arrow points), scraping and cutting tools, ceramics, grinding stones, cooking stones, hammer stones, and flaking debris from tool manufacture. Food debris (e.g. bone, burned seeds, mussel shell) and features (e.g. cooking hearths, house floors, and storage pits) may also be present, but usually are not visible on the surface. Historic sites commonly contain tin cans, glass, ceramics, metal and wooden objects, foundations, and other types of structures. There are also numerous historic roads and trails, such as the Pony Express Trail (across the entire HMA), the Elko to Hamilton stage line (Newark Valley), the Denver-Shepherd Toll Road (Newark Valley), and the 1919-1930 Lincoln Highway (Steptoe Valley)

Livestock use (including cattle, sheep, and domestic and wild horses) over the last 150 years has likely affected most cultural resources in the Complexes to one degree or another. While we cannot specifically identify the types and extent of impacts to most cultural resources in the Complexes, experimental research has demonstrated that livestock trampling can damage, break, and dislocate artifacts (U.S Army 1990; Roney 1977). Common livestock damage observed at archaeological sites includes trampling, trail formation, wallowing, bedding, soil compaction, vegetation removal, rubbing on structural remains (e.g. using a cabin wall as a scratching post), and bodily waste elimination. These actions can impact or obliterate archaeological stratigraphy, site patterning, features, cause or exacerbate erosion, break, displace, and mix artifacts, and contaminate sediments and archaeological organic residues with fecal material and urine (Ataman 1996, Broadhead 1999, U.S Army 1990). Past impacts within the Complexes are likely to have ranged from minor movement of surface artifacts to severe damage to sites and artifacts. Some of the factors thought to play a part in current cultural resources condition and sensitivity to livestock impacts include soil type, soil moisture, terrain, season of use, grazing history, vegetation cover, and intensity of use.

Spring sites on both the Elko and Ely Districts that have not been subject to historic grazing have shown significant damage to cultural resources by wild horses. Increasing populations of wild horses and competition for limited access to water has resulted in serious impacts to cultural resources at spring systems. In an effort to access water, horses have caused significant ground disturbance from trampling and pawing the ground around the spring source. As a result, both prehistoric and historic artifacts at the spring were displaced and/or destroyed. In addition to the loss of artifacts, the site suffered a serious loss of integrity and data potential that will never be recovered. Further, historic structures a features have been damaged by wild horses in their attempt to access water.

3.2.1.2. Environmental Effects

Effects of the No Action Alternative

Wild horses would continue to increase in numbers and overpopulation would potentially cause an adverse effect to cultural resources, especially at water sources and other areas of congregation as a result of heavy trailing between water and forage.

<u>Effects of the Proposed Action and Alternatives B and C</u>

All temporary corrals and other affiliated facilities, in addition to parking, would be placed within previously disturbed areas whenever possible. If a corral or facility needs to be placed within an undisturbed area a Class III inventory would first be conducted by a District Archeological Technician (DAT) for the purposes of facility placement. The DAT would report all cultural resources identified during inventory to the Cultural Resources Specialist. All cultural resources would be avoided to prevent adverse effects to any properties potentially eligible to the National Register of Historic Places (NRHP).

3.2.1.3. Cumulative Effects

The proposed action and alternatives have no foreseeable cumulative effects to cultural resources because all cultural resources would be avoided.

3.2.2. Fisheries and Aquatic Species

3.2.2.1. Affected Environment

<u>Special Status Species</u>

Special status species include species that are listed or proposed for listing as threatened or endangered (T&E) under the Endangered Species Act (ESA). These species are or were candidates for listing under the ESA, species that are considered for priority management by the State of Nevada under the 2012 Wildlife Action Plan, and species that are considered as Nevada BLM Sensitive Species as of 2011. Two Federally-listed aquatic species are known in the Project Area. There are no known spring snail populations on public lands within the Antelope and Triple B Complexes. The area provides habitat for two fish species and an amphibian species which are considered Nevada BLM Sensitive Species.

Fish

Relict Dace - Sensitive

The Relict Dace (*Relictus solitaries*) is a Nevada endemic fish. Relict dace are an endemic genus of cyprinid minnow occurring only in isolated basin valleys in eastern Nevada. Typically relict dace concentrates in well-vegetated pools, springs, spring-fed streams, ponds, intermittent lakes, and marshes, with mud or stone bottoms where banks are undercut (Sigler and Sigler 1987). Riparian vegetation is critical for hiding from avian predators. The species is restricted to lakes, ponds, and spring-fed streams associated with Pleistocene lakes, including Franklin, Gale, Warning, Steptoe, and Spring basins (Ruby, Butte, Steptoe, Goshute, and Spring Valleys) in eastern Nevada (White Pine and Elko counties) (Sigler & Sigler 1987).

Relict dace (*Relictus solitaries*) are known to occur on private and BLM public sections of the following allotments in the Project Area: East Big Springs, Valley Mountain, Currie, Odgers, Warm Springs and West Cherry Creek Allotments., Medicine Butte, Cherry Creek, and Tippett Allotments.

Independence Valley Tui Chub - BLM Sensitive, Nevada Endangered

Independence Valley Tui Chub (*Gila bicolor isolata*) are found in a private Independence Valley (Ralph's) Warm Springs (Marsh). This area is a temperate, permanent desert stream/marsh fed by six springs. Recent survey work has shown that tui chub occupy approximately eighty-eight hectares, four of the six spring areas of the marsh, and occupy the main body of Ralph's Warm Springs Marsh but they are not as widespread as the co-occurring speckled dace due to overlapping habitat requirement with invasive largemouth bass.

Independence Valley Speckled Dace - Federal Endangered

Independence Valley Speckled dace are restricted to Independence Valley in Elko County, Nevada. The historical range of Independence Valley speckled dace was not known before European settlement, which resulted in manipulating springs for irrigation purposes. This fish is known to occur on private land found in Independence Valley (Ralph's) Warm Springs (Marsh). This area is a temperate, permanent desert stream/marsh fed by six springs. The species adaptability allowed it to survive in the smaller wetland system while its other habitats were taken over by invasive largemouth bass (*Micropterus salmoides*) and bluegill (*Lepomis macrochirus*) (Rissler et al. 2001). It is believed to be derived from an ancestral form of speckled dace similar to the Lahontan speckled dace (*Rhinichthys osculus robustus*) presently occupying the Humboldt River system.

Clover Valley Speckled Dace - Federal Endangered

Clover Valley Speckled Dace (*Rhinichthys osculus oligoporus*) is confined to three springs outflows in the Clover Valley in Elko County, Nevada. Habitats vary from cold streams and rivers to small thermal springs. Accurate life history data for Clover Valley speckled dace is lacking. Speckled dace become mature during its second summer. Spawning usually occurs throughout the summer, with peak activities June and July when water temperatures approach 18 ° C (65 ° F) (USFWS 1998). Males will congregate in small spawning areas where they may clear a small patch of rocks and gravels. Females will deposit eggs underneath rocks or close to the bottom. Once fertilized, the adhesive eggs will hatch in approximately six days. Larval fish remain in the gravel for an additional seven to eight days. Upon emergence (1 week later), fry tend to congregate in the warm shallows near large rocks. They then move into quiet swampy covers to rear. This species is found in the Project Area.

Amphibians

Northern Leopard Frog- BLM Sensitive

Northern Leopard Frog (*Lithobates pipiens*) requires a variety of riparian habitats, involving aquatic winter and breeding habitats, as well as upland post-breeding habitats and the corridors between them. Various temporary riparian habitats can be used including springs, slow streams, marshes, bogs, ponds, canals, flood plains, reservoirs, and lakes. Permanent riparian habitat has water with rooted aquatic vegetation such as wet meadows and fields. These frogs take cover in underwater niches, or in caves when inactive. Northern Leopard Frog overwinters in well-oxygenated not completely frozen water. Eggs are attached to vegetation just below the surface of the permanent water. This species range is found throughout the Project Area.

Great Basin Spadefoot

Great Basin Spadefoot (*Spea intermontana*) have adapted to dry habitats by burrow during cold and dry weather. Spadefoot toads are primarily terrestrial and require upland habitats for feeding and for constructing burrows for their long dry-season dormancy. This toad uses pinyon-juniper, semi desert shrub lands, sagebrush flats, grasslands, and desert habitats. They also require riparian and aquatic habitats for reproduction. This species range is found throughout the Project Area.

3.2.2.2. Environmental Effects

Effects of the No Action Alternative

There would be no direct impacts from gather operations. No direct impacts to Aquatic Wildlife, Special Status Species including Threatened, Endangered and Candidate Species are expected under this alternative. Maintaining the existing excess wild horse numbers within the gather area, which would continue to increase as a result of population growth, would result in continued indirect impacts to Aquatic Wildlife and habitats. Wild horse populations would increase approximately 15-25% each year that the gather is not conducted. Riparian habitats would continue to see locally heavy levels of utilization associated with wild horse use which would be exacerbated as wild horse populations continue to increase.

If excess wild horses are not removed, continued heavy grazing will occur on spring meadow systems that serve important habitat functions for sensitive species. The removal of riparian vegetation would directly affect aquatic fish ability to avoid avian predation pressure leading to a lower population size of these status species. Other beneficial impacts as discussed under Alternatives A, B, and C would not be realized.

Effects of the Proposed Action

Direct and indirect disturbance to wetlands and riparian areas is not anticipated from the Proposed Action. The Proposed Action would avoid direct and indirect impacts to wetland and riparian resources to the extent possible. The Proposed Action would avoid surface disturbance to avoid any adverse impacts to these resources. Avoidance would be implemented and uniformly followed reducing these potential impacts to negligible.

3.2.2.3. Cumulative Effects

Cumulative impacts to riparian and wetland areas may result from past and ongoing surface disturbance from mining exploration operations; grazing by livestock, wild horses, and wildlife; and recreational actives. Livestock, wild horses, and wildlife grazing can impact wetland and riparian areas through trampling and shearing of streambanks, compaction of wetland soil, trampling of plants, and overuse of riparian plant species. Riparian and wetland areas that have been overgrazed are susceptible to invasion by noxious weeds and invasive plant species, which can displace riparian and wetland species over time (Dickard et al 2015).

Cumulative effects of the Action Alternatives would be most impactful during the short-term (the 10-yr time period of the Alternatives), specifically during active gather operations when low-flying helicopters are driving horses toward gather sites and water/bait gather operation are taking place.. Human activity associated with these and water/bait gather operations could temporarily disturb or displace aquatic species in these areas. However, when added to PPRFFAs, the aggregate impacts of direct and indirect effects are not expected to significantly impact aquatic species in a negative way. Over both the short and long-term (10-14 years), when added to PPRFFAs, the aggregate impacts of direct and indirect effects are expected to be beneficial for aquatic species and their habitats including immediate benefit due to reduced competition for forage and water and gradual improvement of riparian health.

3.2.3. Invasive, Non-native Species

3.2.3.1. Affected Environment

Several federal laws, regulations, and policies guide BLM management activities to control noxious weeds and invasive non-native species on public lands. Laws applicable to control invasive vegetation include: the Federal Land Policy and Management Act (FLPMA) 1976; Carlson-Foley Act of 1968; Plant Protection Act of 2000; Federal Noxious Weed Act of 1974; The Federal Insecticide, Fungicide and Rodenticide Act of 1972 (FIFRA); and the Noxious Weed Control Act of 2004. To comply with these Laws, BLM policy directs the agency to inventory and control invasive vegetation utilizing integrated weed management techniques.

Nevada Revised Statutes, Chapter 555.05 defines “noxious weeds” and mandates landowners and land management agencies to control noxious weeds on lands under their jurisdiction. Noxious weeds are aggressive, typically nonnative, ecologically damaging, undesirable plants, which severely threaten biodiversity, habitat quality and ecosystems. These weeds usually occur in a variety of habitats including road side areas, rights-of-way, wetland meadows, and upland rangelands. Because of their aggressive nature noxious weeds can spread into established plant communities, which is often facilitated by ground disturbing activities. In addition new weed species and sites can become established when their seeds and propagules (.i.e. root fragments) attach themselves to equipment or vehicles, animal fur, and clothing or are carried by wind or water.

An extensive inventory of the entire project area has not been conducted; however, the following table lists the noxious or invasive weed species are known to exist within the Complexes based on site visits and existing data.

Table 7 Known Noxious or Invasive Weeds in Complexes

Common Name	Scientific Name
Black henbane	*Hyoscyamus niger*
Bull thistle	*Cirsium vulgare*
Canada thistle	*Cirsium arvense*
Cheatgrass	*Bromus tectorum*
Halogeton	*Halogeton glomerata*
Hoary cress	*Cardaria draba*
Houndstongue	*Cynoglossum officinale*
Musk thistle	*Carduus nutans*
Perennial pepperweed	*Lepidium latifolium*
Poison hemlock	*Conium maculatum*
Russian knapweed	*Acroptilon repens*
Russian thistle	*Salsola tragus*
Salt cedar	*Tamarix spp.*
Scotch thistle	*Onopordum acanthium*
Spotted knapweed	*Centaurea stoebe*
Tumble mustard	*Sisymbrium altissimum*
Water hemlock	*Cicuta maculata*

3.2.3.2. Environmental Effects

Effects of the No Action Alternative

Under this alternative, the wild horse gather would not take place. The potential of noxious weeds being introduced and spread by gather operations would not exist.

However, wild horses would continue to trail farther out from limited waters to foraging areas, subsequently broadening the areas receiving heavy grazing or trailing use. Indirect impacts would include increased competition for forage among multiple-users of the range as wild horse populations continue to increase. Forage utilization would exceed the capacity of the range, resulting in a loss of desired forage species from plant communities as plant health and watershed conditions deteriorate. Abundance and long-term production potential of desired plant communities may be compromised and become irreversible, potentially creating areas for invasive, non-native species to establish. The no action alternative would provide for an overall increased risk for noxious weed invasion in the long-term in site specific areas.

Effects of the Proposed Action, Alternative B, and C

Areas most vulnerable to establishment of invasive vegetation are heavily disturbed areas, such as gather trap sites and temporary holding facilities. These areas would be prioritized for follow up inventory and treatment reducing the potential for establishment and spread. Setting gather trap sites and holding facilities outside of areas known to contain noxious or non-native species would limit the potential to spread invasive vegetation.

Increases in vehicle use along roads within the assessment area by observers, transportation of wild horses, and transportation of support personnel could potentially introduce weed seed into the area. These areas would be prioritized for follow up inventory and treatment to reduce the potential for establishment and spread. Promoting on-road use and limiting off-road travel would also prevent the spread of non-native species into areas that were not previously infested. In areas where perennial vegetation is sparse, helicopter use could cause the removal of vegetation around landing zones; these areas would be susceptible to erosion and invasive species establishment. Using sites with established perennial vegetation likely to withstand helicopter pressure would limit the potential for vegetation removal and spread. Selecting landing zones outside of areas known to contain noxious or non-native species would also limit the potential to spread invasive vegetation.

Rangeland not heavily disturbed from gather operations contain native shrubs, understory grasses, and forbs that remain intact and would serve to compete with the invasive species. Following BLM policy, integrated weed management practices including continued treatments throughout the area, would help control the spread of invasive vegetation along roadsides and other areas used during gather operations.

Indirect impacts to invasive, non-native species from gathering wild horses and implementing population control measures would, over time, reduce areas of bare ground caused from concentrated wild horse grazing and hoof action thereby decreasing the areas available for weed infestation. In the short term some of these areas may re-establish with invasive vegetation. However, as land health improves, less soil compaction and erosion would occur. These conditions would promote the re-establishment of native vegetation in the long term. While the removal of excess wild horses and fertility control would make areas more resilient to infestation by invasive species, other activities within the assessment areas that spread invasive species would still continue.

To further minimize the potential for introduction and spread within the project area, all equipment and vehicles exposed to weed infestations or arriving on site carrying dirt, mud, or plant debris would be cleaned before moving onto project sites or between project areas. All gather sites, holding facilities, and camping areas on public lands would be documented with GPS coordinates and monitored for weeds for the duration of the gather operation. Additional SOPs listed in Appendix VI will minimize the introduction and spread of weeds.

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 to non-native plant species invasion.

3.2.3.3. Cumulative Effects of the Alternatives

Impacts from Past and Present Actions

Past impacts from road maintenance, grazing, recreation, wild fires, and other ground disturbing activities have introduced and spread invasive species throughout the assessment area.
Since these non-native species are capable of out-competing most perennial seedlings, increased distribution and abundance of invasive species has occurred. Cattle trailing was and continues to be a catalyst in distributing invasive species across the landscape. The Taylor Grazing Act of 1934, ongoing grazing management projects and practices to promote rangeland health have eased the pressure on perennial vegetation; however, areas that were previously invaded by non-native species would likely remain in a dominated state. With correct management, continued livestock grazing within the project area should maintain current conditions. Above AML-range use of the project area by wild horses has and continues to adversely impact soil and vegetative health, promoting establishment and spread of non-native species.

The establishment of roads, trails, fiber optic lines, communication sites, past water pipelines, and current lands and realty projects within the CESA result in varying degrees of ground disturbance. Disturbances that are not re-vegetated with desirable competitive species create opportunities for a non-native takeover. Past and current implementation of best management practices including treatments on ground disturbing activities have been occurring on public and private land within the assessment area and reduce the spread of invasive species. Preventive measures such as cleaning equipment and vehicles prior to on-site arrival and using certified weed free seed in reclamation (mining, lands, and/or post wildland fire) activities have also reduced introduction and spread

In addition, these non-natives, especially invasive annual grasses such as cheatgrass, contributed to high levels of fine fuel loading, resulting in more frequent fires. Without rehabilitation, burn areas have and would continue to be extremely susceptible to invasive species dominance. Existing areas dominated with invasive species would continue to be susceptible to wildfire ignition.

Impacts from Reasonably Foreseeable Future Actions

With correct management, continued livestock grazing within the project area should maintain current conditions. Above AML-range use of the project area by wild horses would continue to adversely impact soil and vegetative health, promoting establishment and spread of non-native species in the future. Water-hauling activities associated with increasing wild horse populations would also provide conduits for invasive species spread within the area.

Disturbances that are not re-vegetated with native species create opportunities for non-native establishment, and spread. Future implementation of best management practices including implementing prevention measures and treatments on ground disturbing activities have been occurring on public and private land within the assessment area and reduce the spread of invasive species.

In areas with recreation sites or use past and current implementation of best management practices including treatments have been occurring on public and private land; these have reduced the spread of invasive species within the assessment area.

Areas dominated with invasive species would continue to be susceptible to wildfire ignition. New infestations, as well as recreation (especially off-road) could increase the probability of ignition.

Cumulative Impacts

Degraded soils and depleted vegetation would be furthered stressed by congregations of horses within traps, impacts from helicopter landings, and transportation to and observation of the gather. However, these stresses would be short-term and pale in comparison to the effect caused by previous grazing pressures. The cumulative impacts of the Proposed Action, Alternative B and C would positively affect long term management goals to maintain rangeland health and healthy wild horse populations. This would minimize trailing as well as reduce the probability of invasive species being transported to new locations. The reduction of wild horses would also lower the amount of herbivory of native perennial species which compete with invasive species. The cumulative impacts from the No Action with correct management, continued livestock grazing within the project area should maintain current conditions. Above AML-range use of the project area by wild horses would continue to adversely impact soil and vegetative health, promoting establishment and spread of non-native species in the future. Water-hauling activities associated with increasing wild horse populations would also provide conduits for invasive species spread within the area. See Tables 4-6 above.

3.2.4. Livestock Grazing

3.2.4.1. Affected Environment

Antelope Complex

The Antelope Complex encompasses portions of several livestock grazing allotments: Antelope Valley, Badlands, Becky Creek, Becky Springs, Boone Springs, Chase Springs, Cherry Creek, Chin Creek, Currie, Deep Creek, East Big Springs, Ferber Flat, Goshute Mountain, Lead Hills, Leppy Hills, Lovell Peak, McDermid Creek, North Steptoe, North Steptoe Trail, Sampson Creek, Schellbourne, Spruce, Sugarloaf, Tippett, Tippett Pass, Utah/Nevada North, Utah/Nevada South, Valley Mountain, West Big Springs, White Horse, and West White Horse.

Table 8 Antelope Complex

Allotment	Season of Use Kind of Livestock	% of Allotment in HMA	Permitted Use (AUM)[1,5]	Ten Year Average AUM Use	Percent Actual Use of Permit Use
Antelope Valley[2]	11/1-5/31 Cattle	100%	5,376	883	16%
Badlands[2]	11/1-3/31 Sheep	100%	1,018	957	64%
Becky Creek	11/1-3/15 11/1-3/15 Goats and Sheep	99%	671	276	41%
Becky Springs	11/01-4/30 11/15-2/28 Cattle and Sheep	100%	3,842	824	21%
Boone Springs	11/1-3/31 Sheep	100%	2,947	1,026	35%
Chase Springs	4/1-11/30 Cattle	31%	2,586	878	34%
Cherry Creek	3/1-2/28 Cattle	5%	9,089	3,734	41%
Chin Creek	11/1-5/313/1-2/28 Cattle and Sheep	99%	13,245	2,586	20%
Currie	3/1-2/28 3/1-2/28 Cattle/Domestic horses	91%	5,504	3,611	67%
Deep Creek	11/1-5/15 Cattle	98%	2,934	1,525	52%
East Big Springs[5]	3/1-2/28 Cattle	20%	3,396	1,799	53%
Ferber Flat	11/1-4/20 Sheep	100%	2,013	828	41%
Goshute		100%	465	--	--

Allotment	Season of Use Kind of Livestock	% of Allotment in HMA	Permitted Use (AUM)[1,5]	Ten Year Average AUM Use	Percent Actual Use of Permit Use
Mountain[2,3]	Sheep				
Lead Hills	11/1-4/15 Sheep	51%	5,609	1,700	30%
Leppy Hills	11/1-4/30 Sheep	53%	3,351	1,786	53%
Lovell Peak	7/1-9/30 7/1-9/30 Goats and Sheep	94%	162	0	0
McDermid Creek[4]	5/1-7/15 Cattle	100%	--	--	--
North Steptoe	10/1-3/15 Sheep	75%	1,289	371	28%
North Steptoe Trail	9/15-10/15 3/1-3/30 Sheep	74%	253	98	38%
Sampson Creek	5/1-9/30 Sheep	99%	1,592	682	42%
Schellbourne	10/15-5/15 Cattle	16%	685	294	43%
Spruce	3/1-2/28 Cattle	67%	13,423	2,588	19%
Sugarloaf	11/1-4/20 Sheep	97%	2,001	948	47%
Tippett	3/1-2/28 4/16-12/15 Cattle and Sheep	27%	13,615	3,453	25%
Tippett Pass	11/1-5/15 10/1-6/15 Cattle and Sheep	14%	8,177	2,216	27%
UT/NV North	11/1-4/30 Sheep	65%	3,704	1,065	29%
UT/NV South	11/1-4/30 Sheep	100%	2,646	935	35%
Valley Mountain	11/1-5/15 Cattle	57%	5,572	3,281	59%
West Big Springs[6]	3/1-2/28 Cattle	<1%	5,385	--	--
West White Horse	12/1-2/28 Sheep	100%	465	302	65%
White Horse	11/1-4/15 Sheep	53%	3,916	1,966	50%

[1] Includes suspended AUMs.
[2] Administered by the Bristlecone Field Office
[3]Goshute Mountain is managed and grazed in conjunction with the Badlands Allotment. Goshute Mountain actual use AUMs are combined with the actual use AUMs of the Badlands Allotment summarized above.
[4]McDermid Creek is managed and permitted as part of the Currie Allotment. McDermid Creek actual use AUMs are reported as part of the Currie Allotment actual use AUMs summarized above.
[5] Actual use is for the Shafter Pasture only. The Shafter Pasture is the only pasture of the East Big Springs Allotment is within an HMA.
[6] That portion of the West Big Springs Allotment within the Spruce-Pequop HMA is not grazed by livestock.

Permitted livestock grazing use has generally been reduced over the past decade 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. Adjustments can include livestock stocking levels, seasons of use, grazing rotations, and other management requirements to better control livestock distribution.

Over the past ten years, actual use has generally been less than permitted use for each of the grazing allotments (Table 8). This has been in part due to persistent drought and competition with wild horses for forage.

Triple B Complex

The Triple B and Maverick-Medicine HMAs, portion of Antelope Valley HMA west of U.S. Highway 93 and the Cherry Springs WHT include 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 HMAs.

Table 9. Triple B Complex

Allotment	Season of Use	% of Allotment in HMA	Permitted Use (AUM)	Ten Year Average AUM Use	Percent Actual Use of Permit Use
Cherry Creek	5/01 to 2/28 Cattle	22%	9,089	3,734	41%
Dry Mountain	10/01 to 4/01 Cattle and Sheep	100%	1,149	375	33%
Goshute Basin	7/01 to 10/15 Sheep	97%	449	180	40%
Gold Canyon	6/20 to 11/30 Sheep	59%	1,068	147	14%
Horse Haven	5/01 to 7/31 Cattle	100%	1,056	20	2%
Indian Creek	7/01 to 8/31 Cattle	100%	177	0	0
Maverick Springs	3/01 to 2/28 Cattle	100%	1,500	1,654	110%
Medicine Butte	3/01 to 2/28 Cattle 4/15 to 11/15 Sheep	98%	7,226	6,160	85%
Moorman Ranch	3/01 to 2/28 Cattle	58%	10,092	2,995	30%
Newark	11/01 to 4/02 Cattle	51%	9,709	3,335	34%
Ruby Valley	3/01 To 03/31 11/01 to 2/28 Cattle	100%	467	450	96%
Thirty Mile Spring	4/15 to 2/28 Cattle and Sheep	32%	8,405	4,582	55%
Warm Spring	3/01 to 2/28 Cattle 11/01 to 11/30 Sheep	95%	7,709	4,127	54%
Warm Springs Trail	Sheep	38%	2,480	447	18%
North Butte	8/01 to 10/31 2/15 to 4/15 Cattle	100%	180*	0	0
South Butte	4/15 to 2/28 Cattle	91%	396	390	98%
Steptoe	11/1 to 6/15 Cattle	11%	2,836	1,765	62%
McDermid Creek[1]	3/1 to 2/28 Cattle	100%	--	--	--
Bald Mountain	6/15 to 9/15 Cattle	100%	312	184	59%
Currie	3/1 to 2/28 Cattle	3%	5,504	3,611	67%
Harrison[2]	4/16 to 12/3 Cattle	55%	620	423	68%
Maverick/Ruby #9[4]	7/1 to 11/1 Cattle	92%	2,757	99	3%
North Butte Valley	4/15 to 12/22	92%	2,420	990	41%

Allotment	Season of Use	% of Allotment in HMA	Permitted Use (AUM)	Ten Year Average AUM Use	Percent Actual Use of Permit Use
	Cattle				
Odgers[3]	10/1 to 12/31 Cattle	100%	1,596	0	0
Ruby #8[2]	4/20 to 9/30 Cattle	< 1%	1,963	--	--
Valley Mountain	11/1 to 5/1 Cattle	40%	5,572	3,281	59%
West Cherry Creek	5/1 to 10/31 Cattle and Sheep	100%	2,674	1,837	69%

[1]The McDermid Creek Allotment is administered as part of the Currie Allotment by the Elko District. Permitted use and average AUM use is combined with the Currie Allotment.
[2] Although technically within the Maverick-Medicine HMA, the Harrison and Ruby #8 Allotments are completely fenced from the remainder of the Maverick-Medicine HMA. Less than <1% of Ruby 8 allotment is in HMA.
[3] The Odgers Allotment has not had an annually active grazing permit for over 20 years. Grazing use was approved once as Temporary Not Renewable (TNR) for the 2003-04 grazing season.
[4] No use has occurred in the summer range of the Maverick-Ruby #9 Allotment since 2001 and no use has occurred on the winter range since 2009.

Permitted livestock grazing has generally been reduced 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. Adjustments can include livestock stocking levels, seasons of use, grazing rotations, and other management requirements to better control livestock distribution.

Over the past ten years, actual use has generally been less than permitted use for each of the grazing allotments (as shown in the tables above for the Antelope and Triple B Complexes). This has been in part due to persistent drought and competition with wild horses for forage.

3.2.4.2. Environmental Effects

Effects of the No Action Alternative

Livestock would not be displaced or disturbed due to trapping operations under the No Action Alternative; however, there would be continued competition with wild horses for limited water and/or forage resources in site specific areas within the Complexes. As wild horse numbers increase, combined with dry conditions, livestock grazing within the Complexes would be negatively impacted by excess wild horses and livestock grazing may be further reduced in an effort to slow the deterioration of the range to the greatest extent possible. Grazing allotments would be closed to livestock grazing and or permittees would be required to reduce numbers as wild horse numbers increase and available forage decreases due to excessive wild horse numbers.

Effects of the Proposed Action and Alternatives B & C

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. Competition between livestock and wild horses for water and forage resources would continue at or near current condition. Under the Proposed Action and Alternatives forage availability and quality would improve over time since wild horse population would be gathered in increments and growth rates would be less.

3.2.4.3. *Cumulative Effects of the Alternatives*

Cumulative impacts from activities proposed would be potential trampling of forage from activities around trap sites, both human and animal. In addition to any disturbance to livestock from gather operations listed above, livestock in areas outside of the critical area of concern may be frightened and leave the area due to helicopter, traffic, and human interactions. Cumulative Impacts from the No Action would incrementally increase damage to rangeland ecosystems. Which unchecked population growth and no planned gathers, rangeland resources would become degraded at an accelerated rate. Livestock would be continually reduced to accommodate the increasing wild horse numbers. See Tables 4-6 above.

3.2.5. Migratory Birds

3.2.5.1. Affected Environment

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, implements treaties for the protection of migratory birds. Executive Order (EO) 13186, issued in 2001, directed actions that would further implement the MBTA. As required by MBTA and EO 13186, BLM signed a MOU with the USFWS in April 2010, which is intended to strengthen migratory bird conservation efforts by identifying and implementing strategies to promote conservation and reduce or eliminate adverse effects to migratory birds.

Per the MOU with USFWS, BLM should:

- Evaluate the effects of their actions on migratory birds and identify where take reasonably attributable, those actions may have a measureable negative effect on migratory bird populations;
- Develop conservation measures and ensure monitoring or the effectiveness of the measures to minimize, reduce or avoid unintentional take; and,
- Consider approaches to the extent practicable for identifying and minimizing take that is incidental to otherwise lawful activities including:
    - Altering the season of activities to minimize disturbances during the breeding season;

- Retaining the integrity of breeding sites, especially those with long histories of use; and,
- Coordinating with the USFWS when planning projects that are likely to have a negative effect on migratory bird populations and cooperating in developing approaches that minimize negative impacts and maximize benefits to migratory birds.

The Project Area contains 16 of the 20 habitat types described for birds in the Nevada Comprehensive Bird Conservation Plan (GBBO 2010). This Plan identified Priority bird species for each of these habitat types. A Priority species is one which 1) regularly occurs in Nevada, and 2) meets one or more of the following criteria as determined by agencies, bird conservation initiatives, legal mandate, or Nevada stewardship responsibility:

a) *Audubon Watchlist*: Red or Yellow List rankings
b) *Partners in Flight North American Landbird Conservation Plan* (Rich et al. 2004): Watch List ranking
c) *Intermountain West Waterbird Conservation Plan* (Ivey and Herziger 2006): High or Moderate Concern rankings
d) *Intermountain West Regional Shorebird Plan* (Oring et al. 2000): Critically Important or Very Important rankings
e) Pacific Flyway portions of the *North American Waterfowl Management Plan* (USFWS 1986, 1998): High-ranking species with significant presence in Nevada
f) *Nevada Department of Wildlife Upland Game Species Management Plan* (NDOW 2008): High Concern ranking
g) Listed by USFWS under the Endangered Species Act (ESA), including candidate species
h) Protected under the Bald and Golden Eagle Protection Act
i) Significant species stewardship responsibility: ≥ 20% of the estimated global population occurs in Nevada (GBBO 2010, Appendix 1).

Table 10 displays the Priority species for each habitat within the Project Area.

Table 10. Priority bird species (in alphabetical order) and primary associated habitat types within the Project Area (GBBO 2010).

Priority Species	Agriculture	Alpine	Aspen	Cliff	Coniferous Forest	Ephemeral Wetland and Playa	Great Basin Lowland Riparian	Marsh	Montane Riparian	Montane Shrubland	Open Water	Pinyon-Juniper	Sagebrush	Salt Desert Scrub	Springs	Wet Meadow
American Avocet						X					X					
American white pelican											X					
Bald Eagle							X				X					
Band-tailed Pigeon					X											
Black Rosy-Finch		X														
Black Tern								X			X					
Black-chinned Sparrow										X		X				
Black-necked Stilt						X					X					
Brewer's Sparrow										X			X	X		
Burrowing owl													X	X		
Calliope Hummingbird			X		X				X	X					X	
Canvasback								X			X					
Cinnamon Teal								X			X					
Clark's grebe											X					
Common loon											X					
Common Poorwill										X		X	X			
Dusky Grouse			X		X					X						
Eared grebe											X					
Ferruginous hawk												X	X			
Flammulated Owl			X		X											
Franklin's Gull								X			X					

Priority Species	Agriculture	Alpine	Aspen	Cliff	Coniferous Forest	Ephemeral Wetland and Playa	Great Basin Lowland Riparian	Marsh	Montane Riparian	Montane Shrubland	Open Water	Pinyon-Juniper	Sagebrush	Salt Desert Scrub	Springs	Wet Meadow
Golden Eagle				X									X			
Priority Species	Agriculture	Alpine	Aspen	Cliff	Coniferous Forest	Ephemeral Wetland and Playa	Great Basin Lowland Riparian	Marsh	Montane Riparian	Montane Shrubland	Open Water	Pinyon-Juniper	Sagebrush	Salt Desert Scrub	Springs	Wet Meadow
Gray Flycatcher										X		X	X			
Gray vireo												X				
Greater Sage-Grouse										X			X		X	X
Green-tailed Towhee			X						X	X		X				
Least Sandpiper						X					X					
Lesser Scaup								X			X					
Lewis's Woodpecker			X						X							
Long-billed Curlew	X															X
Long-billed Dowitcher						X		X			X					
Northern Goshawk			X		X											
Northern Pintail								X			X					
Olive-sided Flycatcher					X											
Peregrine Falcon				X												
Pinyon jay												X				
Prairie Falcon				X									X	X		
Redhead								X			X					
Red-necked Phalarope						X					X					
Rufous Hummingbird			X				X		X						X	X
Sage Thrasher										X			X	X		

Priority Species	Agriculture	Alpine	Aspen	Cliff	Coniferous Forest	Ephemeral Wetland and Playa	Great Basin Lowland Riparian	Marsh	Montane Riparian	Montane Shrubland	Open Water	Pinyon-Juniper	Sagebrush	Salt Desert Scrub	Springs	Wet Meadow
Sagebrush sparrow													X	X		
Sandhill Crane	X						X	X								X
Short-eared owl																X
Snowy Egret							X	X								
Priority Species	Agriculture	Alpine	Aspen	Cliff	Coniferous Forest	Ephemeral Wetland and Playa	Great Basin Lowland Riparian	Marsh	Montane Riparian	Montane Shrubland	Open Water	Pinyon-Juniper	Sagebrush	Salt Desert Scrub	Springs	Wet Meadow
Snowy Plover						X										
Swainson’s Hawk	X						X						X			
Trumpeter Swan								X			X					
Tundra Swan								X			X					
Virginia’s Warbler									X	X		X				
Western grebe											X					
Western Sandpiper						X					X					
White-faced Ibis	X							X								X
White-throated Swift				X			X									
Willet								X								X
Williamson’s Sapsucker			X		X											
Willow Flycatcher							X		X							
Wilson’s Phalarope						X		X			X					
Yellow-billed Cuckoo							X									

3.2.5.2. Environmental Effects

Effects Common to Alternatives A-C

The project area contains 16 of 20 habitats described for migratory bird species in Nevada (GBBO 2010), most of which are directly impacted by wild horses. The action alternatives would not directly impact migratory bird populations but individual birds may be temporarily displaced or disturbed by the helicopter and/or ground personnel involved in gathering horses. Gather activities would occur outside the breeding season for most migratory bird species. Small areas of migratory bird habitat would be impacted by trampling at trap sites and holding facilities. This impact would be minimal (generally less than 0.5 acre/trap site), temporary, and short-term (two weeks or less) in nature.

Indirect impacts would be related to decreases in wild horse densities and altered patterns of use. The reduction in the wild horse population size would provide opportunity for vegetative communities to recover from overuse where they haven't already transitioned to altered steady-states. The action alternatives would support a more diverse vegetation composition and structure through improvement and maintenance of healthy populations of native perennial plants. Habitat condition would improve for the majority of migratory bird species.

Competition with migratory birds for water at artificial pit reservoirs and water catchments, or natural catchments, would be drastically reduced. For example, there are 200 horses in a HMA where the AML is 48, each of these horses uses 12 gallons of water a day during the summer. If the AML is achieved then only 17,100 gallons of water would be consumed in a month rather than 72,000 gallons a month. This would mean more water would be available for a longer period of time for both wild horses at AML and migratory bird species dependent on the same water source(s). In addition, the reduced numbers of wild horses at watering sites would be expected to result in wildlife, including birds, spending more time at these sites with fewer incidences of displacement or exclusion (Hall et al. 2016).

Effects Specific to Alternative A

Gather, Selective Removal, Fertility Control, Sex Ratio Adjustments and Gelding
After the initial gather, the wild horse population would be reduced. With follow-up gathers, the application of fertility control, sex ratio adjustments and gelding of a portion of the male population impacts to migratory bird habitat would still occur, but to a lesser degree over the 10-year period than Alternatives B, C and the No Action. Improved habitat conditions and decreased resource competition would be maintained for a longer period of time before wild horse populations exceeded high AML.

Effects Specific to Alternative B

Selective Removal to low AML, Fertility Control and Sex Ratio Adjustments
This alternative would have similar impacts to Alternative A but the beneficial impacts would occur slower if the wild horse population cannot be successfully reduced to low AML.

The improved habitat and decreased resource competition that would come from population control will continue until the wild horses reach high AML or above.

Effects Specific to Alternative C

Selective Removal to low AML, sex ratio adjustments
Impacts to migratory bird habitats would be as described in Impacts from Actions Common to A-C but beneficial impacts from improved native perennial plants would be shorter-lived since the wild horse population would increase faster without the application of fertility control for some mares.

Effects of the No Action Alternative

There would be no direct impacts from gather operations. However, the continued over-population of wild horses within the project area would lead to indirect impacts due to the increasing inability of rangelands to support healthy populations of native perennial plants and the loss of habitat they provide. These indirect impacts to vegetative communities and migratory birds would increase each year that a gather is postponed.

3.2.5.3. Cumulative Effects

Cumulative effects of the Action Alternatives would be most impactful to migratory birds during the short-term (the 10-yr time period of the Alternatives), specifically during active gather operations when low-flying helicopters are driving horses toward capture sites. Human activity associated with these and water/bait gather operations could temporarily disturb or displace migratory birds in these areas. However, when added to PPRFFAs, the aggregate impacts of direct and indirect effects are not expected to significantly impact migratory bird populations in a negative way. Over both the short and long-term (10-14 years), when added to PPRFFAs, the aggregate impacts of direct and indirect effects are expected to be beneficial for migratory birds and their habitats including immediate benefit due to reduced competition for forage and water and gradual improvement of upland and riparian health. Cumulative Effects from the No Action the continued over-population of wild horses within the project area would lead to the increasing inability of rangelands to support healthy populations of native perennial plants and the loss of habitat they provide. These impacts to vegetative communities and migratory birds would increase each year that a gather is postponed. See Tables 4-6 above.

3.2.6. Public Health and Safety

3.2.6.1. Affected Environment

In recent gathers, members of the public have increasingly traveled to the public lands to observe BLM's gather operations. Members of the public can inadvertently wander into areas that put them in the path of wild horses that are being herded or handled during the gather operations, creating the potential for injury to the wild horses or burros and to the BLM employees and contractors conducting the gather and/or handling the horses as well as to the public themselves. Because these horses are wild animals, there is always the potential for injury when individuals get too close or inadvertently get in the path of gather activities.

The helicopter work is done at various heights above the ground, from as little as 10-15 feet (when herding the animals the last short distance to the gather corral) to several hundred feet (when doing a recon of the area). While helicopters are highly maneuverable and the pilots are very skilled in their operation, unknown and unexpected obstacles in their path can impact their ability to react in time to avoid members of the public in their path. When the helicopter is working close to the ground, the rotor wash of the helicopter is a safety concern for members of the public by potentially causing loose vegetation, dirt, and other objects to fly through the air which can strike or land on anyone in close proximity as well as cause decreased vision.

During the herding process, wild horses or burros will try to flee if they perceive that something or someone suddenly blocks or crosses their path. Fleeing horses can go through wire fences, traverse unstable terrain, and go through areas that they normally don’t travel in order to get away, all of which can lead them to injure people by striking or trampling them if they are in the animal’s path.

Disturbances in and around the gather and holding corral have the potential to injure the government and contractor staff who are trying to sort, move and care for the wild horses by causing them to be kicked, struck, and possibly trampled by the animals trying to flee such disturbance. Such disturbances also have the potential for similar harm to the members of the public.

Public observation of the gather activities on public lands would be allowed during helicopter gather operations, but would be subject to observation protocols intended to minimize potential for harm to members of the public, to government and contractor staff, and to the wild horses, and would be consistent with BLM IM No. 2010-164 and in compliance with Observation Day Protocol and Ground Rules for scheduled and nonscheduled visitation found in Appendix IV.

Public observation would not be allowed during bait/water trapping operations. Because of the nature of the bait/ water trap method, wild horses are reluctant to approach the trap site when there is too much activity; therefore, only essential gather operation personnel would be allowed at the trap site during operations.

3.2.6.2. Environmental Effects

Effects of the No Action Alternative

There would be no gather related safety concerns for BLM employees, contractors or the general public as no gather activities would occur.

Effects of the Proposed Action and Alternatives B and C

Public safety as well as that of the BLM and contractor staff is always a concern during the helicopter gather operations and is addressed through the implementation of Observation Day Protocol and Ground Rules (see Appendix IV) that have been used in recent gathers to ensure that the public remains at a safe distance and does not impede gather operations. Appropriate BLM staffing (public affair specialists and law enforcement officers) would be present to assure compliance with visitation protocols at the site. These measures minimize the risks to the health and safety of the public, BLM staff and contractors, and to the wild horses themselves during the gather operations.

During bait/water gather operations (due to this type of operation luring wild horses to bait) spectators and viewers would be prohibited as it would directly interfere with the ability to safely capture wild horses. Only essential personnel (COR/PI, veterinarian, contractor, contractor employees, etc.) would be allowed at the trap sites during trapping operations, thereby minimizing the risks to the health and safety of the public, BLM staff and contractors. Visitors would be allowed to view wild horses once they are removed to the temporary holding facilities.

3.2.6.3. Cumulative Effects

As defined by 40 CFR 1508.7, the cumulative impact is the impact which results from the incremental impact of the action, decision, or project when added to the other past, present, and reasonably foreseeable future actions. No impacts to public health and safety have been identified from past, present, or reasonably foreseeable future actions; therefore, cumulative impacts to public health and safety would be the same as described above.

3.2.7. Soils

3.2.7.1. Affected Environment

Soils within the Complexes are Aridisols that vary in depth, texture, erosion potential, and other characteristics based upon several soil forming factors. These soils typically have a mesic or frigid temperature regime and aridic soil moisture regime. Most are well drained, are either moderately deep or very deep and have a coarse surface texture ranging from silt loam to cobbly loam. Detailed information for soils within these complexes can be found in the Soil Survey of Elko County, Southeast Part 1 and White Pine County, Nevada, East Part 1.

Detailed information for these soils can be found in applicable USDA soil survey publications and be found at:

http://websoilsurvey.nrcs.usda.gov/app/homepage/htm.

Biological soil crusts are likely to be present within the Complexes. Presence of these crusts increases soil cohesiveness and reduces the hazard of erosion by wind and water. The extent and influence of biological soil crusts within the Antelope Complex is not known.

Monitoring of soil quality within the Complexes has not been completed, but due to the large area and many uses it can be assumed that a wide variety of soil quality conditions exist. Soil quality in the Complexes is affected by a variety of land uses including livestock grazing, wild horse use, and vehicular travel. Impacts from wild horses and livestock are typically concentrated at and between water resources. (See pictures below.)

Figure 2. Impacts to soils by wild horses around Erickson spring left (October 2016). Substantial soil loss has occurred at the spring as a result of erosion. Impacts to soils by wild horses around Rock Springs right (August 2017). Substantial soil loss has occurred at the spring as a result of erosion. Lack of stabilizing riparian vegetation has allowed erosional forces to remove considerable amounts of soil as seen in the profile of the "perched" adjacent willow where anchoring roots have retained the soil. Livestock season when authorized is from 11/1 to 12/1 and from 4/1 to 4/30, wild horse use is year round.

Figure 3. Impacts to soils by wild horses around Deer spring conveyance (February 2015). The areas around Deer spring conveyance are dominated by annual, invasive species and non-riparian native species (i.e., rabbitbrush). These species are indicative of a highly disturbed area and all of these upland species are indicative of the loss.

Figure 4. Impacts to soils by wild horses near Deer Spring conveyance (June 2017).

The areas around Deer spring conveyance are dominated by annual, invasive species and non-riparian native species (i.e., rabbitbrush). These species are indicative of a highly disturbed area and all of these upland species are indicative of the loss.

Figure 5. Impacts to soils by wild horses near Ayarbe spring conveyance (Google imagery 2013). Livestock season of use is 11/1 to 5/15, wild horse use is year round.

Figure 6. Impacts to soils by year round wild horses use around Dolly Varden Spring (private land) (June 2017). Green vegetation in picture is cheatgrass, annual mustard and halogeton. Winds regularly pick up soil (blowing dust pictured) which further enhances soil loss.

Figure 7. Impacts to soils by wild horses around Cherry Spring (July 2015). No livestock grazing has occurred since 2001. The areas around Cherry spring are dominated by annual, invasive species and non-riparian native species (i.e., rabbitbrush and sagebrush). These species are indicative of a highly disturbed area and all of these upland species are indicative of the loss.

Trailing and hoof action by wild horses has accelerated erosion especially following intense storms or snow melt. Aerial monitoring indicates heavy and increasing trailing by wild horses between limited water sources and foraging areas. Heavy wild horse utilization and trailing are occurring in the Antelope Complex and are decreasing vegetative cover, particularly in areas of water sources, resulting in increased compaction which increases run off and soil erosion and decreases soil productivity.

3.2.7.2. Environmental Effects

Effects of the No Action Alternative

If the proposed gather does not occur the deteriorating conditions described under the Affected Environment would continue and would increase in intensity as the wild horse population increases, particularly in areas of congregation around water and/or in specific upland areas.

Effects of the Proposed Action and Alternatives B and C

Project implementation activities would primarily be limited to existing roads, washes and horse trail areas, and only relatively small areas would be used for trapping and holding operations. Horses may be concentrated for a limited period of time in traps. Traps placed on upland areas may result in some new soil disturbance and compaction, but these impacts would be temporary and would not be expected to adversely affect soil quality in the long term. Soil quality may improve in the long term since physical impacts from wild horse use would decrease due to the proposed gather.

3.2.7.3. Cumulative Effects

Past and present impacts to soil resources in the HMAs have resulted from wildlife and wild horse-use, livestock grazing, road construction and maintenance, OHV use and recreation, exploration, mining and processing, aggregate operations, public land management activities (e.g., fuel reduction treatment), and wildland fire. Reclamation of areas disturbed from past actions and natural revegetation have helped minimize impacts to soil resources through improved vegetation cover and stabilization to varying degrees.

Impacts to soil resources from reasonably foreseeable future actions (RFFAs) are considered to be similar to those described for present actions. Impacts from the Proposed Action (Alternative A) would include soil compaction and disturbance erosion during the occasions the BLM conducts gathers over the life span of the document. The cumulative impact on soil resources from the incremental impact of the Proposed Action when added to the past actions, present actions, and RFFAs would be moderate and intermittent. The Cumulative Impacts from the No Action Alternative would incrementally increase damage to soil resources. See Tables 4-6 above.

3.2.8. Special Status Species (SSS)

3.2.8.1. Affected Environment

Birds

Greater Sage-Grouse

On September 21, 2015, BLM finalized the Nevada and Northeastern California Greater Sage-Grouse Approved Resource Management Plan Amendment (ARMPA; BLM 2015). The Record of Decision amended Resource Management Plans for BLM offices containing Greater Sage-Grouse (GRSG) habitat in response to the 2010 US Fish and Wildlife Service (USFWS) finding that the GRSG was "warranted but precluded" from listing under the Endangered Species Act. The USFWS identified the inadequacy of existing regulatory mechanisms as a primary threat to the species, including the principal regulatory mechanisms for the BLM as conservation measures incorporated into land use plans. Therefore, the purpose of the ARMPA is to identify and incorporate appropriate measures in existing land use plans. It is intended to conserve, enhance and restore GRSG habitat by avoiding, minimizing, or compensating for unavoidable impacts on GRSG habitat in the context of the BLM's multiple-use and sustained yield mission.

Greater Sage-Grouse habitat within the ARMPA planning area falls into three management categories: priority habitat management areas (PHMA), general habitat management areas

(GHMA) and other habitat management areas (OHMA). These management areas are defined as follows:

- PHMA - BLM-administered lands identified as having the highest value to maintaining sustainable GRSG populations. Areas of PHMA largely coincide with areas identified as priority areas for conservation in the USFWS's Conservation Objectives Team (COT) report (USFWS 2013). These areas include breeding, late brood-rearing and winter concentration areas and migration or connectivity corridors.

- GHMA - BLM-administered lands where some special management will apply to sustain GRSG populations; these are areas of occupied seasonal or year-round habitat outside of PHMA.

- OHMA - BLM-administered lands identified as unmapped habitat in the Draft Land Use Plan Amendment (LUPA)/EIS that are within the planning area and contain seasonal or connectivity habitat areas. With the generation of updated modeling data (Coates et al. 2014,) the areas containing characteristics of unmapped habitat were identified and are now referred to as OHMAs.

The ARMPA also identifies specific sagebrush focal areas (SFA), a subset of PHMA (BLM 2015; Figure 1-3). Sagebrush Focal Areas were derived from GRSG stronghold areas described by the USFWS in a memorandum to the BLM titled Greater Sage-Grouse: Additional Recommendations to Refine Land Use Allocations in Highly Important Landscapes (USFWS 2014). The memorandum and associated maps provided by the USFWS identify areas that represent recognized strongholds for GRSG that have been noted and referenced as having the highest densities of GRSG and other criteria important for the persistence of the species.

While it contains no SFA, much of the Project Area provides important habitat in all three primary management categories, encompassing all of the seasonal habitat types (Lek habitat: March 1 - May 15, Nesting: April 1-June 30, Early brood-rearing: May 15-June 15, Upland/riparian late brood-rearing: June 15-September 15 and Winter: November 1- February 28). Several of these seasonal habitats may overlap, highlighting the importance of these areas to sage-grouse.

Following direction from the Nevada BLM State Office, sage-grouse seasonal habitat delineations were obtained for the Project Area and a four mile buffer around it. Seasonal habitat acreages are presented in Table 11 and depicted in Figure 8. Seasonal restrictions are outlined within the ARMPA (BLM 2015, pgs. 2-8 to 2-10) during the seasonal use periods for surface-disturbing activities and uses on public lands to prevent disturbances to GRSG during seasonal life-cycle periods.

Table 11. Greater sage-grouse seasonal habitat types and associated acreages within a four-mile buffered project area.

Seasonal Habitat Type	Seasonal Use Period	Acres
Lek (Active and Pending only)	March 1 to May 15	146,730
Nesting	April 1 to June 30	1,699,212
Early brood-rearing	May 15 to June 15	2,746,815
Late brood-rearing (riparian)	June 15 to September 15	9,071
Winter	November 1 to February 28	1,733,849
Total buffered project area		**6,335,677**

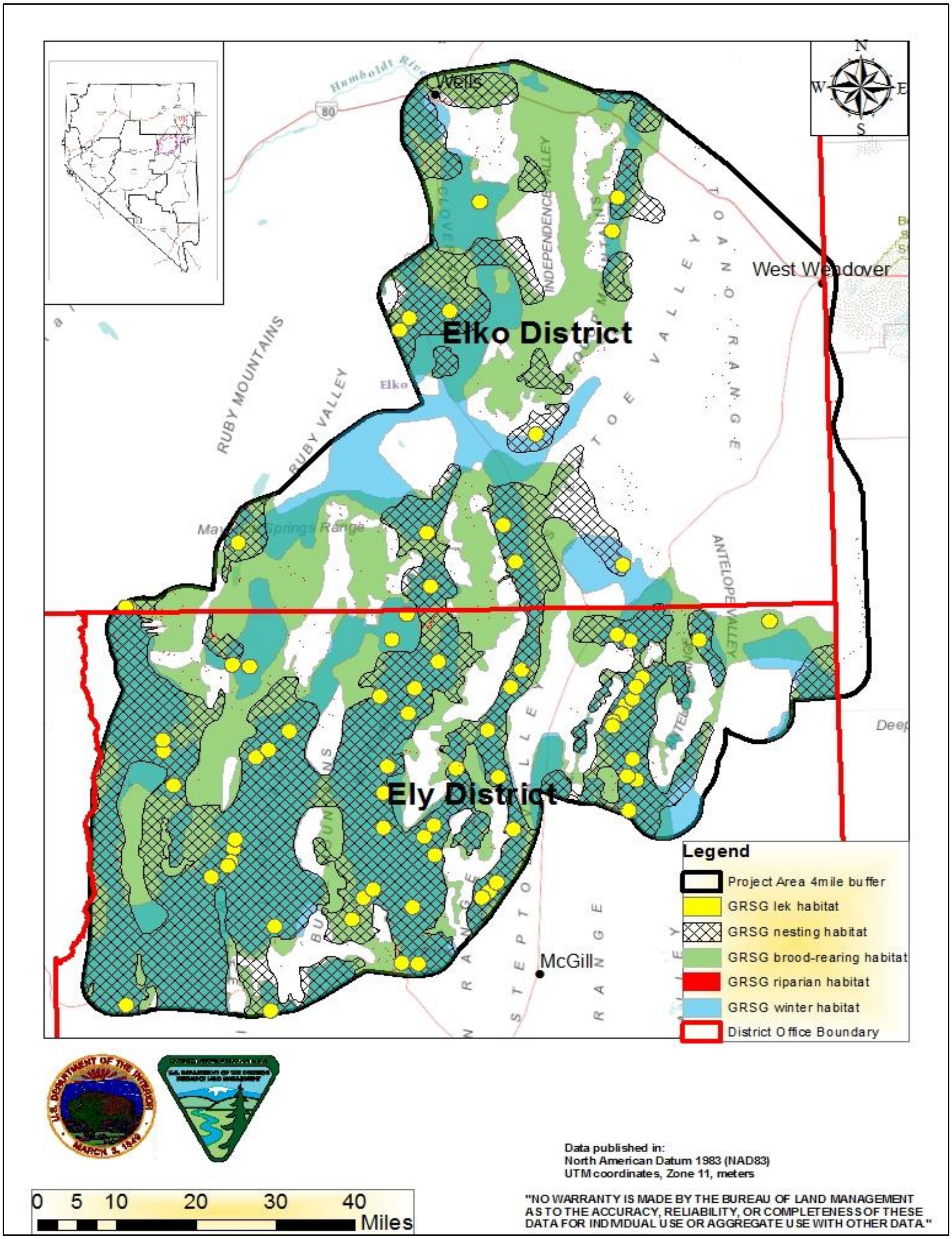


Figure 8. Sage grouse seasonal habitats within a four mile buffer of the Project Area.

Sage-grouse is an appropriate "umbrella" species to represent the habitat needs of a suite of sagebrush-obligate and sagebrush-associated species, including, but not limited to sage thrasher, pygmy rabbit, Brewer's sparrow (all of which are Elko and Ely District BLM Sensitive Species), sagebrush sparrow and sagebrush vole. It is recognized that managing for habitat characteristics that benefit the sage-grouse will also generally benefit other species that fall under the sage-grouse umbrella (Rowland et al. 2006, Hanser and Knick 2011).

The Project Area overlaps portions of seven different GRSG Population Management Units (Butte/Buck/White Pine, Diamond, East Valley, Ruby Valley, Schell/Antelope, Snake and South Fork). One-hundred forty-five leks (63 Active, 3 Historic, 14 Inactive, 10 Pending and 55 Unknown) occur inside or within four miles of the Project Area.

Raptors

Five hundred ninety-nine raptor nests have been documented within the project area (NDOW 2016). Many of these are historic nests documented over a period of decades and therefore may not have been occupied upon discovery. Based on structure, size and surrounding habitat an educated guess was often made as to which species or type of raptor (e.g., hawk, eagle, and owl) created or likely used each nest if it wasn't known with certainty. Given these considerations, Table 12 displays the number of nests by species within the Project Area. Data were derived from the NDOW GIS Raptor Database (2016).

Table 12. Raptor nests within the Project Area (NDOW GIS Raptor Database 2016).

Species	Number of nests
Accipiter/Buteo	13
Burrowing Owl	10
Buteo (Red-tailed, Ferruginous or Swainson's)	55
Eagle (Golden)	105
Eagle/*Buteo*	48
Falcon (Prairie or Kestrel)	15
Ferruginous Hawk	345
Northern Goshawk	7
Great Horned Owl	1

Bald and Golden Eagle

In 2007, the bald eagle was removed from the list of threatened and endangered species. Bald eagles and golden eagles continue to receive protection under the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act, and both species are classified as Sensitive by Nevada BLM. Within the Project Area, the golden eagle is a year-round resident while the bald eagle is a spring/fall migrant and winter resident. Suitable bald eagle winter habitat is widely dispersed on uplands, irrigated lands and riparian areas throughout the Project Area. Recent data suggest declines in golden eagle populations both regionally but the trend is inconclusive in Nevada (Kochert et al. 2002 and Sauer et al. 2008 *in* GBBO 2010), while bald eagle winter populations are stable to increasing (Buehler 2000 and Sauer et al. 2008 *in* GBBO 2010, WAP 2012).

Ferruginous and Swainson's Hawk

Ferruginous and Swainson's hawks often occur sympatrically during the breeding season. In Nevada, ferruginous hawks prefer open, rolling sagebrush near the pinyon-juniper interface (GBBO 2010). Their favored prey is rabbits (*Lepus* spp.), but they are also known to take other small rodents and occasionally birds and reptiles. The species has probably undergone recent population declines within Nevada (GBBO 2010). The Swainson's hawk is a summer resident in Nevada (Herron et al. 1985). Often associated with agricultural and riparian areas, it will also use sagebrush steppe, nesting in scattered junipers, cliffs or other trees (GBBO 2010). Favored prey on breeding territories includes rabbits and ground squirrels. Local populations have likely been in recent decline (GBBO 2010), however, recent restrictions on pesticide use on their wintering grounds in South America appear to have resulted in positive population trends. Ferruginous hawks occasionally overwinter in northern Nevada while Swainson's hawks leave the area entirely. While ferruginous hawk nests comprise the majority of documented nests within the Project Area (Table 12), it is likely that many additional nest sites for these two species exist that are currently not documented.

Peregrine Falcon

The peregrine falcon utilizes various open environments including open water, desert shrub, and marshes usually in close association with suitable nesting cliffs; also mountains, open forested regions, and human population centers (AOU 1983 cited *in* WAP 2012). When not breeding, they occur in areas where prey is concentrated, including marshes, lake shores, rivers and river valleys, cites, and airports. In Nevada, nests are often on a ledge or hole on face of rocky cliff or crag; also uses ledges of city high-rise buildings. On cliffs, nest ledges are commonly sheltered by an overhang (Palmer 1988, Campbell et al. 1990 cited *in* WAP 2012). Feeds primarily on birds (medium-size passerines up to small waterfowl); rarely or locally, small mammals (e.g., bats), lizards, fishes, and insects (by young birds) may be taken (WAP 2012). The Project Area provides winter (e.g. Ruby Valley and the Cherry Creek Range) and migration habitat (e.g., Goshute Range) for this species.

Northern Goshawk

In Nevada, the Northern goshawk forages in open sagebrush adjacent to riparian aspen stands (Younk and Bechard 1992, cited in Squires and Reynolds 1997). Nests are generally constructed in the largest trees of dense, large tracts of mature or old growth aspen stands with high canopy closure (60-95 %) and sparse groundcover, near the bottom of moderate slopes, and near water or dry openings (Bull and Hohmann 1994, Daw and DeStefano 2001, Hargis et al. 1994, Reynolds et al 1982, Siders and Kennedy 1994, Squires and Ruggiero 1996, Younk and Bechard 1994). The Project Area provides limited habitat for this species, primarily in the Dolly Varden, Cherry Creek, Schell Creek and Egan Ranges.

Western Burrowing Owl

Burrowing owls nest within the Project Area. Abandoned mammal burrows, such as those created by badgers and coyotes, provide nesting habitat. This species uses open or even disturbed sites with minimal vegetation for nesting and loafing; the lack of vegetation enables increased visibility from the burrow entrance. Ten nest burrows have been documented within the Project Area (NDOW 2016) but it is likely that many more exist that are currently undocumented.

<u>Other Sensitive Birds</u>

Western Snowy Plover

This shorebird is often seen on alkali playas near standing pools of shallow water. During times of drought it relies heavily on artesian wells and springs that spill water onto the dry playas. Generally nests on recently exposed alkaline flats (Paton and Edwards 1992). The snowy plover picks insects, small crustaceans and other minute invertebrates from substrate, probing in sand or mud in or near shallow water, sometimes using its feet to stir up prey in shallow water. The Project Area contains a number of playas that may support breeding snowy plovers but, if present, they have not been documented and are believed to be rare.

Pinyon Jay

The pinyon jay is found in pinyon-juniper woodland and less frequently in pine; in the nonbreeding season, it also inhabits scrub oak and sagebrush (AOU 1983). Pinyon jays may wander widely in search of food resources during the nonbreeding season. Jays eat primarily pinyon seeds, but may forage on other seeds and arthropods found in sagebrush habitats. A GBBO radio-telemetry study found that foraging pinyon jays appeared to favor transitional areas where pinyon-juniper woodland is interspersed with sagebrush. During the daytime, jays were usually found within 800m [2,600 f] of woodland edge, and always within 2 km [1.2 mi] of the edge. During roosting and nesting, jays went deeper (but usually no more than 3 km [1.8mi]) into the woodland interior to denser tree stands. Jays were nearly always found in areas with diverse woodland canopy closure and age structure; they were not observed in large contiguous areas of mature, dense woodland (WAP 2012). The Project Area contains abundant year-round habitat for this species.

Loggerhead Shrike

Loggerhead shrike inhabits desert scrub, sagebrush rangelands, grasslands and meadows (WAP 2012). Shrikes often perch on poles, wires, or fence posts; suitable hunting perches are an important part of suitable habitat. Arthropods, amphibians, small to medium-sized reptiles, small mammals and birds are primary prey (Reuven 1996). Typical nest sites include shrubs or small trees, with nest height averaging 0.8-1.3 meters (2.6-4.3 feet) off the ground (Wiggins 2005). The Project Area serves as year-round habitat for the species and likely supports resident breeding pairs as well as wintering migratory individuals that breed further north.

Black Rosy-Finch

Black rosy-finches (*Leucosticte atrata*) breed in remote alpine habitats, where they are difficult to monitor and study. They are more easily observed after they descend to lower elevations for the winter, where they often join with the gray-crowned rosy-finch (*L. tephrocotis*) in mixed foraging and roosting flocks of 25-1,000 individuals. Nevada trends and population size are unknown, and breeding populations are small and discontinuous (GBBO 2010). Most of the conservation attention for this bird is focused on protecting communal winter roost sites (which are critical for survival) and winter foraging areas.

Winter telemetry studies in northeastern Nevada revealed that black rosy-finches depend heavily upon the shelter offered by below-ground communal roost sites, including abandoned mine shafts, caves, and deep fissures in metamorphic rock outcrops. The flocks return to these roost sites every evening after foraging in sagebrush or montane shrubland habitat up to 10 km [6 mi] away. Flocks may remain in the roosts for extended periods when the weather is inclement. Known roost sites were located at elevations ranging from 1,400 – 2,800 m [4,600 – 9,200 ft.] within a matrix of sagebrush, montane shrubland, and pinyon-juniper habitats, and were typically higher in elevation than their associated foraging sites. Much of the lower elevations of the Project Area likely provides winter habitat for this species.

Lewis's Woodpecker

In Nevada, this species generally occurs within riparian corridors with aspens or montane riparian habitat. As a weak excavator, the Lewis's woodpecker is even more dependent on dead trees than other woodpeckers. Key habitat factors include the presence of large, partly-decayed snags, an open forest structure for aerial foraging, and a well-developed shrub or native herbaceous layer that promotes healthy populations of flying insects (Abele et al. 2004 *in* GBBO 2010). Annual variation in Lewis's woodpecker numbers and their very patchy breeding distribution within the state make it hard to pinpoint current trends in Nevada, but the species is a conservation concern because of historic range-wide declines and Nevada's moderately high global stewardship responsibility (GBBO 2010). The project contains limited habitat primarily in the upper elevations of the more significant mountain ranges.

Sage Thrasher

Nevada contains about one-fifth of the global population of sage thrasher (GBBO 2010). Breeding Bird Survey results indicate possible declines in the state dating from approximately 1980 (Sauer et al. 2008 *in* GBBO 2010). Sage Thrashers are consistently more numerous in areas with greater cover of high-quality sagebrush, and they are often positively associated with greater shrub height and vertical complexity. They avoid areas with junipers, even if present in low densities. The Project Area contains abundant habitat for Sage Thrasher.

Brewer's Sparrow

Brewer's sparrow populations have declined by ~2% per year in recent years (GBBO 2010). It is most abundant in relatively large sagebrush patches, both in valley floors and montane sagebrush settings, and is negatively affected by the widespread loss and degradation of high-quality sagebrush habitat (GBBO 2010). While perennial grasses are a valuable component of occupied habitat, this species forages mostly in shrubs (>75% of over 600 observation periods) and relatively little on open ground between shrubs or at base of bunchgrasses (Wiens et al. 1987). The Project Area contains abundant habitat for Brewer's sparrow.

Mammals

Pygmy rabbit

The pygmy rabbit is a BLM Sensitive Species that was petitioned for listing as threatened or endangered under the ESA. On 20 May 2005, the U.S. Fish and Wildlife Service announced a 90-Day finding in the Federal Register indicating that, "… the petition does not provide substantial information indicating that listing the pygmy rabbit may be warranted." The finding, however, does not downplay the need to conserve, enhance or protect pygmy rabbit habitat.

Typical pygmy rabbit habitat consists of dense stands of big sagebrush growing in loose soils that are deeper than 20 inches, have 13 to 30 percent clay content, and are light colored and friable. Habitat is generally on flatter ground or moderate slopes in Wyoming big sagebrush uplands, in Basin big sagebrush (*Artemisia tridentata tridentata*) drainages, and in ephemeral drainages in between ridges of little sagebrush (*Artemisia arbuscula*) (Ulmschneider 2008).

The winter diet of pygmy rabbits is composed of up to 99 percent sagebrush. During spring and summer, diet may consist of roughly 51 percent sagebrush, 39 percent grasses, and 10 percent forbs. Pygmy rabbits use extensive snow burrows in the winter to access sagebrush forage, as travel corridors between their burrows, and possibly as thermal cover (USFWS 2003). The project area contains habitat for pygmy rabbits where the combination of suitable vegetation and soil factors overlap.

Preble's shrew

Likely habitat is ephemeral and perennial streams dominated by shrubs, primarily below 2500 m. Recorded habitats include arid and semiarid shrub-grass associations, openings in montane coniferous forests dominated by sagebrush (WA), willow-fringed creeks, marshes (OR), bunchgrass associations, sagebrush-aspen associations (CA), sagebrush-grass associations (NV), and alkaline shrubland (UT) (Hoffman et al. 1969, Williams 1984, Cornely et al. 1992 cited *in* WAP 2012).

Preble's shrew is an invertivore. Feeding habits probably resembles other shrews in that they primarily feed on insects and other small invertebrates (worms, mollusks, centipedes, etc.).

They are active throughout the year and can be active at any time throughout the day or night, but probably most active during morning and evening hours (WAP 2012). The Project Area contains limited potential habitat for this species but surveys have not occurred.

Dark kangaroo mouse

Inhabits stabilized dunes and other sandy soils in valley bottoms and alluvial fans dominated by big sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus* spp.), and horsebrush (*Tetradymia* spp.). Typically occurs in sandy habitats below the elevation where pinyon-juniper occur and above those habitats where greasewood and saltbush predominate (Hafner and Upham 2011). Although restricted to sand, it displays a broad tolerance for varying amounts of gravel. Seeds are the primary food source although it will also eat some insects. It does not appear to use free-standing water and probably gets moisture from its food sources. It is believed to store food in seed caches within their burrow system (O'Farrell and Blaustein 1974). Individuals are underground in burrows when inactive and during hibernation in the winter (WAP 2012). The Project Area contains potential habitat for this species but occurrence surveys have not occurred.

Bats

Fourteen species of bats are designated Sensitive within the Elko District and sixteen in the Ely District. Many of these species are associated with specific habitats that are particularly important for roosting or foraging, including: 1) bridges and buildings, 2) natural caves, mine shafts and adits, 3) cliffs, crevice and talus slopes, 4) desert wash foraging habitat, 5) forest and woodland foraging habitat, 6) tree roosting habitat, and 7) water source foraging and watering habitat (Bradley et al. 2006). The Project Area contains all of these habitat types.

American pika

Pika does not occur within the Project Area; the nearest populations occur in the Ruby Mountains and East Humboldt Range to the west.

<u>Other</u>

Mattoni's blue

Mattoni's blue, a migratory butterfly, is dependent upon slender buckwheat (*Eriogonum microthecum laxiflorum*) as a host plant. Slender buckwheat is fairly widespread and grows in mountain habitats from about 5,000-10,500'. Mattoni's blue is known in Nevada from the North Pequop Range, Charleston Reservoir and the west fork of Beaver Creek (Shields 1975), although because its host plant is widespread it may be more common than is currently known. Slender buckwheat does occur within the Project Area, therefore it is reasonable to conclude that Mattoni's blue may occur in association. The documented occurrence of Mattoni's blue within the North Pequop Range is at the extreme northern end of the Project Area.

<u>Plants</u>

Several Sensitive plant species may occur within the Project Area but only one has been confirmed, the Nachlinger catchfly (*Silene nachlingerae*). It is known to occur within the Project

Area on Telegraph Peak in the Egan Range and in the southern Cherry Creek Range east of the Goshute Wilderness. It is designated Sensitive because it inhabits ecological refugia, or specialized or unique habitats: generally dry, exposed or somewhat sheltered carbonate (rarely quartzite) crevices in ridgeline outcrops, talus, or very rocky soils on or at the bases of steep slopes or cliffs, on all aspects but predominantly on northwesterly to northeasterly exposures, mainly in the subalpine conifer zone (Nevada Natural Heritage Program 2001).

3.2.8.2. Environmental Effects

Effects common to Alternatives A, B and C

Sensitive Migratory Birds and Raptors
Impacts to sensitive migratory birds (including raptors) would be the same as those discussed under Chapter 3.2.5 Migratory Birds.

Bats

The only direct impact to bats is potential disturbance to roosting bats from the low flying helicopter during active gather operations. These alternatives would have positive indirect impacts to bats that depend upon flying insects associated with riparian zones. Flying insect populations would be expected to increase as riparian meadows become more productive and stubble heights increase, creating favorable micro sites for insects. Increased insect production would be expected to provide increased foraging opportunities for resident and migratory bats.

Pygmy rabbit

A slight chance of damage to pygmy rabbit burrows could occur due to trampling by wild horses. Rabbit behavior may be disrupted due to noise from the low-flying helicopter and running wild horses. Potential indirect impacts to pygmy rabbits would include increased herbaceous cover under existing stands of big sagebrush used as pygmy rabbit habitats. Decreased wild horse numbers would decrease physical damage to tall sage-brush plants that screen rabbit burrows and decrease hoof damage to burrows.

Nachlinger catchfly

Impacts to this sensitive plant are not expected. This species grows in crevices in ridgeline outcrops, talus, or very rocky soils on or at the bases of steep slopes or cliffs. These areas are rarely, if ever, used by wild horses.

Effects Specific to Alternative A

Phased-in Gather, Selective Removal, Fertility Control, Sex Ratio Adjustments and Gelding
Under Alternative A, the wild horse population would be reduced to low AML over a period of several years. Impacts to special status species habitat would still occur, but to a lesser degree. With the population controls and follow-up gathers under Alternative A, improved habitat

conditions would be maintained for a longer period of time before wild horse populations, once again, increase to high AML or above.

Effects Specific to Alternative B

Selective Removal to low AML, Fertility Control and Sex Ratio Adjustments
This alternative would have similar impacts to Alternative A.With the population controls improved habitat conditions would be maintained for a longer period of time before horse populations, once again, increase to high AML or above, but populations would increase more rapidly than under Alternative A.

Effects Specific to Alternative C

Selective Removal to low AML, sex ratio adjustments
Short-term impacts to special status species from the gather are expected to be the same as was discussed under Alternative A but the beneficial long-term impacts would be to a lesser extent since without the use of PZP the wild horse population would increase to high AML or above at a faster rate.

Effects of the No Action Alternative

No direct impacts to special status species are expected under this alternative. Without any gathers then the wild horse population will only continue to grow causing increased indirect impacts to the sensitive species populations and habitat. Wild horse populations would increase approximately 15-25% each year that the gather is not conducted. Upland habitats would continue to see locally heavy levels of utilization associated with wild horse use which would be exacerbated as wild horse populations continue to increase.

If excess wild horses are not removed, continued heavy grazing would occur on spring meadow systems that serve important habitat functions for sensitive species. Sage-grouse brooding habitats would continue to be degraded. Insect production, important for bats and sage-grouse, would continue to be substantially less than potential. Other beneficial impacts as discussed under Alternatives A, B, and C would not be realized.

3.2.8.3. Cumulative Effects

Cumulative effects of the Action Alternatives would be most impactful to Special Status Species during the short-term (the 10-yr time period of the Alternatives), specifically during active gather operations when low-flying helicopters are driving horses toward capture sites. Human activity associated with these and water/bait gather operations could temporarily disturb or displace Special Status animal species in these areas. However, when added to PPRFFAs (see Tables 5 and 6), the aggregate impacts of direct and indirect effects are not expected to significantly impact SSS populations in a negative way. Over both the short and long-term (10-14 years), when added to PPRFFAs, the aggregate impacts of direct and indirect effects are expected to be beneficial for SSS and their habitats including immediate benefit due to reduced competition for forage and water and gradual improvement of upland and riparian health. The Cumulative Impacts from the No Action Alternative would not see beneficial impacts to habitats and wild horse numbers in excess of AML would result in continuing decline of habitat conditions. See Tables 4-6 above.

3.2.9. Terrestrial Wildlife

3.2.9.1. Affected Environment

General Wildlife

Typically, food and especially water occur in abundance in relatively few places across the Nevada landscape. Throughout the remainder of the landscape such resources are widely scattered and at a low density. Accordingly, the distribution and abundance of most wildlife species reflect this sporadic distribution of resources (WAP 2012).

Approximately 350 species of terrestrial vertebrate wildlife occur in northeastern Nevada (Appendix VII), including representatives of all major taxa: mammal, bird, reptile and amphibian. A host of invertebrate and aquatic wildlife species are also possible in appropriate habitats. Many of these species may inhabit the Project Area and adjacent habitats on a seasonal or year-long basis. Approximately 100 birds, 70 mammals, and several reptile and amphibian species are found in sagebrush-steppe, the dominant habitat type throughout the Elko and Ely Districts.

Big Game

The Project Area lies primarily within NDOW Hunt Area 10 with smaller portions of Areas 07, 11, 12 and 14 (Figure 9). These Areas contain significant populations of pronghorn antelope, mule deer and elk with associated seasonal habitats (Table 13).

Table 13. Big game seasonal habitat areas within the Project Area (from NDOW GIS habitat designations, 2016).

Seasonal habitat	Pronghorn antelope (ac)	Mule deer (ac)	Elk (ac)
Agricultural	--	19	9,772
Crucial Summer	119,250	146,859	241,148
Crucial Winter	185,810	572,276	--
Limited Use	--	148,107	--
Low Density	--	--	664
Movement Corridor	54,457	--	--
Potential	--	--	406,584
Summer Range	3,540	84,863	291,606

Seasonal habitat	Pronghorn antelope (ac)	Mule deer (ac)	Elk (ac)
Transition Range	--	82,499	--
Winter Range	708,180	438,120	187,718
Year-round	1,956,523	431,381	1,809,031
Total	**3,027,760**	**1,904,124**	**2,946,523**

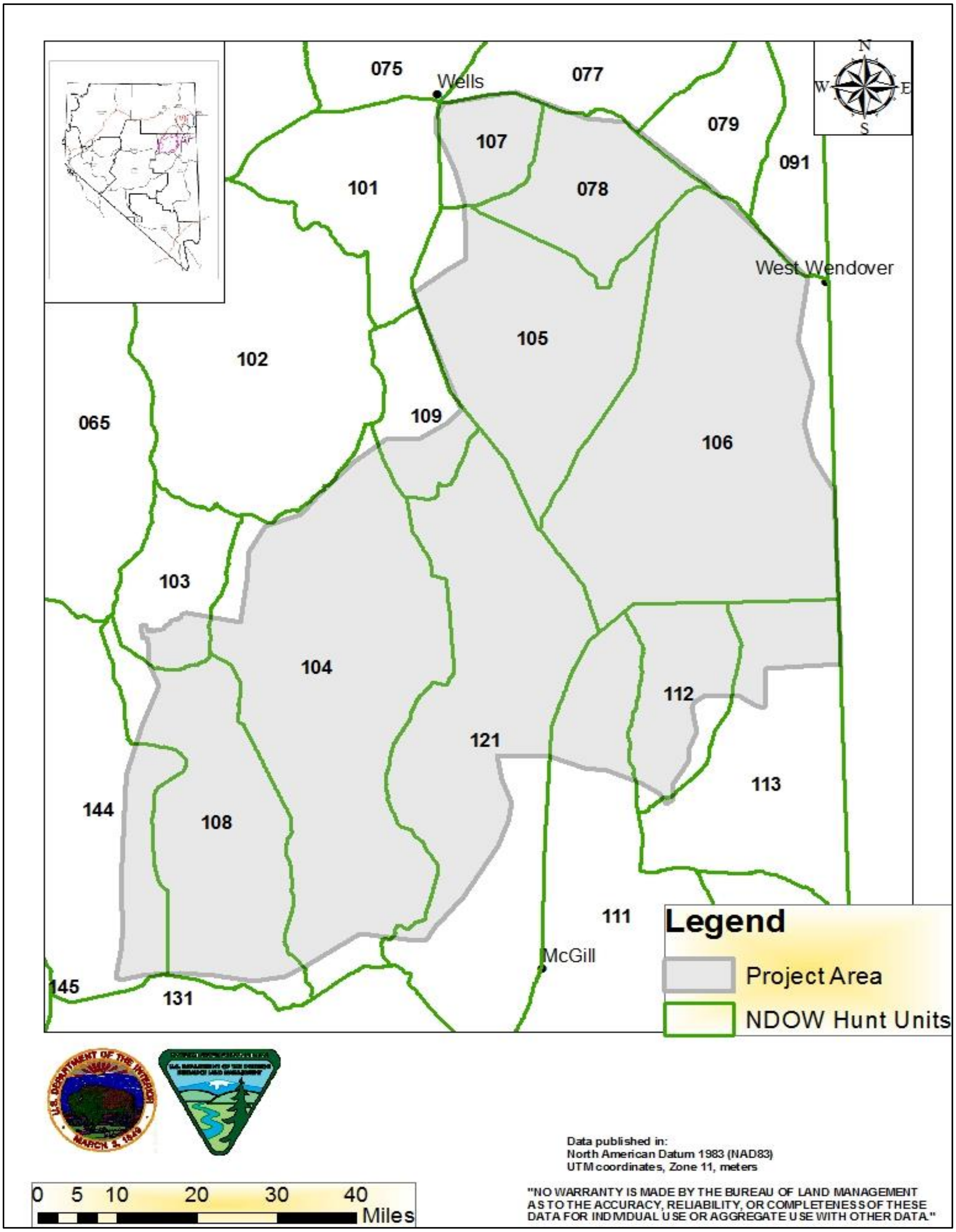


Figure 9. Nevada Department of Wildlife big game Hunt Units associated with the Project Area. The first two digits of a Hunt Unit denote which Hunt Area a particular Unit lies within.

Pronghorn antelope

Pronghorn seasonal use areas are shown in Figure 10. In general, pronghorn are found in valleys between mountain ranges, but low sagebrush on mountain ridges is commonly used during summer. Yearlong habitat is found primarily in areas dominated by salt desert scrub and greasewood flats. Additional habitat, particularly during winter, is located in sagebrush communities. In general, pronghorn numbers are stable to increasing and at or near carrying capacity in most of the project area. Overgrazing by wild horses has been identified by NDOW as a factor limiting carrying capacity of the range for pronghorn (NDOW 2016).

Mule deer

Mule deer seasonal use areas are shown in Figure 11. In general, mule deer are found within mountainous areas. Lower slopes may be used during winter while upper elevations are summer habitat. Salt desert scrub and greasewood flats in valley bottoms are generally avoided except during migration. The population estimate for the Area 10 mule deer herd (most of the Project Area falls within this Area) dropped from 18,000 in 2015 to 15,000 in 2016, with the drop attributed to winter conditions resulting in both extremely low fawn recruitment, as well as some adult mortality (NDOW 2016).

Elk

Elk seasonal use areas are shown in Figure 12. In general, elk use the forested higher elevations but riparian and sagebrush habitats also provide important seasonal habitat. Elk numbers within the Project Area have been relatively stable in recent years. Despite overpopulation of wild horses and the concomitant resource competition with elk, several habitat improvement projects have benefitted elk within the vicinity of the Project Area (NDOW 2016).

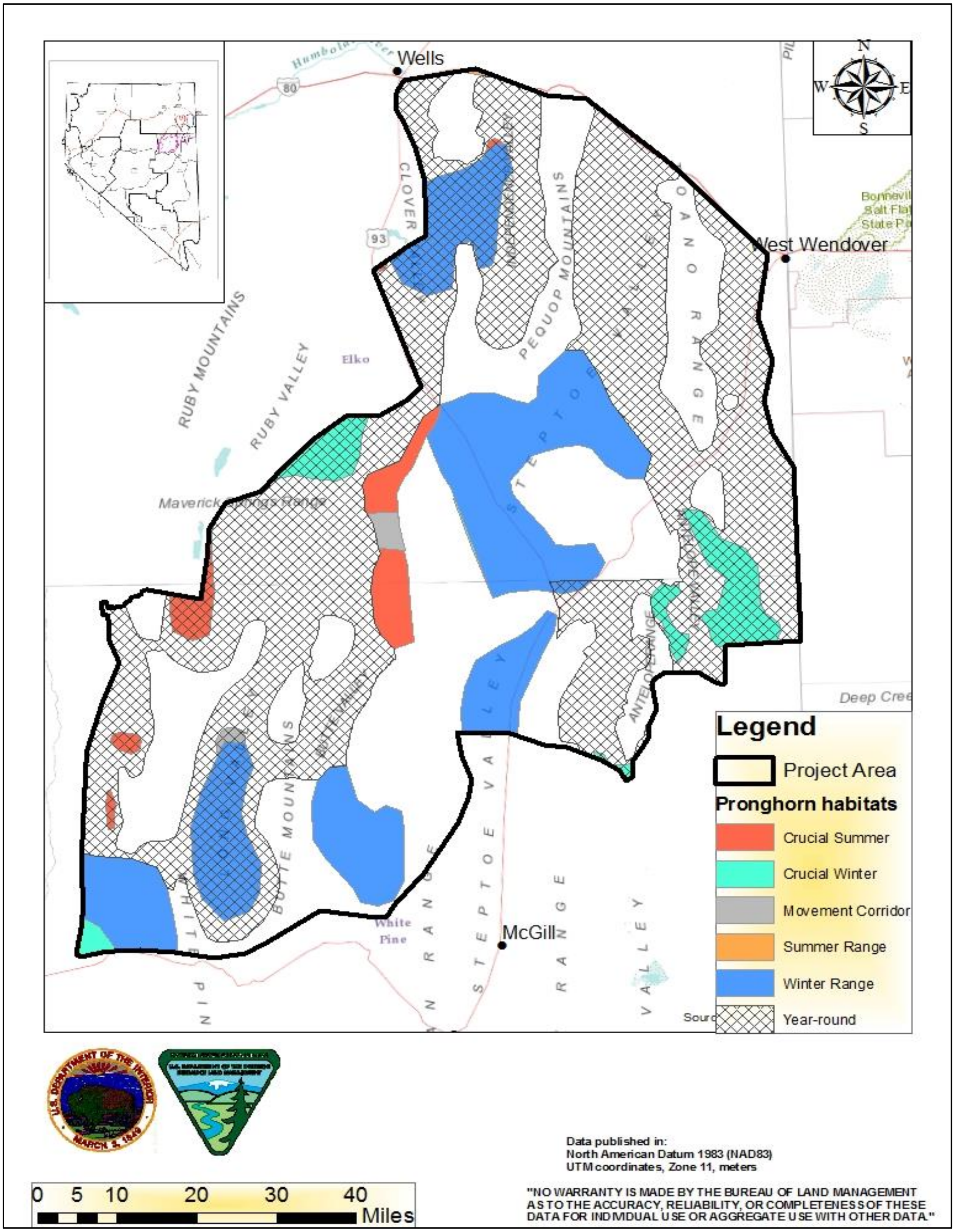


Figure 10. Pronghorn antelope seasonal habitats within the Project Area.

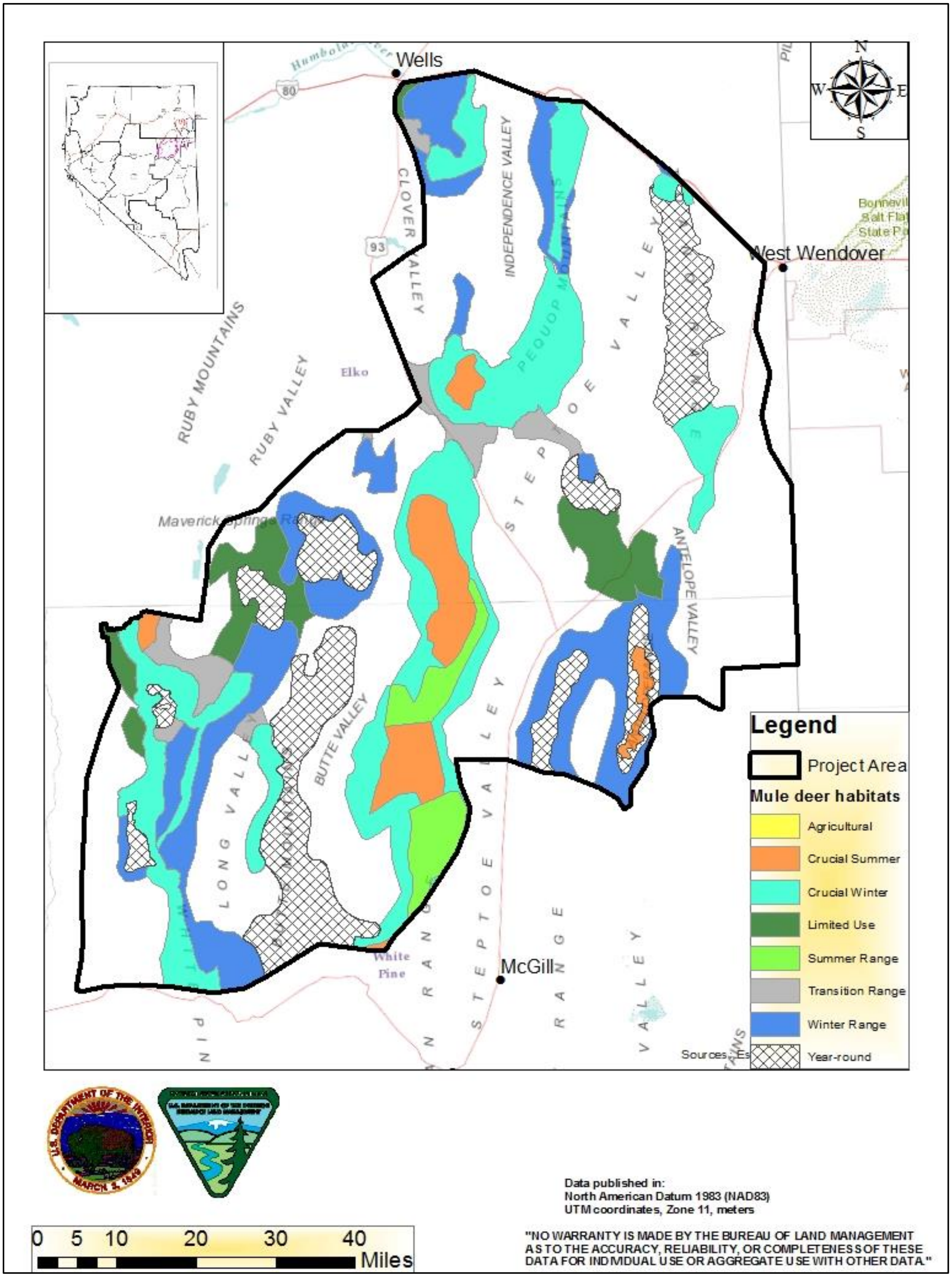


Figure 11. Mule deer seasonal habitats within the Project Area.

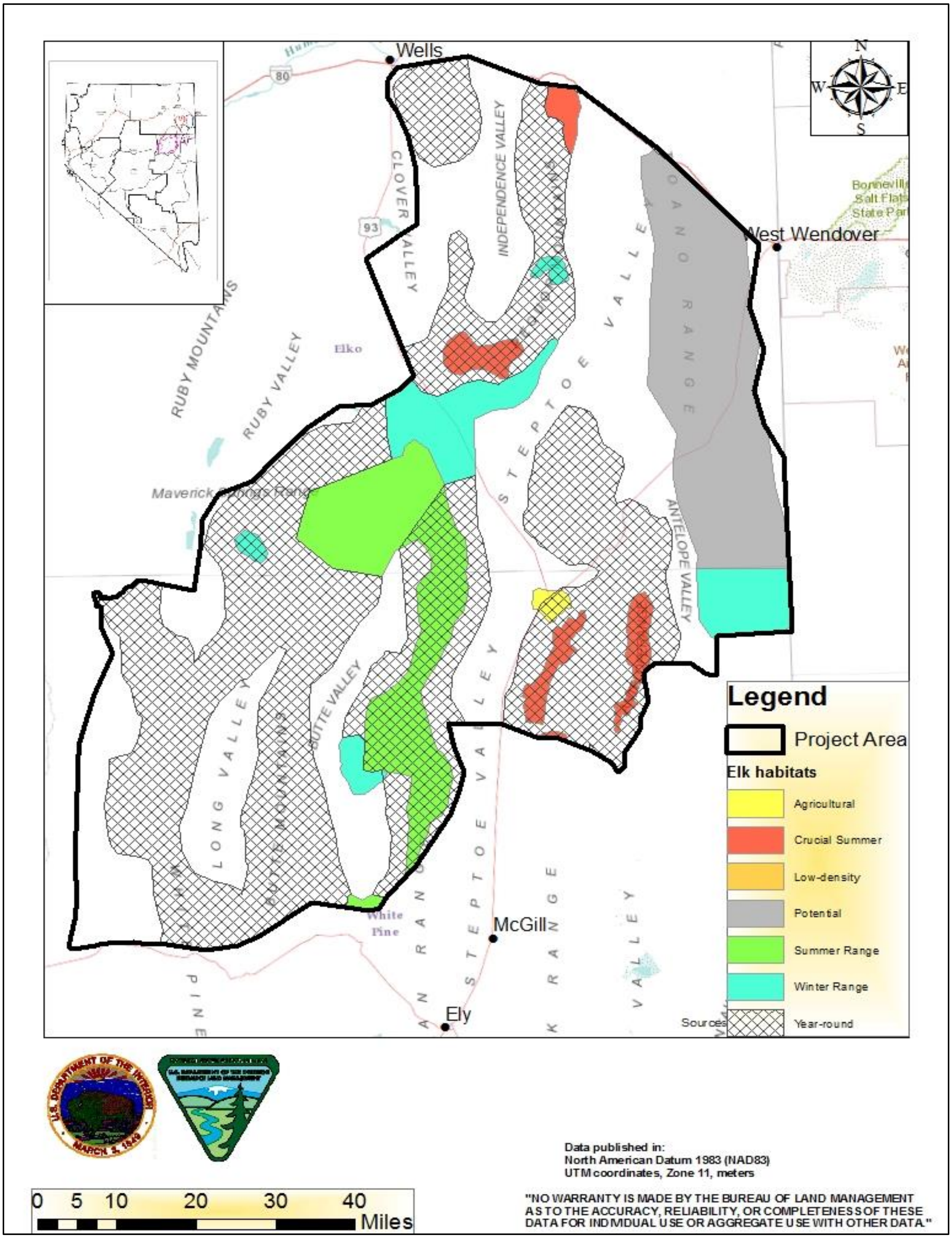


Figure 12. Elk seasonal habitats within the Project Area.

Bighorn Sheep

Bighorn sheep do not occur within the Project Area.

Mountain Lion

Mountain lions occur throughout the project area. Based on sex and age ratios in hunter harvest, long-term harvest data analysis, and recorded mortality, the overall Eastern Region mountain lion population trend is considered to be healthy and stable (NDOW 2016).

<u>Other</u>

The three most common habitat types within the Project Area include Sagebrush, Pinyon-Juniper and Salt Desert Scrub. Although Riparian comprises a relatively small proportion of the available habitat, these areas are of disproportionately high importance to wildlife. Many wildlife species associated with the predominant upland habitat types require riparian habitat to satisfy certain life cycle requirements. Other species derive all of their habitat requirements from these small patches of riparian habitat.

In addition to the predominant upland habitat types, smaller areas of Coniferous Forest, Cliffs, Wet Meadow, Aspen and other unique habitats are present and important on a local scale. The combination of all these habitat types provide quality habitat for over 350 animal species that may occur within northeastern Nevada. Typical wildlife that could be observed within the Project Area include coyote, American badger, pronghorn antelope, black-tailed jackrabbit, deer mouse, Townsend's ground squirrel, common raven, red-tailed hawk, mourning dove, sagebrush lizard and bull snake.

3.2.9.2. Environmental Effects

<u>Effects Common to Alternatives A-C</u>

Direct impacts would consist primarily of disturbance and displacement of wildlife by the low-flying helicopter, running wild horses and construction of temporary trap/holding facilities. Typically, the natural survival instinct of wildlife to this type of disturbance is to flee from the perceived danger. These impacts would be minimal, temporary, and of short duration. There is a slight possibility that slower moving animals would be trampled.

Indirect impacts would be related to decreases in wild horse densities. Reducing the wild horse population to AML would decrease competition for available cover, space, forage, and water between wild horses and wildlife. Reduced utilization of vegetation by wild horses would result in increased plant vigor, production, seedling establishment, and ecological health of important wildlife habitat. Resident populations of mule deer, pronghorn antelope, elk and a myriad of other species would benefit from an increase in forage availability, vegetation density, and heterogeneous structure.

Competition with wildlife for water at artificial reservoirs and water catchments, or natural catchments, would be drastically reduced. More water would be available for a longer period of time for both wild horses at AML and wildlife dependent on the same water source(s). In addition, the reduced numbers of horses at watering sites would be expected to result in wildlife spending more time at these sites with fewer incidences of displacement or exclusion by wild horses (Hall et al. 2016).

<u>Effects Specific to Alternative A</u>

Phased-in Gather, Selective Removal, Fertility Control, Sex Ratio Adjustments and Gelding

With follow-up gathers, the application of fertility control, sex ratio adjustments and gelding of a portion of the male population, impacts to wildlife habitat would still occur, but to a lesser degree over the 10-year period compared to Alternatives B, C and the No Action. Improved habitat conditions and decreased resource competition would be maintained for a longer period of time before wild horse populations exceeded high AML.

<u>Effects Specific to Alternative B</u>

Selective Removal to low AML, Fertility Control and Sex Ratio Adjustments

This alternative would have similar impacts to Alternative A. With the population controls, improved habitat conditions and decreased resource competition would be maintained for a longer period of time compared to Alternative C and the No Action before wild horse populations, once again, increase to high AML or above.

<u>Effects Specific to Alternative C</u>

Selective Removal to low AML, sex ratio adjustments

Impacts to wildlife and habitats would be as described in Impacts from Actions Common to A-C but beneficial impacts from improved native perennial plants would be shorter-lived since the wild horse population would increase faster without the application of fertility control for some mares.

<u>Effects of the No Action Alternative</u>

Wildlife would not be directly disturbed or displaced by gather activities. However, competition between wildlife and wild horses for limited forage and/or water resources would continue to increase. Wild horses are aggressive around water sources and some wildlife may not be able to compete, which could lead to the deaths of individual animals. Habitats associated with wetland and riparian areas would remain degraded due to removal of residual stubble height and soil compaction, leading to increased disturbance and levels of bare ground. Increasing wild horse populations would continue to concentrate in and trample riparian areas, thereby degrading riparian habitats and the important functions these sites provide for many wildlife species. Hall et al. (2016) demonstrated that native wildlife communities were less diverse and less species-rich at watering sites where wild horses had access compared to where they were excluded, likely indicating that fewer wild horses at these sites would be correlated with greater native wildlife diversity.

Habitat conditions would continue to deteriorate as wild horse populations continue to grow, ultimately negatively impacting the vital rates of native wildlife populations within the Project Area. State and transition theory (Stringham et al. 2003) indicates that over-use of many ecological sites, such as winterfat flats, can result in transition to less desirable/productive sites (e.g., noxious/invasive weeds or annual grasses). These transitions may be irreversible and permanent in nature, thus reducing the carrying capacity of the land for many wildlife populations in perpetuity.

3.2.9.3. Cumulative Effects

Cumulative effects of the Action Alternatives would be most impactful to wildlife during the short-term (the 10-yr time period of the Alternatives), specifically during active gather operations when low-flying helicopters are driving horses toward capture sites. Human activity associated with these and water/bait gather operations could temporarily disturb or displace wildlife in these areas. However, when added to PPRFFAs (see Tables 5 and 6), the aggregate impacts of direct and indirect effects are not expected to significantly impact wildlife populations in a negative way. Over both the short and long-term (10-14 years), when added to PPRFFAs, the aggregate impacts of direct and indirect effects are expected to be beneficial for wildlife and their habitats including immediate benefit to wildlife through less competition for forage and water and gradual improvement of upland and riparian health. The Cumulative Impacts from the No Action Alternative would not see beneficial impacts to habitats and wild horse numbers in excess of AML would result in continuing decline of habitat conditions. See Tables 4-6 above.

3.2.10.Vegetation

3.2.10.1. Affected Environment

Dominant vegetation communities in the project area include big sagebrush shrublands (1,068,170 acres; 28% of the project area), piñon-juniper woodlands (941,120 acres; 24%), mixed sagebrush shrublands (810,740 acres; 21%), salt desert scrublands (541,037 acres; 14%), montane sagebrush steppe (229,706 acres; 6%), and greasewood flats (204,442; 5%).

The valleys and lower foothills are dominated by big sagebrush shrublands and salt desert scrublands. Greasewood flats and playas (29,601 acres; <1%) play a minor role in these areas. Big sagebrush shrublands are typically dominated by Wyoming big sagebrush (*Artemisia tridentata* spp. *wyomingensis*) or black sagebrush (*Artemisia nova*) in the overstory. In the understory, graminoid species typically include Indian ricegrass (*Achnatherum hymenoides*), Sandberg's bluegrass (*Poa secunda*), needlegrass (*Hesperostipa comata*), and bottlebrush squirreltail *(Elymus elymoides*). Common forb species include globemallow (*Sphaeralcea* sp.)

and milkvetch (*Astragalus* sp.). Shadscale (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), sickle saltbush (*Atriplex falcata*), bud sagebrush (*Picrothamnus desertorum*), black sagebrush, and rabbitbrush (*Chrysothamnus* and *Ericameria* sp.) are common overstory species in salt desert scrub communities. Common graminoids include those listed above (except needlegrass), in addition to alkali sacaton (*Sporobolus airoides*), inland saltgrass (*Distichlis spicata*), western wheatgrass (*Pascopyrum smithii*), and basin wildrye (*Leymus cinereus*). Forbs are generally limited.

The upper foothills and lower mountain slopes are dominated by pinyon-juniper woodlands and mixed sagebrush shrublands. The pinyon-juniper community is primarily composed of Utah juniper (*Juniperus osteosperma*), Rocky Mountain juniper (*Juniperus scopulorum*) and singleleaf pinyon (*Pinus monophylla*). Understory shrub species, where present, typically include Wyoming big sagebrush, mountain big sagebrush (*Artemisia tridentata* spp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), snowberry (S*ymphoricarpos* sp.), cliffrose (*Purshia stansburiana*) and serviceberry (*Amalanchier* sp.). Graminoid species include bluebunch wheatgrass (*Pseudoroegneria spicata*), Indian ricegrass, Thurber’s needlegrass (*Achnatherum therberianum*), Sandberg’s bluegrass, and bottlebrush squirreltail. Forbs are numerous and varied. Mixed sagebrush shrublands have similar understory species as compared to piñon-juniper woodlands, with the addition of little sagebrush (*Artemisia arbuscula*) as an important shrub component.

The higher mountainous areas are dominated by the montane sagebrush steppe, but also support some small mountain mahogany woodland (32,008 acres; 1%) and mixed conifer forest (14,094 acres; <1%) inclusions. The montane sagebrush steppe is dominated by mountain big sagebrush and little sagebrush, but also supports mountain browse species including serviceberry (*Amelianchier alnifolia*), mountain snowberry (*Symphoricarpos oreophilus*), chokecherry (*Prunus virginiana*) and antelope bitterbrush. Understory graminoids include bluebunch wheatgrass, slender wheatgrass (*Elymus trachycaulus*), Letterman’s needlegrass (*Achnatherum lettermanii*), mountain brome (*Bromus marginatus*), muttongrass (*Poa fendleriana*), Sandberg’s bluegrass, and Indian ricegrass. Forbs are many and varied, balsamroot (*Balsamorhiza* sp.), buckwheat (*Eriogonum* sp.), and milkvetch species are common. The high elevation forests and woodlands support many of these understory species in addition to tree species such as curl-leaf mountain mahogany (*Cercocarpus ledifolius*) limber pine (*Pinus flexilis*), white fir (*Abies concolor*), Rocky Mountain Douglas-fir (*Pseudotsuga menziesii* var. *glauca*) Engelmann spruce (*Picea engelmannii*), and Great Basin bristlecone pine (*Pinus longaeva*).

Annual non-native species such as halogeton (*Halogeton glomeratus*), cheatgrass (*Bromus tectorum*), prickly Russian thistle (*Salsola tragus*), and tall tumblemustard (*Sisymbrium altissimum*) are pervasive across the project area, if not always common. In many areas, past disturbance events (e.g. fire, long-term drought, inappropriate livestock grazing management, unsuccessful vegetation treatments, wild horse overgrazing etc.) have enabled annual species to dominate the landscape (see Figures 13 and 14) (Stringham et al. 2015).

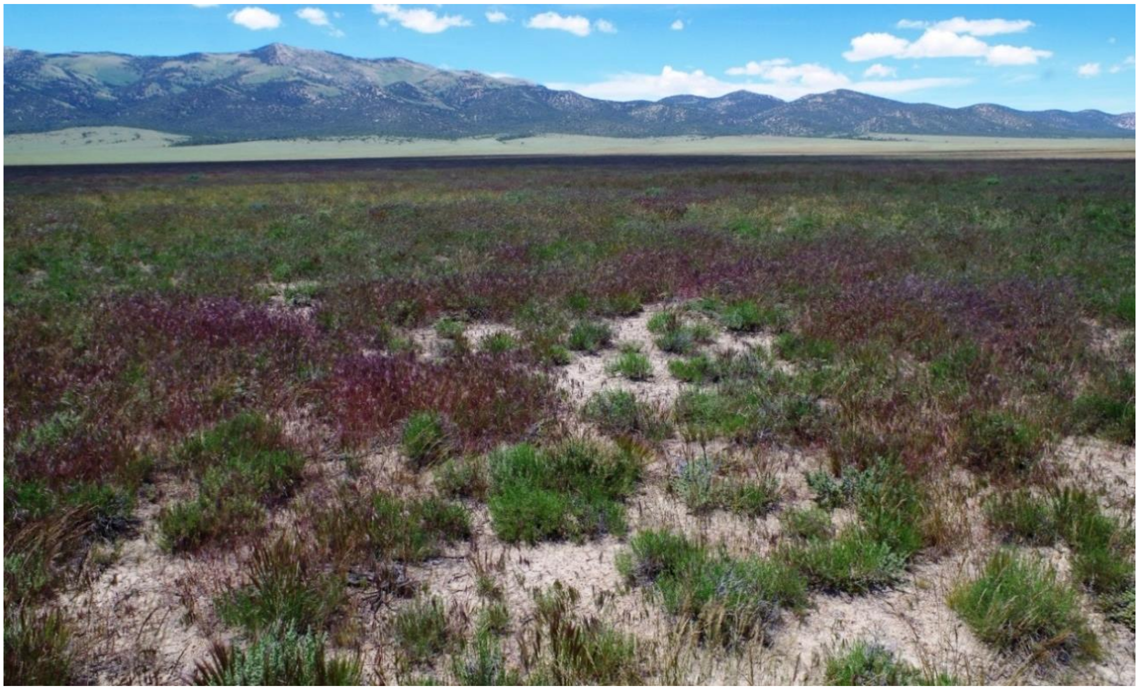


Figure 13. Cheatgrass dominating the understory of a black sagebrush plant community in the Currie Allotment.

Figure 14. A historic winterfat and Indian ricegrass plant community that has been replaced by a non-native annual monoculture.

As the majority of the dominant vegetation communities in the project area (i.e. big sagebrush shrublands, lower elevation pinyon-juniper woodlands, mixed sagebrush shrublands, salt desert scrublands, and greasewood flats – approximately 80% of the project area) are adapted to arid climates with narrow windows for plant establishment and recovery, the resilience of these communities to disturbance is relatively low (Davies et al. 2015; Holechek 2010; Pyke 2011; Romo et al. 1995; Stringham et al. 2015). As such, care needs to be taken in these communities to ensure that ecological thresholds are not crossed. When transitions to alternative stable states are made in these vegetation communities, the recovery of crucial ecosystem processes and functions may not be possible without substantial energy input (Anderson and Holte 1981, Anderson and Inouye 2001, Briske et al. 2008; Clements 2011, Curtin 2002; Pyke 2011, Rice and Westoby 1978, Stringham et al. 2015; Wambolt and Payne 1986, West et al. 1984).

Across the project area there are over 100 distinct ecological sites. A full analysis of the impacts of the alternatives on each of these ecological sites would be unnecessarily redundant and complex as many of these sites are similar. To simplify the analytical process, disturbance response groups (DRGs) are the base ecological unit for the vegetation analysis in this EA[3]. DRGs are groupings of ecological sites that act similarly when subjected to ecological stresses such as overgrazing. State-and-transition models (STMs) developed by Stringham et al. (2015)[4] are tied to DRGs and are most relevant at the DRG-scale.

The record clearly shows that overgrazing has occurred and is occurring across almost all sampled DRGs within the project area (see Table 14) and that allotments are being impacted differently (see Table 15). In some areas wild horses are the causal factor (Table 15 and Figures 15-20); whereas in other areas wild horses and livestock are both contributing factors (Table 15). Median utilization levels are actually higher in pastures where livestock no longer graze or where only pre-livestock use data were collected as compared to pastures where both livestock and wild horse use is occurring – 78% as compared to 66%, respectively. As stated in the affected environment section, many of the ecological sites within the project area have low resilience to disturbance (Blaisdell and Holmgren 1984; Chambers et al. 2014). These sites respond poorly to overgrazing (Holechek et al. 2010) and, depending on the current state, can

[3] Although the broad dominant vegetation communities described above are useful for descriptive purposes, they have little useful quantitative community data attached to them, e.g. state-and-transition models cannot be directly applied to these communities.

[4] As defined by Stringham et al. (2015): *"[A] state-and-transition model… identifies the different vegetation states, describes the disturbances that caused vegetation change, and the restoration activities needed to restore plant communities. State-and-transition models are powerful tools that utilize professional knowledge, data and literature to describe the resistance and resilience of an ecological site to various disturbances, the triggers leading to ecological thresholds, the feedback mechanisms maintaining ecological states and the restoration techniques required for moving from one ecological state to another."*

cross ecological thresholds and transition to undesirable alternative stable states that provide only limited ecosystem services and have low ecological resilience (Chambers et al. 2014; Stringham et al. 2015).

The main thrust of the vegetation analysis will focus on those DRGs where wild horse and livestock use data have been collected. Eighty percent of all utilization samples (117 of 150) were collected within five DRGs: 28 1B, 28 18AB, 28 3B, 28 1A, and 28 7B (see Table 14). These DRGs encompass approximately 1.6 million acres, 40% of the total project area. The sites within these DRGs were selected for monitoring due to their value in providing forage for wildlife, livestock, and wild horses. Most of these DRGs include shrub and herbaceous species that maintain palatability through the winter months. The median use level within these top five DRGs is 68%.

Table 14. Summary of median utilization by disturbance response group (DRG). The descriptions are summarized from Stringham et al. (2015). Cell colors represent specific utilization levels: blue = slight, 0-20%; green = light, 20-40%; yellow = moderate, 40-60%; orange = heavy, 60-80%; and red = severe, 80-100%.

DRG	Description	Acres	Median Utilization	Samples
28 1B	Soils: shallow calcareous loam, gravelly, 8-12" precip. Vegetation: black sagebrush, shadscale, winterfat, Indian ricegrass, and needle and thread.	699,373	55%	38
28 18AB	Soils: deep silt, 5-10" precip. Vegetation: winterfat, bud sagebrush, and Indian ricegrass.	111,847	72%	33
28 3B	Soils: loam, 8-12" precip. Vegetation: Wyoming big sagebrush, Indian ricegrass, needle and thread, and Thurber's needlegrass.	391,844	69%	24
28 1A	Soils: calcareous loam, 6-12" precip. Vegetation: black sagebrush, shadscale, winterfat, Indian ricegrass, needle and thread, and several warm-season grasses.	222,875	66%	13
28 7B	Soils: clay/loam, gravelly, 12-16" precip. Vegetation: mountain big sagebrush, antelope bitterbrush, bluebunch wheatgrass, and Thurber's needlegrass.	128,632	70%	9
28 19AB	Soils: saline terrace, 5-10" precip. Vegetation: sickle saltbush, Indian ricegrass, and western wheatgrass.	27,034	85%	6
28 2B	Soils: shallow clay/loam, gravelly/cobbly, 10-14+" precip. Vegetation: black sagebrush, bluebunch wheatgrass, yellow rabbitbrush, and bluegrasses (*Poa* sp.).	350,247	64%	6
28 12AB	Soils: deep, salt affected, 8-12" precip. Vegetation: big sagebrush, black greasewood, and basin wildrye.	233,827	88%	5
28 16B	Soils: loam/silt, alkaline and calcareous, 5-10" precip. Vegetation: shadscale, black greasewood, and basin wildrye.	114,292	74%	5
28 21AB	Soils: shallow, rock fragments, 10-14" precip. Vegetation: Utah juniper, singleleaf pinyon, black sagebrush, bluebunch wheatgrass, and Indian ricegrass.	796,531	88%	4

DRG	Description	Acres	Median Utilization	Samples
28 29AB	Soils: variable, rock fragments, 14-22" precip. Vegetation: curl-leaf mountain mahogany, mountain big sagebrush, and bluebunch wheatgrass.	74,910	81%	2
28 15AB	Soils: deep, salt and sodium affected with a high water table, 5-10" precip. Vegetation: black greasewood, basin wildrye, alkali sacaton, and inland saltgrass.	59,557	88%	1
28 16A	Soils: gravelly loam, alkaline and calcareous, 5-8" precip. Vegetation: shadscale, bud sagebrush, winterfat, and Indian ricegrass.	79,440	69%	1
28 4B	Soils: shallow claypan, gravelly, 12-16" precip. Vegetation: low sagebrush, antelope bitterbrush, Utah serviceberry, bluebunch wheatgrass, and various forbs.	18,549	66%	1
25 1	Soils: claypan, 8-16" precip. Vegetation: low/black sagebrush, antelope bitterbrush, Utah serviceberry, bluebunch wheatgrass, Thurber's needlegrass, and various forbs.	13,504	48%	1
28 8AB	Soils: deep loam, 14-20+" precip. Vegetation: mountain big sagebrush, bluebunch wheatgrass, slender wheatgrass, Letterman's needlegrass, mountain brome, and snowberry.	52,251	13%	1
Total		**3,374,713**	**70%**	**150**

Table 15. Summary of median use levels for each of the pastures within allotments where utilization was sampled in the project area. All data were gathered within the last three years. In pastures where wild horses are listed as the primary user, data was collected previous to livestock turnout or livestock no longer use the pasture. Cell colors represent specific utilization levels: blue = slight, 0-20%; green = light, 20-40%; yellow = moderate, 40-60%; orange = heavy, 60-80%; and red = severe, 80-100%.

Allotment	Pasture	Primary User	Median Utilization
Bald Mountain	--	Wild Horse	77%
Becky Creek	--	Cattle and Horse	70%
Becky Springs	--	Cattle and Horse	60%
Chin Creek	Spring Valley	Cattle and Horse	58%
"	Antelope Range	Cattle and Horse	66%
"	Black Hills	Cattle and Horse	56%
"	Antelope Valley South	Cattle and Horse	68%
"	Antelope Valley North	Cattle and Horse	66%
Currie	Currie Flats	Cattle and Horse	59%
Dry Mountain	--	Cattle and Horse	70%
Horse Haven	--	Wild Horse	80%
Maverick/Ruby #9	Ruby #9	Wild Horse	93%
"	Ruby Wash	Wild Horse	90%
Maverick Spring	--	Wild Horse	13%
Medicine Butte	Hunter Point	Cattle and Horse	47%
"	Telegraph	Cattle and Horse	88%
"	Butte Valley	Cattle and Horse	36%
"	Sloughs/Meadows	Cattle and Horse	63%
"	Pony Mountain/Paris Seeding	Wild Horse	80%
Moorman Ranch	Long Valley	Cattle and Horse	53%
"	Antelope	Cattle and Horse	30%

Allotment	Pasture	Primary User	Median Utilization
"	Divide	Cattle and Horse	70%
Newark	Newark Winter	Cattle and Horse	51%
North Butte	--	Wild Horse	88%
North Steptoe	--	Cattle and Horse	62%
Sampson Creek	--	Cattle and Horse	72%
South Butte	--	Cattle and Horse	13%
Spruce	C-1	Cattle and Horse	80%
"	C-1a	Wild Horse	77%
"	C-3	Cattle and Horse	70%
"	C-4	Wild Horse	77%
"	D-2	Cattle and Horse	77%
"	E-1	Cattle and Horse	61%
"	E-2	Cattle and Horse	72%
Thirty Mile Spring	--	Wild Horse	47%
Tippett	N.S.V., West Bench	Cattle and Horse	38%
"	N.S.V., East Bench	Cattle and Horse	69%
Valley Mountain	A-2	Wild Horse	93%
"	B-2	Cattle and Horse	76%
Warm Springs	Newark Valley	Cattle and Horse	88%
"	Buck and Bald	Cattle and Horse	50%
"	Nevada	Cattle and Horse	78%
"	Long Valley Wash	Cattle and Horse	59%
"	Long Valley	Cattle and Horse	52%
"	Warm Springs	Cattle and Horse	76%

Figure 15. Severe use by wild horses on Indian ricegrass and winterfat has likely played a role in transitioning this community in disturbance response group 28 18AB to a shrub state (July 2013). This area in the Maverick-Medicine HMA has not been grazed by livestock in more than five years.

Figure 16. Heavy use by wild horses on native bunchgrasses has likely contributed to the degraded understory found in this sagebrush community in disturbance response group 28 3B (May 2015). This area in the Maverick-Medicine HMA has not had surface disturbance or been grazed by livestock in more than five years.

Figure 17. Severe use by wild horses on winterfat in the Maverick-Medicine HMA (April 2015); this area has not been grazed by livestock in more than five years.

Figure 18. Severe use on Indian ricegrass previous to livestock turnout in the Antelope Valley HMA (September 2015).

Figure 19**.** Extreme use by wild horses on Indian ricegrass and winterfat has likely been a contributing factor in this site crossing an ecological threshold to an annual state (January 2015). The herbaceous stubble is cheatgrass with has very limited forage value when dormant. Mature cheatgrass plants are unpalatable, the characteristic drooping seed heads becoming brittle as the plant dries, shattering upon disturbance and disseminating the sharp-tipped seeds with their barbed awns. These sharp-tipped seeds work their way into the eyes, nostrils, mouths, and

intestines of grazing animals.This area in disturbance response group 28 1B in the Antelope Valley HMA has not been grazed by livestock in more than five years.

Figure 19a. Severe use on crested wheatgrass by wild horses previous to livestock turnout puts this community at risk of a transition to an annual state (March 2015). This community is in disturbance response group 28 3B in the Spruce-Pequops HMA.

Figure 20. Heavy use by wild horses on native bunchgrasses has likely contributed to the replacement of deep rooted perennial bunchgrasses with non-native annual species in this community in disturbance response group 7B (May 2015). The current degraded state of this community is at risk of further losses to ecosystem services if overgrazing continues and/or if

the site is subjected to a disturbance event (e.g. wildland fire). This area in the Spruce-Pequops HMA has not been grazed by livestock in more than five years.

3.2.10.2. Environmental Effects

<u>Effects of the No Action Alternative</u>

Currently, most DRGs in the project area are being impacted by overgrazing – both in areas where wild horses and cattle or sheep graze conjointly, and where wild horses are the sole grazer (see Table 15 and Figures 15-20). These impacts are both concentrated (e.g. hoof action and trampling in the vicinity of water sources) and diffuse (e.g. inappropriate grazing across much of the project area) and have been ongoing for some time.

Concentrated impacts would likely continue to increase with the current wild horse numbers. These impacts can be severe in nature, but are generally limited in scope to relatively small areas where wild horses congregate (see Figure 21). These impacts would be both short-term and long-term, as the recovery of these denuded areas is difficult. It is important to note that, for the most part, much of the damage that is possible has already occurred.

Figure 21**.** Upland area proximal to a Boone Spring in the Spruce-Pequops HMA that has been heavily impacted by wild horses concentrating in the area (September 2016).

Diffuse impacts have a much greater potential to detrimentally affect vegetation communities in the project area. In all of the STMs for the DRGs where utilization data have been collected, inappropriate grazing is listed as a phase pathway in plant community transitions to undesirable alternative stable states (Stringham et al. 2015). Were the no action alternative selected, it is likely that wild horses would continue to negatively impact vegetation communities across the project area. These impacts would be detrimental in the short-term. It is possible that some of these short-term impacts could be mitigated in the future through proper management and restoration treatments; however, in many at risk vegetation communities, these impacts may lead plant communities across ecological thresholds to alternative stable states with reduced ecosystem services. Once an ecological threshold has been crossed, system recovery is often not possible, even with the implementation of active restoration treatments.

As explained in the affected environment section for this resource, the main thrust of the vegetation analysis will focus on those DRGs where the majority of the wild horse and livestock use data have been collected. These DRGs are key to maintaining the forage base for wildlife, livestock, and wild horses across the project area. The ecological principles, concepts, and conclusions drawn in the analysis of these key DRGs apply broadly to most vegetation communities across the project area.

DRGs 28 1A and 28 1B

Disturbance Response Group 28 1B is a grouping of arid bordering on xeric ecological sites with calcareous, gravelly soils. Ecological sites within these DRGs can be deep, but typically have a hardpan or restrictive layer that limits rooting depth. Black sagebrush is the dominant shrub at this site, but shadscale, spiny hopsage, and winterfat are also important. Indian ricegrass and needle and thread – deep-rooted cool season perennial bunchgrasses – dominate the understory. In DRG 1A the presence of summer monsoonal precipitation allows for the growth of several warm-season grasses, including galleta (*Pleuraphis* sp.), sand dropseed (*Sporobolus cryptandrus*), and threeawn (*Aristida* sp.). In DRG 28 1B Sandberg's bluegrass and bottlebrush squirreltail are common.

The recommended utilization level for these DRGs is 60% or less (Stringham et al. 2015), especially in areas where winterfat and needle and thread are present. Winterfat and needle and thread are both intolerant of grazing during the growing season (Romo et al. 1995; Smoliak et al. 1972; Tueller and Blackburn 1974). For this reason, areas where species such as winterfat are common or dominant are often only permitted for livestock grazing during the dormant season (see Actual Use Tables 8 and 9). The vulnerability of these communities to growing season use is a problem because wild horses utilize these ecological sites year round (Bruce Thompson, Ruth Thompson, and Ben Noyes, personal communication). Even where season of use is not an issue, half of the utilization samples collected in these DRGs exceed 60% use – 15% exceed 80% use.

The state and transition models for the ESDs within these DRGs indicate that inappropriate grazing can play an important role in transitioning sites to undesirable alternative stable states.

Based on field observations, many of the plant communities within this DRG are currently in good[5] (i.e. Current Potential State 2.0 within the STM) or fair condition[6] (i.e. Shrub State 3.0 within the STM). For those communities in good condition, important herbaceous species are still present, if not dominant, and invasive species are limited. However, as indicated in the STM, inappropriate grazing is a pathway by which these communities can transition from good to fair condition.

The growing season use by wild horses and the combined cattle and wild horse utilization levels described above constitute inappropriate grazing. Were the No Action Alternative selected, it is expected that with time some plant communities in good condition within DRGs 28 1A and 28 1B would transition to a shrub dominated state with reduced ecological resilience (i.e. ability to recover from disturbances such as fire or soil surface disturbance). Once in a shrub dominated state (i.e. Shrub State 3.0), it is not likely that perennial herbaceous species would recover in the short- or long-term, even were passive (e.g. the future removal of wild horses) or active restoration (e.g. the input of energy through vegetation manipulation) treatments implemented (Curtin 2002; Davies et al. 2014a; Suding et al. 2004).

Furthermore, this shrub dominated state is vulnerable to further transitions. It is likely that the selection of the No Action Alternative could, in some cases, accelerate the encroachment of Utah juniper and the transition to a woodland state (i.e. Tree State 4.0 in the STM) (Stringham et al. 2015). Both woodland and shrub states are vulnerable to a final transition to an annual state (i.e. Annual State 5.0 in the STM) where species such as halogeton and cheatgrass dominate and most ecological services are lost. Inappropriate grazing does not play a direct role in this transition; however, the selection of the No Action Alternative would negatively impact the overall ecological resilience of most plant communities within the project area, including DRGs 28 1A and 28 1B (Brooks and Chambers 2011; Carpenter et al. 2001; Gunderson 2000). As such, the selection of this alterative would likely limit recovery following fire, indirectly increasing the likelihood that plant communities within these two DRGs would eventually transition to an annual state.

DRG 28 18AB

Disturbance Response Group 28 18AB is a grouping of xeric ecological sites with deep silty soils. In this group winterfat dominates the overstory and Indian ricegrass dominates the

[5] Sites in good condition are those in the Current Potential State. They have not yet crossed an ecological threshold to an alternative stable state with reduced ecological services, but differ from the reference state in that non-native annual species have been introduced.
[6] Sites in fair condition are those in a Shrub State. They have crossed an ecological threshold to an alternative stable state where shrubs dominate, perennial herbaceous species are generally lacking, and annual and encroaching woodland species are sub-dominant but may be increasing. As compared to sites in good condition, fair sites have reduced ecological resilience and are, as a whole, at risk.

understory. Squirreltail, galleta grass, bud sagebrush, and fourwing saltbush are also common to these sites.

As discussed previously, winterfat does not tolerate growing season use or overgrazing in general (Ogle et al. 2001; Leary 2008). For this reason, areas where species such as winterfat are common or dominant are often only permitted for livestock grazing during the dormant season (see Actual Use Tables 8 and 9). The vulnerability of these communities to growing season use is a problem because wild horses utilize these ecological sites year round (Bruce Thompson, Ruth Thompson, and Ben Noyes, personal communication). Although Indian ricegrass is more tolerant of grazing during the growing season, it too declines if grazing exceeds moderate levels (Blaisdell and Holmgren 1984; Chambers and Norton 1993; Davies et al. 2015; Leary 2008). The median utilization level for this ecological DRG is 72%, well into the heavy utilization range; 27% of the samples exceeded 80% utilization. This level of use is not sustainable for any of the rangeland ecological sites in the Great Basin, let alone sites that average 5-10” of precipitation annually.

The state and transition models for the ESDs within this DRG indicate that inappropriate grazing is the most important pathway by which these sites transition to undesirable alternative states. The other pathways are already in place (i.e. introduced species are present: Dayton 1951; Young 2002) or are naturally uncommon (i.e. wildland fire is very rare in these systems: Stringham et al. 2015). Plant communities within this DRG are found in all the various states outlined in the STM. Field observations indicate that many are currently in good (i.e. Current Potential State 2.0 within the STM) or fair condition (i.e. Shrub State 3.0 within the STM). Communities in the annual state (i.e. Annual State 4.0 in the STM) are found throughout the project area. Some few communities are still relatively undisturbed and in excellent condition (i.e. Reference State 1.0). For those communities in good or excellent condition, important herbaceous species are still present, if not dominant, and invasive species are absent or limited.

The growing season use by wild horses and the combined cattle and wild horse utilization levels described above constitute inappropriate grazing; indeed, the levels of grazing observed within this DRG are entirely unsustainable (Leary 2008). Were the No Action Alternative selected, it is expected that some plant communities in good condition within DRG 28 18AB would transition to shrub dominated states with reduced ecological resilience. Once in a shrub dominated state, it is unlikely that perennial herbaceous species would recover in the short- or long-term, even were passive or active restoration treatments implemented (Suding et al. 2004).

Perhaps more importantly for this DRG, it is likely that the selection of the No Action Alternative could eventually lead many good and fair sites across the ultimate ecological threshold to an annual state (i.e. Annual State 5.0 in the STM) where species such as halogeton and cheatgrass dominate and most ecological services are lost (Billings et al. 1994; Knapp 1996). The full recovery of winterfat communities following the transition to the annual state has never been documented (Clements et al. 2010; Pellant and Reichert 1984). The selection of the No

Action Alternative would negatively impact the overall ecological resilience of most plant communities within the project area, including DRG 28 18AB (Brooks and Chambers 2011; Carpenter et al. 2001; Gunderson 2000).

DRG 28 3B

Disturbance Response Group 28 3B is a grouping of arid ecological sites with moderately deep to deep loamy soils. Generally, ecological sites within this DRG are dominated by Wyoming big sagebrush in the overstory and Indian ricegrass in the understory. Needle and thread and Thurber's needlegrass are also important understory species at some of the sites.

As discussed previously, while Indian ricegrass is generally tolerant of moderate grazing during the growing season, whereas dormant season grazing is recommended for Thurber's needlegrass and needle and thread (Davies et al. 2015; Ganskopp 1988; Stringham et al. 2015). As with the other DRGs discussed previously, this DRG is utilized year round by wild horses (Bruce Thompson, Ruth Thompson, and Ben Noyes, personal communication) and utilization greatly exceeds moderate levels – 60% of the utilization samples collected in this DRG exceed 60% use, 20% exceed 80% use.

The state and transition models for the ESDs within these DRGs indicate that excessive grazing (i.e. grazing during the growing season or heavy use) can play an important role in transitioning sites to undesirable alternative stable states. Based on field observations, many of the plant communities within this DRG are currently at risk – either in fair condition (i.e. Shrub State 3.0 in the STM) or in good condition, but with a reduced perennial understory (i.e. Current Potential State 2.3 in the STM). The overall lack of herbaceous species can be attributed in part to historic inappropriate livestock grazing practices; however, current overgrazing is a contributing to the problem.

The herbaceous species found in this DRG cannot continue to sustain heavy use levels and persist (Davies et al. 2014b; Holechek et al. 2010). If the no action alternative is selected, inappropriate grazing would continue. It is likely that under these conditions, even in the absence of fire, future stressors (e.g. drought) will lead these communities across ecological thresholds to an alternative state with a sagebrush overstory and a non-native annual understory (i.e. Annual State 4.2 in the STM). These degraded communities have very low ecological resilience and are likely to transition to an annual monoculture if the sagebrush overstory is disturbed (Davies et al. 2012; Wisdom et al. 2005).

The selection of the No Action Alternative would negatively impact the overall ecological resilience of most plant communities within the project area, including DRG 28 3B (Brooks and Chambers 2011; Carpenter et al. 2001; Gunderson 2000). As such, the selection of this alterative would likely limit recovery following fire, indirectly increasing the likelihood that plant communities within this DRG would eventually transition to an annual state. As discussed previously, once in an annual state, the recovery of these systems is unlikely. If the no action alternative is selected and sites transition to an annual state, the removal of excess wild horses in the future will do nothing to promote the recovery of these systems.

In certain cases, the selection of the No Action Alternative could accelerate the encroachment of Utah juniper and the transition to a woodland state (i.e. Tree State 4.0 in the STM) (Stringham et al. 2015).

DRG 28 7B

Disturbance Response Group 28 7B is a grouping of arid ecological sites with moderately deep to deep soils having high rock fragment volumes. The topographic variability of this DRG creates a broad range in native plant communities. The overstory is typically dominated by mountain big sagebrush and antelope bitterbrush; serviceberry, snowberry, and Mormon tea are also important components in the shrub community. Deep-rooted perennial bunchgrasses comprise the majority of the understory, including bluebunch wheatgrass, Thurber needlegrass, basin wildrye Indian ricegrass, squirreltail, and muttongrass.

The response of these species to grazing is varied. Use of antelope bitterbrush by ungulates is closely related to season. As the season progresses and grasses go dormant, the relative palatability of this species increases (Ganskopp et al. 1999). Although more tolerant of grazing in the spring, antelope bitterbrush does not persistent under consistent heavy grazing (Ganskopp et al. 1999; Krannitz et al. 2008; McConnell and Smith 1977). Bluebunch wheatgrass and Thurber needlegrass are sensitive to grazing during the early growing season when they're in the boot stage (Britton et al. 1990; Ganskopp 1988). As with bitterbrush – and most rangeland species – bluebunch wheatgrass, Thurber needlegrass, and basin wildrye decline under heavy grazing (Krall et al. 1971; Britton et al. 1990; Holechek et al. 2010). The median utilization level sampled in DRG 28 7B was 70%, well beyond the light and moderate use levels recommended for this group.

Inappropriate grazing is the one of the most important pathways by which these sites in DRG 28 7B transition to undesirable alternative states. As explained in the analysis of 28 3B, this is primarily accomplished as heavy grazing reduces the presence and vigor of perennial herbaceous species (Stringham et al. 2015). This shifts community dynamics towards shrub dominance and increases invasibility by opening ecological niches (Davies et al. 2000). If the no action alternative is selected, inappropriate heavy grazing would likely continue and many communities would shift towards shrub dominance (i.e. Shrub State 3.0 in the STM). This would provide a pathway for annuals to increase their presence in the understory; some systems would likely cross thresholds to an annual dominated state that retains an intact overstory (i.e. Annual State 4.2). These alternative shrub or annual states have low ecological resilience and are difficult to restore to their current potential (i.e. Current Potential State 2.0).

A complicating factor for this DRG is that, unlike DRG 28 3B, fire is a common disturbance. Thus, while selecting the no action alternative would likely result in more communities making the transition to an annual monoculture (i.e. Annual State 4.1 in the STM), the chances of successful recovery following fire to a perennial state (i.e. Seeded State 6.0 or Current Potential State 2.4) are also greater.

Overall Summary

The No Action Alternative would have negative, short and long term impacts on vegetation communities throughout the project area. If this alternative is selected, these impacts would be concentrated (e.g. trampling of vegetation in the vicinity of water sources) and diffuse (e.g. overgrazing across broad areas). As detailed above, diffuse impacts are largely tied to overgrazing and generally fall into two broad groups: 1) a general shift to various shrub dominated states as perennial herbaceous species are weakened, and 2) an increase in annual species and a transition towards an annual state as ecological resilience is compromised and the loss of desirable species increases invasibility. It is likely that the selection of the no action alternative would eventually result inthe impacts outlined above. If communities within the project area transition to undesirable alternative stable states (e.g. shrub or annual dominance), ecosystem services – including the capacity to produce forage for wildlife, livestock, and wild horses – would be lost. This could in turn lead to the development of a positive feedback loop where reductions in forage production (i.e. carrying capacity), increase the pressure on intact communities, further degrading rangeland health, etc. There is likely room for debate with regard to the rate or completeness of the loss of ecosystem services within the project area if the no action alternative is selected; however, it is very likely that if this alternative is selected, vegetation communities would decline and ecosystem services would be lost.

Effects of the Proposed Action and Alternatives B and C

The Proposed Action and Alternatives B and C, i.e. the gather alternatives, would overall have similar impacts on vegetation communities as all include similar gather methods and would reduce wild horse numbers to AML. The selection of these alternatives would result in a net conservation gain for vegetative resources. Negative impacts tied to gather activities would be minor and largely temporary. Furthermore, these effects would be wholly superseded by the major positive impacts that would be realized with reduced wild horse number.

All of the alternatives that include gather activities would have concentrated impacts on vegetation at gather sites and holding locations if selected. Native vegetation proximal to temporary gather corrals and holding facilities would be disturbed by concentrated wild horses in addition to vehicles. These concentrated impact areas would be relatively small in size (less than one acre). These impacts would largely be short-term; however, some impacts to vegetation communities (e.g. mechanical damage to sagebrush) could persist. These impacts would be mitigated wherever possible by the strategic placement of gather corrals and holding facility locations. These facilities are usually placed in areas easily accessible to livestock trailers and standard equipment, often utilizing roads, gravel pits or other previously disturbed sites, and which are accessible using existing roads. New roads are not created to construct capture corrals. Impacts from potential trap sites would be minimal and generally short-term: temporary panels would be used, and wherever possible, trap sites would be set near roads or in previously disturbed areas. Other gather actives (e.g. gathering horses) would have minimal effects as wild horses naturally move and graze in large groups.

These concentrated impacts would be balanced by a reduction in impacts at wild horse congregation areas. Reducing wild horse numbers to AML would greatly reduce competition for water and would lower pressure in concentration areas across the project area. It is not likely that heavily impacted congregation areas will recover in the short-term (e.g. Figure 21); however, in the long-term, it is likely that some level of recovery will occur, especially in sites less severely damaged.

Diffuse impacts associated with inappropriate grazing by wild horses would be greatly reduced were the Proposed Action Alternative, Alternative B, or Alternative C selected. Each of these alternatives would reduce wild horse numbers to AML. This substantial reduction in wild horse numbers would likely slow, stop, or reverse the vegetation community declines expected if the no action alternative is selected.

Many of the pastures/allotments in the project area are no longer grazed by livestock – or are grazed only fractionally. These pastures and allotments – in which utilization objectives are exceeded in the absence of livestock (see Table 8) – would likely benefit the most. Grazing by wild horses within these pastures is completely unmanaged and often occurs at times of the year that native species are most vulnerable to grazing. In these pastures and in all pastures across the project area, the resumption of managed grazing will benefit vegetation communities currently impacted by overgrazing. However, it's not likely that substantial changes in community dynamics would occur in those systems that have already crossed ecological thresholds. For many communities, rest from grazing would have only neutral to slightly positive effects in restoring their current potential; the greatest benefits would be realized in communities currently in decline, but still intact (Curtin 2002; Davies et al. 2014; Fleischer 1994; Rice and Westoby 1978; Stevens et al. 2004; Stringham et al. 2015).

Foreseeing, with any level of exactitude, how vegetation communities will change if wild horses are reduced to AML, is likely impossible. However, it is highly likely that selection of any one of the gather alternatives would benefit vegetation communities across the project area, as compared to the no action alternative.

3.2.10.3. Cumulative Effects

The direct and indirect effects of the alternatives on vegetation would likely interact cumulatively with the effects on vegetation related to the following past, present, and reasonably foreseeable future actions: livestock grazing, non-native invasive species treatments, wild horse management, and wildfires.

Historically, livestock grazing has been one of the primary modifiers of vegetation communities in the Great Basin. In the past – and in some cases, in the present – the effects of livestock grazing on native ecosystems have been principally negative: perennial herbaceous species have declined, non-native species have been introduced and provided opportunities for invasion, shrubs have come to dominate many communities, wildfire intensity and frequency have been modified, and woodlands have replaced shrublands (Beck and Mitchell 2000; Curtin 2002; Fleischner 1994; Holechek et al. 2010; Jones 2000; Stringham et al. 2015). The result of these impacts is that few rangelands are found in a reference state, and many – even in the absence of overgrazing by wild horses – lack resilience and are at risk of transitioning to an undesirable alternative state.

As such, vegetation communities throughout the project area have the potential to interact cumulatively with the No Action Alternative. As detailed in the analysis above, the No Action Alternative is likely to put further stress on native plant communities in the project area. In combination with the past, present, and reasonably foreseeably future impacts of livestock grazing, the No Action Alternative is likely to result in substantial cumulative effects. These cumulative impacts would manifest primarily in the accelerated compromising of ecological resilience and movement towards and across undesirable ecological thresholds.

Much like livestock grazing, wild horse management and wildfires have the potential to interact cumulatively with the effects of the alternative proposed in this EA. Past wild horse management, which has allowed wild horse numbers to greatly exceed AML, has likely been a contributing factor in putting vegetation communities at risk, as explained in the analysis in this section. Implementing the No Action Alternative would result in cumulative impacts as communities put at risk in part by past wild horse management are additively compromised by the effects of the No Action Alternative. As detailed in the effects analysis, the gather alternatives would overall have neutral to positive effects on the vegetation communities in the project area; the effects of these alternatives would mitigate to a limited extent the impacts of past and future wild horse management, but no cumulative effect would occur.

Wildfires – both past and future – have the potential to interact cumulatively with the effect of implementing the No Action Alternative. The frequency and intensity of disturbance events such as wildfire play an important role in determining the resilience of plant communities throughout the project area. The effects of the No Action Alternative would likely be magnified in those areas subjected to frequent or intense wildfires in the past or in the future. The No Action Alternative would likely interact cumulatively with past wildfires by allowing inappropriate grazing to continue on herbaceous perennial species in recovering burned areas. Many of the STMs in the project area specifically show that inappropriate grazing can interact with wildfire to produce phase pathways that leads sites from their current potential to an annual state. The No

Action Alternative could produce cumulative effects in interacting in the development of these phase pathways. A further cumulative effect would involve post-fire recovery; as with the wildfires that have occurred in the past, future wildfires that are heavily grazed by wild horses are not likely to recover well (Stringham et al. 2015; Bruce Thompson, Ruth Thompson, and Ben Noyes, personal communication).

The No Action Alternative would not likely interact cumulatively with non-native invasive treatments; however, it's possible that some cumulative effects would be realized with the selection of one of the gather alternatives. These cumulative effects would be tied to the reduction in inappropriate grazing; overgrazed systems might be aided in their recovery by successful non-native invasive treatments that reduce competition from invasive species.

Substantial cumulative effects are not likely to be realized with ROWs, mineral exploration/extraction, recreation, and spring development as these PPRFFAs are not likely to strongly interact with the impacts of any of the alternatives. Although ROWs, mineral exploration/extraction, and spring developments are likely to directly impact vegetation through the removal or destruction of vegetation (to various extents), these impacts would not interact with the effects of the No Action Alternative. They would completely supersede these effects, but this would occur only in the limited area where these PPRFFAs occur. There would be no synergistic effect on vegetation across the project area (as compared to livestock grazing). As described in the analysis for this resource, none of the gather alternatives would likely have substantial unmitigated direct or indirect effects on vegetation; therefore cumulative effects are not likely. Spring developments can impact wetlands/riparian zones; however, the upland vegetation in the vicinity of these areas has almost universally been severely impacted by past ungulate use. Therefore, although some impacts are likely realized in developing a spring, these impacts are largely minor and in some way counteracted by the spring development itself. See Tables 4-6 above.

3.2.11. Wetlands/Riparian Zones

3.2.11.1. Affected Environment

Antelope Complex

The scarce water resources in the Antelope Complex include springs/seeps (springs), ephemeral/intermittent streams, ephemeral ponds, and water wells. There are some small intermittent streams associated with large springs, but these do not flow more than several hundred feet. There are no perennial streams within the Antelope Complex. Water resource inventory data collected from 1979 to 2011 along with Proper Functioning Condition Assessments provide much of the following information regarding flow, condition, and other characteristics of these water resources. Detailed water resource information is only available and summarized for water sources on the public lands.

Discharge from springs/seeps ranges from no overland flows to a maximum of 10-14 gallons per minute (gpm). Spring flow varies by season and yearly, reflecting climatic variables. Most listed springs in the Antelope Complex have flows that drop to nearly zero during dry conditions. Most springs within the Antelope Complex discharge less than one gpm. These discharge measurements are not a quantification of total water produced by the spring since a portion or all water coming from a spring is evaporated, utilized by nearby vegetation, or seeps into groundwater near the spring source. Some springs within the complex have little if any observable discharge rate. The spring source may show evidence of riparian vegetation and/or surface ponding, but do not have any measurable overland flow (see pictures below of some springs with limited flows).

Figure 22. Sharp spring in the Dolly Varden Range July 2016. Flow measured at <1 gallon per/hour. The spring is Unit F-1 (not part of a livestock grazing permit) in the Valley Mountain Allotment. No livestock use occurs in this portion of the Dolly Varden Range. Based on the 2010-2017 site visits there is insufficient water on public lands in the Dolly Varden range to support the current numbers of wild horses that have been observed.

Figure 23. Austin spring. Spring flow measured at 4-5gph (July 2016 on the left). In 2015 and 2017 (2017 pictured on the right) the spring was dry. This is part of unit F-2 (not part of the livestock grazing permit) in the Spruce Allotment. No livestock AUMs are authorized in this portion of Dolly Varden Range.

Figure 24. Victoria springs 2015 showing impacts by wild horses on the left. On the right an improving Victoria springs with new willow growth in 2016.

Figure 25. Morgan Spring has degraded substantially as a result of wild horse use as documented in historical photographs and aerial imagery available from 1978 to the present. Wild horse use has led to a loss of vegetation and substantial soil erosion. As a consequence, this erosion likely breached a low permeability soil layer that was providing surface expression of perched groundwater, resulting in a localized drop in the water table and a reduction in available surface water.

Many springs within the Antelope Complex are developed to make surface water available for wild horses, livestock, and/or wildlife. There are also numerous undeveloped springs, many of which discharge surface water which is also available for utilization. Spring development was usually accomplished by piping a portion of spring water a short distance from the source into troughs or by constructing an earthen dam for water collection. Spring developments where water is piped longer distances are listed as “conveyance”. The fraction of total spring water made available by the diversion or conveyance depends upon the type and extent of the development as well as spring source topography and substrate. For example, the Mud Spring development located in the Goshute Mountains diverts a small portion of available water while the nearby Sheep Camp Spring diverts nearly all available water (Figures below).

Figure 26. Sheep Camp spring, Goshute Mountains, spring development diverting most of available flow to a trough for wildlife and wild horses. Livestock season of use is from 11/1 to 4/30.

Figure 27. Mud spring, Goshute Mountains, spring development diverting a small portion of available flow. When authorized, the livestock season of use is from 11/1 to 12/1 and from 4/1-4/30.

During dry conditions many springs can cease flowing.

Figure 28. Summit spring October 2016. No water flowing from from spring. Outlet from spring pictured above with no water flowing from pipe.

There is no known water contamination within the Antelope Complex that would have resulted in an inability to use water resources for their known beneficial uses (typically wildlife, livestock and wild horse use). Some water quality data have been collected, but these data are insufficient to determine trends at local springs and do not include any nutrient or bacteria data. For purposes of evaluation, riparian condition assessments can be used to determine whether and to what extent water quality is under anthropogenic influence. In general, a spring is more likely to have water quality issues if its riparian area has been rated as non-functional, than if it is rated at proper functioning condition. Other anecdotal data such as presence of algae, or lack of vegetation at a spring source could indicate problems with water quality. While there have been some recorded observations of high water temperature, moss, and sedimentation for springs in the Antelope Complex, this has not resulted in any contamination that would preclude use by wild horses, livestock, and wildlife. The Nevada Division of Environmental Protection has not listed any of the water bodies within the Antelope Complex on the State of Nevada List of Impaired Water Bodies (Section 303(d) of the Clean Water Act).

Quantity of available water on public lands within the Antelope Complex is limited, and heavy use by wild horses likely results in less available water for other beneficial uses such as riparian vegetation and wildlife. Most springs within the Antelope Complex have little flow, and most available flow is consumed directly by wild horses. Impacts to beneficial users of water resources have not been quantified. Game camera observationation at Deer spring conveyance showed there are a number of incidents when wild horses did not leave the trough over a twenty four hour period, and some instances of the wild horses remaining at the trough for multiple days at a time, and one instance where the wild horses remained at the trough for a week straight . The trough was emptied in less than a twenty four hour period in early August. Game camera observations showed that the trough was only utilized by non-horses during very brief times when there are no wild horses are present at the trough, and capturing one deer and numerous wild horses at the trough with only wild horses drinking from it. On one occasion the 750 gallon trough was drained by wild horses in four hours. Wild horses maintained a daily near constant presence through the late summer and early fall months.

Triple B Complex

Water Resources within the Triple B Complex include springs/seeps, ephemeral/intermittent streams, ephemeral ponds, and water wells. Resource damage has been documented throughout the complex. A majority of the springs/seeps, ephemeral/intermittent streams, ephemeral ponds are not meeting Proper Functioning Condition (PFC) with a downward trend or nonfunctioning.

Within the Triple B HMA two springs have been improved and developed to protect the resources and provide water to the wild horse population (Pot and White Rock springs). However, with the overpopulation of wild horses Pot and White Rock springs cannot supply the wild horse demand for water. The spring improvements have required a number of maintenance repairs, and have had water hauled to them to supplement diminished and disappearing flows. Impacts occur on unfenced private land water resources as well.

Water resource inventory data collected from 1979 to 2011 along with Proper Functioning Condition Assessments provide much of the following information regarding flow, condition, and other characteristics of these water resources. Detailed water resource information is only available and summarized for water sources on the public lands.

Discharge from springs/seeps ranges from no overland flows to a maximum of 12-14 gallons per minute (gpm). Spring flow varies by season and yearly, reflecting climatic variables. Most listed springs in the Triple B Complex have flows that drop to nearly zero during dry conditions. Most springs discharge less than one gpm. These discharge measurements are not a quantification of total water produced by the spring since a portion or all water coming from a spring is evaporated, utilized by nearby vegetation, or seeps into groundwater near the spring source. (A photograph shows a main spring in the Maverick-Medicine HMA with limited flows impacted by wild horses is presented below.)

Figure 29. Cherry spring trough in August 2016 left and August 2017 on the right. Wild horses had damaged the support beams on the trough. No measurable flow of water. The spring was producing <1 gallon/hour.

Wild horses continue to negativley impact riparian areas through out the Triple B Complex in as seen in the photos below.

Figure 30. Severe use by wild horses (2017). Maverick-Medicine HMA. This portion of the Maverick-Medicine has been closed to grazing since the 1990's.

Figure 31. Fenceline contrast (2017). Area outside fence shows significant use by wild horses. Severe use (86%) by wild horses recorded on CASE. This portion of the Maverick-Medicine HMA ouside the exclosure has been closed to grazing since the 1990's.

Figure 32. Riparian area showing severe impacts by wild horses (2017). This pasture within the West Cherry Creek Allotment pictured above has not had use by cattle for close to ten years. Functioning riparian areas lack mid-channel plant growth. In the Odgers Creek/Odger pasture, the riparian lentic springs are showing signs of excessive mid-channel plant growth. The high level of nutrients from the

high level of sewage being produced by horses in the area. Stud piles can be seen next to overgrazed riparian areas. The decomposition of the increased plant growth causes the water to become depleted of oxygen. Larger aquatic life forms (i.e.. fish), can suffocate to death.

3.2.11.2. Environmental Effects

Effects of the 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 wild horse use within and outside the HMAs would adversely impact additional 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.

Effects of the Proposed Action and Alternatives B and C

To avoid the direct impacts potentially associated with the helicopter gather operation, temporary gather sites and holding/processing facilities would not be located within riparian areas. Bait/Water traps placed at or near springs would not cause new damage to water resources and riparian areas since only locations with already existing heavy use by wild horses would be used. Removal of excess wild horses would decrease the overall degradation of these resources and may lead to improvement if the number of animals removed is sufficient.

3.2.11.3. Cumulative Effects

Past and present impacts to water resources and wetland/riparian areas in the HMAs have resulted from wildlife and wild horse use, livestock grazing, road construction and maintenance, OHV use and recreation, exploration, mining and processing, aggregate operations, public land management activities (e.g., fuel reduction treatment), and wildland fire. Reclamation of areas disturbed from past actions and natural revegetation have helped minimize water quality impacts to varying degrees.

Impacts to water resources and wetland/riparian areas from reasonably foreseeable future actions (RFFAs) are considered to be similar to those described for present actions. Impacts from the Proposed Action (Alternative A, B and C) would include riparian trampling and the introduction of sediment into spring water during the occasions the BLM conducts gathers over the 10-year period. The cumulative impact on water resources and wetland/riparian areas from the incremental impact of the Proposed Action when added to the past actions, present actions, and RFFAs would be minimal and intermittent. The cumulative impact from the No Action would have a countervailing impact to the rehabilitations of degraded wetland and riparian zones caused by wild horses. The continued increase of wild horse numbers would impose greater use pressure on water sources and riparian areas under the No Action alternative. See Tables 4-6 above.

3.2.12. Wild Horses and Burros

3.2.12.1. Affected Environment

The environmental consequences for this EA are analyzed for helicopter and non-helicopter gathers of wild horses and associated resources within and adjacent to trap sites. This analysis also tiers to the 2013, 2011 and 2010 EA analyses.

The affected environment encompasses the Antelope and Triple B Complexes.

General Description

Antelope Complex

The Antelope Complex is made up of the Antelope HMA (managed by the Ely District), Antelope Valley HMA, Goshute HMA, and Spruce-Pequop HMA (managed by the Elko District). These HMAs were designated through Land Use-Planning for long-term management of wild horses. The Appropriate Management Level (AML) for the Antelope HMA was reaffirmed through the Ely District RMP. AML for the Antelope Valley, Goshute HMA, and Spruce-Pequop were set through Wells RMPWHA and adjusted through Frame Work Management Plans (FMPs) (please see Table 1 for break out by HMAs). These areas are gathered as a complex due to the wild horse interchange between HMAs. Fences do exist within the HMAs but do not restrict wild horse movement due to the fact that the fences are open at the end (open ended). The wild horses from these HMAs travel back and forth across the Elko and White Pine County Line, mixing with the wild horses from the other HMAs within the Complex. The population within each HMA can fluctuate depending on the season due to these movements.

In 2001, the Nevada Department of Transportation (NDOT) fenced the Highway 93 Right of Way (ROW) to improve public safety as numerous vehicle/horse collisions had occurred in previous years. This fence separates the western portion of the Antelope Valley HMA from the rest of the HMA. The wild horses in the western portion of the HMA move freely back and forth with wild horses from the Maverick/Medicine HMA. It was last gathered as part of the Buck and Bald Complex Gather in 2006.

In the spring of 2007, the NDOT fenced the Alternate Highway 93 right-of-way to ensure public safety. This new fence separates the eastern 1/3 of the Antelope Valley HMA from the rest of the HMA, with the result that the animals in this area can no longer move to their traditional winter range in the Dolly Varden Mountains. However, wild horses have been observed moving from the northern portions (north of the highway right-of-way fence) of Antelope Valley HMA into the Goshute HMA and from the Goshute HMA areas not designated for wild horse management.

Figure 33. Large numbers of wild horses outside HMA boundaries (Wood Hills) 2015.

In an attempt to achieve and maintain AML, the entire Antelope Complex has been gathered four times since 2001 removing 5,603 excess wild horses. There have been two emergency gathers conducted since 2007 resulting in the removal of 1,023 excess wild horses. The emergency gathers were conducted due to lack of resources (forage/water) within the Antelope Complex. Due to the over population of wild horses within the Antelope Complex wild horses are leaving the HMAs boundaries in search of forage/water resources, and the other emergency gather in the Antelope Valley HMA (due to private property concerns, lack of water resources, and declining body condition and health in wild horses) which removed 96 excess wild horses. Two additional emergency gathers were conducted due to lack of resources (forage/water) around the Wood Hills area (outside HMAs boundaries) which removed 350 excess wild horses. The Ely District removed 32 excess wild horses in October 2015, as part of the Water Canyon Wild Horse Growth Suppression Pilot Program.

Figure 34. Wild horses crossing U.S. Alternate Highway 93 from Goshute HMA to Antelope Valley HMA (October 2015).

Figure 35. Wild horses outside Goshute HMA boundary northeast of Shafter just south of Interstate 80. Interstate 80, in the foreground. (June 2017).

Triple B Complex

The Triple B Complex is made up of the Triple B HMA (managed by the Ely District Office), Maverick-Medicine, and west portion of the Antelope Valley HMA (managed by the Elko District Office). These HMAs were designated through Land Use-Planning for long-term management of wild horses. The Appropriate Management Level (AML) for the Triple B HMA was reaffirmed through the Ely District RMP. AML for Maverick-Medicine HMA, and Antelope Valley HMA, was set through WRMPWHA and adjusted through Management Framework Plans (MFPs). These areas are gathered as a complex due to the wild horse interchange between HMAs. Fences do exist within the HMAs but do not restrict wild horse movement due to the fact that the fences are open at the end (open ended). The AML range is 472-889 for the complex (please see Table 2 for break down by HMA). The wild horses from these HMAs travel back and forth across the Elko and White Pine County line, mixing with the wild horses from the other HMAs with in the complex. The population within each HMA can fluctuate depending on the seasons due to the wild horses' migration patterns.Monitoring

Antelope Complex

The Antelope Complex is made up of the Antelope (managed by the Ely District Office), Antelope Valley, Goshute and Spruce-Pequop HMAs (managed by the Elko District Office). These HMAs were designated through Land Use-Planning for long-term management of wild horses. The Appropriate Management Levels (AML) for the Antelope HMA was reaffirmed through the Ely District RMP. AML for Antelope Valley, Goshute and Spruce-Pequop HMAs was set through Wells RMPWHA and adjusted through Management Framework Plans (MFPs). These areas are gathered as a complex due to the wild horse interchange between HMAs. Fences do exist within the HMAs but do not restrict wild horse movement due to the fact that the fences are open at the end (open ended). The AML range is 427-789 for the complex (please see Table 1 for break down by HMA). The wild horses from these HMAs travel back and forth across the Elko and White Pine County line, mixing with the wild horses from the other HMAs within the complex. The population within each HMA can fluctuate depending on the seasons due to the wild horses' migration patterns

Monitoring data collected using the Range Utilization Key Forage Plant Method for the 2015-2017 years has shown severe (81%-99%) and heavy (61%-80%) use within portions of the Antelope HMA. Severity of these impacts has increased with increasing numbers of excess wild horses. Also, Proper Functioning Condition (PFC) studies have been completed on most of the springs throughout the HMAs, indicating that most are not at PFC and are exhibiting downward trends in functionality. Wild horses have been documented as a contributing factor for springs not meeting PFC. Streams and springs functioning at risk are Sharp Creek, North Creek, and Flat Spring. Stockade Spring is non-functional.

In March 2016 monitoring measurements of upland utilization in winter use areas by wild horses in the Antelope Complex (Antelope Valley and Goshute HMAs) on the key shrub species winterfat ranged from 62 percent to 85 percent on previous (2015) year's growth. In 2017 monitoring measurements of upland utilization in winter use areas by wild horses on key shrub species winterfat ranged from 74 percent to 90 percent on previous (2016) year's growth. This represents a large portion of winter use areas where the WRMPWHA listed Resource Constraints on Utilization by all grazing animals will not exceed 55% on key forage species by March 31 on on winter range. Utilization represents wild horse utilization only. Monitoring in the Antelope Valley HMA has shown that wild horse use alone routinely exceeds allowable utilization levels.

This level of use impacts native perennial plants and allows for annuals such as cheatgrass, mustard and halogeton to increase.

Excessive use by wild horses has been observed and documented on reclaimed and re-vegetated mining notice sites, rangeland improvements, seedings, and fire rehabilitation sites inhibiting recovery of disturbed sites within the Complex.

Figure 36. Severe utilization on Indian ricegrass (pre-livestock turn out) by wild horses in the Antelope Complex (October 2017).

Figure 37. Severe utilization on winterfat by wild horses in the Antelope Complex (Spring 2016). Use occurred in an area not grazed by livestock due to excessive wild horse numbers.

Figure 38. Severe utilization on winterfat by wild horses in the Antelope Complex (Spring 2017). Use occurred in an area not grazed by livestock due to excessive wild horse numbers.

Figure 39. Severe utilization on winterfat by wild horses in the Antelope Complex (Spring 2017). Use occurred in an area not grazed by livestock due to excessive wild horse numbers. Cheatgrass, an annual invasive species, is indicative of highly disturbed areas on many of these upland sites.

In addition, another limiting factor for wild horses is the lack of available perennial water on public lands to sufficiently sustain them on a year round basis. Extensive on-the-ground monitoring within the Antelope Complex shows limited availability of water. This is based on visits conducted in 2012, 2013, 2015, and 2016 at key water sources which showed insufficient water to support the wild horse population. Due to limited water availability, the Elko District has hauled water to portions of the Antelope Complex in 2012, 2014 and 2016. Wild horses need a minimum of 12-15 gallons per day. Based on the size of the current population of wild horses within the complex there is not sufficient water to provide adequate water supplies for the current wild horse population. Wild horses also utilize unfenced private land waters throughout the complex. Private land waters are not allocated for wild horse use. Due to insufficient water production wild horses are at risk of suffering from dehydration.

Figure 40. Wild horse impacts at Deer spring conveyance. Vegetation around Deer spring conveyance has been denuded by wild horses (June 2017). Livestock season of use is from 11/1 to 5/15.

Figure 41. Four Mile flowing well (June 2014).

Figure 42. Upper Deer spring (July 2016) showing limited flow and impacts by wild horses.

Heavy trailing occurs throughout the complex especially around heavily concentrated areas (such as seedings, burns, and range improvements) and water sources.

Figure 43. Trail made by wild horses to Dolly Varden spring in the Antelope Valley HMA (2017).

Figure 44. Trails made by wild horses at Dolly Varden Springs (Private) (August2017).

Triple B Complex

Monitoring data collected using the Range Utilization Key Forage Plant Method since 2012 has shown heavy (61%-80%) to severe (81%-100%) use within portions of the Triple B Complex. These areas of heavy and severe use have been increasing with the overpopulation of wild horses.

In March 2016 monitoring measurements of upland utilization in winter use areas by wild horses in the Triple B Complex on the key shrub species winterfat ranged from 62 percent to 97 percent on previous (2015) year's growth. In 2017, utilization in winter use areas by wild horses on key shrub species ranged from 78 percent to 95 percent on previous (2016) year's growth. This excessive use by wild horses has damaged these ecosystems, perhaps beyond recovery in places.

Figure 45. SP24 April 2016, winter fat and saltbush site depicting severe use by wild horses.

Figure 46. SP24 April 2016, depicting severe use by wild horses.

Figure 47. Severe use on winterfat at key area SP06 by wild horses (2017).

In addition another limiting factor for wild horses is the lack of available perennial water on public lands to sufficiently sustain them on a year round basis. Extensive on-the-ground monitoring within portions of the Triple B Complex shows limited production of water. This is based on visits conducted in 2012-2016 to key water resources which showed insufficient water to support the wild horse population. Due to limited water production, the Elko and Ely Districts have hauled water to portions of the Triple B Complex in 2014, 2015 and 2016. Wild horses need a minimum of 12-15 gallons per day. Based on the current population of wild horses within the complex there is not sufficient water to support the wild horse population. Wild horses utilize unfenced private land waters throughout the complex. Private land waters are not allocated for wild horse use. Emergency gathers have been conducted within portions of the Triple B Complex to address the limited water availability and herd health concerns.

Diet

Numerous studies identify dietary overlap of preferred forage species and habitat preference between horses, cattle, and wildlife species in the Great Basin ecosystems for all seasons (Ganskopp 1983; Ganskopp et al. 1986, 1987; McInnis 1984; McInnis et al. 1987; Smith et al. 1982; Vavra et al. 1978). A strong potential exists for exploitative competition between horses and cattle under conditions of limited forage (water and space) availability (McInnis et al. 1987).

Although horses and cattle are often compared as grazers, horses can be more destructive to the range than cattle due to their differing digestive systems and grazing habits. The dietary overlap between wild horses and cattle is much higher than with wildlife, and averages between 60 and 80% (Hubbard and Hansen 1976, R. Hansen, R. Clark, and W. Lawhorn 1977, Hanley 1982, Krysl et al. 1984, McInnis and Vavra 1987). Horses are cecal digesters while most other ungulates including cattle, pronghorn, and others are ruminants (Hanley and Hanley 1982, Beever 2003). Cecal digesters do not ruminate, or have to regurgitate and repeat the cycle of chewing until edible particles of plant fiber are small enough for their digestive system. Ruminants, especially cattle, must graze selectively, searching out digestible tissue (Olsen and Hansen 1977). Horses, however, are one of the least selective grazers in the West because they can consume high fiber foods and digest larger food fragments (Hanley and Hanley 1982, Beever 2003).

Wild horses can exploit the high cellulose of graminoids, or grasses, which have been observed to make up over 88% of their diet (McInnis and Vavra 1987, Hanley 1982). However, this lower quality diet requires that horses consume 20-65% more forage than a cow of equal body mass (Hanley 1982, Menard et al. 2002). With more flexible lips and upper front incisors, both features that cattle do not have, wild horses trim vegetation more closely to the ground (Symanski 1994, Menard and others 2002, Beever 2003). As a result, areas grazed by horses may retain fewer plant species and may be subject to higher utilization levels than areas grazed by cattle or other ungulates. A potential benefit of a horse's digestive system may come from seeds passing through system without being digested but the benefit is likely minimal when compared to the overall impact wild horse grazing has on vegetation in general.

Wild horses also compete with wildlife species for various habitat components, especially when populations exceed AML and/or habitat resources become limited (i.e. reduced water flows, low forage production, dry conditions, etc.). Smith (1986) determined that elk and bighorn sheep were the most likely to negatively interact with wild horses. Hanley and Hanley (1982) compared the diets of wild horses, domestic cattle and sheep, pronghorn antelope, and mule deer and found that horse and cattle diets consisted mostly of grasses, pronghorn and mule deer diets consisted mostly of shrubs (>90%) and sheep diets were intermediate. Due to different food preferences, diet overlap between wild horses, deer, and pronghorn rarely exceeds 20% (Hubbard and Hansen 1976, R. Hansen, R. Clark, and W. Lawhorn 1977, Meeker 1979, Hanley and Hanley 1982).

There is growing concern about limited water and forage available to wild horses, livestock, and wildlife in the desert climate of the Great Basin. Heavy use of forage near available water and competition between wild horses, livestock, and wildlife for limited forage and water has increased. An NDOW Wildlife biologist has observed, "The aggressive nature of wild horses kept elk from drinking, in some cases, and in other cases temporarily delayed their apparent need for water for approximately one hour. The aggressive acts documented included bluff charges and in one case a horse biting the rump of an adult elk" (McAdoo, 2010). In addition, wild horses can have an impact on native wild life around water sources (Gooch et al. 2017, Impacts of feral horses on pronghorn behavior and Hall et al. 2015, Influence of exotic horses on the use of water by communities of native wildlife in a semi-arid environment.).

Livestock permittees often haul water, transport water in water pipelines, or pump wells to provide water for their livestock. However, when livestock are not turned out there is limited water for wild horses.

Livestock permittees often haul water, transport water in water pipelines, or pump wells to provide water for their livestock. Because there are limited sources of water in the Complexes, the wild horses tend to stay closer to, and concentrate around, those sources of water. Forage around the water sources is heavily impacted because of the high concentration of wild horses in that area. Wild horses have to travel greater distances to meet both their forage and water needs. Increasing competition at the water source, can cause increased stress to the animals and can lead to emergency conditions where a failure to take action may result in the suffereing or death of individual wild horses.

Given the dry conditions that occur annually in the summer time, and the expanding wild horse numbers along with the limited perennial water sources in the Antelope and Triple B Complexes, there is a real concern that wild horses could suffer from dehydration and possible death in the Antelope and Triple B Complexes. If their known or common (habitual) water sources become dry or unavailable wild horses will linger sometimes until death, instead of searching out new or unknown water sources.

Figure 48. Wild horses waiting for water at Tunnel spring (well) September 2016. Wood fence is part of a historic horse trap. The wild horses pictured have a Henneke body condition score (BCS) poor (BCS 1.5). Wild horses with a BCS of 2 or less are at risk of death if they remain on the range given the current high numbers of excess of wild horses in the HMA and extremely limited water availability.

Figure 49. Rock spring, October 2013 on the left and September 2016 on the right. Wild horses have damaged the spring looking for water. When authorized, authorized use for livestock is 12/1 to 12/31 and from 4/1 to 4/30.

Figure 50. Wild horse impacts on Dolly Varden spring (private land) June 2017. Green vegetation is annual mustard (non-palatable invasive annual). Tumble mustard is briefly palatable when young. Palatability of mature plants is low. The seeds are unpalatable to livestock, wildlife and wild horses. Tumble mustard out- competes native plants and disrupts native plant communities and helps fuel wildfires in plant communities that previously did not burn.

Figure 51. Cherry Spring August 2016. Very limited water and overuse on surrounding forage by wild horses. The area around the spring is dominated by annual, invasive species and non-riparian native species (i.e., rabbitbrush and sagebrush). These annual, invasive species are indicative of a highly disturbed area and all of these upland species are indicative of the loss of

riparian characteristics from trampling and congregation of large numbers of wild horses at the water source.

Population Modeling

Population modeling was completed for the Antelope and Triple B Complexes using Version 3.2 of the WinEquus population (Jenkins 200) to analyze how the alternatives would affect the wild horse population. This modeling analyzed removal of excess wild horses with no fertility control, as compared to removal of excess wild horses with fertility control and sex ratio adjustments for released horses. The No Action (no removal) Alternative was also modeled. One objective of the modeling was to identify whether any of the alternatives "crash" the population or cause extremely low population numbers or growth rates. Minimum population levels and growth rates were found to be within reasonable levels and adverse impacts to the population not likely. Graphic and tabular results are also displayed in detail in Appendix VIII.

3.2.12.2. 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 Complexes 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 and a thriving natural ecological balance and excess concentrations of wild horses would continue to impact site specific areas throughout the Complexes 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 Complexes. 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 (Wolfe 1980, L Eberhardt et al 1982, Garrott and Taylor 1990). 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. Coyotes are not prone to prey on wild horses unless they are young, or extremely weak. Other predators such as wolf or bear do not inhabit the area. Being a non-self-regulating species, 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 Complexes 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 Complexes. 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 Complexes 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.

<u>Proposed Action</u>

The Proposed Action would decrease the existing overpopulation of wild horses in the course of successive helicopter gather operations over a period of six to ten years and stallions would be selected for release with the objective of establishing a 60% male ratio within the core breeding population of 899 horses (low-range AML) on the range. Some gelded horses that would otherwise be excess animals permanently removed from the range and sent to holding facilities for adoption/sales or long-term holding, 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 target population when the objectives of this alternative are reached is to manage a total population at approximately mid-range AML or 1,289 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. 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 reproducing wild horse population back to mid-range AML and slowing its growth rate once the proposed action 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 Proposed Action has been completed, 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. 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, typically 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 in the core breeding population. Stallions would be selected to maintain a diverse age structure, herd characteristics and body type (conformation). It is expected that releasing additional stallions to reach the targeted sex ratio of 60% males would result in smaller band sizes, larger bachelor groups, and some increased competition for mares. With more stallions involved in breeding it should result in increased genetic exchange and improvement of genetic health within the herd.

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 in the core breeding population, the result will be that there will be a lower number of breeding females in the population.

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 II). 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.

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.

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. 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 may not be available for some years.

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 will change, how quickly any change will occur after surgery, or exactly what effect gelding an adult stallion and releasing him back in to a wild horse population will 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 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).

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 will 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 Act. 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 Complexes where this action would take place.

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 Complexes would experience inbreeding because there would be a core breeding population of stallions consistent with low end 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 427-789 on the Antelope complex and 472-889 on the Triple B 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 a large number of other HMAs could be used as sources for fertile wild horses that could be transported into the HMA of concern.

The Antelope and Triple B Complexes are 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 Complexes population and other populations that interact with it genetically, then future management of the Complexes 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 intrusivefor wild horses and potentially less sustainable than an activity that requires only one period of handling.

It should be noted that 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 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.

<u>Effects Common to the Proposed Action and Alternative B</u>

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 in section 3.2.12.1, above.

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 herdsTaking 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). 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 m (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).

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). 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 two years of ~40% - 50% reduced foaling rates, compared to untreated animals (Rutberg et al. 2017).

The highest success for fertility control has been obtained when applied during the timeframe of November through February. The efficacy for a single application of the PZP vaccine pellets (PZP-22) based on winter applications can be expected to fall in the efficacy rarges as follows:

Year 1	Year 2	Year 3	Year 4
Normal	60-85%	40-50%	0-68%

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; 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
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 sould 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
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." In contrast to transient stresses, Creel et al (2013) highlight that variation in population density is one of the most well-established causal factors of chronic activation of the hypothalamic-pituitary-adrenal axis, which mediates stress hormones; high population densities and competition for resources can cause chronic stress. Creel also states that "…there is little consistent evidence for a negative association between elevated baseline glucocorticoids and fitness." Band fidelity is not an aspect of wild horse biology that is specifically protected by the WFRHBA of 1971. It is also notable that Ransom et al. (2014b) found higher group fidelity after a herd had been gathered and treated with a contraceptive vaccine; in that case, the researchers postulated that higher fidelity may have been facilitated by the decreased competition for forage after excess horses were removed. At the population level, available research does not provide evidence of the loss of harem structure among any herds treated with PZP. Long-term implications of these changes in social behavior are currently unknown, but no negative impacts on the overall animals or populations welfare or well-being have been noted in these studies.

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

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

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 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 [GonaCon-KHL], but more recently produced formulations where the GnRH antigen is linked to a protein from the blue mussel [GonaCon-B] proved less expensive and more effective (Miller et al. 2008). GonaCon-Equine is in the category of GonaCon-B vaccines.

Adjuvants are included in vaccines to elevate the level of immune response, inciting recruitment of lymphocytes and other immune cells which foster a long-lasting immune response that is specific to the antigen. For some formulations of anti-GnRH vaccines, a booster dose is required to elicit at contraceptive response, though GonaCon can cause short-term contraception in a fraction of treated animals from one dose (Powers et al. 2011, Gionfriddo et al. 2011a, Baker et al. 2013, Miller et al 2013). The adjuvant used in GonaCon, Adjuvac, generally leads to a milder reaction than Freunds complete adjuvant (Powers et al. 2011). Adjuvac contains a small number of killed *Mycobacterium avium* cells (Miller et al. 2008, Miller et al. 2013). The antigen and adjuvant are emulsified in mineral oil, such that they are not all presented to the immune system right after injection; it is thought that the mineral oil emulsion leads to a depot effect and longer-lasting immune response (Miller et al. 2013). Miller et al. (2008, 2013) have speculated that, in cases where memory-B leukocytes are protected in immune complexes in the lymphatic system, it can lead to years of immune response. Increased doses of vaccine may lead to stronger immune reactions, but only to a certain point; when Yoder and Miller (2010) tested varying doses of GonaCon in prairie dogs, antibody responses to the 200µg and 400µg doses were equal to each other but were both higher than in response to a 100µg dose.

The most direct result of successful GnRH vaccination is that it has the effect of decreasing the level of GnRH signaling in the body, as evidenced by a drop in 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 GonaCon-Equine vaccine appears to be lower than for a combined primer plus booster dose of the PZP vaccine ZonaStat-H (Kirkpatrick et al. 2011), and the initial effect of a single GonaCon dose can be limited to as little as one breeding season. However, preliminary results on the effects of boostered doses of GonaCon-Equine indicate that it can have high efficacy and longer-lasting effects in free-roaming horses (Baker et al. 2017) than the one-year effect that is generally expected from a single booster of ZonaStat-H.

GonaCon and other anti-GnRH vaccines can be injected while a female is pregnant (Miller et al. 2000, Powers et al. 2011, Baker et al. 2013) – in such a case, a successfully contracepted mare 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 anti-GnRH vaccines (Killian et al. 2006, Miller et al. 2008, Levy et al. 2011). A number of factors may influence responses to vaccination, including age, body condition, nutrition, prior immune responses, and genetics (Cooper and Herbert 2001, Curtis et al. 2001, Powers et al. 2011). One apparent trend is that animals that are treated at a younger age, especially before puberty, may have stronger and longer-lasting responses (Brown et al. 1994, Curtis et al. 2001, Stout et al. 2003, Schulman et al. 2013). It is plausible that giving 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 anti-GnRH vaccine (Stout et al. 2003), three of seven treated mares had returned to cyclicity within 8 weeks after delivery of the primer dose, while four others were still suppressed for 12 or more weeks. In elk, Powers et al. (2011) noted that contraception after one dose of GonaCon was reversible. In white-tailed deer, single doses of GonaCon appeared to confer two years of contraception (Miller et al. 2000). Ten of 30 domestic cows treated became pregnant within 30 weeks after the first dose of Bopriva (Balet et al. 2014).

Permanent sterility as a result of single-dose or boostered GonaCon-Equine vaccine, or other anti-GnRH vaccines, has not been recorded, but that may be because no long-term studies have tested for that effect. It is conceivable that some fraction of mares could become sterile after receiving one or more booster doses of GonaCon-Equine, but the rate at which that could be expected to occur is currently unknown. If some fraction of mares treated with GonaCon-Equine were to become sterile, though, that result would 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 anti-GnRH 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 previously-treated mares should lead to two or more years with relatively high rates (80+%) of additional infertility expected, with the potential that some as-yet-unknown fraction of boostered mares may be infertile for several to many years. There is no data to support speculation regarding efficacy of multiple boosters of GonaCon-Equine; however, given it is formulated as a highly immunogenic long-lasting vaccine, it is reasonable to hypothesize that additional boosters would increase the effectiveness and duration of the vaccine.

GonaCon-Equine only affects the fertility of treated animals; untreated animals will still be expected to give birth. Even under favorable circumstances for population growth suppression, gather efficiency might not exceed 85% via helicopter, and may be less with bait and water trapping.

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 anti-GnRH vaccine (2013). In cows treated with Bopriva there was a mildly elevated body temperature and mild swelling at injection sites that subsided within 2 weeks (Balet et al. 2014).

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

Kirkpatrick et al. (2011) raised concerns that anti-GnRH vaccines could lead to adverse effects in other organ systems outside the reproductive system. GnRH receptors have been identified in tissues outside of the pituitary system, including in the testes and placenta (Khodr and Siler-Khodr 1980), ovary (Hsueh and Erickson 1979), bladder (Coit et al. 2009), heart (Dong et al. 2011), and central nervous system, so it is plausible that reductions in circulating GnRH levels could inhibit physiological processes in those organ systems. Kirkpatrick et al. (2011) noted elevated cardiological risks to human patients taking GnRH agonists (such as leuprolide), but the National Academy of Sciences (2013) concluded that the mechanism and results of GnRH agonists would be expected to be different from that of anti-GnRH antibodies; the former flood GnRH receptors, while the latter deprive receptors of GnRH.

GnRH Vaccine Effects on Fetus and Foal

Although fetuses are not explicitly protected under the WFRHBA of 1971, as amended, it is prudent to analyze the potential effects of GonaCon-Equine or other anti-GnRH vaccines on developing fetuses and foals. GonaCon had no apparent effect on pregnancies in progress, foaling success, or the health of offspring, in horses that were immunized in October (Baker et al. 2013), elk immunized 80-100 days into gestation (Powers et al. 2011, 2013), or deer 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 Complexes. With rangeland conditions more closely approaching a thriving natural ecological balance, and with a less concentrated distribution of wild horses across the Complexes, 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 anti-GnRH vaccines did continue to exhibit reproductive behaviors, albeit at irregular intervals and durations (Dalin et al. 2002, Stout et al. 2003, Imboden et al. 2006), which is a result that is similar to spayed (ovariectomized) mares (Asa et al. 1980). Gray et al. (2009) found no difference in sexual behaviors in mares treated with GonaCon and untreated mares. When progesterone levels are low, small changes in estradiol concentration can foster reproductive estrous behaviors (Imboden et al. 2006). Owners of anti-GnRH vaccine treated mares reported a reduced number of estrous-related behaviors under saddle (Donovan et al. 2013). Treated mares may refrain from reproductive behavior even after ovaries return to cyclicity (Elhay et al. 2007). Studies in elk found that GonaCon treated cows had equal levels of precopulatory behaviors as controls (Powers et al. 2011), though bull elk paid more attention to treated cows late in the breeding season, after control cows were already pregnant (Powers et al. 2011).

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

<u>Effects Common to the Proposed Action and Alternatives B and C</u>

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. During this time, methods and procedures have been identified and refined to minimize stress and impacts to wild horses during gather implementation. A CAWP in 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-09-77). 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.

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 427-789 on the Antelope Complex and 472– 889 on the Triple B Complex should provide for acceptable genetic diversity. If at any time in the future the genetic diversity in either the Complexes 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 Complex of concern.

By maintaining wild horse population size near the AML, there would be a lower density of wild horses across the complexes, 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.

The wild horses that are gathered using water/bait trapping would be subject to one or more of several outcomes listed below.

Impacts to individual animals could occur as a result of stress associated with the gather, capture, processing, and transportation of animals. The intensity of these impacts would vary by individual and would be indicated by behaviors ranging from nervous agitation to physical distress. Mortality of individual 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 biting and /or kicking bruises. Horses may potentially strike or kick gates, panels or the working chute while in corrals or trap which may cause injuries. Lowered competition for forage and water resources would reduce stress and fighting for limited resources (water and forage) and promote healthier animals. Indirect individual impacts are those impacts which occur to individual wild horses after the initial stress event, and may include spontaneous abortions in mares. These impacts, like direct individual impacts, are known to occur intermittently during wild horse gather operations. An example of an indirect individual impact would be the brief skirmish which occurs among studs following sorting and release into the stud pen, which lasts less than a few minutes and ends when one stud retreats. Traumatic injuries usually do not result from these conflicts. These injuries typically involve a bite and/or kicking with bruises which don't break the skin. Like direct individual impacts, the frequency of occurrence of these impacts among a population varies with the individual animal.

Spontaneous abortion events among pregnant mares following capture is also rare, though poor body condition at time of gather can increase the incidence of spontaneous abortions. Given the two different capture methods proposed, spontaneous abortion is not considered to be an issue for either of the two proposed plans. Since helicopter/drive trap method would not be utilized during peak foaling season (March 1 thru June 30), unless an emergency exists, and the water/bait trapping method is anticipated to be low stress.

Foals are often gathered that were orphaned on the range (prior to the gather) because the mother rejected it or died. These foals are usually in poor, unthrifty condition. Orphans encountered during gathers are cared for promptly and rarely die or have to be euthanized. It is unlikely that orphan foals would be encountered since majority of the foals would be old enough to travel with the group of wild horses. Also depending on the time of year the current foal crop would be six to nine months of age and may have already been weaned by their mothers.

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.

The BLM has been gathering excess wild horses from public lands since 1975, and has been using helicopters for such gathers since the late 1970's. Refer to Appendix I, II, and III for information on the methods that are utilized to reduce injury or stress to wild horses and burros during gathers.

Since 2006, BLM Nevada has gathered over 34,829 excess animals. Of these, gather related mortality has averaged only 0.5%, which is very low when handling wild animals. Another 0.6% of the animals captured were humanely euthanized due to pre-existing conditions and in accordance with BLM policy. This data affirms that the use of helicopters and motorized vehicles are a safe, humane, effective and practical means for gathering and removing excess wild horses and burros from the range. BLM policy prohibits gathering wild horses with a helicopter (unless under emergency conditions) during the period of March 1 to June 30 which includes and covers the six weeks that precede and follow the peak of foaling period (mid-April to mid-May).

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. Animals that are euthanized for non-gather related reasons include those with old injuries (broken hip, leg) that have caused the animal to suffer from pain or which prevent them from being able to travel or maintain body condition: old animals that have lived a successful life on the range, but now have few teeth remaining, are in poor body condition, or are weak from old age; and wild horses that have congenital (genetic) or serious physical defects such as club foot, or sway back and should not be returned to the range.

Transport, Off-range Corrals, 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 short-term holding 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

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 31,250 wild horses that are in excess of the current adoption or sale demand (because of age or other factors such as economic recession) are currently located on private land pastures in Oklahoma, Kansas, and South Dakota. The establishment of ORPs was subject to a separate NEPA and decision-making process. Located 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

256,000 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 HMA 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. 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 Complexes 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.

<u>Alternative C</u>

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 Complexes. 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 pasture facilities. Currently the BLM is facing limited funding available to pay for the cost of holding excess wild horses. Due to National issues 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.

3.2.12.3. Cumulative Effects

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 Complexes could lead to decreased ability to effectively gather horses in the future as released horses learn to evade gather operations.

Cumulative Effects of the Proposed Action and Alternatives B and C

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. Removeal 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, short term holding, adoption or sale with limitations and about 8% per year associated with long-term holding. These rates are comparable to natural mortality on the range ranging from about 5-8% per year for foals (animals under age 1), about 5% per year for horses ages 1-15, and 5-100% for animals age 16 and older (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

Complexes 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.

Cumulative Effects of the No Action Alternative

Under the No Action Alternative, the wild horse population within the Antelope and Triple B Complexes combined could exceed 13,716 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 Complexes, 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.

3.2.13. Wilderness and Wilderness Study Areas

3.2.13.1. Affected Environment

The Antelope Complex contains the entire Becky Peak Wilderness Area and Bluebell, Goshute Peak, and South Pequop Wilderness Study Areas (WSA). Refer to Figure 52 for WSA locations.

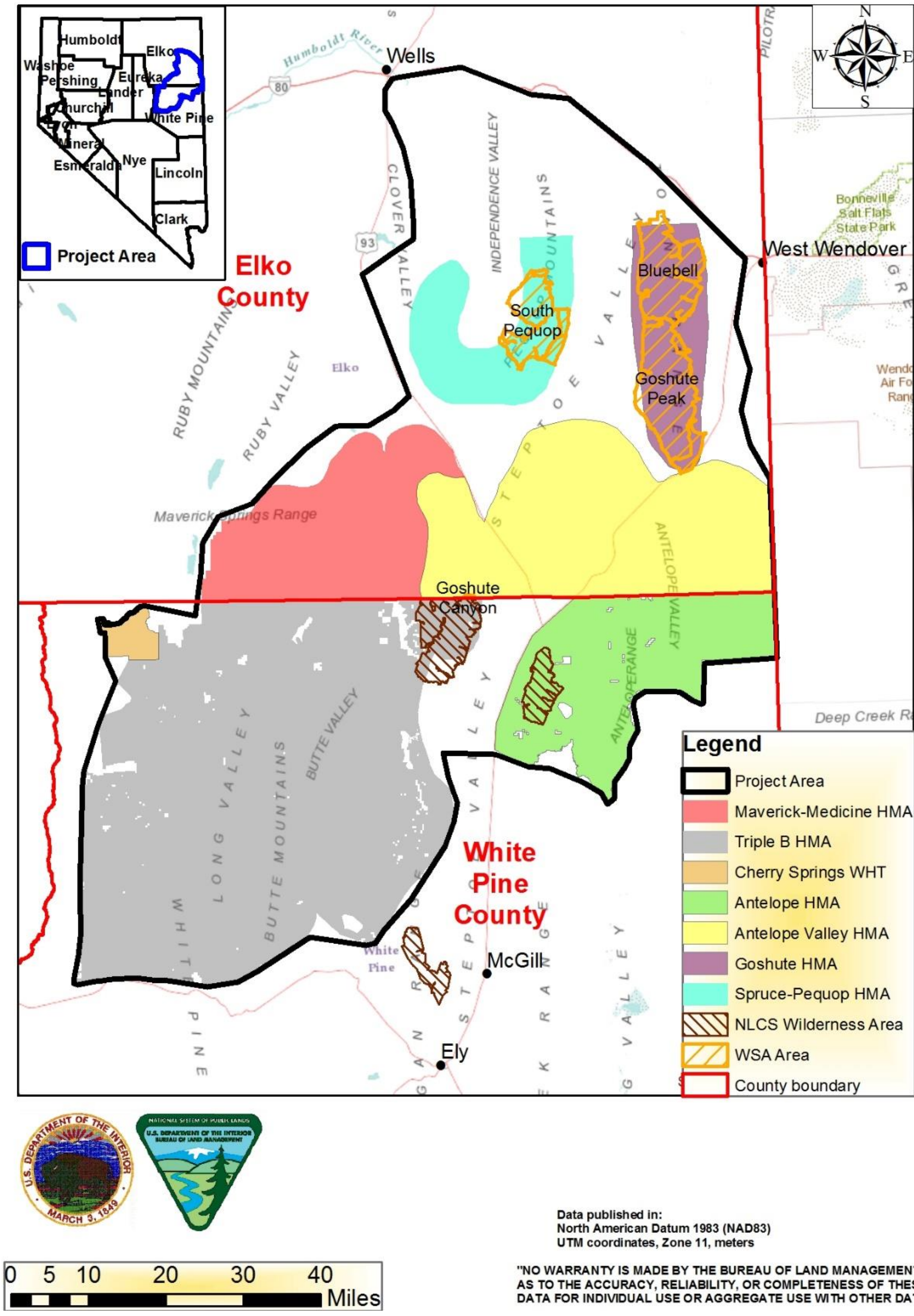


Figure 52. Wilderness and Wilderness Study Areas

The Becky Peak Wilderness area lies at the northern end of the Schell Creek Range in eastern Nevada. Vegetation primarily includes desert brush and grass at the lower elevations and a scattering of pinyon pine and juniper stands on the upland slopes of Becky Peak and surrounding hillsides. Atop Becky Peak itself (9,859 feet), you will encounter bristlecone and limber pine trees. Wildflowers can be abundant in the spring and include yarrow, prickly poppy, prickly pear cactus, larkspur, lupine, paintbrush, and Sego lilies. Pronghorn antelope are frequently seen through the sagebrush lowlands. Other animals that may be spotted on a visit to Becky Peak Wilderness area include mule deer, wild horses, lizards and a variety of birds.

The Nevada Wilderness Study Area Notebook (Elko District Office, October 2000), states that the Goshute Peak WSA consists of steep, mountainous topography with small stands of mixed conifers and many canyons radiating from the central ridgeline, providing outstanding naturalness. Man's imprints are absent from the higher elevations. In the lower elevations, man's imprint is present but not noticeable due to the dense pinyon-juniper woodlands. There is approximately one mile of cherry-stem road, 27 miles of vehicular ways, an old deer hunter's cabin, a deer hunting camp, a corral, one mile of barbed wire fence, and one developed spring. Most of these intrusions penetrate less than one mile into the WSA. Only the raptor research project, with its plywood blinds, tents and maintained access trail affects the higher elevations. Outstanding opportunities for solitude exist within the WSA due to topography and densely wooded areas. The WSA also has outstanding opportunities for primitive and unconfined recreation. Special features of the WSA include the raptor migration route and the presence of bristlecone pine trees at higher elevations.

The South Pequop WSA is predominately natural with densely-forested, highly dissected terrain essentially untouched by man. Vegetation ranges from sagebrush and grasses on the south-facing slopes to dense stands of white fir and limber pine on the northern exposures. Pinyon-juniper woodlands occupy much of the mountain range, while nearly impenetrable shrub thickets cover many slopes. The area's 11 miles of vehicle ways are generally unnoticeable and do not affect its naturalness. There are outstanding opportunities for solitude due to the steep canyons extending east and west from the knife-edged ridgeline and dense vegetation. Occasionally military aircraft disrupt the solitude. The WSA also contains outstanding opportunities for primitive and unconfined recreation. Bristlecone pine trees are present in higher elevations, and the area offers outstanding opportunities for fossil collecting.

Bluebell WSA consists of steep, mountainous terrain, with many canyons radiating from the central ridgeline of mountain peaks. The WSA is essentially free of man's imprints. Manmade features include approximately 20 miles of ways, eight miles of cherry stem roads, four corrals, one mile of barbed wire fence, two developed springs, and 10 small pit reservoirs. Outstanding opportunities for solitude exist within the WSA due to the topographic and vegetative screening. There are about 15 drainages and hundreds of small canyons with moderately dense stands of pinyon pine, limber pine, Utah juniper, white fir, and mountain mahogany. Military aircraft sometimes disrupt the solitude. Bristlecone pine trees also occur at higher elevations. The Bluebell WSA does have moderate to high potential for mineral resources, including gold.

Because of this mineral potential and the less than outstanding wilderness values in the northern part of the WSA, the entire area is recommended for non-wilderness by the BLM.

Wild horses are present in all three of the Wilderness Study Areas and Becky Peak Wilderness. The presence of wild horses in a WSA or Wilderness, in most cases, positively contributes to the visitor's experience. However, it is shown that when horse numbers exceed AML, impacts occur in the Wilderness and WSAs. Vegetation monitoring in relation to use by wild horses in the Antelope Complex has shown that current wild horse population levels are exceeding the capacity of the area to sustain wild horse use over the long-term. Monitoring at several springs within the three WSAs shows increased trampling and disturbance at those sites.

Figure 53. Bluebell WSA Rock spring (2016). Excess wild horse use has denuded spring head vegetation resulting in lowered water table, absence of riparian plants and absence of hydric soil. The loss of vegetation reduces the aesthetical and naturalness character of the WSAs.

Figure 54. Wild horse manure covers the ground at Rock spring, Bluebell WSA (October 2016). The loss of vegetation reduces the aesthetical and naturalness character of the WSAs.

Figure 55. Bluebell spring in the Bluebell WSA showing impacts from wild horse use (August 2017). The loss of vegetation reduces the aesthetical and naturalness character of the WSAs.

Antelope Complex

During the gather operations it is proposed to utilize a historic gather site, Shafter Well, within the Bluebell WSA. The proposed gather site is located at Shafter Well, in T33N, R67E; Section 12, NWSE (Figure 52 below). The site is currently used as a livestock water development just inside the WSA boundary. Disturbance includes an earthen reservoir, well and pump, a two-track road and a borrow pit. The development was in existence prior to the WSA designation and is a grandfathered use. The original well and pump were installed in 1948. The gather site is proposed because as wild horses are continually captured and subsequently released, they become extremely "educated." The wild horses in the Goshute HMA are reluctant to leave the mountains and the heavy tree cover as they know they are vulnerable. The most efficient and humane way to catch wild horses in the Goshute HMA is to herd them from the high elevations of the mountain into the valley, then have traps set along their path as they travel back into mountains A gather site oriented to gather the horses as they return to the mountain must be constructed somewhere along the west bench of the Goshute HMA. Because the Bluebell WSA boundary follows the road along the western bench of the Toano and Goshute Mountain Ranges, it is extremely difficult to find a gather site location that doesn't involve portions of the WSA. By utilizing the site at Shafter Well, it would be possible to humanely catch wild horses and prevent impairment to the Bluebell WSA. No gather site activities would occur within the Becky Peak Wilderness, Goshute Peak or South Pequop WSAs. Refer to Appendix V for the operating requirements for the Shafter Well gather site.

Figure 56. Bluebell WSA, Shafter Well Proposed gather site.

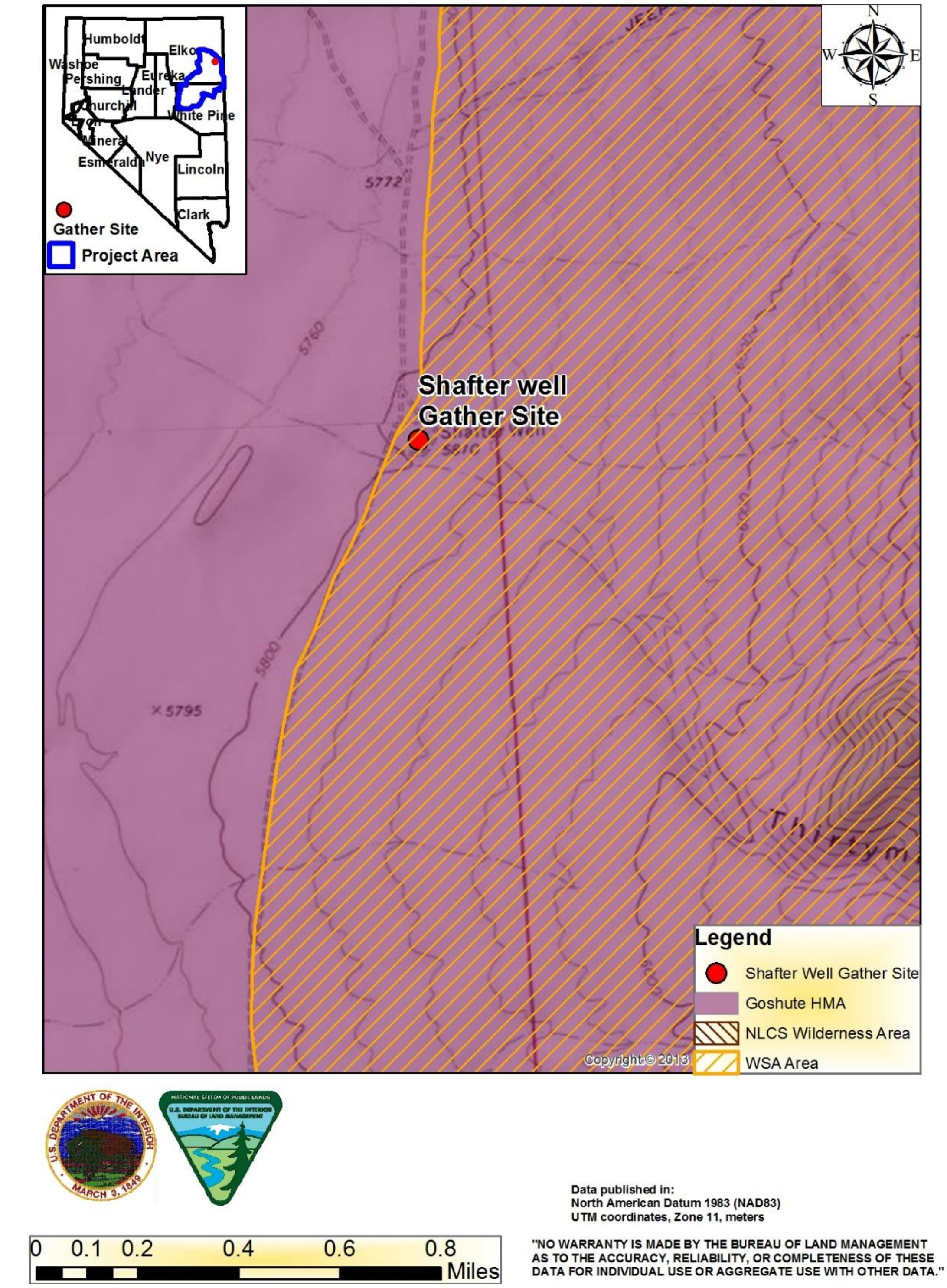


Figure 57. Shafter Well Site.

BLM Wilderness Study Areas are managed under the Interim Management Policy (IMP) for Lands under Wilderness Review (H-8550-1). According to the IMP, Chapter III, Policies for

Specific Activities; Section E, Wild Horse and Burro Management, "The Bureau must endeavor to make every effort **not** to allow populations within WSAs to degrade wilderness values, or vegetative cover as it existed on the date of the passage of FLPMA. Wild horse and burro populations must be managed at appropriate management levels as determined by monitoring activities to ensure a thriving natural ecological balance."

Triple B Complex

The Triple B HMA and the Antelope Valley HMA contain a portion of the Goshute Canyon Wilderness Area (WA). The Goshute Canyon WA lies in the Cherry Creek Range. The 13 mile long WA is a rugged, uplifted range, with massive white limestone cliffs jutting from its slopes. The lower elevations are thickly forested by pinyon pine and juniper, while bristlecone and limber pine occur at the higher elevations. Aspens and cottonwoods in the moist drainages provide for a cool retreat. Large high elevation basins rimmed by peaks contain pockets of aspen and white fir and are filled with wild flowers in the spring and summer. Snowmelt and numerous springs provide riparian settings and water sources for a great number of wildlife species including Bonneville cutthroat trout in Goshute Creek, mule deer, mountain lions, bobcats, and various birds of prey.

There are outstanding opportunities for primitive forms of recreation in the Goshute Canyon WA. Goshute Cave is an extensive limestone solution cave that offers excellent opportunities for caving and geological study. The cave is rich with formations and are relatively well preserved although nearly 100 years of visitation has led to some deterioration.

3.2.13.2. Environmental Effects

Effects of the No Action Alternative

There would be no direct impacts to wilderness or wilderness study areas because trapping operations would not occur. Impacts to naturalness could be threatened through the continued growth of wild horse populations. Wilderness or wilderness study areas currently receive moderate to heavy use by wild horses during certain times of the year. Increasing wild horse populations even further in excess of available capacity 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.

Taking no action would result in an increase in impacts to the WSAs and WA. Excess wild horses would continue to trample spring sources and vegetation surrounding them, and the deterioration would accelerate as wild horse numbers continued to increase. The BLM would need to improve spring sources by other management actions such as fencing and seeding disturbed areas in order to re-vegetate impacted areas in WSAs. Actions such as fencing are not the minimum tool and would introduce more intrusions and man-made features into the landscape. At this point in time, the existing wild horse population is degrading the wilderness values. Failure to remove excess wild horses would be a violation of the BLM's Interim Management Policy for Lands under Wilderness Review (H-8550-1).

Effects of the Proposed Action

Becky Peak and Goshute Canyon Wilderness

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. Impacts would be short-term in nature, typically only a few days. Those impacts would cease when the gather was completed. No surface impacts within wilderness are anticipated to occur during the gather since all trap sites and holding facilities would be placed outside wilderness. 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.

Bluebell, South Pequop, Goshute Peak WSAs

Impacts to opportunities for solitude could occur during gather operations due to the possible noise of the helicopter and increased vehicle traffic around the WSAs. Impacts would be short-term in nature, typically only a few days. Those impacts would cease when the gather was completed. However, wilderness values would be positively affected by implementation of the Proposed Action and Alternative B, as it would result in an overall lower number of horses for a longer period of time when compared to the other alternatives. This lower number of horses over a greater period of time would result in an improved ecological condition of the plant communities that are aesthetically more appealing to the public, and contributes to the "naturalness" character of the wilderness study areas.

3.2.13.3. Cumulative Effects of the Alternatives

The long term protection of wilderness values is the intent for both Wilderness and WSAs. Maintaining AML over the greatest period of time meets the direction of the IMP. Wild horses would still be present in the Becky Peak Wilderness and WSAs but at lower concentrations over different periods of time under each alternative.

The gather site within the Bluebell WSA (Shafter Well) could potentially be used in all Alternatives (except the No Action) if the contractor gathering the horses determines that a site at the foothills of the Toano Mountain Range is necessary for gathering. Impacts to the WSA could include additional vegetation trampling outside of the already disturbed areas from horses going into the gather sites and while in the temporary corral. This impact would be temporary and the operating requirements would limit any long term impacts or impairment to the WSA. Compliance with operating requirements would eliminate any impacts to the WSA.

Impacts from Alternative C would temporarily improve conditions within the WSA because the number of excess wild horses in the area would be decreased. However, this decrease in horse numbers would last for a shorter period of time than the Proposed Action and Alternative B due to the fact that the fertility control vaccine would not be used on females under this alternative. As a result, horse numbers would be over AML within four years. This may not allow enough time for re-growth of vegetation at disturbed areas, thus areas would continue to be adversely impacted by the wild horses.

The cumulative impacts from the No Action Alternative would result in an increase in impacts to the WSAs and WA. Excess wild horses would continue to trample spring sources and vegetation surrounding them, and the deterioration would accelerate as wild horse numbers continued to increase. The BLM would need to improve spring sources by other management actions such as fencing and seeding disturbed areas in order to re-vegetate impacted areas in WSAs. Actions such as fencing are not the minimum tool and would introduce more intrusions and man-made features into the landscape. At this point in time, the existing wild horse population is degrading the wilderness values. Failure to remove excess wild horses would be a violation of the BLM's Interim Management Policy for Lands under Wilderness Review (H-8550-1).
See Tables 4-6 above.

4. Consultation and Coordination

4.1. Native American Consultation

Tribe Contacted	Type of Contact	Date
Battle Mountain Band Council	Letter	January 31, 2017
Confederated Tribes of the Goshute Indian Reservation	Letter/Meeting	February 2, 2017
Duckwater Shoshone Tribe	Letter	February 2, 2017
Elko Band Council	Letter	February 2, 2017
Ely Shoshone Tribe	Letter	February 2, 2017
South Fork Band Council	Letter	February 2, 2017
Shoshone-Paiute Tribe of the Duck Valley Indian Reservation	Letter	February 2, 2017
Te-Moak Tribal Council	Letter	February 2, 2017
Wells Band Council	Letter	February 2, 2017
Yomba Shoshone Tribe	Letter	February 2, 2017

4.2. Statewide Annual Public Hearing for Motorized Vehicles

The Ely District Office held the state-wide meeting on June 27, 2017; four public participants attended and their comments were entered into the record for this hearing. Specific concerns included: (1) whether Most were in support of the use of helicopters and the gathering of excess wild horses. 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 July 2004, Nevada has gathered 26,000 animals with a total mortality of 1.1% (of which 0.5% was gather related) which is very low when handling wild animals. BLM also avoids gathering wild horses six weeks prior to or after peak foaling and therefore does not conduct helicopter removals of wild horses from March 1 through June 30.

4.3. Public Involvment

The Preliminary Antelope and Triple B Complexes Gather Plan EA, DOI-BLM-NV-N030-2017-0010-EA, was made available to interested individuals, agencies and groups for a public review and comment period that opened July 21, 2017 and closed August 21, 2017. The BLM received over 4,950 comment submissions during the public comment period; more than 4,780 of those submissions were a form letter. Form letters are generated from a singular website from a non-governmental organization, such as an animal advocacy group. Comments identified on the form letters were considered along with the rest of the comments received, but as one collective comment letter. Form letters are not counted as separate comments due to their duplicative nature. However, where individuals added their own comments to the form, the personalized comments were considered as separately submitted comments. Duplicate comments or comments from outside the country were not accepted. All other comments received prior to the end of the public comment period were reviewed and considered. Substantive comments were used to finalize the EA as appropriate (see Appendix IX)

4.4. List of Preparers

Name	Title	Section(s)
Elko District Office		
Bruce Thompson	Wild Horse Specialist	Project Lead/ Wild Horse Specialist
Cameron Collins	Wildlife Biologist	Wildlife, Migratory Birds, Special Status Species
Samantha Cisney	Noxious & Invasive Weeds Specialist	Non-native Invasive Species Including Noxious Weeds
Terri Dobis	Planning and Environmental Coordinator	NEPA Compliance
Terri Dobis	Environmental Protection Specialist	Human Health and Safety, Hazardous Wastes
Glen Uhlig	Outdoor Recreation Planner (acting)	Visual Resource Management and Wilderness
Rob Hegemann	Hydrologist	Soil, Water, Wetlands and Riparian/Flood Plans
Dan Zvirzdin	Rangeland Management Specialist	Livestock Grazing, Vegetation
Dayna Reale	Archaeologist	Cultural Resources
Dayna Reale	Native American Coordinator	Native American Religious Concerns
Ely District Office		
Ruth Thompson	Wild Horse Specialist	Wild Horses, Ely District
Ben Noyes	Wild Horse Specialist	Wild Horses, Ely District
Chris Mayer	Rangeland Management Specialist	Livestock Grazing, Vegetation
Nancy Herms	Biologist	Wildlife, Migratory Birds, Special Status Species
Lisa Gilbert	Archaeologist	Cultural Resources
Andrew Gault	Hydrologist	Soil, Water, Wetlands and Riparian/Flood Plains
John Miller	Outdoor Recreation Planner	Visual Resource Management and Wilderness
Paul Nordstrom	Geologist	Geology

5. References

109 Interior Board of Land Appeals 115, 119 API 1989.

118 Interior Board of Land Appeals 75.

Abele, S.C., V.A. Saab, and E.O. Garton. 2004. Lewis's Woodpecker (*Melanerpes lewis*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region.

Achiraman, S., D. Sankar Ganesh, S. Kannan, S. Kamalakkannan, N. Nirmala, and G. Archunan. 2014. Response of male mice to odors of female mice in different stages of estrous cycle: self-grooming behavior and the effect of castration. Indian Journal of Experimental Biology 52:30–35.

American Ornithologists' Union. 1983. Check-list of North American Birds. Sixth Edition. American Ornithologists' Union, Allen Press, Inc., Lawrence, KS.

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

Anderson, J.E., K.E. Holte. 1981. Vegetation development over 25 years without grazing on sagebrush-dominated rangeland in southeastern Idaho. *Journal of Range Management* 34:25-29.

Angle, M., J. W. Turner Jr., R. M. Kenney, and V. K. Ganjam. 1979. Androgens in feral stallions. Pages 31–38 in Proceedings of the Symposium on the Ecology and Behavior of Wild and Feral Equids, University of Wyoming, Laramie.

Asa, C. S. 1999. Male reproductive success in free-ranging feral horses. Behavioural Ecology and Sociobiology 47:89–93.

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

Ashley, M.C., and D.W. Holcombe. 2001. Effects of stress induced by gathers and removals on reproductive success of feral horses. Wildlife Society Bulletin 29:248-254.

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

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

Bagavant, H., C. Sharp, B. Kurth, and K.S.K. Tung. 2002. Induction and immunohistology of autoimmune ovarian disease in cynomolgus macaques (*Macaca fascicularis*). American Journal of Pathology 160:141-149.

Balet, L., F. Janett, J. Hüsler, M. Piechotta, R. Howard, S. Amatayakul-Chantler, A. Steiner, and G. Hirsbrunner, 2014. Immunization against gonadotropin-releasing hormone in dairy cattle: Antibody titers, ovarian function, hormonal levels, and reversibility. Journal of Dairy Science 97:2193-2203.

Ballou, J. D., K. Traylor-Holzer, A. Turner, A. F. Malo, D. M. Powell, J. E. Maldonado, and L. S. Eggert. 2008. Simulation model for contraceptive management of the Assateague Island feral horse population using individual-based data. Wildlife Research 35:502–512.

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

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

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

Beever, E. 2003. Management Implications of the Ecology of Free-Roaming Horses in Semi-Arid Ecosystems of the Western United States. Wildlife Society Bulletin 31 (3):887-895.

Beever, E. A. and P.F. Brussard. 2004. Community- and Landscape-level Responses of Reptiles and Small Mammals to Feral-Horse Grazing in the Great Basin. Journal of Arid Environments59: 271-297.

Beever, E.A. and J.E. Herrick. 2006. Effects of Feral Horses in Great Basin Landscapes on Soils and Ants: Direct and Indirect Mechanisms. Journal of Arid Environments 66: 96-112.

Beever, E.A., R. J. Tausch, and P.F. Brussard. 2003. Characterizing Grazing Disturbance in Semiarid Ecosystems Across Broad Scales, Using Diverse Indices. Ecological Applications 13 (1): 119-136.

Berger, J. 1986. Wild horses of the Great Basin. University of Chicago Press, Chicago.

Bhattacharyya, J., D. S. Slocombe, and S. D. Murphy. 2011. The “wild” or “feral” distraction: effects of cultural understandings on management controversy over free-ranging horses (*Equus ferus caballus*). Human Ecology 39:613–625.

Blaisdell, J.P., R.C. Holmgren. 1984. Managing Intermountain rangelands - salt-desert shrub ranges. Gen. Tech. Rep. INT-163. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 52 p.

BLM, 2010. Antelope Complex Wild Horse Gather Plan EA (DOI-BLM-NV-N030-2010–0019–EA). U.S. Department of the Interior, Bureau of Land Management, Elko District

BLM, 2010. Triple B Complex Wild Horse Gather Plan EA (DOI-BLM-NV-L010-2011-0004-EA). U.S. Department of the Interior, Bureau of Land Management, Ely District

BLM, 2013. Three HMA Water/Bait Gather EA (DOI-BLM-NV-L010-2012-004-EA) U.S. Department of the Interior, Bureau of Land Management, Elko District.

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

BLM. 2015. Ely District Water Canyon wild horse growth suppression pilot program; environmental assessment. Bureau of Land Management, Ely District Office, Ely, Nevada.

BLM. 2015. Nevada and Northeastern California Greater Sage-Grouse Approved Resource Management Plan Amendment. US Department of the Interior, Bureau of Land Management, Nevada State Office, Reno, NV.

BLM. 2015. Instruction Memorandum 2015-151; Comprehensive animal welfare program for wild horse and burro gathers. Washington, D.C.Boedeker, N.C., L.A.C. Hayek, S. Murray, D.M. De Avila, and J.L. Brown. 2012. Effects of a gonadotropin-releasing hormone vaccine on ovarian cyclicity and uterine morphology of an Asian elephant (Elephas maximus). Journal of Zoo and Wildlife Medicine 43:603-614.

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

Borsberry, S. 1980. Libidinous behaviour in a gelding. Veterinary Record 106:89–90.

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

Bradley, P.V., M.J. O'Farrell, J.A. Williams and J.E. Newmark (eds). 2006. The Revised Nevada Bat Conservation Plan. Nevada Bat Working Group. Reno, Nevada.

Briske, D.D., B.T. Bestelmeyer, T.K. Stringham, P.L. Shaver. 2008. Recommendations for development of resilience-based state-and-transition models. *Rangeland Ecology & Management* 61:359-367.

Britton, C.M., G.R. McPherson and F.A. Sneva. 1990. Effects of burning and clipping on five bunchgrasses in eastern Oregon. *The Great Basin Naturalist* 50:115-120.

Brooks C, Bonyongo C, Harris S. (2010) Effects of global positioning system collar weight on zebra behavior and location error. J Wildlife Manage 72: 527–534. doi: 10.2193/2007-061.

Brooks, M.L. and Chambers, J.C., 2011. Resistance to invasion and resilience to fire in desert shrublands of North America. *Rangeland Ecology & Management* 64:431-438.

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

Buehler, D.A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). *In* The Birds of North America, No. 506 (A. Poole and F. Gill, *eds.).* The Academy of Natural Sciences, Philadelphia, PA.

Bull, E.L and J.E. Hohman. 1994. Breeding biology of northern goshawks in northeastern Oregon. *Studies in Avian Biology* 16:103-105.

Campbell, R.W., N.K. Dawe, I. McTaggar-Cowan, J.M. Cooper, G.W. Kaiser, and M.C.E McNall. 1990. The Birds of British Columbia. Vol. 1. Nonpasserines: introduction and loons through waterfowl. Royal British Columbia Museum.

Carpenter, S., Walker, B., Anderies, J.M. and Abel, N., 2001. From metaphor to measurement: resilience of what to what?. Ecosystems 4:765-781.

Carr CA, Petersen SL, Bristow L, Johnson DE, Collins GH, et al.. (2012) Effect of GPS collar sampling interval on measures of free-roaming horse activity and resource use. Abstracts of the 65th annual meeting of the Society for Range Management, 2012, Spokane, WA.

Chambers, J.C., B.E. Norton. 1993. Effects of grazing and drought on population dynamics of salt desert shrub species on the Desert Experimental Range, Utah. *Journal of Arid Environments* 24:261–275.

Chambers, J.C., Miller, R.F., Board, D.I., Pyke, D.A., Roundy, B.A., Grace, J.B., Schupp, E.W. and Tausch, R.J., 2014. Resilience and resistance of sagebrush ecosystems: implications for state and transition models and management treatments. *Rangeland Ecology and Management* 67:440-454.

Chaudhuri, M., and J. R. Ginsberg. 1990. Urinary androgen concentrations and social status in two species of free ranging zebra (Equus burchelli and E. grevyi). Reproduction 88:127–133.

Clements, C.D., Young, J.A., Harmon, D.N. and McCuin, G., 2010. Revegetation of Degraded Winterfat Communities. *Rangelands* 32:37-40.

Clements, F.E. 1936. Nature and structure of the climax. *Journal of Ecology* 24:252-284.

Coates, P. S., M. L. Casazza, B. E. Brussee, M. A. Ricca, K. B. Gustafson, C. T. Sanchez-ChopiteaOverton, E. Kroger, et al. 2014. Spatially explicit modeling of greater sage-grouse (*Centrocercusurophasianus*) habitat in Nevada and northeastern California - A decision-support tool for management: US Geological Survey Open-File Report 2014-1163.

Coates-Markel, L. 2000. Summary Recommendations, BLM Wild Horse and Burro Population Viability Forum April 1999, Ft Collins, CO. Resource Notes 35:4pp.

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

Colborn, D. R., D. L. Thompson, T. L. Roth, J. S. Capehart, and K. L. White. 1991. Responses of cortisol and prolactin to sexual excitement and stress in stallions and geldings. Journal of Animal Science 69:2556–2562.

Collins GH, Petersen SL, Carr CA, Pielstick L (2014) Testing VHF/GPS Collar Design and Safety in the Study of Free-Roaming Horses. PLoS ONE 9(9): e103189. doi:10.1371/journal.pone.0103189

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

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

Cornely, J.E., L.N. Carraway, and B.J. Verts. 1992. Sorex preblei. *Mammalian Species* 416:1-3.

Costantini, R. M., J. H. Park, A. K. Beery, M. J. Paul, J. J. Ko, and I. Zucker. 2007. Post-castration retention of reproductive behavior and olfactory preferences in male Siberian hamsters: Role of prior experience. Hormones and Behavior 51:149–155.

Cothran. G. E., 2013 Genetic Analysis of the Frisco HMA, UT 445.

Creel, S., B. Dantzer, W. Goymann, and D.R. Rubenstein. 2013. The ecology of stress: effects of the social environment. Functional Ecology 27:66-80.

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

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

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

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

Davies, K.W. and Bates, J.D., 2014a. Attempting to restore herbaceous understories in Wyoming big sagebrush communities with mowing and seeding. *Restoration ecology* 22:608-615.

Davies, K.W., Bates, J.D. and Nafus, A.M., 2012. Mowing Wyoming big sagebrush communities with degraded herbaceous understories: has a threshold been crossed?. *Rangeland Ecology and Management* 65:498-505.

Davies, K.W., C.S. Boyd D.D. Johnson A.M. Nafus M.D. Madsen. 2015. Success of seeding native compared with introduced perennial vegetation for revegetating medusahead-invaded sagebrush rangeland. *Rangeland Ecology & Management* 68:224-230.

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

Daw, S.K. and S. DeStefano. 2001. Forest characteristics of Northern Goshawk nest stands and post-fledging areas in Oregon. *Journal of Wildlife Management* 65:59-65.

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

Demas, G. E., C. A. Moffatt, D. L. Drazen, and R. J. Nelson. 1999. Castration does not inhibit aggressive behavior in adult male prairie voles (Microtus ochrogaster). Physiology and Behavior 66:59–62.

Deniston, R. H. 1979. The varying role of the male in feral horses. Pages 93–38 in Proceedings of the Symposium on the Ecology and Behaviour of Wild and Feral Equids, University of Wyoming, Laramie.

Dixson, A. F. 1993. Sexual and aggressive behaviour of adult male marmosets (Callithrix jacchus) castrated neonatally, prepubertally, or in adulthood. Physiology and Behavior 54:301–307.

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

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

Dunbar, I. F. 1975. Behaviour of castrated animals. The Veterinary Record 92–93.

Eagle, T. C., C. S. Asa, R. A. Garrott, E. D. Plotka, D. B. Siniff, and J. R. Tester. 1993. Efficacy of dominant male sterilization to reduce reproduction in feral horses. Wildlife Society Bulletin 21:116–121.

Eberhardt, L.L., A.K. Majorowicz, and J.A. Wilcox. 1982. Apparent Rates of Increase for Two Feral Horse Herds. Journal of Wildlife Management 46 (2): 367-374.

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

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

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

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

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

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

Feh, C. 1999. Alliances and reproductive success in Camargue stallions. Animal Behaviour 57:705–713.

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

Feist, J. D., and D. R. McCullough. 1976. Behavior patterns and communication in feral horses. Zietschrift für Tierpsychologie 41:337–371.

Floyd, Ted et al. 2007. Atlas of the Breeding Birds of Nevada. University of Nevada Press, Reno NV.

Frankham, R., J. D. Ballou, and D. A. Briscoe. 2010. Introduction to conservation genetics. Cambridge University Press, Cambridge, England.

French, H., E. Peterson, R. Ambrosia, H. Bertschinger, M. Schulman, M. Crampton, R. Roth, P. Van Zyl, N. Cameron-Blake, M. Vandenplas, and D. Knobel. Porcine and recombinant zona pellucida vaccines as immunocontraceptives for donkeys in the Caribbean. Proceedings of the 8th International Wildlife Fertility Control Conference, Washington, D.C.

Ganskopp, D., 1988. Defoliation of Thurber needlegrass: herbage and root responses. *Journal of Range Management* 41:472-476.

Ganskopp, D., T. Svejcar, F. Taylor, J. Farstvedt, K. and Paintner. 1999. Seasonal cattle management in 3 to 5 year old bitterbrush stands. *Journal of Range Management* 52:166-173.

Ganskopp, D.C. 1983. Habitat use and Spatial Interactions of Cattle, Wild Horses, Mule Deer, and California Bighorn Sheep in the Owyhee Breaks of Southeast Oregon. PhD Dissertation, Oregon State University.

Ganskopp, D.C. and M. Vavra. 1986. Habitat Use by Feral Horses in the Northern Sagebrush Steppe. Journal of Range Mangement 39(3):207-211.

Ganskopp, D.C. and M. Vavra. 1987. Slope Use by cattle, feral horses, deer, and bighorn sheep. Northwest Science, 61(2):74-80.

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

Garrott, R. A., D. B. Siniff, and L. L. Eberhardt. 1991. Growth rates of feral horse populations. Journal of Wildlife Management 55:641–648.

Garrott , R.A., and D.B. Siniff. 1992. Limitations of male-oriented contraception for controlling feral horse populations. Journal of Wildlife Management 56:456-464.

Garrott, R.A., and M.K. Oli. 2013. A Critical Crossroad for BLM's Wild Horse Program. Science 341:847-848.

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

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

Gionfriddo, J.P., A.J. Denicola, L.A. Miller, and K.A. Fagerstone. 2011b. Health effects of GnRH immunocontraception of wild white-tailed deer in New Jersey. Wildlife Society Bulletin 35:149-160.

Goodloe, R.B., 1998. Immunocontraception, genetic management, and demography of feral horses on four eastern US barrier islands. UMI Dissertation Services.

Goto, H., O. A. Ryder, A. R. Fisher, B. Schultz, S. L. K. Pond, A. Nekrutenko, and K. D. Makova. 2011. A massively parallel sequencing approach uncovers ancient origins and high genetic variability of endangered Przewalski's horses. Genome Biology and Evolution 3:1096–1106.

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

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

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

Great Basin Bird Observatory (GBBO). 2010. Nevada Comprehensive Bird Conservation Plan, ver. 1.0. Great Basin Bird Observatory, Reno, NV. Available online at www.gbbo.org/bird_conservation_plan.html.

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

Gunderson, L.H., 2000. Ecological resilience—in theory and application. *Annual review of ecology and systematics* 31:425-439.

Gupta, S., and V. Minhas. 2017. Wildlife population management: are contraceptive vaccines a feasible proposition? Frontiers in Bioscience, Scholar 9:357-374.

Hafner, J.C. and N.S. Upham. 2011. Phylogeography of the dark kangaroo mouse, *Microdipodops megacephalus*: cryptic lineages and dispersal routes in North America’s Great Basin. *Journal of Biogeography* 38:1077-1097.

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

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

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

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

Hanley, T.A. 1982. The Nutritional Basis for Food Selection by Ungulates. Journal of Range Management 35 (2): 146-151.

Hanley, T.A., and K.A. Hanley. 1982. Food Resource Partitioning by Sympatric Ungulates on Great Basin Rangeland. Journal of Range Management 35 (2): 152-158.

Hansen, R.M., R.C. Clark, and W. Lawhorn. 1977. Foods of Wild Horses, Deer, and Cattle in the Douglas Mountain Area, Colorado. Journal of Range Management 30 (2): 116-118.

Hanser, S.E and S.T. Knick. 2011. Greater sage-grouse as an umbrella species for shrubland passerine birds: a multiscale assessment. Pgs. 475-487 *in* S.T. Knick and J.W. Connelly, eds. Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology, vol. 38. University of California Press, Berkely, CA.

Hargis, C. D., C. McCarthy, and R.D. Perloff. 1994. Home ranges and habitats of Northern Goshawk in eastern California. *Studies Avian Biology*. 16:66–74.

Hart and Jones, 1975. Effects of Castration and Sexual Behavior of tropical Male Goats. Hormones and Behavior, 6, 247-258.

Hart, 1968. Role of Prior Experience in the Effects of Castration on Sexual behavior of Male Dogs. Journal of Comparative and Physiology Phycology Vol 66, N0. 3, 719-725.

Hart, B.L. 1968. Role of prior experience in the effects of castration on sexual behavior of male dogs. Journal of Comparative and Physiological Psychology 66:719–725.

Hart, B. L., and T. O. A. C. Jones. 1975. Effects of castration on sexual behavior of tropical male goats. Hormones and Behavior 6:247–258.

Heilmann, T.J., Garrott, R.A., Caldwell, L.L., Tiller, B.L. 1998. Behavioral response of free-ranging elk treated with an immunocontraceptive vaccine. Journal of Wildlife Management 62:243-250.

Henneke, D. R., G. D. Potter, J. L. Kreider, and B. F. Yeates. 1983. Relationship between condition score, physical measurements and body fat percentage in mares. Equine Veterinary Journal 15:371–372.

Herbel, H. Carlton., Jerry L. Holechek., Rex D. Pieper., 2004. Range Management Principles and Practices. Fifth Edition. Pgs. 141-142.

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

Herron, G.B., C.A. Mortimore and M.S. Rawlings. 1985. Raptors of Nevada: Their Biology and Management. Biological Bulletin No. 8. Nevada Department of Wildlife, Reno, NV.

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

Hoffman, R.S., D.L. Pattie, and J.F. Bell. 1969. The distribution of some mammals in Montana, I. mammals other than bats. *Journal of Mammalogy* 50:737-741.

Holechek, J.L., R.D. Pieper, and C.H. Herbel. 2010. Range management: principles and practices (6th Edition). Prentice-Hall.

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

Hubbard, R.E., and R. M. Hansen. 1976. Diets of Wild Horses, Cattle, and Mule Deer in the Piceance Basin, Colorado. Journal of Range Management 29 (5): 389-392.

Hume, J. M., and K. E. Wynne-Edwards. 2005. Castration reduces male testosterone, estradiol, and territorial aggression, but not paternal behavior in biparental dwarf hamsters (Phodopus campbelli). Hormones and Behavior 48:303–310.

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

Interior Board of Land Appeals 88-591, 88-638, 88-648, 88-679 at 127. 109 Interior Board of Land Appeals 119 API 1989. 118 Interior Board of Land Appeals 75.

Ivey, G.L., and C.P. Herziger. 2006. Intermountain West Waterbird Conservation Plan, Version 1.2. A plan associated with the Waterbird Conservation for the Americas Initiative. US Fish and Wildlife Service, Pacific Region, Portland, OR.

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

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

Jewell, P. A. 1997. Survival and behaviour of castrated Soay sheep (Ovis aries) in a feral island population on Hirta, St. Kilda, Scotland. Journal of Zoology 243:623–636.

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

Joonè, C.J., H. French, D. Knobel, H.J. Bertschinger, and M.L. Schulman. 2017b. Ovarian suppression following PZP vaccination in pony mares and donkey jennies. Proceedings of the 8th International Wildlife Fertility Control Conference, Washington, D.C.

Joonè, C.J., M.L. Schulman, G.T. Fosgate, A.N. Claes, S.K. Gupta, A.E. Botha, A-M Human, and H.J. Bertschinger. 2017c. Serum anti-Müllerian hormone dynamics in mares following immunocontraception with anti-zona pellucida or -GnRH vaccines, Theriogenology (2017), doi: 10.1016/

Jørgensen, G. H. M., L. Borsheim, C. M. Mejdell, E. Søndergaard, and K. E. Bøe. 2009. Grouping horses according to gender—Effects on aggression, spacing and injuries. Applied Animal Behaviour Science 120:94–99.

Kaseda, Y. 1981. The structure of the groups of Misaki horses in Toi Cape. Japanese Journal of Zootechnical Science 52:227–235.

Kaseda, Y., H. Ogawa, and A. M. Khalil. 1997. Causes of natal dispersal and emigration and their effects on harem formation in Misaki feral horses. Equine Veterinary Journal 29:262–266.

Kaur, K. and V. Prabha. 2014. Immunocontraceptives: new approaches to fertility control. BioMed Research International v. 2014, ArticleID 868196, 15 pp. http:/dx.doi.org/10.1155/2014/868196

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

Khalil, A. M., and N. Murakami. 1999. Effect of natal dispersal on the reproductive strategies of the young Misaki feral stallions. Applied Animal Behaviour Science 62:281–291.

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

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

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

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

King, S. R. B., and J. Gurnell. 2006. Scent-marking behaviour by stallions: an assessment of function in a reintroduced population of Przewalski horses (Equus ferus przewalskii). Journal of Zoology 272:30–36.

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

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

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

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

Kirkpatrick, J.F., A.T. Rutberg, L. Coates-Markle, and P.M. Fazio. 2012. Immunocontraceptive Reproductive Control Utilizing Porcine Zona Pellucida (PZP) in Federal Wild Horse Populations. Science and Conservation Center, Billings, Montana.

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

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

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

Kitchell, K., S. Cohn, R. Falise, H. Hadley, M. Herder, K. Libby, K. Muller, T. Murphy, M. Preston, M. J. Rugwell, and S. Schlanger. 2015. Advancing science in the BLM: an implementation strategy. Department of the Interior, BLM, Washington DC.

Klages, K.H.W. 1942. Ecological Crop Geography. The Macmillan Company, New York.

Knapp, P.A. 1996. Cheatgrass (*Bromus tectorum*) dominance in the Great Basin Desert: history, persistence, and influences to human activities. *Global Environmental Change* 6:37-52.

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

Kochert, M.N., K. Steenhof, C.L. McIntyre and E.H. Craig. 2002. Golden Eagle (*Aquila chrysaetos*). *In* The Birds of North America, No. 684 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia.

Krall, J.L., J.R. Stroh, C.S. Cooper, and S.R. Chapman. 1971. Effect of time and extent of harvesting basin wildrye. *Journal of Range Management* 24:414-418.

Krannitz, P.G., 2008. Response of antelope bitterbrush shrubsteppe to variation in livestock grazing. *Western North American Naturalist* 68:138-152.

Krysl, L.J., M.E. Hubbert, B.F. Sowell, G.E. Plumb, T.K. Jewett, M.A. Smith, and J.W. Waggoner.1984. Horses and Cattle Grazing in the Wyoming Red Desert, I. Food Habits and Dietary Overlap. Journal of Range Management 37 (1): 72-76.

Lau, A. N., L. Peng, H. Goto, L. Chemnick, O. A. Ryder, and K. D. Makova. 2009. Horse domestication and conservation genetics of Przewalski's horse inferred from sex chromosomal and autosomal sequences. Molecular Biology and Evolution 26:199–208.

Leary, R. 2008. Winterfat seed viability and dormant season livestock grazing (Doctoral dissertation).

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

Line, S. W., B. L. Hart, and L. Sanders. 1985. Effect of prepubertal versus postpubertal castration on sexual and aggressive behavior in male horses. Journal of the American Veterinary Medical Association 186:249–251.

Linklater, W. L., and E. Z. Cameron. 2000. Distinguishing cooperation from cohabitation: the feral horse case study. Animal Behavior 59:F17–F21.

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

Lubow, B. C., and J. I. Ransom. 2016. Practical bias correction in aerial surveys of large mammals: validation of hybrid double-observer with sightability method against known abundance of feral horse (*Equus caballus*) populations. PLoS-ONE 11(5):e0154902. doi:10.1371/journal.pone.0154902.

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

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

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

Mason, B. J., J. R. Newton, R. J. Payne, and R. C. Pilsworth. 2005. Costs and complications of equine castration: a UK practice-based study comparing ‘standing nonsutured’ and ‘recumbent sutured’ techniques. Equine Veterinary Journal 37:468-472.

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

McConnel, B.R. and J.G. Smith. 1977. Influence of grazing on age-yield interactions in bitterbrush. J. Range Manage. 20:9 1-93.

McInnis, M.A. 1984. Ecological Relationships among Feral Horses, Cattle, and Pronghorn in Southeastern Oregon. PhD Dissertation. Oregon State University.

McInnis, M.A. and M. Vavra. 1987. Dietary relationships among feral horses, cattle, and Prognhorn in southeastern Oregon. Journal of Range Management. 40(1):60-66.Meeker, J.O. 1979. Interactions Between Pronghorn Antelope and Feral Horses in Northwestern Nevada. Master's Thesis. University of Nevada, Reno, Reno, Nevada.

Menard, C., P. Duncan, G. Fleurance, J. Georges, and M. Lila. 2002. Comparative Foraging and Nutrition of Horses and Cattle in European Wetlands. Journal of Applied Ecology39 (1): 120-133.

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

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

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

National Research Council (NRC), 2013, Using Science to Improve the BLM Wild Horse and Burro Program, A Way Forward, 383 pp. National Academies Press. Washington, DC.

Neel, L.A. (Editor). 1999. Nevada Partners in Flight Bird Conservation Plan. Nevada Department of Wildlife. 007. www.ndow.orgMarch.

Nelson, K. J. 1980. Sterilization of dominant males will not limit feral horse populations. USDA Forest Service Research Paper RM-226.

Nettles, V. F. 1997. Potential consequences and problems with wildlife contraceptives. Reproduction, Fertility and Development 9, 137–143.

Nevada Department of Wildlife (NDOW). 2008. Nevada Upland Game Species Management Plan. Game Division Internal Document. Nevada Department of Wildlife, 1100 Valley Road, Reno, NV.

Nevada Department of Wildlife (NDOW). 2016. 2015-2016 Big Game Status. Nevada Department of Wildlife, Reno, NV. NOAA. www.ncdc.noaa.gov

Nevada Natural Heritage Program. 2001. Rare Plant Fact Sheet: Nachlinger Catchfly. Available: http://heritage.nv.gov/sites/default/files/atlas/silennachl.pdf

Nickolmann, S., S. Hoy, and M. Gauly. 2008. Effects of castration on the behaviour of male llamas (Lama glama). Tierärztliche Praxis Großtiere 36:319–323.

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

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

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

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

O'Farrell, M.J. and A.R. Blaustein. 1974. Microdipodops megacephalus. Mammalian Species 46:1-3.

Ogle, D.G., L. St. John, L. Holzworth. 2001. Plant guide: Management and use ofWinterfat. Boise, ID, USA: USDA-NRCS. 4 p.

Olsen, F.W., and R.M. Hansen. 1977. Food Relations of Wild Free-Roaming Horses to Livestock and Big Hame, Red Desert, Wyoming. Journal of Range Management 30 (1): 17-20.

Oring, L.W., L. Neel, and K.E. Oring. 2000. Intermountain west regional shorebird plan. U.S. Shorebird Conservation Plan. Version 1.0. U.S. Fish and Wildlife Service. Arlington, Virginia. http://www.fws.gov/shorebirdplan/RegionalShorebird/downloads/IMWEST4.pdf

Ostermann-Kelm, S.D., E.A. Atwill, E.S. Rubin, L.E. Hendrickson, and W.M. Boyce, 2009. Impacts of Feral Horses on a Desert Environment. BMC Ecology 9:22.

Paige, C., and S.A. Ritter. 1999. Birds in a Sagebrush Sea: Managing Sagebrush Habitats for Bird Communities. Partners in Flight Western Working Group, Boise, ID.

Palmer, R.S., ed. 1988. Handbook of North American birds. Vol. 5. Yale University Press, New Haven, CN.

Paton, P.W.C. and T.C. Edwards. 1992. Nesting ecology of the snowy plover at Great Salt Lake, Utah – 1992 breeding season. Progress Report, Contract No. 90-2028, Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, UT.

Pearce, O. 1980. Libidinous behaviour in a gelding. Veterinary Record 106:207–207.

Pellant, M.; Reichert, L. 1984. Management and rehabilitation of a burned winterfat community in southwestern Idaho. In: Tiedemann, A. R.; McArthur, E. D.; Stutz, H. C.; [and others], compilers. Proceedings symposium on the biology of Atriplex and related chenopods; 1983 May 2-6; Provo, UT. Gen. Tech. Rep. INT-172. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station: 281-285.

Platts, W.S., and J.N. Rinne. 1985. Riparian and stream enhancement management and research in the Rocky Mountains. North American Journal of Fisheries Management 5:115-125.

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

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

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

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

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

Pyke, D.A. 2011. Restoring and rehabilitating sagebrush habitats. *Studies in Avian Biology* 38:531-548.

Ransom, J. I., and B. S. Cade. 2009. Quantifying Equid Behavior--A Research Ethogram for Free-Roaming Feral Horses. Publications of the US Geological Survey. U.S. Geological Survey Techniques and Methods 2-A9.

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

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

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

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

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

Reuven, Y. 1996. Loggerhead Shrike (Lanius ludovicianus), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/231

Reynolds, R.T., E.C. Meslow and H.M. Wight. 1982. Nesting habits of coexisting Accipiter in Oregon. *Journal of Wildlife Management* 46:124-131.

Rice, B., M. Westoby. 1978. Vegetative responses of some Great Basin shrub communities protected against jackrabbits or domestic stock. *Journal of Range Management* 31:28-34.

Rich, T. D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D. Demarest, E.H. Dunn, W.C. Hunter, E. Iñigo-Elias, J.A. Kennedy, A. Martell, A. Panjabi, D.N. Pashley, K.V. Rosenberg, C. Rustay, S. Wendt, and T. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, New York.

Rios, J. F. I., and K. Houpt. 1995. Sexual behavior in geldings. Applied Animal Behaviour Science 46:133–133.

Roelle, J.E. and J. I. Ransom. 2009. Injection-site reactions in wild horses (*Equus caballus*) receiving an immunocontraceptive vaccine. US Geological Survey Report 2009-5038.

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

Roelle, J.E. and S.J. Oyler-McCance, S.J., 2015. Potential demographic and genetic effects of a sterilant applied to wild horse mares. US Geological Survey Report 2015-1045.

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

Romo, J.T., R.E. Redmann, B.L. Kowalenko, A.R. Nicholson. 1995. Growth of winterfat following defoliation in northern mixed prairie of Saskatchewan. *Journal of Range Management* 48:240-245.

Rowland, M.M., M.J. Wisdom, L.H. Suring and C.W. Meinke. 2006. Greater sage-grouse as an umbrella species for sagebrush-associated vertebrates. *Biological Conservation* 129:323-335.

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

Rubin, T. Sicheritz-Ponten, L. Andersson, M. Hofreiter, T. Marques-Bonet, M. T. P. Gilbert, R. Nielsen, L. Excoffier, E. Willerslev, B. Shapiro, and L. Orlando. 2014. Prehistoric genomes reveal the genetic foundation and cost of horse domestication. Proceedings of the National Academy of Sciences of the United States of America 111:E5661–9.

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

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

Saltz, D., M. Rowen, and D. I. Rubenstein. 2000. The effect of space-use patterns of reintroduced Asiatic wild ass on effective population size. Conservation Biology 14:1852–1861.

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

Sauer, J.R., J.E. Hines and J. Fallon. 2008. The North American Breeding Bird Survey, Results and Analysis 1966 - 2007. Version 5.15.2008. USGS Patuxent Wildlife Research Center, Laurel, MD; http://www.mbr-pwrc.usgs.gov/bbs/bbs.html.

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

Schumacher, J. 2006. Why do some castrated horses still act like stallions, and what can be done about it? Compendium Equine Edition Fall:142–146.

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

Shields, O. 1975. Studies on North American *Philotes* (lycaenidae): IV. Taxonomic and biological notes, and new subspecies. *Bull. Allyn Mus*. 28.

Shumake, S.A. and G. Killian. 1997. White-tailed deer activity, contraception, and estrous cycling. Great Plains Wildlife Damage Control Workshop Proceedings, Paper 376.

Siders, M.S and P.L. Kennedy. 1994. Nesting habitat of Accipiter hawks: is body size a consistent predictor of nest habitat characteristics? *Studies in Avian Biology* 16:92-96.

Sigurjónsdóttir, H., M. C. Van Dierendonck, S. Snorrason, and A. G. Thorhallsdóttir. 2003. Social relationships in a group of horses without a mature stallion. Behaviour 140:783–804.

Siniff, D.B., J.R. Tester, and G.L. McMahon. 1986. Foaling Rate and Survival of Feral Horses in Western Nevada. Journal of Range Management 39 (4): 296-297.

Skinner, S.M., Mills, T., Kirchick, H.J. and Dunbar, B.S., 1984. Immunization with Zona Pellucida Proteins Results in Abnormal Ovarian Follicular Differentiation and Inhibition of Gonadotropin-induced Steroid Secretion. Endocrinology, 115(6), pp.2418-2432.

Smith, J. A. 1974. Proceedings: Masculine behaviour in geldings. The Veterinary Record 94:160–160.

Smith, M.A and J.W. Waggoner, Jr., et al. 1982. Vegetation Utilization, Diets, and Estimated Dietary Quality of Horses and Cattle Grazing in the Red Desert of West central Wyoming. BLM Contract No. AA851-CTO-31.Society for Range Mgt. 1974. A glossary of terms used in Range Management, 2nd Edition. Society for Range Management, Denver, Colo.

Smith, M.A. 1986a. Impacts of Feral Horses Grazing on Rangelands: An Overview. Equine Veterinary Science, 6(5):236-238.

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

Squires, J.R. and L.F. Ruggiero. 1996. Nest-site preference of northern goshawks in southcentral Wyoming. *Journal of Wildlife Management* 60:170-177.

Squires, J.R. and Reynolds, R. T. 1997. Northern Goshawk (*Accipiter gentilis*), in The Birds of North America (A. Poole and F. Gill, *eds*.), no. 298. Birds N. Am., Philadelphia.

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

Stringham, T.K., P. Novak-Echenique, P. Blackburn, C. Coombs, D. Snyder, and A. Wartgow. 2015. Final Report for USDA Ecological Site Description State-and-Transition Models, Major Land Resource Area 28A and 28B Nevada. University of Nevada Reno, Nevada Agricultural Experiment Station Research Report 2015-01. p. 1524.

Stringham, T.K., W.C. Krueger and P.L. Shaver. 2003. State and transition modeling: An ecological process approach. *Journal of Range Management* 56:106-113.

Suding, K.N., K.L. Gross, G.R. Houseman. 2004. Alternative states and positive feedbacks in restoration ecology. *Trends in Ecology & Evolution* 19:46-53.

Thompson, D. L., Jr, B. W. Pickett, E. L. Squires, and T. M. Nett. 1980. Sexual behavior, seminal pH and accessory sex gland weights in geldings administered testosterone and(or) estradiol-17. Journal of Animal Science 51:1358–1366.

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

Turner Jr, J.W., I.K. Liu, A.T. Rutberg, and J.F. Kirkpatrick. 1997. Immunocontraception limits foal production in free-roaming feral horses in Nevada. Journal of Wildlife Management 61:873-880.

Turner, J.W., and J.F. Kirkpatrick. 2002. Effects of immunocontraception on population, longevity and body condition in wild mares (*Equus caballus*). Reproduction (Cambridge, England) Supplement, 60, pp.187-195.

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

Turner, B. N., S. L. Iverson, and K. L. Severson. 2011. Effects of castration on open-field behavior and aggression in male meadow voles (Microtus pennsylvanicus). Canadian Journal of Zoology 58:1927–1932.

Turner, J.W., I.K. Liu, D.R. Flanagan, A.T. Rutberg, and J.F. Kirkpatrick. 2007. Immunocontraception in wild horses: one inoculation provides two years of infertility. Journal of Wildlife Management 71:662-667.

Turner, J. W., Jr., A. T. Rutberg, R. E. Naugle, M. A. Kaur, D. R. Flanagan, H. J. Bertschinger, and I. K. M. Liu. 2008. Controlled-release components of PZP contraceptive vaccine extend duration of infertility. Wildlife Research 35:555–562.

Tyler, S. 1972. The behaviour and social organisation of the New Forest ponies. Animal Behaviour Monographs 5:85–196.

U.S. Fish and Wildlife Service (USFWS). 1986. North American Waterfowl Management Plan. U.S. Department Interior, Washington, D.C. http://www.fws.gov/birdhabitat/nawmp/index.shtm

U.S. Fish and Wildlife Service (USFWS). 1998. North American Waterfowl Management Plan. 1998 update, Expanding the vision. U.S. Department of the Interior, Washington, D.C.

U.S. Fish and Wildlife Service (USFWS). 2013. Greater Sage-grouse (*Centrocercus urophasianus*) Conservation Objectives: Final Report. U.S. Fish and Wildlife Service, Denver, CO.

U.S. Fish and Wildlife Service (USFWS). 2014. Memorandum: Greater Sage-Grouse: Additional Recommendations to Refine Land Use Allocations in Highly Important Landscapes.

Ulmschneider, H. 2008. Surveying for pygmy rabbits (*Brachylagus idahoensis*). Interagency Pygmy Rabbit Working Group.

USDOI. 1983. Proposed Wells Resource Management Plan and Final Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management.

USDOI. 1985. Approved Wells RMP and Record of Decision. U.S. Department of the Interior, Bureau of Land Management.

USDOI. 1993. Wells RMP Wild Horse Amendment and Decision Record. U.S. Department of the Interior, Bureau of Land Management. BLM-EK-PT-93-001-1610.

USDOI. 2007. Ely Proposed Resource Management Plan/Final Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management. BLM/EL/PL-07/09+1793. DOI No. FES07–40. November.

USDOI. 2008. Ely District Record of Decision and Approved Resource Management Plan. U.S. Department of the Interior, Bureau of Land Management. BLM/NV/EL/PL-GI08/25+1793.

USDOI. 2008. National Environmental Policy Act. Handbook-1790-1.

USGAO. 2008. Bureau of Land Management Effective Long-Term Options Needed to Manage Unadoptable Wild Horses. GAO-09-77.

Van Dierendonck, M. C., H. De Vries, and M. B. H. Schilder. 1995. An analysis of dominance, its behavioral parameters and possible determinants in a herd of Icelandic horses in captivity. Journal of Zoology 45:362–385.

Van Dierendonck, M. C., H. De Vries, M. B. H. Schilder, B. Colenbrander, A. G. Þorhallsdóttir, and H. Sigurjónsdóttir. 2009. Interventions in social behaviour in a herd of mares and geldings. Applied Animal Behaviour Science 116:67–73.

Van Dierendonck, M. C., H. Sigurjónsdóttir, B. Colenbrander, and A. G. Thorhallsdóttir. 2004. Differences in social behaviour between late pregnant, post-partum and barren mares in a herd of Icelandic horses. Applied Animal Behaviour Science 89:283–297.

Vinke, C. M., R. van Deijk, B. B. Houx, and N. J. Schoemaker. 2008. The effects of surgical and chemical castration on intermale aggression, sexual behaviour and play behaviour in the male ferret (Mustela putorius furo). Applied Animal Behaviour Science 115:104–121.

Wambolt, C. L., G.F. Payne. 1986. An 18-year comparison of control methods for Wyoming big sagebrush in southwestern Montana. *Journal of Range Management* 39:314-319.

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

West, N.E., F.D. Provenza, P.S. Johnson, M.K. Owens. 1984. Vegetation change after 13 years of livestock grazing exclusion on sagebrush semi-desert in central Utah. *Journal of Range Management* 37:262-264.

Wiens, J.A., B. Van Horne, and J.T. Rotenberry. 1987. Temporal and spatial variations in the behavior of shrubsteppe birds. *Oecologia* 73:60-70.

Wiggins, D.A. 2005. Loggerhead Shrike (*Lanius ludovicianus*): A Technical Conservation Assessment. Prepared for USDA Forest Service, Rocky Mountain Region, Species Conservation Project.

Wildlife Action Plan. 2012. Nevada Wildlife Action Plan. Nevada Department of Wildlife, Reno, NV.

Williams, D.F. 1984. Habitat associations of some rare shrews (Sorex) from California. *Journal of Mammology* 65:325-328.

Wisdom, M.J., M.M. Rowland, L.H. Suring, D.S. Dobkin, B. Abbey. 2005. Habitat threats in the sagebrush ecosystem. Alliance Communications Group.

Wisdom, M.J., Rowland, M.M., Suring, L.H., Dobkin, D.S. and Abbey, B., 2005. Habitat threats in the sagebrush ecosystem. Alliance Communications Group.

Wolfe, M.L. 1980. Feral Horse Demography: A Preliminary Report. Journal of Range Management 33 (5):354-360.

Wolfe, M.L., Ellis, L.C., and R. MacMullen.. 1989. Reproductive Rates of Feral Horses and Burros. Journal of Wildlife Management 53 (4): 916-9

Wood-Gush, D. G. M., and F. Galbraith. 1987. Social relationships in a herd of 11 geldings and two female ponies. Equine Veterinary Journal 19:129–1.

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

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

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

Younk, J. V., and M. Bechard. 1994. Breeding ecology of the Northern Goshawk in high-elevation aspen forests of northern Nevada. *Studies in Avian Biology* 16:119–121.

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

Other references can be found in pages 55–58 of the 2011 Triple B, Maverick–Medicine and Antelope HMAs Gather EA and pages 102–106 of the Antelope Complex Gather EA

6. APPENDIX I: STANDARD OPERATING PROCEDURES FOR POPULATION LEVEL FERTILITY CONTROL TREATMENTS

The following are implementation and monitoring requirements for the PZP vaccine.

22-month time-release pelleted vaccine:

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

1. PZP vaccine would be administered only by trained BLM personnel or collaborating partners.
2. 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). Mares identified for re-treatment receive 0.5 cc of the PZP vaccine emulsified with 0.5 cc of Freund's Incomplete Adjuvant (FIA).
3. 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 delivered using a modified syringe and jab stick to inject the pellets into the gluteal muscles of the mares being returned to the range. The pellets are designed to release PZP over time similar to a time-release cold capsule.
4. Delivery of the vaccine would be by intramuscular injection into the gluteal muscles while the mare is restrained in a working chute. The primer would consist of 0.5 cc of liquid PZP emulsified with 0.5 cc of Freunds Modified Adjuvant (FMA). The pellets would be loaded into the jab stick for the second injection. With each injection, the liquid or pellets would be injected into the left 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).
5. In the future, the vaccine may be administered remotely using an approved long range darting protocol and delivery system if or when that technology is developed.
6. All treated mares will be freeze-marked on the hip or neck HMA managers to positively identify the animals during the research project and at the time of removal during subsequent gathers.

Monitoring and Tracking of Treatments:

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

3. A PZP Application Data sheet will be used by field applicators to record all pertinent data relating to identification of the mare (including photographs if mares are not freeze-marked) and date of treatment. Each applicator will submit a PZP Application Report and accompanying narrative and data sheets will be forwarded to the NPO (Reno, Nevada). A copy of the form and data sheets and any photos taken will be maintained at the field office.
4. A tracking system will be maintained by NPO detailing the quantity of PZP issued, the quantity used, disposition of any unused PZP, the number of treated mares by HMA, field office, and State along with the freeze-mark(s) applied by HMA and date.

7. Appendix II: Standard Operating Procedures for Field Castration (Gelding) of Wild Horse Stallions

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 (I.M. 2009-063).

7.1. 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 can't 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.

7.2. 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 redosed 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 meglamine 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. Gelded animals would be monitored periodically for complications for approximately 7-10 days following release. This monitoring may be completed either through aerial reconnaissance, 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 HMA. All adults would have been freeze-marked at the first gather with a digit freeze mark number high on their hip to facilitate post-treatment 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 would 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, 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 by replacing breeding males with sterilized animals, and thereby extending the gather cycle when used in conjunction with other population control techniques.

8. APPENDIX III: 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 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.

8.1. Helicopter Gather Methods used in the Performance of Gather Contract Operations

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

1) 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. All trap and holding facilities locations must be approved by the LCOR/COR/PI prior to construction. The Contractor may also be required to change or move trap locations as determined by the LCOR/COR/PI. LCOR/COR/PI will determine when capture objectives are met. All traps and holding facilities not located on public land must have prior written approval of the landowner that will be provided to the LCOR prior to use. Selection of all traps and holding sites will include consideration for public and media observation.
2) The rate of movement and distance the animals travel must not exceed limitations set by the LCOR/COR/PI who will consider terrain, physical barriers, access limitations, weather, condition of the animals, urgency of the operation (animals facing drought, starvation, fire, etc.) and other factors. The trap site shall be moved close to WH&B locations whenever possible to minimize the distance the animals need to travel.
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) When moving the animals from one pasture/allotment to another pasture/allotment, the fencing wire needs to be let down for a distance that is approved by the LCOR on either side of the gate or crossing..
    b) If jute is hung on the fence posts of an existing wire fence in the trap wing, the wire should either be rolled up or let down for the entire length of the jute in such a way that minimizes the possibility of entanglement by WH&Bs unless otherwise approved by the LCOR/COR/PI. No modification of existing fences will be made without authorization from the LCOR/COR/PI. The Contractor shall be responsible for restoration of any fence modification which they have made.
    c) Building a trail using domestic horses through the fence line, crossing or gate may be necessary to avoid animals hitting the fence.
    d) The trap site and temporary holding facility must be constructed of stout materials and must be maintained in proper working condition. 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 with rounded corners.
    e) All portable loading chute sides shall be a minimum of 6 feet high and shall be fully covered on the sides with plywood, or metal without holes.
    f) All alleyways that lead to the fly chute or sorting area shall be a minimum of 30 feet long and a minimum of 6 feet high for horses, and 5 feet high for burros and the bottom rail must not be more than 12 inches from ground level. All gates and panels in the animal holding and handling pens and alleys of the trap site must be covered with plywood, burlap, plastic snow fence or like material approximately 48” in height to provide a visual barrier for the animals. All materials shall be secured in place. These guidelines apply:

i) For exterior fences, material covering panels and gates must extend from the top of the panel or gate toward the ground.
ii) For alleys and small internal handling pens, material covering panels and gates shall extend from no more than 12 inches below the top of the panel or gate toward the ground to facilitate visibility of animals and the use of flags and paddles during sorting.
iii) The initial capture pen may be left uncovered as necessary to encourage animals to enter the first pen of the trap.

g) . Padding must be installed on the overhead bars of all gates used in single file ally.
h) An appropriate chute designed for restraining WH&B's must be available for necessary procedures at the temporary holding facility. The government furnished portable fly chute to restrain, age, or provide additional care for the animals shall be placed in the alleyway in a manner as instructed by or in concurrence with the LCOR/COR/PI.
i) There must be no holes, gaps or openings, protruding surfaces, or sharp edges present in fence panels, latches, or other structures that may cause escape or possible injury.
j) Hinged, self-latching gates must be used in all pens and alleys except for entry gates into the trap, which may be secured with tie ropes or chains.
k) 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.

All animals gathered shall be sorted into holding pens as to age, size, temperament, sex, condition, and whether animals are identified for removal as excess or retained in the HMA. These holding pens shall be of sufficient size to minimize, to the extent possible, injury due to fighting and trampling as well as to allow animals to move easily and have adequate access to water and feed. All pens will be capable of expansion on request of the LCOR/COR/PI. Alternate pens, within the holding facility shall be furnished by the Contractor to separate mares or Jennies with small foals, sick and injured animals, and private animals from the other animals. Under normal conditions, the BLM will require that animals be restrained to determine an animal's age, sex, and ownership. In other situations restraint may be required to conduct other procedures such as veterinary treatments, restraint for fertility control vaccinations, castration, spaying, branding, blood draw, collection of hair samples for genetic testing, testing for equine diseases, application of GPS collars and radio tags. 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 capture area(s) following selective removal and/or population suppression treatments. 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 LCOR/COR/PI. The LCOR will determine if the corral size needs to be expanded due to horses staying longer, large.

FEEDING AND WATERING

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

b. Dependent foals must be reunited with their mares/jennies at the temporary holding facility within four hours of capture unless the LCOR/COR/PI authorizes a longer time or foals are old enough to be weaned. If a nursing foal is held in temporary holding pens for longer than 4 hours without their dams, it must be provided with water and good quality weed seed free hay.

c. Water must be provided at a minimum rate of 10 gallons per 1,000 pound animal per day, adjusted accordingly for larger or smaller horses, burros and foals, and environmental conditions, with each trough placed in a separate location of the pen (i.e. troughs at opposite ends of the pen) with a minimum of one trough per 30 horses. Water must be refilled at least every morning and evening when necessary.

d. Good quality weed seed free hay must be fed at a minimum rate of 20 pounds per 1,000 pound adult animal per day, adjusted accordingly for larger or smaller horses, burros and foals.

1. Hay must not contain poisonous weeds or toxic substances.
2. Hay placement must allow all WH&B's to eat simultaneously.

e. When water or feed deprivation conditions exist on the range prior to the gather, the LCOR/COR/PI shall adjust the watering and feeding arrangements in consultation with the onsite veterinarian as necessary to provide for the needs of the animals to avoid any toxicity concerns.

TRAP SITE

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

TEMPORARY HOLDING FACILITY

a. All WH&B's in confinement must be observed at least twice daily during feeding time to identify sick or injured WH&Bs and ensure adequate food and water.

b. Non-ambulatory WH&B's must be located in a pen separate from the general population and must be examined by the LCOR/COR/PI and/or on-call or on-site veterinarian no more than 4 hours after recumbency (lying down) is observed. Unless otherwise directed by a veterinarian, hay and water must be accessible to an animal within six hours after recumbency.

c. Alternate pens must be made available for the following:

1. WH&Bs that are weak or debilitated
2. Mares/jennies with dependent foals
3. Aggressive WH&B's that could cause serious injury to other animals.

d. WH&B's in pens at the temporary holding facility shall be maintained at a proper stocking density such that when at rest all WH&B's occupy no more than half the pen area.

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

f. It is the responsibility of the Contractor to provide for the safety of the animals and personnel working at the trap locations and temporary holding corrals in consultation with the LCOR/COR/PI. This responsibility will not be used to exclude or limit public and media observation as long as current BLM policies are followed.

g. The contractor will ensure that non-essential personnel and equipment are located as to minimize disturbance of WH&Bs. Trash, debris, and reflective or noisy objects shall be eliminated from the trap site and temporary holding facility.

h. The Contractor shall restrain sick or injured animals if treatment is necessary in consultation with the LCOR/COR/PI and/or onsite veterinarian. The LCOR/COR/PI and/or onsite veterinarian will determine if injured animals must be euthanized and provide for the euthanasia 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 LCOR/COR/PI, at no additional cost to the Government.

i. Once the animal has been determined by the LCOR/COR/PI to be removed from the HMA/HA, animals shall be transported to final destination from temporary holding facilities within 48 hours after capture unless prior approval is granted by the LCOR/COR/PI. Animals to be released back into the HMA following gather operations will be held for a specified length of time as stated in the Task Order/SOW. The Contractor shall schedule shipments of animals to arrive at final destination between 7:00 a.m. and 4:00 p.m. unless prior approval has been obtained by the LCOR. No shipments shall be scheduled to arrive at final destination on Sunday and Federal holidays, unless prior approval has been obtained by the LCOR. Animals shall not be allowed to remain standing on gooseneck or semi-trailers while not in transport for a combined period of greater than three (3) hours. Total planned transportation time from the temporary holding to the BLM facility will not exceed 10 hours. Animals that are to be released back into the capture area may need to be transported back to the original trap site per direction of the LCOR.

CAPTURE METHODS THAT MAY BE USED IN THE PERFORMANCE OF A GATHER

Helicopter Drive Trapping

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

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

i) WH&B's that are weak or debilitated must be identified by BLM staff or the contractors. Appropriate gather and handling methods shall be used according to the direction of the LCOR/COR/PI as defined in this contract.
ii) The appropriate herding distance and rate of movement must be determined the LCOR/COR/PI on a case-by-case basis considering the weakest or smallest animal in the group (e.g., foals, pregnant mares, or horses that are weakened by body condition, age, or poor health) and the range and environmental conditions present.
iii) Rate of movement and distance travelled must not result in exhaustion at the trap site, unless the exhausted animals were already in a severely compromised condition prior to the gather. Where compromised animals cannot be left on the range or where doing so would only serve to prolong their suffering, the LCOR/COR/PI will determine if euthanasia will be performed in accordance with BLM policy.

c) WH&B's must not be pursued repeatedly by the helicopter such that the rate of movement and distance travelled exceeds the limitation set by the LCOR/COR/PI. Abandoning the pursuit or alternative capture methods may be considered by the LCOR/COR/PI in these cases.

d) The helicopter is prohibited from coming into physical contact with any WH&B regardless of whether the contact is accidental or deliberate.

e) WH&B's may escape or evade the gather site while being moved by the helicopter. If there are mare/dependent foal pairs in a group being brought to a trap and half of an identified pair is thought to have evaded capture, multiple attempts by helicopter may be used to bring the missing half of the pair to the trap or to facilitate capture by roping. In these instances, animal condition and fatigue will be evaluated by the LCOR/COR/PI or on-site veterinarian on a case-by-case basis to determine the number of attempts that can be made to capture an animal.

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

g) The contractor shall assure that dependent foals shall not be left behind. Any animals identified as such will be recovered as a priority in completing the gather.

h) Any adult horse or burro that cannot make it to the trap due to physical limitations shall be identified to the LCOR/COR/PI by the pilot or contractor immediately. An inspection of the animal will be made to determine the problem and the LCOR/COR/PI and/or veterinarian will decide if that animal needs to be humanely euthanized.

ROPING

a. The roping of any WH&B must be approved by the LCOR/COR/PI prior to the action.

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

c. Ropers should dally the rope to their saddle horn such that animals can gradually be brought to a stop and must not tie the rope hard and fast to the saddle, which can cause the animals to be jerked off their feet.

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

e. WH&Bs that are roped and tied down in recumbency must be untied within 30 minutes.

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

g. Sleds, slide boards, or slip sheets must be placed underneath the animal’s body to move and/or load recumbent WH&Bs.

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

i. All animals captured by roping must be marked at the trap site by the contractor for evaluation by the on-site/on-call veterinarian within four hours after capture, and re-evaluation periodically as deemed necessary by the on-site/on-call veterinarian.

HANDLING

Willful Acts of Abuse

The following are prohibited:

a. Hitting, kicking, striking, or beating any WH&B in an abusive manner.

b. Dragging a recumbent WH&B across the ground without a sled, slide board or slip sheet. Ropes used for moving the recumbent animal must be attached to the sled, slide board or slip sheet unless being loaded as specified in Section C 9.2.h

c. Deliberate driving of WH&Bs into other animals, closed gates, panels, or other equipment.

d. Deliberate slamming of gates and doors on WH&Bs.

e. Excessive noise (e.g., constant yelling) or sudden activity causing WH&Bs to become unnecessarily flighty, disturbed or agitated.

General Handling

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

b. WH&Bs should be handled to enter runways or chutes in a forward direction.

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

d. With the exception of helicopters, equipment should be operated in a manner to minimize flighty behavior and injury to WH&Bs.

Handling Aids

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

b. Routine use of electric prods as a driving aid or handling tool is prohibited. Electric prods may be used in limited circumstances only if the following guidelines are followed:

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

2. The electric prod device must never be disguised or concealed.

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

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

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

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

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

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

MOTORIZED EQUIPMENT
Loading and Unloading Areas
a. Facilities in areas for loading and unloading WH&B's at the trap site or temporary holding facility must be maintained in a safe and proper working condition, including gates that swing freely and latch or tie easily.

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

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

d. All gates and doors must open and close properly and latch securely.

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

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

g. Stock trailers shall be positioned for loading or unloading such that there is no more than 12" clearance between the ground and floor of the trailer for burros and 18" for horses. . If animals refuse to load, it may be necessary to dig a tire track hole where the trailer level is closer to ground level.

TRANSPORTATION
A. General

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

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

3. Shipping delays for animals that are being held for release to range or potential on-site adoption must be approved by the LCOR/COR/PI.
4. Shipping should occur in the following order of priority; 1) debilitated animals, 2) pairs, 3) weanlings, 4) dry mares and 5) studs.

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

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

B. **Vehicles**

1. All motorized equipment employed in the transportation of captured 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 CO annually, 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. Only tractor-trailers or stock trailers with a covered top or overhead bars 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 two (2) partition gates providing three (3) compartments within the trailer to separate animals. Tractor-trailers less than 40 feet shall have at least one partition gate providing 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 prohibited. Only straight deck trailers and stock trailers are to be used for transporting WH&B’s.

3. WH&B’s must have adequate headroom during loading and unloading and must be able to maintain a normal posture with all four feet on the floor during transport without contacting the roof or overhead bars.

4. The width and height of all gates and doors must allow WH&B’s to move through freely.

5. All gates and doors must open and close easily and be able to be secured in a closed position.

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

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

8. All partitions and panels inside of trailers must be free of sharp edges or holes that could cause injury to WH&B's.
9 The inner lining of all trailers must be strong enough to withstand failure by kicking that would lead to injuries.

10 Partition gates in transport vehicles shall be used to distribute the load into compartments during travel.

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

12 Surfaces and floors of trailers shall have non-slip surface, use of shavings, dirt, and floor mates.

c. **Care of WH&B's during Transport Procedures**

1. WH&B's that are loaded and transported from the temporary holding facility to the BLM preparation facility must be fit to endure travel per direction of LCOR/COR/PI following consultation with on-site/on-call veterinarian.

2. WH&B's that are non-ambulatory, blind in both eyes, or severely injured must not be loaded and shipped unless it is to receive immediate veterinary care or euthanasia.

3. WH&B's that are weak or debilitated must not be transported without approval of the LCOR/COR/PI in consultation with the on-site veterinarian. Appropriate actions for their care during transport must be taken according to direction of the LCOR/COR/PI.

4. WH&B's shall be sorted prior to transport to ensure compatibility and minimize aggressive behavior that may cause injury.

5. Trailers must be loaded using the minimum space allowance in all compartments as follows:
a. For a 6.8 foot wide; 24 foot long stock trailer 12 to 14 adult horses;
b. For a 6.8 foot wide; 24 foot long stock trailer 18 to 21 adult burros
c. For a 6.8 foot wide; 20 foot long stock trailer 10 to 12 adult horses can be loaded
d. For a 6.8 foot wide; 20 foot long stock trailer 15 to 18 adult burros
e. For a semi-trailer
1. 12 square feet per adult horse.
2. 6.0 square feet per dependent horse foal.
3. 8.0 square feet per adult burro.
4. 4.0 square feet per dependent burro foal

6. Considering the condition of the animals, prevailing weather, travel distance and other factors or if animals are going down on trailers or arriving at their destination down or with injuries or a condition suggesting they may have been down, additional space or footing provisions may be necessary and will be required if directed by the LCOR/COR.

7 The LCOR/COR/PI, in consultation with the receiving Facility Manager, must document any WH&B that is recumbent or dead upon arrival at the destination. Non-ambulatory or recumbent WH&B's must be evaluated on the trailer and either euthanized or removed from the trailers using a sled, slide board or slip sheet.

8 Saddle horses must not be transported in the same compartment with WH&B's.

EUTHANASIA or DEATH

Euthanasia Procedure during Gather Operations

1. An authorized, properly trained, and experienced person as well as a firearm appropriate for the circumstances must be available at all times during gather operations. When the travel time between the trap site and temporary holding facility exceeds one hour or if radio or cellular communication is not reliable, provisions for euthanasia must be in place at both the trap site and temporary holding facility during the gather operation.

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

3. The decision to euthanize and method of euthanasia must be directed by the LCOR/COR/PI who must be on site and may consult with the on-site/on-call veterinarian. In event and rare circumstance that the LCOR/COR/PI is not available, the contractor if properly trained may euthanize an animal as an act of mercy.

4. All carcasses will be disposed of in accordance with state and local laws and as directed by the LCORCOR/PI.

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

COMMUNICATIONS

a. The Contractor shall have the means to communicate with the LCOR/COR/PI and all contractor personnel engaged in the capture of wild horses and burros utilizing a VHF/FM Transceiver or VHF/FM portable Two-Way radio.
b. The Contractor shall obtain the necessary FCC licenses for the radio system.

SAFETY AND SECURITY

a. All accidents involving animals or people that occur during the performance of any task order shall be immediately reported to the LCOR/COR/PI.

b. It is the responsibility of the Contractor to provide security to prevent unauthorized release, injury or death of captured animals until delivery to final destination.

c. The contractor must comply with all applicable federal, state and local regulations.

d. Fueling operations shall not take place within 1,000 feet of animals or personnel and equipment other than the refueling truck and equipment.

e. Children under the age of 12 shall not be allowed within the gather's working areas which include near the chute when working animals at the temporary holding facility, or near the pens at the trap site when working and loading of animals. Children under the age of 12 in the non-working area must be accompanied by an adult at either location at all times.

BIOSECURITY

a. Health records for all saddle and pilot horses used on WH&B gathers must be provided to the LCOR during the BLM/Contractor pre-work meeting, including:

1. Certificate of Veterinary Inspection (Health Certificate, within 30 days).
2. Proof of:
a. A negative test for equine infectious anemia (Coggins or EIA ELISA test) within 12 months.
b. Vaccination for tetanus, eastern and western equine encephalomyelitis, West Nile virus, equine herpes virus, influenza, *Streptococcus equi*, and rabies within 12 months.

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

c. WH&B's, saddle horses, and pilot horses showing signs of infectious disease must be examined by the on-site/on-call veterinarian.

1. Any saddle or pilot horses showing signs of infectious disease (fever, nasal discharge or illness) must be removed from service and isolated from other animals on the gather until such time as the horse is free from signs of infectious disease and approved by the on-site/on-call veterinarian to return to the gather.
2. WH&B's showing signs of infectious disease will normally not be mixed with groups of healthy WH&B's at the temporary holding facility, or during transport..

PUBLIC AND MEDIA INTERACTION

a. Due to heightened public interest in wild horse and burro gathers, the BLM expects an increasing number of requests from the public and media to view the operation. All requests received by the Contractor to view gather operation shall be forwarded to the BLM, who will provide a person with the expertise necessary to escort the public and media. The safety of the WHB's, BLM employees, Contractor crew, Contractor's private animals, and the media and public will be the first priority in determining whether a viewing opportunity will be provided, and if so, the time, location, and conditions associated with the viewing opportunity.

b. Assuming the BLM determines that providing a viewing opportunity for the media and the public is appropriate, the Contractor will establish the viewing area in accordance with instructions from the LCOR/COR/PI and current wild horse and burro program policy and guidance. BLM's observation policy will be discussed with the contractor during the pre-work meeting.

c. Member(s) of the viewing public or media whose conduct interferes with the gather operation in a way that threatens the safety of the WH&B's, BLM employees, contractor crew (including animals), the media, or the public will be warned once to terminate the conduct. If the conduct persists, the offending individual(s) will be asked to leave the viewing area and the gather operation. The LCOR/COR/PI may direct the Contractor to temporarily shut down the gather operation until the situation is resolved.

d. Under no circumstances will the public or any media or media equipment be allowed in or on the gather helicopter or on the trap or holding equipment. The public, media, and media equipment must be at least 500 feet away from the trap during the trapping operation.

e. The public and media may be escorted closer than 500 feet to the trap site if approved by the LCOR/COR and in consultation with the Contractor during the time between gather runs or before or after the gather operation.

f. The Contractor shall not release any information to the news media or the public regarding the activities being conducted under this contract. All communications regarding BLM WH&B management, including but not limited to media, public and local stakeholders, are to come from the BLM unless it expressly authorizes the Contractor to give interviews, etc.

CONTRACTOR-FURNISHED PROPERTY

a. As specified herein, it is the contractor's responsibility to provide all necessary support equipment and vehicles including weed seed free hay and water for the captured animals and any other items, personnel, vehicles (which shall include good condition trucks and stock trailers to haul horses and burros from the trap site to the holding facility and two tractor trailers in good condition to haul horses from the holding facility to the preparation facility), saddle horses, etc. to support the humane and compassionate capture, care, feeding, transportation, treatment, and as appropriate, release of WHB's. Other equipment includes but is not limited to, a minimum 2,500 linear feet of 72-inch high (minimum height) panels for horses or 60-inch high (minimum height) for burros for traps and holding facilities. Separate water troughs shall be provided at each pen where animals are being held meeting the standards in section C.6. Water troughs shall be constructed of such material (e.g., rubber, galvanized metal with rolled edges, rubber over metal) so as to avoid injury to the animals.

b. The Contractor shall provide a radio transceiver to insure communications are maintained with the BLM project PI when driving or transporting the wild horses/burros. The contractor needs to insure communications can be made with the BLM and be capable of operating in the 150 MHz to 174 MHz frequency band, frequency synthesized, CTCSS 32 sub-audible tone capable, operator programmable, 5kHz channel increment, minimum 5 watts carrier power.

c. The Contractor shall provide water and weed seed free hay.

d. The proper operation, service and maintenance of all contractor furnished property is the responsibility of the Contractor.

BLM ROLES AND RESPONSIBILITIES

a. **Veterinarian**

1. On-site veterinary support must be provided for all helicopter gathers.
2. Veterinary support will be under the direction of the LCOR/COR/PI. Upon request, the on-site/on-call veterinarian will consult with the LCOR/COR/PI on matters related to WH&B health, handling, welfare and euthanasia. All final decisions regarding medical treatment or euthanasia will be made by the on-site LCOR/COR/PI based on recommendations from the on-site veterinarian.

b. Transportation

1. The LCOR/COR/PI shall consider the condition and size of the animals, weather conditions, distance to be transported to the final destination or release, recommendations from the contractor and on-site veterinarian and other factors when planning for the movement of captured animals. The LCOR/COR/PI shall provide for any brand inspection services required for the movement of captured animals to BLM prep facilities. If animals are to be transported over state lines the LCOR will be responsible for obtaining a waiver from the receiving State Veterinarian.
2. If the LCOR/COR/PI determines that conditions are such that the animals could be endangered during transportation, the Contractor will be instructed to adjust speed or delay transportation until conditions improve.

GOVERNMENT FURNISHED EQUIPMENT/SUPPLIES/MATERIALS

a. The government will provide:

1. A portable restraining chute for each contractor to be used for the purpose of restraining animals to determine the age of specific individuals or other similar procedures. The contractor will be responsible for the maintenance of the portable restraining chute during the gather season.
2. All inoculate syringes, freezemarking equipment, and all related equipment for fertility control treatments.
3. A boat to transport burros as appropriate.
4. Sleds, slide boards, or slip sheets for loading of recumbent animals.

b. The Contractor shall be responsible for the security of all Government Furnished Property.

SITE CLEARANCES

a. Prior to setting up a trap or temporary holding facility, BLM will conduct all necessary legal reviews and clearances (NEPA, ARPA, NHPA, 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 coordinated and arranged for by the COR/ PI, or other BLM employees.

8.1.1. Water and Bait Trapping Standard Operating Procedures

The work consists of the capture, handling, care, feeding, daily rate and transportation of wild horses and/or burros from the States of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah and Wyoming. The method of capture will be with the use of bait and/or water traps in accordance with the standards identified in the Comprehensive Animal Welfare Program (CAWP) for Wild horse and Burro Gathers, Bureau of Land Management (BLM) Instruction Memorandum 2015-151 (Attachment 1). Items listed in the sections of the Statement of Work (SOW) either are not covered or deviate from the CAWP, the SOW takes precedence over the CAWP when there is conflicting information. Extended care, handling and animal restraint for purposes of population growth suppression treatments may be required for some trapping operations. The contractor shall furnish all labor, supplies, transportation and equipment necessary to accomplish the individual task order requirements with the exception of a Government provided restraint fly chute, as needed for population growth suppression. The work shall be accomplished in a safe and humane manner and be in accordance with the provisions of 43 CFR Part 4700, the CAWP, the specifications and provisions included in this SOW, and any subsequent SOW documents issued with individual task orders.

The primary concern of the contractor shall be the safety of all personnel involved and the humane capture and handling of all wild horses and burros. It is the responsibility of the contractor to provide appropriate safety and security measures to prevent loss, injury or death of captured wild horses and burros.

Any reference to hay in this SOW or subsequent SOW documents issued with individual task orders will be implied as certified weed-free hay (grass or alfalfa). The contractor will be responsible for providing certifications upon request from the Government.

The COR/PI's will observe a minimum of at least 25% of the trapping activity.
BLM reserves the right to place game cameras or other cameras in the capture area to document animal activity and response, capture techniques and procedures, and humane care during trapping. No private/non-BLM camera will be placed within the capture areas.

Trapping activities would be on the HA/HMA/WHBT or outside areas specified in the task order. However, trapping could be required on adjacent land, federal, state, tribal, military, or private property. If trapping operations include work on military and/or other restricted areas, the BLM will coordinate all necessary clearances, such as background checks, to conduct operations for equipment and personnel.

The permissions to use private/state/tribal lands during task order performance will be coordinated by the BLM, contractor, and landowner. The need for these permissions will be identified in the Task Order SOW and will be obtained in writing.
Prior to any gathering operation, the BLM will provide for a pre-capture evaluation of existing conditions in the gather area(s). The evaluation will include animal conditions, prevailing temperatures, drought conditions, soil conditions, road conditions, and preparation of a topographic map with wilderness boundaries, the location of fences, other physical barriers, and acceptable gather site 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 capture operations necessitate the services of a veterinarian, one would be obtained before the capture would proceed. The contractor will be apprised of all conditions and will be given instructions regarding the capture and handling of animals to ensure their health and welfare is protected.

Gather sites and temporary holding sites will be located to reduce the likelihood of undue injury and stress to the animals, and to minimize potential damage to the natural and cultural resources of the area. Temporary holding sites would be located on or near existing roads.

Bait Trapping - Facility Design (Temporary Holding Facility Area and Traps)

All trap and temporary holding facility areas locations must be approved by the COR and/or the Project Inspector (PI) prior to construction and/or operation. The contractor may also be required to change or move trap locations as determined by the COR/PI. All traps and temporary holding facilities not located on public land must have prior written approval of the landowner or other management agency.

Facility design to include traps, wings, alleys, handling pens, finger gates, and temporary holding facilities, etc. shall be constructed, maintained and operated to handle the wild horses and burros in a safe and humane manner in accordance with the standards identified in the Comprehensive Animal Welfare Program (CAWP) for Wild Horse and Burro Gathers, Bureau of Land Management (BLM) Instruction Memorandum 2015-151 (Attachment 1).

Some gather operations will require the construction of an off-site temporary holding facility as identified in specific individual task orders for extended care and handling for purposes of slow trapping conditions or management activities such as research, population growth suppression treatments, etc.

No modification of existing fences will be made without authorization from the COR/PI. The contractor shall be responsible for restoring any fences that are modified back to the original condition.

Temporary holding and sorting pens shall be of sufficient size to prevent injury due to fighting and trampling. These pens shall also allow for captured horses and burros to move freely and have adequate access to water and feed.

All pens will be capable of expansion when requested by the COR/PI.

Separate water troughs shall be provided for each pen where wild horses and burros are being held. Water troughs shall be constructed of such material (e.g., rubber, plastic, fiberglass, galvanized metal with rolled edges, and rubber over metal) so as to avoid injury to the wild horses and burros.

Any changes or substitutions to trigger and/or trip devices previously approved for use by the Government must be approved by the COR prior to use.

Bait Trapping, Animal Care, and Handling

If water is to be used as the bait agent and the Government determines that cutting off other water sources is the best action to take under the individual task order, elimination of other water sources shall not last longer than a period of time approved by the COR/PI.

Hazing/Driving of wild horses and burros for the purpose of trapping the animals will not be allowed for the purposes of fulfilling individual task orders. Roping will be utilized only as directed by the COR.

Darting of wild horses and burros for trapping purposes will not be allowed.
No barbed wire material shall be used in the construction of any traps or used in new construction to exclude horses or burros from water sources.

Captured wild horses and burros shall be sorted into separate pens (i.e. by age, gender, animal health/condition, population growth suppression, etc.).

A temporary holding facility area will be required away from the trap site for any wild horses and burros that are being held for more than 24 hours.

The contractor shall assure that captured mares/jennies and their dependent foals shall not be separated for more than 4 hours, unless the COR/PI determines it necessary.

The contractor shall provide a saddle horse on site that is available to assist with the pairing up of mares/jennies with their dependent foals and other tasks as needed.

Contractor will report any injuries/deaths that resulted from trapping operations as well as preexisting
conditions to the COR/PI within 12 hours of capture and will be included in daily gather activity report to the COR.

The COR/PI may utilize contractor constructed facilities when necessary in the performance of individual task orders for such management actions as population growth suppression, and/or selecting animals to return to the range.

In performance of individual task orders, the contractor may be directed by the COR to transport and release wild horses or burros back to the range.

At the discretion of the COR/PI the contractor may be required to delay shipment of horses until the COR/PI inspects the wild horses and burros at the trap site and/or the temporary holding facility prior to transporting them to the designated facility.

Wild Horse and Burro Care and Biosecurity

The contractor shall restrain sick or injured wild horses and burros if treatment is necessary in consultation with the COR/PI and/or veterinarian.

Any saddle or pilot horses used by the contractor will be vaccinated within 12 months of use (EWT, West Nile, Flu/rhino, strangles).

Transportation and Animal Care

The contractor, following coordination with the COR, shall schedule shipments of wild horses and burros to arrive during the normal operating hours of the designated facility unless prior approval has been obtained from the designated facility manager by the COR. Shipments scheduled to arrive at designated facilities on a Sunday or a Federal holiday requires prior facility personnel approval.

All motorized equipment employed in the transportation of captured wild horses and burros shall be incompliance with appropriate State and Federal laws and regulations.

Sides or dividers of all trailers used for transporting wild horses and burros shall be a minimum height of 6 feet 6 inches from the floor. A minimum of one full height partition is required in each stock trailer. All trailers shall be covered with solid material or bars to prevent horses from jumping out.

The contractor shall consider the condition and size of the wild horses and burros, weather conditions, distance to be transported, or other factors when planning for the movement of captured wild horses and burros.

The Government shall provide for any brand and/or veterinary inspection services required for captured wild horses and burros. Prior to shipping across state lines the Government will be responsible for coordinating with the receiving state veterinarian to transport the animals without a health certificate or coggins test. If the receiving state does not agree to grant entry to animals without a current health certificate or coggins test, the Government will obtain them prior to shipment.

When transporting wild horses and burros, drivers shall inspect for downed animals a minimum of every two hours when travelling on gravel roads or when leaving gravel roads onto paved roads and a minimum of every four hours when travelling on paved roads.

a)

Euthanasia or Death

The COR/PI will determine if a wild horse or burro must be euthanized and will/may direct the contractor to destroy the animal in accordance with the BLM Animal Health, Maintenance, Evaluation, and Response Instruction Memorandum, 2015-070 (Attachment 2). Any contractor personnel performing this task shall be trained as described in this Memorandum.

Pursuant to the IM 2015-070 the contractor may be directed by the Authorized Officer and/or COR to humanely euthanize wild horses and burros in the field and to dispose of the carcasses in accordance with state and local laws.

Safety and Communication

The nature of work performed under this contract may involve inherently hazardous situations. The primary concern of the contractor shall be the safety of all personnel involved and the humane handling of all wild horses and burros. It is the responsibility of the contractor to provide appropriate safety and security measures to prevent loss, injury or death of captured wild horses and burros until delivery to the final destination.

The BLM reserves the right to remove from service immediately any contractor personnel or contractor furnished equipment which, in the opinion of the COR and/or CO violate contract rules, are unsafe or otherwise unsatisfactory. In this event, BLM will notify the contractor to furnish replacement personnel or equipment within 24 hours of notification. All such replacements must be approved in advance by the COR and/or CO.

Contractor personnel who utilize firearms for purposes of euthanasia will be required to possess proof of completing a State or National Rifle Association firearm safety certification or equivalent (conceal carry, hunter safety, etc.).

All accidents involving wild horses and burros or people that occur during the performance of any task order shall be immediately reported to the COR/PI.

The contractor shall have the means to communicate with the COR/PI and all contractor personnel engaged in the capture of wild horses and burros utilizing a cell/satellite phone or radio at all times during the trapping operations. The Contractor will be responsible for furnishing all communication equipment for contractor use. BLM will provide the frequency for radio communications.

The contractor will provide daily gather activity reports to the COR/PI if they are not present.

Public and Media

Due to increased public interest in the Wild Horse and Burro Gathers, any media or visitation requests received by the contractor shall be forwarded to the COR immediately. Only the COR or CO can approve these requests.

The Contractor shall not post any information or images to social media networks or release any information to the news media or the public regarding the activities conducted under this contract.

If the public or media interfere in any way with the trapping operation, such that the health and well-being of the crew, or horses and burros are threatened, the contractor will immediately report the incident to the COR and trapping operations will be suspended until the situation is resolved as directed by the COR.

1. All motorized equipment employed in the transportation of captured 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 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 captured 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 gather 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 two (2) partition gates providing three (3) compartments within the trailer to separate animals. Tractor-trailers less than 40 feet shall have at least one partition gate providing 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.
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:
a. 11 square feet per adult horse (1.4 linear foot in an 8 foot wide trailer);
b. 8 square feet per adult burro (1.0 linear foot in an 8 foot wide trailer);
c. 6 square feet per horse foal (.75 linear foot in an 8 foot wide trailer);
d. 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 captured animals. The COR/PI shall provide for any brand and/or inspection services required for the captured 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.

Safety and Communications

1) The Contractor shall have the means to communicate with the COR/PI and all contractor personnel engaged in the capture of wild horses and burros 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 are 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.

Public and Media

Due to heightened public interest in wild horse and burro gathers, the BLM/Contractor may expect an increasing number of requests from the public and media to view the operation.

1) Due to this type of operation (luring wild horses and burros to bait) spectators and viewers will be prohibited as it will have impacts on the ability to capture wild horses and burros. Only essential personnel (COR/PI, veterinarian, contractor, contractor employees, etc.) will be allowed at the trap site during operations.
2) Public viewing of the wild horses and burros trapped may be provided at the staging area and/or the BLM preparation facility by appointment.
3) The Contractor agrees that there shall be no release of information to the news media regarding the removal or remedial activities conducted under this contract.
4) All information will be released to the news media by the assigned government public affairs officer.

5) If the public or media interfere in any way with the trapping operation, such that the health and wellbeing of the crew, horses and burros is threatened, the trapping operation will be suspended until the situation is resolved.

COR/PI Responsibilities

a) In emergency situations, the COR/PI will implement procedures to protect animals as rehab is initiated, i.e. rationed feeding and watering at trap and or staging area.
b) The COR/PI will authorize the contractor to euthanize any wild horse or burros as an act of mercy.
c) The COR/PI will ensure wild horses or burros with pre-existing conditions are euthanized in the field according to BLM policy.
d) Prior to setting up a trap or staging area on public land, the BLM and/or Forest Service will con- duct all necessary clearances (archaeological, T&E, etc.). All proposed sites must be inspected by a government archaeologist or equivalent. Once archaeological clearance has been obtained, the trap or staging area may be set up. Said clearances shall be arranged for by the COR/PI.
e) The COR/PI will provide the contractor with all pertinent information on the areas and wild horses and burros to be trapped.
f) The COR/PI will be responsible to establish the frequency of communicating with the contractor.
g) The COR/PI shall inspect trap operation prior to Contractor initiating trapping.
h) The Contractor shall make all efforts to allow the COR/PI to observe a minimum of at least 25% of the trapping activity.
i) The COR/PI is responsible to arrange for a brand inspector and/or veterinarian to inspect all wild horses and burros prior to transporting to a BLM preparation facility when legally required.
j) The COR/PI will be responsible for the establishing a holding area for administering PZP, gelding of stallions, holding animals in poor condition until they are ready of shipment, holding for EIA testing, etc.
k) The COR/PI will ensure the trailers are cleaned and disinfected before WH&B's are transported. This will help prevent transmission of disease into our populations at a BLM Preparation Facility.

Responsibility and Lines of Communication

The Wild Horse Specialist (COTR) or delegate has direct responsibility to ensure human and animal safety. The Wells or Bristlecone Field Managers will take an active role to ensure that 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 and public contact and inquiries will be handled through the Elko and Ely District Offices and Nevada State Office of Communications. These individuals will be the primary contact and will coordinate with the COR on any inquiries.

The BLM delegate will coordinate with the corrals to ensure animals are being transported from the capture site in a safe and humane manner and are arriving in good condition.

The BLM 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 capture of the animals. The specifications will be vigorously enforced.

Resource Protection

Gather sites and holding facilities would be located in previously disturbed areas whenever possible to minimize potential damage to the natural and cultural resources.

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

Prior to implementation of gather operations, gather sites and temporary holding facilities would be evaluated to determine their potential for containing cultural resources. All gather facilities (including gather sites, gather run- ways, blinds, holding facilities, camp locations, parking areas, staging areas, etc.) that would be located partially or totally in new locations (i.e. not at previously used gather locations) or in previously undisturbed areas would be inventoried by a BLM archaeologist or district archaeological technician before initiation of the gather. A buffer of at least 50 meters would be maintained between gather facilities and any identified cultural resources.

Gather sites and holding facilities would not be placed in known areas of Native American concern.

The contractor would not disturb, alter, injure or destroy any scientifically important paleontological remains; any historical or archaeological site, structure, building, grave, object or artifact; or any location having Native American traditional or spiritual significance within the project area or surrounding lands. The contractor would be responsible for ensuring that its employees, subcontractors or any others associated with the project do not collect artifacts and fossils, or damage or vandalize archaeological, historical or paleontological sites or the artifacts within them.

Should damage to cultural or paleontological resources occur during the period of gather due to the unauthorized, inadvertent or negligent actions of the contractor or any other project personnel, the contractor would be responsible for costs of rehabilitation or mitigation. Individuals involved in illegal activities may be subject to penalties under the Archaeological Resources Protection

Act (16 U.S.C 470ii), the Federal Land Management Policy Act (43 U.S.C 1701), the Native American Graves and Repatriation Act (16 U.S.C. 1170) and other applicable.

9. Appendix IV: 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.

10. APPENDIX V: BLUEBELL WSA OPERATING REQUIREMENTS FOR THE SHAFTER WELL GATHER SITE

1) A wilderness specialist or a COR who is knowledgeable on the non-impairment standard will be present during set-up and removal of the gather site. The COR will inform the contractor and all personnel on-site of the location and rules for uses in Wilderness Study Areas.
2) All motorized vehicles must stay on existing roads. Vehicles that are parked in the area must be parked in already disturbed areas.
3) All gather sites and blinds will be erected without causing surface disturbance.
4) Any helicopter landings will be in previously disturbed areas at the site. For example, there is a gravelly area that is devoid of vegetation near the well pump that could be used for landing a helicopter.
5) All trash and waste will be disposed of properly and not buried or burned on-site.
6) Any new or additional disturbance within the WSA will be repaired by BLM as soon as possible. This includes reseeding if necessary.

11. Appendix VI: Operating Requirements for Noxious Weeds and Non-Native Invasive Plants

To reduce the introduction and spread of existing infestations, the following procedures shall be applied to horse gather operations:

- Clean all equipment and vehicles prior to entering BLM project area; clean equipment when moving between trapping locations and/or after traveling through weed infestations.
- All such vehicles and equipment will be cleaned prior to entering or leaving the work site or project area. Cleaning efforts will concentrate on tracks, feet and tires, and on the undercarriage. Special emphasis will be applied to moving parts, axles, frames, cross members, motor mounts, underneath steps, running boards, and front bumper/brush guard assemblies. Vehicle cabs will be swept out and disposed of on-site (of infestation) or in-waste receptacles.
- Avoid staging, setting up bait traps, camping and traveling through weed infestations.
- If wild horses or those used in trapping operations (ropers) will be fed on site, ensure hay/straw materials are certified weed free (includes both seed and propagule).
- GPS staging, bait trap locations, holding facilities, and camping areas. Monitor them throughout the gather operation and for a minimum of three years after project is completed (approximately 10 years after its initiation).
- Reduce the opportunity for weed invasion by minimizing ground disturbance/bare ground creation when and where feasible.

12. APPENDIX VII: SPECIES LIST

Comprehensive list of all animal species (excluding fishes and other aquatic species) that may occur in northeastern Nevada.

Birds
Order: *Gaviiformes* (Diver/Swimmers)
Family: *Gaviidae* (Loons)

Common Loon	*Gavia immer*

Order: *Podicipediformes* (Flat-toed Divers)
Family: *Podicipedidae* (Grebes)

Pied-billed Grebe	*Podilymbus podiceps*
Horned Grebe	*Podiceps auritus*
Eared Grebe	*Podiceps nigricollis*
Western Grebe	*Aechmophorus occidentalis*
Clark's Grebe	*Aechmophorus clarkii*

Order: *Pelecaniformes* (Four-toed Fisheaters)
Family: *Pelecanidae* (Pelicans)

American White Pelican	*Pelecanus erythrorhynchos*

Family: *Phalacrocoracidae* (Cormorants)

Double-crested Cormorant	*Phalacrocorax auritus*

Order: *Ciconiiformes* (Long-legged Waders)
Family: *Ardeidae* (Bitterns, Herons, Egrets)

American Bittern	*Botaurus lentiginosus*
Least Bittern	*Ixobrychus exilis*
Great Blue Heron	*Ardea herodias*
Great Egret	*Ardea alba*
Snowy Egret	*Egretta thula*
Cattle Egret	*Bubulcus ibis*
Green Heron	*Butorides virescens*
Black-crowned Night Heron	*Nycticorax nycticorax*

Family: *Threskiornithidae* (Ibises)

White-faced Ibis	*Plegadis chihi*

Family: *Cathartidae* (New World Vultures)

Turkey Vulture	*Cathartes aura*
California Condor	*Gymnogyps californianus(loc.ex)*

Order: *Anseriformes* (Waterfowl)
Family: *Anatidae* (Ducks, Geese, Swans)

Greater White-fronted Goose	*Anser albifrons*
Snow Goose	*Chen caerulescens*
Canada Goose	*Branta canadensis*
Tundra Swan	*Cygnus columbianus*
Trumpeter Swan	*Cygnus buccinator*
Wood Duck	*Aix sponsa*
Gadwall	*Anus strepera*
American Widgeon	*Anus americana*
Mallard	*Anus platyrhynchos*
Blue-winged Teal	*Anas discors*
Cinnamon Teal	*Anas cyanoptera*
Northern Shoveler	*Anas clypeata*
Northern Pintail	*Anas acuta*
Green-winged Teal	*Anas crecca*
Canvasback	*Aythya valisinaria*
Redhead	*Aythya americana*
Ring-necked Duck	*Aythya collaris*
Lesser Scaup	*Aythya affinis*
Bufflehead	*Bucephala albeola*
Common Goldeneye	*Bucephala clangula*
Barrow's Goldeneye	*Bucephala islandica*
Hooded Merganser	*Lophodytes cucullatus*
Common Merganser	*Mergus merganser*
Red-breasted Merganser	*Mergus serrator*
Ruddy Duck	*Oxyura jamaicensis*

Order: *Falconiformes* (Diurnal Flesh Eaters)
Family: *Accipitridae* (Hawks, Eagles, Osprey)

Osprey	*Pandion haliaetus*
Bald Eagle	*Haliaeetus leucocephalus*
Northern Harrier	*Circus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Northern Goshawk	*Accipiter gentilis*
Red-shouldered Hawk	*Buteo lineatus*
Broad-winged Hawk	*Buteo platypterus*
Swainson's Hawk	*Buteo swainsoni*
Red-tailed Hawk	*Buteo jamaicensis*
Ferruginous Hawk	*Buteo regalis*
Rough-legged Hawk	*Buteo lagopus*
Golden Eagle	*Aquila chrysaetos*

Family: *Falconidae* (Falcons)

American Kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Gyrfalcon	*Falco rusticolus*
American Peregrine Falcon	*Falco peregrinus*
Prairie Falcon	*Falco mexicanus*

Order: *Galliformes* (Chicken Relatives)
Family: *Phasianidae* (Grouse, Partridge)

Chukar	*Alectoris chukar*
Himalayan Snowcock	*Tetraogallus himalayensis*
Gray Partridge	*Perdix perdix*
Ruffed Grouse	*Bonasa umbellus*
Greater Sage-Grouse	*Centrocercus urophasianus*
Blue Grouse	*Dendragapus obscurus*
C. Sharp-tailed Grouse	*Tympanuchus phasianellus columbianus*
Wild Turkey	*Meleagris gallopavo*

Family: *Odontophoridae* (New World Quail)

California Quail	*Callipepla californica*
Mountain Quail	*Oreortyx pictus*

Order: *Gruiformes* (Cranes and Allies)
Family: *Rallidae* (Rails, Coots)

Virginia Rail	*Rallus limicola*
Sora	*Porzana carolina*
Common Moorhen	*Gallinula chloropus*
American Coot	*Fulica americana*

Family: *Gruidae* (Cranes)

Greater Sandhill Crane	*Grus canadansis tabida*

Order: *Charadriiformes* (Wading Birds)
Family: *Charadriidae* (Plovers)

Black-bellied Plover	*Pluvialis squatarola*
Snowy Plover	*Charadrius alexandrinus*
Semi-palmated Plover	*Charadrius semipalmatus*
Killdeer	*Charadrius vociferus*
Mountain Plover	*Charadrius montanus*

Family: *Recurvirostridae* (Avocets)

Black-necked Stilt	*Himantopus mexicanus*
American Avocet	*Recurvirostra americana*

Family: *Scolopacidae* (Sandpipers, Phalaropes)

Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Solitary Sandpiper	*Tringa solitaria*
Willet	*Catoptrophorus semipalmatus*
Spotted Sandpiper	*Actitus macularia*
Long-billed Curlew	*Numenius americanus*
Marbled Godwit	*Limosa fedoa*
Western Sandpiper	*Calidris mauri*
Least Sandpiper	*Calidris minutilla*
Baird's Sandpiper	*Calidris bairdii*
Long-billed Dowitcher	*Limnodromnus scolopaceus*
Wilson's Snipe	*Gallinago delicata*
Wilson's Phalarope	*Phalaropus tricolor*
Red-necked Phalarope	*Phalaropus lobatus*

Family: *Laridae* (Gulls, Terns)

Franklin's Gull	*Larus pipixcan*
Bonaparte's Gull	*Larus philadelphia*
Ring-billed Gull	*Larus delawarensis*
California Gull	*Larus californicus*
Herring Gull	*Larus argentatus*
Caspian Tern	*Sterna caspia*
Forster's Tern	*Sterna forsteri*
Black Tern	*Chlidonias niger*

Order: *Columbiformes* (Pigeons and Allies)
Family: *Columbidae* (Doves)

Rock Dove	*Columba livia*
White-winged Dove	*Zenaida asiatica*
Mourning Dove	*Zenaida macroura*
Eurasian Collared Dove	*Streptopelia decaocto*

Order: *Cuculiformes* (Cuckoos and Allies)
Family: *Cuculidae* (Cuckoos andRoadrunners)

Yellow-billed Cuckoo	*Coccyzus americanus*
Greater Roadrunner	*Geococcyx californianus*

Order: *Strigiformes* (Nocturnal Flesh Eaters)
Family: *Tytonidae* (Barn Owls)

Barn Owl	*Tyto alba*

Family: *Strigidae* (Owls)

Flammulated Owl	*Otus flammeolus*
Western Screech-Owl	*Megascops kennicottii*
Great Horned Owl	*Bubo virginianus*
Burrowing Owl	*Athene cunicularia*
Long-eared Owl	*Asio otus*
Short-eared Owl	*Asio flammeus*
Northern Saw-whet Owl	*Aegolius acadicus*
Northern Pygmy-Owl	*Glaucidium gnoma*

Order: *Caprimulgiformes* (Night Jars)
Family: *Caprimulgidae* (Goatsuckers)

Common Nighthawk	*Chordeiles minor*
Common Poorwill	*Phalaenoptilus nuttallii*

Order: *Apodiformes* (Small Fast Fliers)
Family: *Apodidae* (Swifts)

White-throated Swift	*Aeronautes saxatalis*

Family: *Trochilidae* (Hummingbirds)

Black-chinned Hummingbird	*Archilochus alexandri*
Calliope Hummingbird	*Stellula calliope*
Broad-tailed Hummingbird	*Selasphorus platycercus*
Rufous Hummingbird	*Selasphorus rufus*

Order: *Coraciiformes* (Cavity Nesters)
Family: *Alcedinidae* (Kingfishers)

Belted Kingfisher	*Ceryle alcyon*

Order: *Piciformes* (Cavity Builders)
Family: *Picidae* (Woodpeckers)

Lewis' Woodpecker	*Melanerpes lewis*
Williamson's Sapsucker	*Sphyrapicus thyroideus*
Red-naped Sapsucker	*Sphyrapicus nuchalis*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*Picoides villosus*
Three-toed Woodpecker	*Picoides tridactylus*
Northern Flicker	*Colaptes auratus*

Order: *Passeriformes* (Perching Birds)
Family: *Tyrannidae* (Flycatchers)

Olive-sided Flycatcher	*Contopus cooperi*
Western Wood-Pewee	*Contopus sordidulus*
Willow Flycatcher	*Epidonax traillii*
Hammond's Flycatcher	*Epidonax hammondii*
Gray Flycatcher	*Epidonax wrightii*
Dusky Flycatcher	*Epidonax oberholseri*
Cordilleran Flycatcher	*Epidonax occidentalis*
Black Phoebe	*Sayornis nigricans*
Say's Phoebe	*Sayornis saya*
Ash-throated Flycatcher	*Myiarchus cinerascens*
Western Kingbird	*Tyrannus verticalis*
Eastern Kingbird	*Tyrannus tyrannus*

Family: *Laniidae* (Shrikes)

Loggerhead Shrike	*Lanius ludovicianus*
Northern Shrike	*Lanius excubitor*

Family: *Vireonidae* (Vireos)

Plumbeous Vireo	*Vireo plumbeus*
Warbling Vireo	*Vireo gilvus*

Family: *Corvidae* (Jays)

Western Scrub-Jay	*Aphelocoma californica*
Pinyon Jay	*Gymnorhinus cyanocephalus*
Clark's Nutcracker	*Nucifraga columbiana*
Black-billed Magpie	*Pica pica*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*

Family: *Alaudidae* (Larks)	
Horned Lark	*Eremophila alpestris*
Family: *Hirundinidae* (Swallows)	
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallow	*Tachycineta thalassina*
Bank Swallow	*Riparia riparia*
N. Rough-winged Swallow	*Stelgidopteryx serripennis*
Cliff Swallow	*Petrochelidon pyrrhonota*
Barn Swallow	*Hirundo rustica*
Family: *Paridae* (Chickadees, Titmice)	
Black-capped Chickadee	*Poecile atricapillus*
Mountain Chickadee	*Poecile gambeli*
Juniper Titmouse	*Baeolophus griseus*
Family: *Aegithalidae* (Bushtits)	
Bushtit	*Psaltriparus minimus*
Family: *Sittidae* (Nuthatches)	
Red-breasted Nuthatch	*Sitta canadensis*
White-breasted Nuthatch	*Sitta carolinensis*
Pygmy Nuthatch	*Sitta pygmaea*
Family: *Certhiidae* (Creepers)	
Brown Creeper	*Certhia americana*
Family: *Troglodytidae* (Wrens)	
Rock Wren	*Salpinctes obsoletus*
Canyon Wren	*Catherpes mexicanus*
Bewick’s Wren	*Thyromanes bewickii*
House Wren	*Troglodytes aedon*
Winter Wren	*Troglodytes troglodytes*
Marsh Wren	*Cistothorus palustris*
Family: *Cinclidae* (Dippers)	
American Dipper	*Cinclus mexicanus*
Family: *Regulidae* (Kinglets)	
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Redulus calendula*
Family: *Sylviidae* (Gnatcatchers)	
Blue-gray Gnatcatcher	*Polioptila caerulea*
Family: *Turdidae* (Thrushes)	
Western Bluebird	*Sialia mexicana*
Mountain Bluebird	*Sialia currucoides*
Townsend’s Solitaire	*Myadestes townsendi*
Veery	*Catharus fuscescens*
Swainson’s Thrush	*Catharus ustulatus*
Hermit Thrush	*Catharus guttatus*
Family: *Turdidae* (Thrushes) (continued)	
American Robin	*Turdus migratorius*
Varied Thrush	*Ixoreus naevius*
Family: *Mimidae* (Thrashers, Mockingbirds)	
Northern Mockingbird	*Mimus polyglottos*
Sage Thrasher	*Oreoscoptes montanus*
Family: *Sturnidae* (Starlings)	
European Starling	*Sturnus vulgaris*
Family: *Motacillidae* (Pipits)	
American Pipit	*Anthus rubescens*
Family: *Bombycillidae* (Waxwings)	
Bohemian Waxwing	*Bombycilla garrulus*
Cedar Waxwing	*Bombycilla cedrorum*
Family: *Parulidae* (Wood-Warblers)	
Orange-crowned Warbler	*Vermivora celata*
Nashville Warbler	*Vermivora ruficapilla*
Virginia’s Warbler	*Vermivora virginae*
Yellow Warbler	*Dendroica petechia*
Yellow-rumped Warbler	*Dendroica coronata*
Black-throated Gray Warbler	*Dendroica nigrescens*
Townsend’s Warbler	*Dendroica townsendi*
MacGillivray’s Warbler	*Oporornis tolmiei*
Common Yellowthroat	*Geothlypis trichas*
Wilson’s Warbler	*Wilsonia pusilla*
Yellow-breasted Chat	*Icteria virens*
Family: *Thraupidae* (Tanagers)	
Western Tanager	*Piranga ludoviciana*
Family: *Emberizidae* (Sparrows, Towhees, Juncos)	
Green-tailed Towhee	*Pipilo chlorurus*
Spotted Towhee	*Pipilo maculatus*
American Tree Sparrow	*Spizella arborea*
Chipping Sparrow	*Spizella passerina*
Brewer's Sparrow	*Spizella breweri*
Vesper Sparrow	*Pooecetes gramineus*
Lark Sparrow	*Chondestes grammacus*
Black-throated Sparrow	*Amphispiza bileneata*
Sage Sparrow	*Amphispiza belli*
Savannah Sparrow	*Passerculus sandwichensis*
Grasshopper Sparrow	*Ammodramus bairdii*
Fox Sparrow	*Passerella iliaca schistacea*
Song Sparrow	*Melospiza melodia*
Lincoln’s Sparrow	*Melospiza lincolnii*
White-throated Sparrow	*Zonotrichia albicollis*
Harris’s Sparrow	*Zonotrichia querula*
Gambel'sWhite-crowned Sparrow	*Zonotrichia leucophrys gambelii*
Mountain W-crowned Sparrow	*Zonotrichia leucophrys oriantha*
Golden-crowned Sparrow	*Zonotrichia atricapilla*
Dark-eyed Junco*(Oregon)*	*Junco hyemalis therburi*
Dark-eyed Junco(*Gray-headed*)	*Junco hyemalis caniceps*
Lapland Longspur	*Calcarius lapponicus*
Family: *Cardinalidae* (Grosbeaks, Buntings)	
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Blue Grosbeak	I*raca caerulea*
Lazuli Bunting	*Passerina amoena*
Indigo Bunting	*Passerina cyanea*
Family: *Icteridae* (Blackbirds, Orioles)	
Bobolink	*Dolichonyx oryzivorus*
Red-winged Blackbird	*Agelaius phoeniceus*
Western Meadowlark	*Sturnella neglecta*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Brewer's Blackbird	*Euphagus cyanocephalus*

Great-tailed Grackle	*Quiscalus mexicanus*
Brown-headed Cowbird	*Molothrus ater*

Family: *Icteridae* (Blackbirds, Orioles continued)

Bullock's Oriole	*Icterus bullockii*
Scott's Oriole	*Icterus parisorum*

Family: *Fringillidae* (Finches, Grosbeaks)

Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*
Black Rosy-Finch	*Leucosticte atrata*
Pine Grosbeak	*Pinicola enucleator*
Purple Finch	*Carpodacus purpureus*
Cassin's Finch	*Carpodacus cassinii*
House Finch	*Carpodacus mexicanus*
Red Crossbill	*Loxia curvirostra*
Common Redpoll	*Carduelis flammea*
Pine Siskin	*Carduelis pinus*
Lesser Goldfinch	*Carduelis psaltria*
American Goldfinch	*Carduelis tristis*
Evening Grosbeak	*Coccothraustes vespertinus*

Family: *Passeridae* (Old World Sparrows)

House Sparrow	*Passer domesticus*

Mammals

Order: *Insectivora* (Insect Eaters)

Family: *Soricidae* (Shrews)

Merriam's Shrew	*Sorex meriammi*
Dusky Shrew	*Sorex monticolus*
Vagrant Shrew	*Sorex vagrans*
Water Shrew	*Sorex palustris*
Preble's Shrew	*Sorex preblei*

Order: *Chiroptera* (Bats)

Family: *Vespertilionidae* (Plainnose Bats)

California Myotis	*Myotis californicus*
Small-footed Myotis	*Myotis ciliolabrum*
Long-eared Myotis	*Myotis evotis*
Little Brown Bat	*Myotis lucifugus*
Fringed Myotis	*Myotis thysanodes*
Long-legged Myotis	*Myotis volans*
Yuma Myotis	*Myotis yumanensis*
Western Red Bat	*Lasiurus blossvellii*
Hoary Bat	*Lasiurus cinereus*
Silver-haired Bat	*Lasionycteris noctivagans*
Western Pipistrelle	*Pipistrellus hesperus*
Big Brown Bat	*Eptesicus fuscus*
Townsend's Big-eared Bat	*Corynorhinus townsendii*
Spotted Bat	*Euderma maculata*
Pallid Bat	*Antrozous pallidus*

Family: *Molossidae* (Freetail Bats)

Brazilian Free-tailed Bat	*Tadarida brasiliensis*

Order: *Lagomorpha* (Pikas, Hares, Rabbits)

Family: Ochotonidae (Pikas)

Pika	*Ochotona princeps*

Family: *Leporidae* (Hares, Rabbits)

White-tailed Jackrabbit	*Lepus townsendi*
Snowshoe Hare	*Lepus americanus*
Black-tailed Jackrabbit	*Lepus californicus*
Mountain Cottontail	*Sylvilagus nuttalli*
Pygmy Rabbit	*Brachylagus idahoensis*

Order: *Rodentia* (Rodents)

Family: *Sciuridae* (Squirrels)

Least Chipmunk	*Tamias minimus*
Cliff Chipmunk	*Tamias dorsalis*
Uinta Chipmunk	*Tamias umbrinus*
Yellow-bellied Marmot	*Marmota flaviventris*
White-tailed Antelope Squirrel	*Ammospermophilus leucurus*
Townsend Ground Squirrel	*Spermophilus townsendii*
Belding Ground Squirrel	*Spermophilus beldingi*

Family: *Geomyidae* (Gophers)

Botta's Pocket Gopher	*Thomomys bottae*
Northern Pocket Gopher	*Thomomys talpoides*
Southern Pocket Gopher	*Thomomys umbrinus*

Family: *Heteromyidae* (Kangaroo Rodents)

Little Pocket Mouse	*Perognathus longimembris*
Great Basin Pocket Mouse	*Perognathus parvus*
Dark Kangaroo Mouse	*Microdipodops megacephalus*
Ord's Kangaroo Rat	*Dipodomys ordii*
Chisel-toothed Kangaroo Rat	*Dipodomys microps*

Family: *Castoridae* (Beavers)

Beaver	*Castor canadensis*

Family: *Cricetidae* (Mice, Rats, Voles)

Western Harvest Mouse	*Reithrodontomys megalotis*
Canyon Mouse	*Peromyscus crinitus*
Deer Mouse	*Peromyscus maniculatus*
Pinion Mouse	*Peromyscus truei*
Northern Grasshopper Mouse	*Onychomys leucogaster*
Desert Woodrat	*Neotoma lepida*
Bushy-tailed Woodrat	*Neotoma cinerea*
Mountain Vole	*Microtus montanus*
Long-tailed Vole	*Microtus longicaudus*
Sagebrush Vole	*Lemmiscus curtatus*
Muskrat	*Ondatra zibethica*

Family: *Zapodidae* (Jumping Mice)

Western Jumping Mouse	*Zapus princeps*

Family: *Erethizontidae* (New World Porcupines)

Porcupine	*Erethizon dorsatum*

Order: *Carnivora* (Flesh-Eaters)

Family: *Canidae* (Dogs, Wolves, Foxes)

Coyote	*Canis latrans*
Gray Wolf	*Canis lupus* (*locally extirpated*)
Gray Fox	*Urocyon cinereoargenteus*
Kit Fox	*Vulpes macrotus*
Red Fox	*Vulpes vulpes*

Family: *Procyonidae* (Racoons and Allies)

Raccoon	*Procyon lotor*

Family: *Mustelidae* (Weasels and Allies)

Short-tailed Weasel	*Mustela erminae*
Long-tailed Weasel	*Mustela frenata*

Family: *Mustelidae* (Weasels and Allies) (cont.)

Mink	*Mustela vison*
American Marten	*Martes americana (l. extirpated)*
Wolverine	*Gulo gulo (locally extirpated)*
River Otter	*Lutra canadensis*
American Badger	*Taxidea taxus*
Striped Skunk	*Mephitis mephitis*
Western Spotted Skunk	*Spilogale gracilis*

Family: *Felidae* (Cats)

Mountain Lion	*Felix concolor*
Lynx	*Lynx lynx (locally extirpated)*
Bobcat	*Lynx rufus*

Order: *Artiodactyla* (Hoofed Mammals)
Family: *Cervidae* (Deer)

Rocky Mountain Elk	*Cervus canadensis*
Mule Deer	*Odocoileus hemionus*

Family: *Antilocapridae* (Pronghorn)

Pronghorn	*Antilocapra americana*

Family: *Bovidae* (Bison, Sheep, Goats)

Bison	*Bison bison (locally extirpated)*
Mountain Goat	*Oreamnos americanus*
Bighorn Sheep	*Ovis canadensis*

Reptiles
Order: *Squamata* (Lizards, Snakes)
Family: *Iguanidae* (Iguanas and Allies)

Western Fence Lizard	*Sceloporus occidentalis*
Sagebrush Lizard	*Sceloporus graciosus*
Side-blotched Lizard	*Uta stansburiana*
Pygmy Short-horned Lizard	*Phrynosoma douglassii*
Greater Short-horned Lizard	*Phrynosoma hernadesi*
Desert Horned Lizard	*Phrynosoma platyrhinos*

Family: *Scincidae* (Skinks)

Western Skink	*Eumeces skiltonianus*

Family: *Teiidae* (Whiptails)

Western Whiptail	*Cnemidophorus tigrus*

Family: *Boidae* (Boas, Pythons)

Rubber Boa	*Charina bottae*

Family: *Colubridae* (Solid-toothed Snakes)

Ringneck Snake	*Diadophis punctatus*
Striped Whipsnake	*Masticophis taeniatus*
Great Basin Gopher Snake	*Pituophis cantenifer deserticola*
Common Kingsnake	*Lampropeltis getulus*
Sonoran Mountain Kingsnake	*Lampropeltis pyromelana*
Long-nosed Snake	*Rhinocheilus lecontei*
Western Terrestrial Garter	*Thamnophis elegans*
Ground Snake	*Sonora semiannulata*
Night Snake	*Hypsiglena torquata*

Family: *Viperidae* (Vipers)

Great Basin Rattlesnake	*Crotalus oreganus lutosus*

Amphibians

Order: *Anura* (Frogs and Toads)
Family: *Pelobatidae* (Spadefoots)

Great Basin Spadefoot Toad	*Scaphiopus intermontanus*

Family: *Ranidae* (True Frogs)

Columbia Spotted Frog	*Rana luteiventris*
Northern Leopard Frog	*Rana pipiens*
Bullfrog	*Rana catesbeiana*

Family: *Bufonidae* (Toads)

Western Toad	*Bufo boreas*

Family: *Hylidae* (Treefrogs)

Pacific Treefrog	*Hyla regilla*

Note: This list is a combination of wildlife sight record data and our best effort to predict what wildlife species live in this area in all seasons and under optimum habitat conditions.

*With the exception of the European Starling, House Sparrow, Eurasian Collared Dove, and Rock Dove, all birds are protected in Nevada by either the International Migratory Bird Treaty Act or as game species. Several mammal and one amphibian species are also protected as game species.

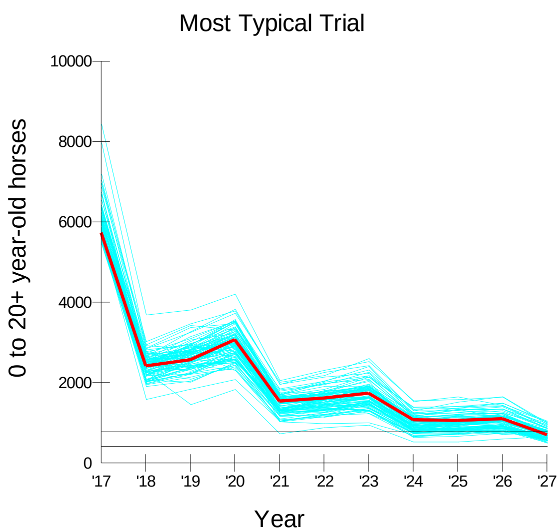
Updated: 4/2005 - Peter V. Bradley - Nevada Department of Wildlife - Elko, Nevada

13. APPENDIX VIII: POPULATION MODELING

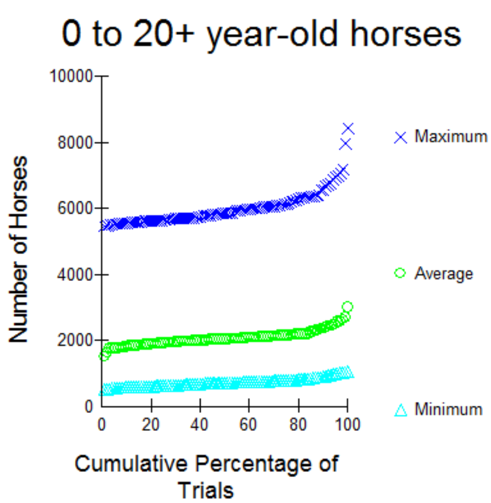
Antelope Complex

Alternative A & B

Most Typical



Population Size

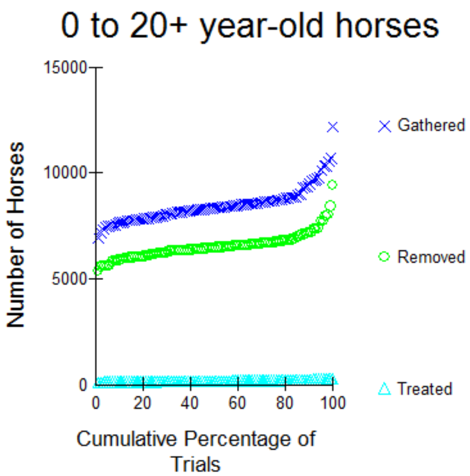


	Population Size		
	Minimum	Average	Maximum
Lowest Trial	505	1502	5457
10th Percentile	575	1807	5566
25th Percentile	626	1911	5654
Median Trial	706	2022	5866
75th Percentile	788	2143	6162
90th Percentile	898	2366	6612
Highest Trial	1055	2988	8436

Explanation

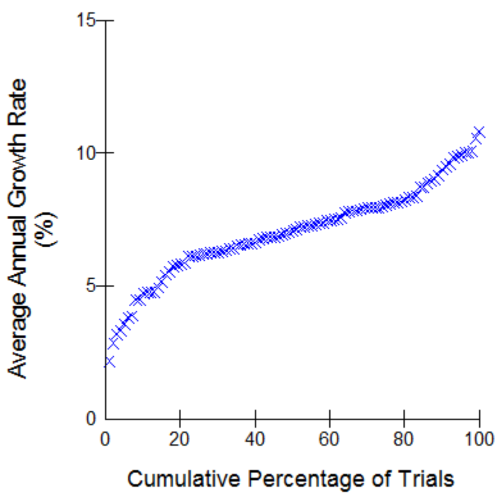
In 11 years and 100 trials, the lowest number of 0 to 20 year old horses ever obtained was 505 and the highest was 8436. In half the trials, the minimum population size in 11 years was less than 706 and the maximum was less than 5866. The average population size across 11 years ranged from 1502 to 2988.

Gather



	Total in 11 years		
	Gather	Removed	Treated
Lowest Trial	6953	5390	122
10th Percentile	7699	5914	140
25th Percentile	7968	6188	158
Median Trial	8394	6478	184
75th Percentile	8730	6731	221
90th Percentile	9594	7190	251
Highest Trial	12205	9432	290

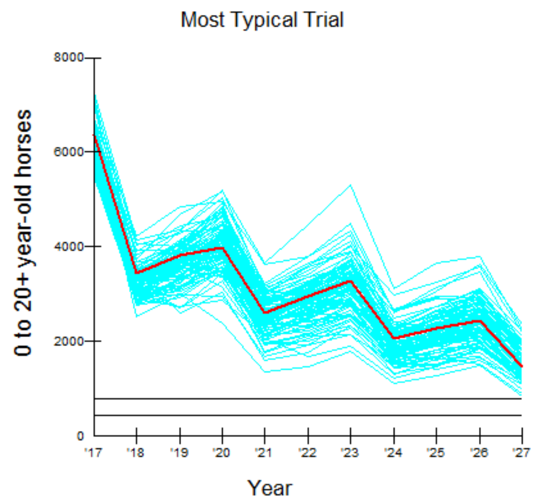
Growth size



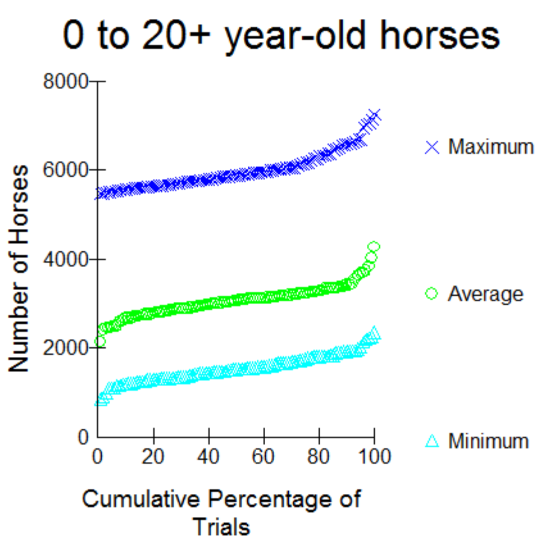
Average Growth Rate in 10 years	
Lowest Trial	2.2%
10th Percentile	4.8%
25th Percentile	6.2%
Median Trial	7.1%
75th Percentile	8.1%
90th Percentile	9.4%
Highest Trial	10.8%

Alternative C

Most Typical



Population Size

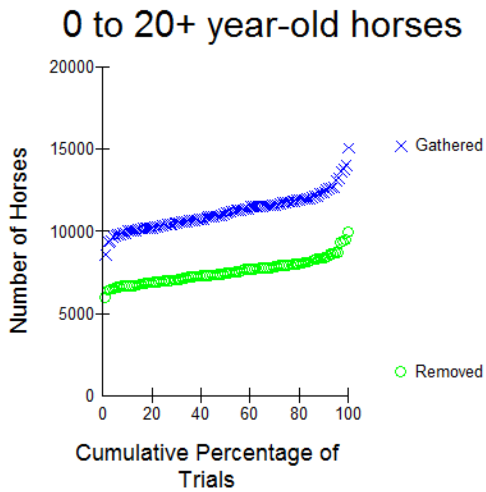


Population Sizes in 11 years

	Minimum	Average	Maximum
Lowest Trial	849	2130	5478
10th Percentile	1190	2668	5586
25th Percentile	1317	2836	5682
Median Trial	1524	3065	5900
75th Percentile	1760	3239	6182
90th Percentile	1925	3415	6603
Highest Trial	2354	4272	7258

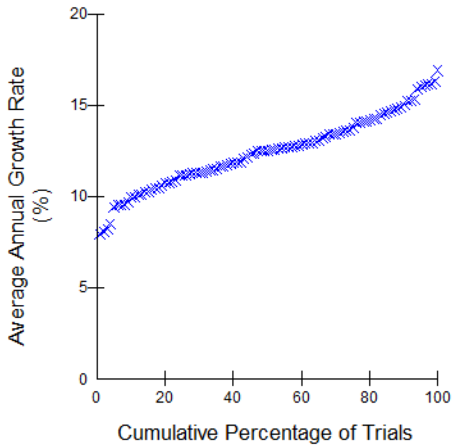
Explanation
In 11 years and 100 trials, the lowest number of 0 to 20 + year-old horses ever obtained was 849 and the highest was 7258. In half the trails, the minimum population size in 11 years was less than 1524 and the maximum was less than 5900. The average population size across 11 years ranged from 2130 to 4272.

Gather



	Totals in 11 years	
	Gathered	Removed
Lowest Trial	8569	5956
10th Percentile	10050	6628
25th Percentile	10416	6930
Median Trial	11164	7423
75th Percentile	11810	7911
90th Percentile	12482	8354
Highest Trail	15083	9916

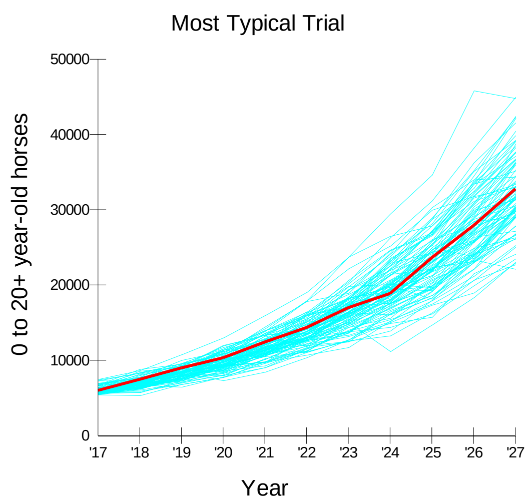
Growth Rate



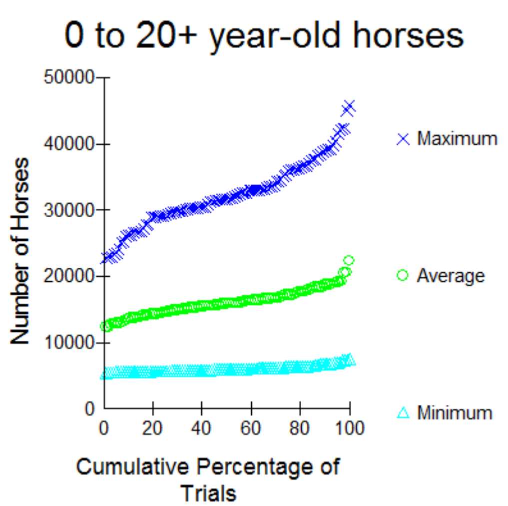
	Growth Rate in 10
Lowest Trial	8.0%
10th Percentile	10.0%
25th Percentile	11.2%
Median Trial	12.5%
75th Percentile	13.9%
90th Percentile	15.1%
Highest Trial	16.9%

No Action

Most Typical



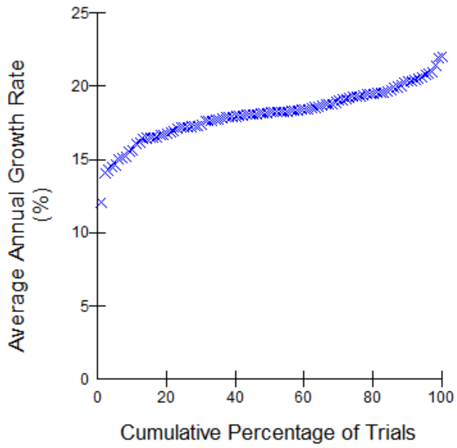
Population Size



	Population Size in 11 years		
	Minimum	Average	Maximum
Lowest Trial	5376	12424	22751
10th Percentile	5572	13638	26297
25th Percentile	5699	14644	29415
Median Trial	5942	15893	31805
75th Percentile	6301	17174	36128
90th Percentile	6760	18777	39192
Highest Trial	7531	22331	45875

Explanation:
In 11 years and 100 trials, the lowest number of 0 to 20 + year-old horses ever obtained was 5376 and the highest was 45875. In half the trials, the minimum population size in 11 years was less than 5942 and the maximum was less than 31805. The average population size across 11 years ranged from 12424 to 22331.

Growth Rate

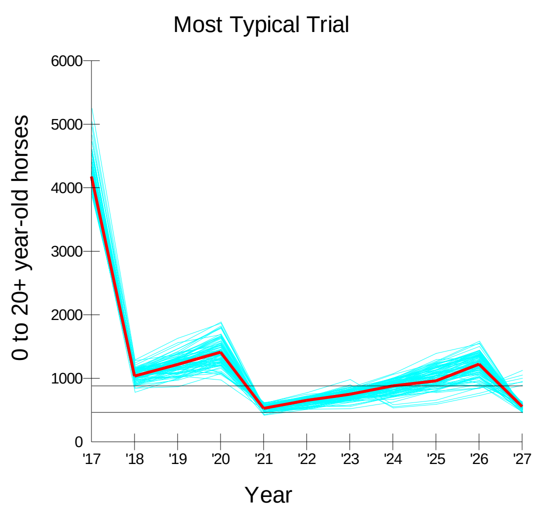


	Average Growth Rate in 10 years
Lowest Trial	12.1%
10th Percentile	15.9%
25th percentile	17.2%
Median Trial	18.3%
75th Percentile	19.3%
90th percentile	20.4%
Highest Trial	22.1%

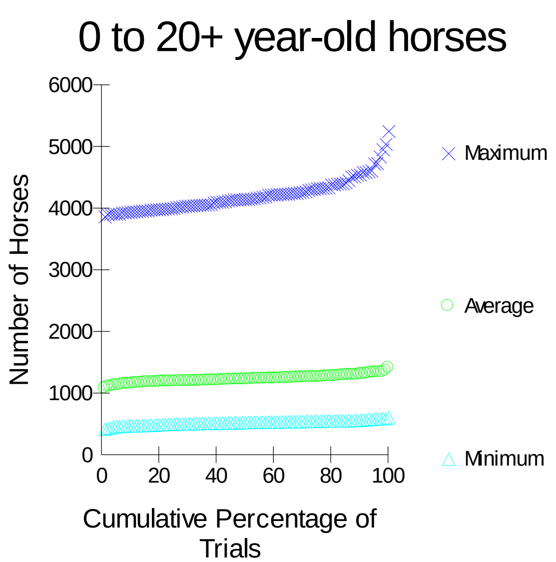
Triple B Complex Population Modeling

Alternative A & B

Most Typical



Population Size

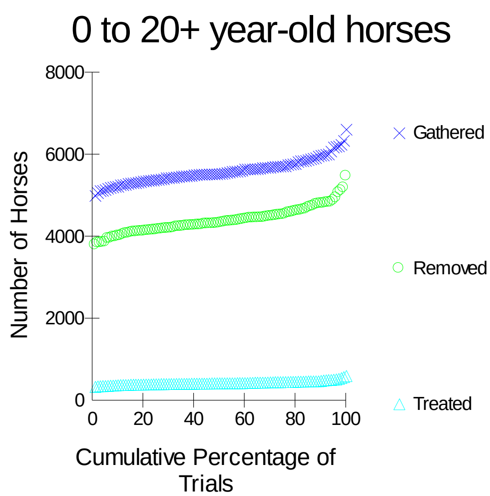


Population Size in 11 years	Minimum	Average	Maximum
Lowest Trial	427	1085	3868
10th Percentile	480	1159	3946
25th Percentile	506	1194	4013
Median Trial	532	1227	4150
75th Percentile	553	1264	4330
90th Percentile	570	1312	4569
Highest Trial	611	1416	5255

Explanation;

In 11 years and 100 trials, the lowest number of 0 to 20 year old horses ever obtained was 427 and the highest was 5255. In half the trials, the minimum population size in 11 years was less than 532 and the maximum was less than 4150. The average population size across 11 years ranged from 1085 to 1416.

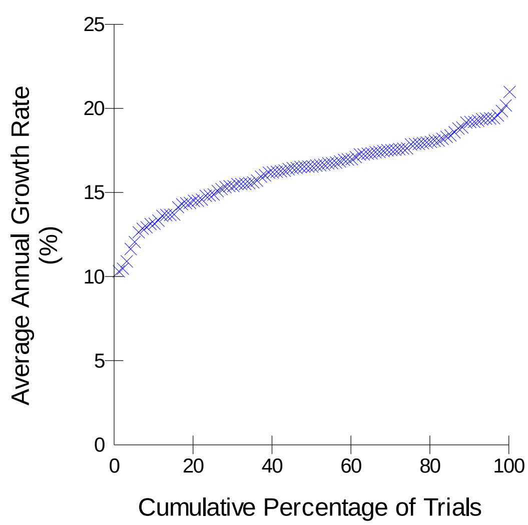
Gather



Total in 11 years

	Gathered	Removed	Treated
Lowest Trial	4998	3793	339
10th Percentile	5242	4014	383
25th Percentile	5388	4168	406
Median Trial	5534	4334	427
75th Percentile	5720	4538	458
90th Percentile	5982	4806	489
Highest Trial	6615	5471	605

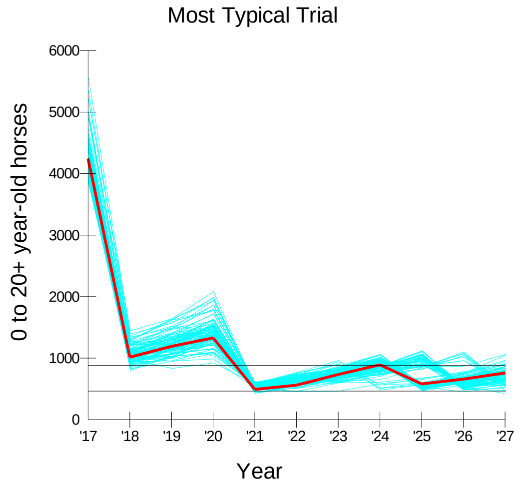
Growth Rate



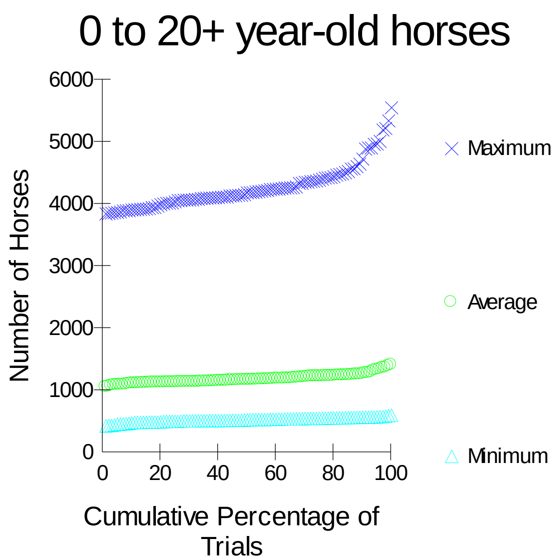
	Average Growth Rate
Lowest Trial	10.4%
10th Percentile	13.3%
25th Percentile	15.0%
Median Trial	16.6%
75th Percentile	17.9%
90th Percentile	19.2%
Highest Trial	21.0%

Alternative C

Most Typical



Population Size



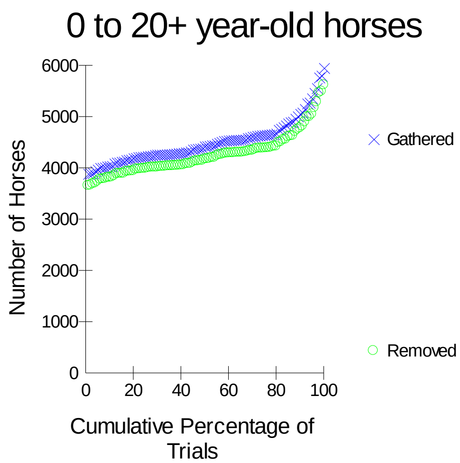
Population Size in 11 years

	Minimum	Average	Maximum
Lowest Trial	429	1049	3845
10th Percentile	482	1108	3910
25th Percentile	504	1127	4049
Median Trial	530	1163	4186
75th Percentile	552	1222	4396
90th Percentile	572	1266	4807
Highest Trial	602	1407	5554

Explanation

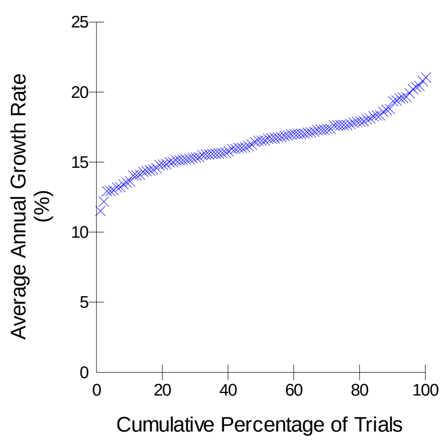
In 11 years and 100 trials, the lowest number of 0 to 20 year old horses ever obtained was 429 and the highest was 5554. In half the trails, the minimum population size in 11 years was less than 530 and the maximum was less than 4186. The average population size across 11 years ranged from 1049 to 1407.

Gather



	Totals in 11 years	
	Gathered	Removed
Lowest Trial	3888	3655
10th Percentile	4039	3819
25th Percentile	4228	3995
Median Trial	4424	4174
75th Percentile	4646	4389
90th Percentile	5068	4798
Highest Trial	5951	5618

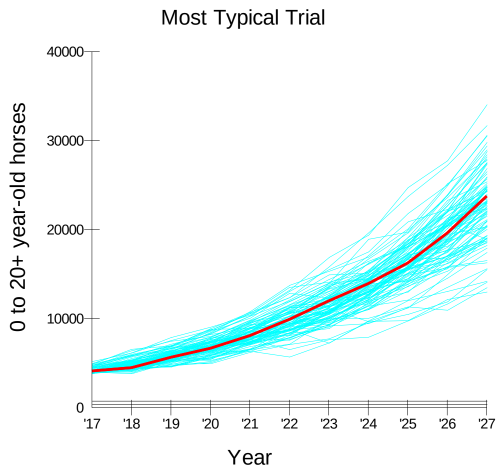
Growth Rate



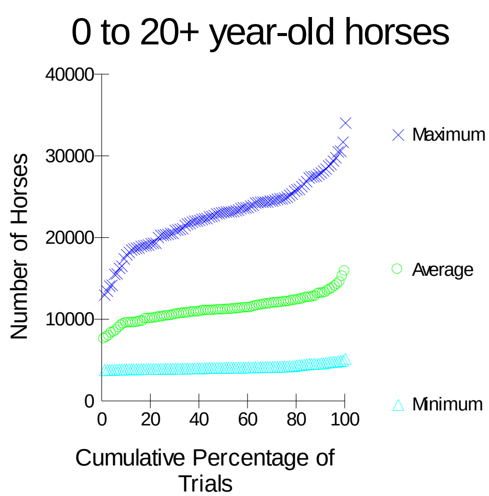
	Average Growth Rate in 10
Lowest Trial	11.6%
10th Percentile	13.9%
25th Percentile	15.2%
Median Trial	16.6%
75th Percentile	17.7%
90th Percentile	19.4%
Highest Trial	21.1%

No Action

Most Typical



Population Size



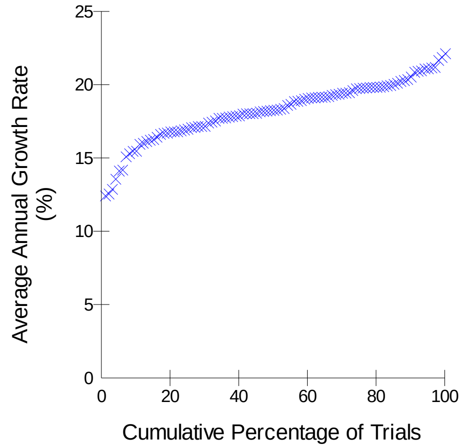
Population Size in 11 years

	Minimum	Average	Maximum
Lowest trial	3845	7597	13036
10th Percentile	3940	9544	18120
25th Percentile	4009	10332	20406
Median Trial	4137	11160	23181
75th Percentile	4290	12125	24986
90th Percentile	4668	13186	28114
Highest Trial	5238	15884	34096

Explanation

In 11 years and 100 trials, the lowest number of 0 to 20 year old horses ever obtained was 3845 and the highest was 34096. In half the trials, the minimum population size in 11 years was less than 4137 and the maximum was less than 23181. The average population size across 11 years ranged from 7597 to 15884.

Growth Rate



Average Growth Rate in 10 years	
Lowest Trial	12.5%
10th Percentile	15.7%
25th Percentile	17.1%
Median trial	18.3%
75th Percentile	19.8%
90th Percentile	20.7%
Highest Trial	22.2%

14. APPENDIX IX COMMENTS

Comments and Responses

The Preliminary Antelope and Triple B Complexes Gather Plan EA, DOI-BLM-NV-N030-2017-0010-EA, was made available to interested individuals, agencies and groups for a public review and comment period that opened July 21, 2017 and closed August 21, 2017. The BLM received over 4,950 comment submissions during the public comment period; more than 4,780 of those submissions were a form letter. Form letters are generated from a singular website from a non-governmental organization, such as an animal advocacy group. Comments identified on the form letters were considered along with the rest of the comments received, but as one collective comment letter. Form letters are not counted as separate comments due to their duplicative nature. However, where individuals added their own comments to the form, the personalized comments were considered as separately submitted comments. Duplicate comments or comments from outside the country were not accepted. All other comments received prior to the end of the public comment period were reviewed and considered. Substantive comments were used to finalize the EA as appropriate. BLM responses are identified in the table below.

No.	**Comment**	**BLM Response**
1.	The BLM should fund a sustainable on the range management program utilizing the best fertility control methods available	Outside the scope of this analysis.
2.	I oppose the Proposed Action to treat all returned mares with PZP or GonaCon. Research has not yet determined the effects of GonaCon on wild horse natural behavior.	Please see EA section 3.2.12, "*Behavioral Effects of GnRH Vaccination*," which summarizes published literature on behavioral effects of GonaCon, including in feral horses.
3.	BLM Must fully consider a broad range of alternative actions. Darting horses with PZP fertility drugs must be considered, and incremental reductions in numbers through this method. This is common sense solution that previous NV BLM Manager refused to allow to take place – and actually canceled one program that was underway. This should be relatively easy to do in this water-limited area, and MUCH more cost effective than a large-scale helicopter round Up, holding of horses etc.	See Section 2.6.1 of the EA.
4.	Stop using PZP, Gonacon, the Sterilizations	Comment noted.
5.	Why native PZP (ZonaStat-H), recently registered by the Environmental Protection Agency, and sanctioned by the Humane Society of the United	See Section 2.6.1 and 2.6.2. The final EA includes the possibility that ZonaStat-H may

	States (HSUS), has not been used in the past and is not being considered for future management of wild horse herds in this complex.	be used as a booster dose for mares.
6.	Treating 3870 mares with PZP-22 and releasing them back into the HMA would have a positive impact on population growth if a comprehensive fertility control program is maintained in subsequent years	This would not meet the Purpose and Need because it would leave more horses than the range can sustain. The WFRHBA requires BLM to maintain herds at a level that will achieve a thriving natural and ecological balance.
7.	Apply PZP or PZP-22 or Gonacon or a combination of both to all adult mares.	See Section 2.2 of the EA.
8.	PZP -- The Pesticide Porcine zona pellucida -- PZP aka ZonaStat-H or Native PZP -- is an EPA-registered pesticide derived from the ovaries of slaughtered pigs. PZP is approved for use on wild horses "in areas where they have become a nuisance ...." Some persons argue that, because PZP does not kill the mare, it is not really a "pesticide." Actually, PZP does kill. As will be documented herein, PZP's use is associated with stillborn foals. PZP is further correlated with stolen foals and out-of-season foals, who perish as neonates. In the long term, PZP tends to weaken a herd immunologically, which could swiftly lead to its extinction. So, yes, PZP is a real pesticide.	See Section 3.2.12 of the EA. The EPA has registered PZP vaccine as a pesticide for feral horses and burros because the vaccine is intended to reduce population growth rates in a vertebrate animal that can cause environmental damage. The hypothesis that immunocontraceptives will compromise immunological function at the herd level has not been tested, and is addressed in section 3.2.12, "*Genetic Effects of PZP Vaccination*" and "*Genetic Effects of GnRH Vaccination*"
9.	PZP -- an Anti-Vaccine While touted as a "vaccine," PZP is actually a perversion of what a true vaccine is supposed to be. Instead of preventing disease, PZP causes disease -- auto-immune disease. Thus, PZP could be viewed as an anti-vaccine.	Opinion noted
10.	PZP's Mode of Action as Stated in the Pesticide Registration Is a Disproved Hypothesis HSUS, the registrant of PZP advised the Environmental Protection Agency that, based on information from the pesticide's researcher-manufacturer, PZP works by generating antibodies that "block sperm	See Section 3.2.12 of the EA. A literature review of PZP physiological effects is included in the EA, in section 3.2.12. Of note, in section "*PZP Direct Effects*" the final EA includes the following text, acknowledging that there may be direct effects of PZP vaccination on ovaries: "The historically accepted

	attachment." This representation of PZP as a sort of chemical condom was not fact but merely an untested hypothesis, postulated three decades ago. The old hypothesis was disproved by subsequent research. PZP's manufacturer knew, or should have known, this. The manufacturer should also have been informed and up-to-date regarding the side effects and unintended consequences of PZP. Yet, the manufacturer continued to cite the disproved hypothesis and to deny that PZP has any adverse effects. [25 and 36] HSUS is remiss in not investigating PZP beyond the manufacturer's claims before touting it as the solution to the non-existent wild-horse overpopulation "problem." BLM is irresponsible in ignoring research that has disclosed PZP's risks.	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)."
11.	**PZP's True Mode-of-Action** So how does PZP really work? PZP tricks the immune system into waging immunological war on the ovaries. In a meta-analysis of ZP-type contraceptives, Kaur & Prabha (2014) reported that the infertility brought on by such products is " ... a consequence of ovarian dystrophy rather than inhibition of sperm-oocyte interaction." Thus, PZP's antibodies "work" not by blocking sperm attachment but by destroying the ovaries. Kaur & Prabha further disclosed that " ... histological examination of ovaries of immunized animals revealed the presence of atretic follicles with degenerating oocytes." [Atretic follicles are ovarian follicles in an undeveloped state due to immaturity, poor nutrition or systemic disease; manifested by prolonged anestrus.] Kaur & Prabha's review concluded that PZP's antibodies induce ovarian dystrophy, destruction of oocytes in all growing follicles, and depletion of resting follicles. The manufacturer of PZP as well as BoLM should have been aware of these and other findings about the pesticide. Yet they ignored or disregarded any information that was contrary to their personally-preferred but obsolete and false description of PZP's mode-of-action.	See Response to comment #10. See Section 3.2.12 of the EA The final EA includes text acknowledging that the mechanism of action for PZP vaccine may include direct effects on ovaries. The final EA now includes reference to Kaur and Prabha (2014): "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." It is not contrary to the intended effects of PZP (limiting a mare's reproduction) if there are effects on ovarian function

	Kaur & Prabha warned that "... long term studies showed that immunization with zona antigens might induce immunological attack on many eggs in the ovary which might lead to premature ovarian failure." Included as a reference to the EA? No.	
12.	**Study Shows PZP Elicits Ovarian Pathologies** One of the references cited in the EA was a study by Curtis et al. (2001) on the comparative effects of GnRH and PZP on white-tailed deer. However, Curtis, along with most of the same colleagues issued a newer study (2007) on PZP alone. Curtis, Richmond, Miller, and Quimby (2007) disclosed that 75% of PZP-treated white-tailed deer -- and 50% of re-treated deer -- suffered eosinophilic oophoritis (inflammation of the ovaries). Further, the re-treated deer that did not develop oophoritis instead developed a different problem -- significantly fewer normal secondary follicles than control females. The study-authors concluded that PZP "elicited ovarian pathologies in deer similar to those observed in other species." Included as a reference to the EA? No.	Refer to Section 3.2.12.2 of the EA
13.	**PZP Manufacturer's Own Research Found Markedly Depressed Estrogen Secretion** In a telling study, Kirkpatrick, Liu, Turner, Naugle, and Keiper (1992a), the lead author and manufacturer of Native PZP, along with colleagues, reported that " ... three consecutive years of PZP treatment may interfere with normal ovarian function as shown by markedly depressed oestrogen secretion." So, despite all the hype about PZP being non-hormonal, the manufacturer knew that ZonaStat-H has an adverse hormonal effect,	See responses to comments #10 and 11. The final EA includes text acknowledging that the mechanism of action for PZP vaccine may include direct effects on ovaries. The Kirkpatrick et al. (1992) citation was included in the draft EA. The letter ‘a’ after 1992 is idiosyncratic to the commenter’s text; letting is a device used to differentiate two cited papers that have the same author and are from the same year.

	causing significantly-lowered estrogen. Thus, PZP is an endocrine disruptor. [39] The plummeting estrogen-levels may also reflect the ovarian dystrophy and oophoritis now known to be caused by PZP. Despite personally discovering negative hormonal impacts 24 years ago, PZP's manufacturer continued to cite misinformation regarding the product's mode-of-action and hid its endocrine-disruptor side-effects. Included as a reference to the EA? **Cannot tell**. A 1992 study is listed twice, but *not* 1992**a**.	
14.	**PZP Causes Ovarian Cysts** In their 2010 meta-analysis, Gray & Cameron cited a number of studies that found " ... alterations to ovarian function, oophoritis, and cyst formation with PZP treatment (Mahi-Brown *et al*.1988, Sehgal *et al*. 1989, Rhim *et al*. 1992, Stoops *et al*. 2006, Curtis *et al*. 2007)." These findings support those of Kaur & Prabha while introducing yet another adverse effect: **ovarian cysts**. Gray & Cameron's review also noted that increased irritability, aggression, and **masculine behavior** had been observed in females following PZP-treatment. Included as a reference to the EA? **No**.	See responses to comments #10 and 11. The final EA includes text acknowledging that the mechanism of action for PZP vaccine may include direct effects on ovaries. Gray and Cameron (2010) is noted in the final EA.
15.	**PZP → Endocrine Disruptor → Elevated Testosterone → Masculinizing Effects** Recall that PZP has endocrine-disrupting effects that result in lowered estrogen. Per the observed masculine behavior of treated mares, PZP seems to have a testosterone-elevating effect too. A deficit of estrogen alone would not necessarily manifest in the masculinization of treated females, but an excess of testosterone would. So, it appears that PZP disrupts at least two hormones: estrogen -- by substantially lowering it -- and testosterone -- by substantially elevating it. <u>Adverse effect</u>: Abnormal behavior.	This comment is speculative, and is not made in reference to any published literature.
16.	**PZP Causes Additional Adverse Effects**	See Section 3.2.12 of the EA. The literature review on effects of PZP vaccination already

	Gray & Cameron's review also disclosed that, when PZP was administered to the females of a herd, males ***lost body condition*** while the oft-claimed improvement in female body condition ***did not hold up***. Further, mares remained sexually active beyond the normal breeding season and had more estrus events.	noted that treated mares are expected to continue to cycle throughout the breeding season. Gray and Cameron (2010) is noted in the final EA in the context of the wider body of available literature.
17.	**PZP Confers Dubious "Benefit" of Increased Longevity** Gray & Cameron also cited a study that found that "... PZP treated feral horse mares lived longer, resulting in a new age class (>25 years) not present before treatment ...." Exceptionally-long life is an *ironic* effect of PZP treatments. PZP's manufacturer actually boasted about it, as if the anomaly were a good thing. However, Gray & Cameron questioned the supposed benefit of mares living much longer than their normal life expectancy. Indeed, such mares take up scarce slots within size-restricted populations. The ultra-elderly mares continue to consume resources for many years, but they no longer contribute to the gene-pool. It is detrimental to a population's genetic viability to carry significant numbers of sterile herd-members way-beyond their normal life-span.	See Section 3.2.12 of the EA. The Final EA text includes the following text in section 3.2.12, "*Indirect Effects*": "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 (i.e., Turner and Kirkpatrick 2002, Roelle et al. 2010), with a greater prevalence of older mares in the herd (Gross 2000)."
18.	**Research on Wildlife Contraceptives Revealed Stillbirths and Auto-Immune Oophoritis from PZP** There was an even earlier, definitive meta-analysis on wildlife contraceptives. Nettles (1997) reviewed 75 studies available at that time on the subject. Among his findings regarding PZP-use across different species, including horses, were: Stillbirths; Altered ovarian structure and cyclicity; Interference with normal ovarian function; Permanent ovarian damage; and Some cases of irreversible sterility due to auto-immune oophoritis, which suggested that PZP can be selective against a certain genotype in a population. Many of these findings were confirmed by Kaur & Prabha as well as by	See Section 3.2.12 of the EA. This comment contains several speculations that have not been substantiated in equids. Although Nettles (1997) is now included in the final EA, the results noted there have not been observed in horses or burros treated with PZP vaccine. The text in the final EA section 3.2.12, "*Effects on Existing Pregnancies, Foals, and Birth Phenology*" is: "Similarly, although Nettles (1997) noted reported stillbirths after PZP treatments in cynomolgus monkeys, those results have not been observed in equids despite extensive use."

	Gray & Cameron. The focus now turns to certain of these key findings: Stillbirths, and auto-immune oophoritis. However, in discussing the correlation between stillborn foals and PZP-use, a related abnormality will be addressed: Stolen foals -- abducted by barren mares treated with PZP. Included as a reference to the EA? **No**	
19.	**Foals May Be Their Dam's and/or Sire's Only Offspring** In view of the fact that PZP eventually -- if not immediately -- causes sterility, any foal could be genetically rare and precious. In many cases, a foal may be the only offspring of a certain mare or stallion. By using PZP on the Sand Wash Basin mares *en masse*, BLM could endanger the herd's genetic diversity.	The Sand Wash Basin herd is not under consideration in this EA. BLM includes genetic monitoring as part of the final EA, in support of ensuring that adequate genetic diversity is maintained in the complexes under question.
20.	**Autoimmune Oophoritis and Risk of Other Autoimmune Diseases** Varras, Anastasiadis, Panelos, Balassi, Demou, & Akrivis (2013) disclosed that, *in humans*, autoimmune oophoritis carries the risk of the patient developing other autoimmune diseases. The correlation between autoimmune oophoritis and subsequent *other* autoimmune disorders weighs against injecting the mares with PZP.	See Section 3.2.12 of the EA. The final EA includes text acknowledging that the mechanism of action for PZP vaccine may include direct effects on ovaries, but the connection between PZP vaccination and the acquisition of autoimmune disease in horses made in this comment is speculative.
21.	**Prolonged Breeding Season, Unusually-late Parturition Dates with PZP** Nettles' (1997) previously-mentioned meta-analysis on PZP disclosed additional adverse effects: A prolonged breeding season and Unusually-late parturition dates. (Parturition is the formal term for "giving birth.") These findings have recently been confirmed, as is discussed below.	The draft EA already acknowledged the possibility that PZP vaccinated mares may continue to cycle, and foals may be born outside of the typical foaling season.
22.	**Parturition-Season Extends to Nearly Year-Round When a Herd Is Treated with PZP**	See Section 3.2.12 of the EA. The final EA acknowledges and discusses this study and its implications in section 3.2.12 "*Effects on Existing*

	A longitudinal study by Ransom, Hobbs, and Bruemmer (2013) of three herds currently being managed by PZP -- Little Book Cliffs (Colorado), McCullough Peaks (Wyoming), and Pryor Mountain (Montana) -- found a prolonged parturition-season -- it lasted 341 days. Ransom *et al*.'s finding of a nearly year-round birthing season supports the earlier finding by Nettles (1997). Thus, during its period of potential reversibility, PZP's effects wear off unpredictably. Out-of-season births put the life of both the mare and the foal in jeopardy. Nature designed the equine birthing-season to occur in Spring, not year-round, and certainly not in the dead of Winter. Included as a reference to the EA? **Yes, but EA is dismissive of its findings.**	*Pregnancies, Foals, and Birth Phenology*": "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."
23.	**Autoimmune Ovarian Disease -- Known to Cause Premature Ovarian Failure -- Induced by PZP** Tung, Agersborg, Bagavant, Garza, and Wei (2002) found that autoimmune oophoritis (ovarian inflammation) could be induced by injecting test-animals with ZP3 peptide. The researchers noted that autoimmune ovarian disease is a known cause of *human* premature	The final EA includes text acknowledging that the mechanism of action for PZP vaccine may include direct effects on ovaries, but the connection between PZP vaccination and the acquisition of autoimmune disease in horses made in this comment is speculative.

	ovarian failure. Here again, is causation of autoimmune disease by a ZP-type product. Humans and horses are both mammals. It is logical to conclude that ovarian failure also occurs in horses. This study confirms other research cited herein. Included as a reference to the EA? **No**	
24.	**Prolonged Delay in Recovery of Fertility** The same longitudinal study by Ransom *et al*. found that, after suspension of PZP, there was a delay lasting 411.3 days (1.13 years) per each year-of-treatment before mares recovered their fertility. What this means is that it takes that long, on average, for the ovaries to heal, to clear out all those cysts, and to regain some degree of normal hormonal function. The question is: How is the delay in recovery-of-fertility addressed by BLM management practices? Answer: BLM ignores it. For instance, BLM currently administers PZP to Pryor Mountain's fillies and mares starting at age 1½ -- whom BLM artfully described in the Environmental Assessment as fillies "becoming two year olds" -- through age four. Thus, these fillies and mares receive intentional treatments for four consecutive years before being allowed the privilege of reproductive potentiality. Per Ransom *et al*.'s study, the Pryor Mountain fillies and mares would be expected to need 1,645.2 days (4.51 years) to regain reproductive capacity. But BLM gives the Pryor Mountain mares only 5 years **off** PZP before they are put **back on** it again -- **for the rest of their life**. Thus, these fillies and mares might have just a 6-month window -- at best -- in which to conceive. Due to the unpredictable timing of PZP's wearing off, for some mares that window of fertility will close before they get a chance to produce a foal. Those mares' genetic contribution will be zero. As if the above scenario were not bad enough, PZP's manufacturer conceded that it could take up to **8 years** to recover fertility after just **3** consecutive PZP treatments.	BLM acknowledged in the draft and final EA that it is possible that some mares treated with PZP may not return to fertility. The maintenance of genetic diversity in a large, sexually reproducing population does not require that each mare produce a foal, and BLM will continue with genetic monitoring to ensure that levels of genetic diversity are adequate in these herds.

25.	**Ransom Advises Proceeding with Caution regarding PZP** The Ransom *et al*. study warned: > Humans are increasingly attempting to manage the planet's wildlife and habitats with new tools that are often not fully understood. The transient nature of the immunocontraceptive PZP can manifest into extraordinary persistence of infertility with repeated vaccinations, and ultimately can alter birth phenology in horses. This persistence may be of benefit for managing overabundant wildlife, but also suggests caution for use in small refugia or breeding facilities maintained for repatriation of rare species. Because BLM keeps virtually all of the herds -- including those of the Antelope and Triple B Complexes -- at levels below minimum-viable population (MVP) per the IUCN, these herds qualify as "small refugia."	See Section 3.2.12 of the EA. BLM already acknowledged the considerations suggested by this citation in section 3. 2.12, "*Effects on Existing Pregnancies, Foals, and Birth Phenology*": "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." The National Academies of Sciences (NRC 2013) encouraged BLM to manage wild horses as metapopulations of interacting herds, across multiple herd management areas. The commenter seems to imply that BLM should manage each HMA as a genetically isolated population.
26.	**Ransom's Exclusion of Seven Mares Evidences PZP's Non-Effect on Immunocompromised Mares** In the "Data Collection" methodology section of the Ransom *et al*. report, the authors advised: > We omitted data for one female from the Little Book Cliffs and six females from McCullough Peaks because they produced offspring in every treatment year and thus were never effectively contracepted. This fact is important because it evidences ***PZP's lack-of-efficacy on immunocompromised fillies and mares***. <u>To review</u>: Because PZP activates the immune system, mares with naturally-low or depressed immune function do not "respond" to the	See Section 3.2.12 of the EA. The hypothesis that PZP treatement will lead to an evolutionary shift, such that populations have lower immune responses is addressed in section 3. 2.12 "*Genetic Effects of PZP Vaccination.*" Thus far, the hypothesis has not been tested or supported and is therefore merely speculation.

	treatment. It's as if they had been injected with saline -- their immune system is so weak that it does not react to the PZP by producing antibodies. The good news is such mares' ovaries are saved from PZP's destructive effects. The bad news is that these mares continue to become pregnant year after year, producing foals that will also tend to inherit low immune-function. Over time, the herd will become populated with more such low-immune horses because those with strong immunity get sterilized. Thus, PZP selects for horses with low immune function, which is bad for a herd in the long term. Even a routine infection could spread quickly and wipe out a population of horses or burros with weak immune-function. If the goal is to preserve a herd, the use of PZP constitutes a worst management-practice.	
27.	**Three PZP Injections Can Trigger Sterility in Mares, or Just One Shot in Fillies Before Puberty** Disturbingly, another recent study on PZP (Knight & Rubenstein, 2014) found that " ... three or more consecutive years of treatment or administration of the first dose before sexual maturity may have triggered infertility in some mares. These findings are particularly troubling. They suggest that, actually, only *two* consecutive PZP-treatments may be reversible. Except, that is, in the case of fillies who have not yet reached puberty -- they could be sterilized by just *one* injection. For instance, the Pryor Mountain fillies' PZP treatments begin when they are just 1½ years old. They may not have reached puberty when they are initially treated. And as we shall see later in this report, that first shot of PZP *may not be their first shot of PZP*. Included as a reference to the EA? **No**.	Knight's masters thesis was cited in the draft EA. Rubenstein was not an author on the thesis, although he was the student's graduate advisor. Section 3. 2.12 "*Reversibility and Effects on Ovarie*" states: "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."
28.	**Researchers Again Express Concerns about the Abnormal Life-Spans of Sterilized Mares** Returning to the subject Knight & Rubenstein study, the researchers warned:	See Section 3.2.12 of the EA.

	Inducing sterility, while relieving the mares from the energetic costs of lactation and reducing the stress from harem switching, may have unintended consequences on population dynamics by increasing longevity and eliminating the mares' ability to contribute genetically. Knight & Rubenstein's concerns support those of Gray & Cameron, who also questioned the supposed benefit of sterile mares' extended life-spans. The abnormal numbers of aged, sterile mares count for census-purposes; but their presence disadvantages the younger horses, who become targeted for removal in order for BoLM to achieve arbitrary management levels. Further, such mares no longer belong to the viable gene-pool.	
29.	**PZP's Destructive Antibodies Are Transmitted via the Placenta and Mother's Milk** It gets worse. Sacco, Subramanian, Yurewicz (1981) reported that, per radioimmunoassay, PZP antibodies are transferred from mother to young via the placenta and milk. The transferred antibodies cross-react with and bind to the zonae pellucidae of female offspring, as demonstrated by immunofluorescent techniques. These findings were disclosed in **1981 --** 35 years ago. PZP's manufacturer must have known about this dangerous effect, and certainly BLM should have investigated on its own whether there was any risk to the unborn or the nursing foal. Yet, the manufacturer continued to insist that there was no danger to the foal, whether born or unborn. Indeed, the EA recites the manufacturer's claim in that regard. And in fact, BLM regularly administers PZP to lactating mares, who transfer the destructive antibodies to their foal via mother's milk. Fillies whose dams were injected with PZP while nursing will already have PZP antibodies cross-reacted with and bound to their zonae. Therefore, when those same fillies are injected later, it will be their *second* treatment, or potentially even their *third*. In fact, they could	See Section 3.2.12 of the EA. "*Effects on Existing Pregnancies, Foals, and Birth Phenology*" states: "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."

	already have been sterilized while nursing, the treatment having been received prior to puberty, about which Knight & Rubenstein warned. Likewise, if the Antelope and Triple B mares were to be injected while nursing, their filly-foals would have PZP antibodies inflaming their little ovaries. Subsequent injections could easily sterilize them in one shot, especially if given prior to puberty. Included as a reference to the EA? **Yes, but findings discounted**.	
30.	**PZP Continues the Use of Roundups and Removals** If the promise of PZP were true -- if PZP really did eliminate the need to roundup and remove "excess" wild horses from the range -- gathers and removals would have ended long ago in the Pryor Mountain Wild Horse Range, where PZP has been in use for approximately ***two decades***. Yet removals are scheduled there with regularity every 3 years, the latest one in 2015. But evidently every 3 years, in BLM's mind, wasn't often-enough. BLM announced plans to conduct removals ***every year*** in the Pryor Mountains despite recently-***intensified*** PZP-treatments. Friends of Animals, a renowned animal-advocacy organization that opposes PZP, sued to prevent BLM from initiating the accelerated schedule of gathers. Friends of Animals prevailed, and the annual removals were blocked. The Court directed BLM to fulfill its commitments to reevaluate the Pryor Mountain AML. [25 and 32] As the EA proposes, the Antelope and Triple B Complexes' herd would be rounded up in order to inject / re-inject the mares. Roundups are stressful on wild horses and costly to taxpayers. The better and no-cost population-control method is predation by mountain lions, bears, coyotes, and perhaps even reintroduced wolves.	The Pryor Mountain Wild Horse Range herd cannot be directly compared to other wild horse herds in Nevada such as the Antelope and Triple B Complexex because of the size and numbers of wild horses that need to be gathered. The current population growth rates demonstrate that predation has little if no effect in controlling growth of the wild horse population. Responsibility for predator management also rests with the state wildlife agencies and is outside the scope of a wild horse gather plan.
31.	**Risks to Humans Who Administer PZP Injections** For BLM staff, contractors, and volunteers who inject wild horses with	See Section 3.2.12 of the EA. The EA refers to the EPA fact sheet for ZonaStat-H. BLM takes seriously the risk of an accidental needle stick with

	PZP, EPA's Pesticide Fact Sheet advises that Personal Protective Equipment requirements include long sleeved shirt and long pants, gloves and shoes plus socks to mitigate occupational exposure. EPA specifically warns that pregnant women ***must not*** be involved in handling or injecting ZonaStat-H, and that all women should be aware that ***accidental self-injection may cause infertility***. However, EPA's Fact Sheet, the manufacturer's training, and BLM's operating procedures fail to inform ... ***Pregnant women*** of the reason ***why*** it is so important that they strictly avoid PZP -- because PZP's antibodies cross the placenta and cross-react with and bind to an unborn female child's own little zonae pellucidae. The baby-girl could be "anti-vaccinated" with PZP and even sterilized before birth; EPA's Fact Sheet, the manufacturer's training, and BLM's operating procedures fail to inform ... ***Lactating women*** to avoid PZP and ***why*** -- because PZP's destructive antibodies would be passed along to a nursing female child via mother's milk. The baby-girl could be "anti-vaccinated" with PZP and possibly sterilized simply from nursing. EPA's Fact Sheet, the manufacturer's training, and BLM's operating procedures fail to inform ... ***All women*** of the reason ***why*** to avoid PZP -- due to the risk of ovarian dystrophy, oophoritis, ovarian cysts, depressed estrogen and elevated testosterone-levels -- in addition to infertility and, potentially, sterility -- from unintentional self-injection.	PZP vaccine, and staff are trained to followthe safety precautions listed on the vaccine's label.

	EPA's Fact Sheet, the manufacturer's training, and BLM's operating procedures further fail to emphasize the ***magnitude of the risk*** -- the PZP-in-question is a **dose meant for a horse**.	
32.	**Mandate to Practice Scientific Integrity** Let us return to the Department of the Interior's (DOI) *Code of Scientific and Scholarly Conduct*, which applies to all staff members as well as to contractors, partners, permittees, and volunteers. The Code states: Scholarly information considered in Departmental decision making must be robust, of the highest quality, and the result of as rigorous scientific and scholarly processes as can be achieved. Most importantly, it must be trustworthy. In the EA, BoLM has omitted independent scientific findings about PZP's adverse effects and unintended consequences. Instead, BLM continues to rely almost exclusively on the manufacturer's claims regarding PZP's safety for use on horses or burros and for handling by humans. BLM is thus non-compliant with the Policy and malfeasant in its responsibilities to protect staff, contractors, volunteers, and the wild horses.	As indicated by the comprehensive discussion in Section 3.2.12 of the EA, The analysis of scientific literature available on PZP that is included in the final EA provides a balanced overview that includes publications that discuss possible risks of PZP vaccine use. BLM has not ignored any broad categories of concern in its analysis of available scientific literature.
33.	**PZP Manufacturer Violated the DOI Code of Scientific and Scholarly Conduct** The manufacturer of PZP -- a partner to BLM, but since deceased -- misrepresented the pesticide as safe for use on animals by humans. The manufacturer knew or should have known that the former hypothesis regarding PZP's mode-of-action had been disproved, and that PZP has dangerous side effects, safety-issues, and unintended consequences. Yet he hid and denied that information and failed to warn about PZP's adverse effects. The manufacturer cited his own research as if it were definitive, and aggressively criticized wild-horse-and-burro advocacy groups that oppose PZP, such as Friends of Animals and Protect Mustangs, and independent researchers whose findings did not fully	This comment falls outside the scope of the decision being considered. BLM has appropriately and comprehensively discussed the potential direct and indirect impacts of PZP use in the EA based on the available scientific literature.

	support his claims. Indeed, he submitted an Op-ed to *The Salt Lake Tribune* wherein he accused Friends of Animals and Protect Mustangs of citing "dubious and distorted" data about PZP. He belittled the research of fellow scientists whose studies on PZP yielded results somewhat different from his own. His accusations were so unreasonable that the scientists felt it necessary to submit an Op-ed in response to defend the integrity and validity of their work. The manufacturer also disparaged members of the public -- one of whom was appointed to the Pennsylvania Game Commission -- that expressed concerns about PZP. He dismissively accused them of "an attempt to mislead," of "hyperbole," of "knowingly manipulating information," of "attempts to frighten people," and of indulging in an "anti-intellectual approach to debates." [35] By these actions, the manufacturer violated the DOI Code of Scientific and Scholarly Conduct.	
34.	**PZP -- Conclusions about** PZP is appropriately categorized as a pesticide by the EPA. PZP "works" by tricking the immune system into attacking and destroying the ovaries. PZP has many adverse effects as well as unintended consequences. PZP presents safety-hazards to humans who handle it. PZP is a dangerous pesticide whose use is antithetical to the spirit and intent of the Wild and Free-Roaming Horses and Burros Act.	Potential PZP effects on horses are analyzed in section 3.2.12. of the EA. With respects to potential safety hazards from handling PZP, the EA refers to the EPA fact sheet for ZonaStat-H. BLM take seriously the risk of an accidental needle stick with PZP vaccine, and staff are trained to follow the safety precautions listed on the vaccine's label. The use of PZP is consistent with the WFRHBA of 1971 section 3 (b-1), which states"*…determine appropriate management levels of wild free-roaming horses and burros on these areas of the public lands; and determine whether appropriate management levels should be achieved by the removal or destruction of excess animals, or other options (such as sterilization, or natural controls onl population levels)."*
35.	**Gonacon™ — Yet Another Immuno-Pesticide** GonaCon™ is an EPA-registered, immuno-contraceptive pesticide. Its classification is "restricted-use" due to "non-target injection hazard." EPA warns that "pregnant women should not be involved in handling or injecting GonaCon and that all women should be aware that accidental	See Section 3.2.12 of the EA. The EA refers to the EPA fact sheet for GonaCon. BLM take seriously the risk of an accidental needle stick with GonaCon vaccine, and fstafe are trained to follow the safety precautions listed on the vaccine's label.

	self-injection may cause infertility." Children are not allowed in areas where the product is used. Please keep in mind that the GonaCon™ dose-in-question is meant for a horse.	
36.	**GonaCon™ — Mechanism of Action** GonaCon™ causes an auto-immune disorder. Behaving like a perverted vaccine, GonaCon™ tricks the immune system into producing antibodies that destroy a female's gonadotropin-releasing hormone (GnRH). Without GnRH, a female does not produce sex hormones, does not come into estrus, and is thus infertile. Behaviorally, courtship-rituals cease. Thus, GonaCon™ is a hormone-disruptor.	The EA includes a detailed review of published scientific literature on GonaCon's mechanism of action and behavioral effects, in Section 3.2.12.
37.	**Gonacon™ — Causes Long-Term Infertility** GonaCon™ is long-acting. The treatment-protocol, consisting of two injections administered 30 to 60 days apart, can cause infertility for as long as four-to-five years without the need for booster shots. However, mares would still need to be rounded up and held captive for those 30 to 60 days to administer the injections properly. If all females in a small herd were treated per the multi-year plan, it could result in an unintended consequence -- a huge gap in the herd's age-structure, because very few if any foals would have been born during that period.	The EA includes a detailed review of published scientific literature on GonaCon's mechanism of action and behavioral effects, in Section 3.2.12. If GonaCon fertility control treatment is utilized for fertility control, the initial gather would treat released mares and hold for thirty days and retreat with a booster shot before release. The EA addresses potential effects on age structure in section 3.2.12, "*Indirect Effects*"
38.	**Gonacon™ — Adverse Side-Effects, Chance of Sterilization** Although the pesticide's effectiveness was expected to diminish over time, a 3-year study of GonaCon-treated elk revealed that the percentage of infertile females actually ***increased*** each year, finally reaching 100%. It was also noted that every one of the treated elk suffered an abscess at the injection-site. [1] Because GonaCon™ stimulates the immune-system, it will elicit the greatest reaction -- the greatest output of destructive antibodies -- if a mare is blessed with healthy immune-function. Such a mare will react strongly and be contracepted quickly. But she could just as easily be sterilized. In fact, GonaCon's™ "application instructions" warn of the chance of sterilization.	EA Section 3.2.12 acknowledges that some mares treated with GonaCon may not return to fertility, and addresses the hypothesis that there may be long-term evolutionary effects on immune response in herds treated with immunocontraceptives.

	On the other hand, GonaCon™ may not work at all if a mare suffers from weak immune-function. That mare's immune system will fail to react to GonaCon™, and she will get pregnant in spite of it. Thus, over time, there is the risk of another unintended consequence — selection for immuno-compromised horses. Jenny Powers, a National Park Service wildlife veterinarian and one of three lead scientists who participated in the elk research referenced above commented: "Some things are meant to be wild," Powers says. "At some point, do we not want to treat them like domestic animals and be handling them? I think it's important to point out that this is no silver bullet so that we don't have to kill wild animals. Any time we're manipulative with wild animals, we're messing with natural selection.	
39.	The BLM must reject gelding, GonaCon, sex ratio skewing because of their documented negative impacts and/or lack of research on their use in wild horses and because such use without further research goes against the recommendations of the NAS.	See Section 3.2.12 of the EA. The EA includes an extensive literature review on effects of GonaCon and gelding. See response to comments below with regards to sex ratio. It should be noted that the gelding component in the Proposed Action would result in the permanent removal of fewer total horses and allow for a larger total population to remain on the range under the gather plan (at mid-AML instead of low end AML) because geldings that would otherwise be permanently removed from the range could be released back into the HMAs to resume their free-roaming behaviors.
40.	Impacts of Gelding, GonaCon, and Sex Ratio Skewing Have Not Been Adequately Analyzed Research on the use of permanent sterilization of geldings and GonaCon for mares in wild equine populations – specifically safety and effects on behavioral – and is minimal at best. Gelding	The EA includes an extensive literature review on effects of GonaCon and gelding. The notion that gelding wild stallions will cause them to become docile is speculative, particularly if the gelding occurs in post-pubescent adults. BLM acknowledged in the EA that, "It is therefore unknown exactly what effect gelding an adult stallion and releasing him back in to a wild horse population will have on his behavior and that

	The BLM completely fails to address the following NAS recommendation against gelding stallions who live on the range. However, some or total loss of sex drive would be likely in castrated stallions, and this is counter to the often-stated public interest in maintaining natural behaviors in free- ranging horses. With respect to effects at the population level, it is not clear how castration of males would be better than vasectomy, which does not affect testosterone or male-type behaviors. Ultimately, the growth rate of any population that includes reproductive horses of both sexes will be commensurate with the number of fertile females in the population. (p. 156) and A potential disadvantage of both surgical and chemical castration is loss of testosterone and consequent reduction in or complete loss of male-type behaviors necessary for maintenance of social organization, band integrity, and expression of a natural behavior repertoire. (p. 142) In fact, the Wyoming's 2017 EA for Adobe Town, Salt Wells and Divide Basin HMA states The use of these methods to reduce population growth has yet to be implemented in wild horse populations. Research on the use of these techniques on wild horse behavior is still on going. The effectiveness and impacts of these techniques are well understood in controlled settings, but they have not been extensively researched under field conditions. (Attachment 2, p. 19) Appendix III: Standard Operating Procedures for Field Castration (Gelding) of Wild Horse Stallions describes the protocol that the BLM would use when gelding the stallions. However, it does not acknowledge or analyze the serious risks that gelding represents to the stallions.	of the wider population, and can only be hypothesized from the scarce existing literature." The literature review of potential gelding effects in section 3.2.12 does acknowledge the risks of surgical complications for treated stallions The surgical risks are well understood based on the gelding of domestic horses and of excess stallions that are removed from the range. Opinions about behavioral effects of gelding by Drs. Rutberg, Nock, or Kirkpatrick are speculative, given that none of them has conducted a study on the topic. It is unlikely that a reduced testosterone level will compromise gelding survival in the wild, considering that wild mares survive with low levels of testosterone. The literature review in the EA acknowledged that no study yet has documented those effects, and that the possible effects of gelding wild stallions must be surmised based on existing literature. Because a gelding component will allow for the release of a larger number of horses back to the range, not including a gelding component (i.e., Alternative B) means those geldings would be permanently removed from the range for disposition as excess animals. With regards to sex ratio skewing: 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. By reducing the proportion of breeding mares in a population (as a fraction of the total number of animals present), the technique leads to fewer foals being born per adult horse. The BLM Wild horses and burros management handbook (BLM 2010) discusses this technique and its proper application at length.

	Of particular concern is that Proposed Action targets stallions who are between the ages of 5 and 20 years even though the BLM has first-hand knowledge about the increased risks to older stallions from being castrated. Additionally, according to Dr. Pamela Corey, an equine ambulatory veterinarian and member of AAEP and AVMA, the use of antibiotics mentioned in the EA is problematic. She states, They say they give one dose of PPG or penicillin. That's not enough and is subtherapeutic. There is a ceftofur antibiotic made by Zoetis that lasts (and is therapeutic for) 4 days - there should be one more dose given again in 4 days to complete the course. But even one is better than one PPG which is as if you are not giving any medication at all. It'salso not good when we are trying to use antibiotics more responsibly due to resistance. I think an insurance case would find that the use of Excede, the 4 day dose, in a feral situation would be a better standard of care. Besides the complications of castration such as swelling or evisceration, which they're not addressing due to their wild nature, they aren't addressing infection with the one dose of PPG. (Personal Communication, 8/16/2017) This EA should also disclose castration side effects and deaths for all the stallions in BLM holding facilities. In previous EAs, the BLM noted that castration complications resulting in the death of the animal can be as high as 5%. This data and data regarding stallions in BLM holding facilities who died within one to two months of being castrated must be incorporated and disclosed in the EA. Additionally, the EA should note and consider the often-severe impacts of gelding on wild stallions who will be returned to the range where they	It includes the following text (emphasis added here): "4.5.3.2 Adjust Male/Female Sex Ratios The authorized officer should consider alternatives which would manage WH&B herds for a sex ratio with a female component of less than or equal to 50 percent, as this reduces the population growth rate and extends the gather cycle. See Chapter 4 (4.4.1). Adjusting sex ratios to favor males is another possible management tool which should be considered when the suppression of herd growth rate is desired. **This management option should be considered in** HMAs and **complexes where the low end of AML is greater than 150 animals.** Implementation of sex ratio adjustments is most feasible during maintenance gathers (4-5 years after AML is achieved). Sex ratio adjustments may be accomplished by shifting the overall sex ratio to favor males by (1) releasing greater numbers of stallions post-gather or (2) releasing geldings back to their home range following castration. Adjusting the sex ratio so that males comprise 60-70 percent of the adult herd could be considered. Herd dynamics may change somewhat with adjustments in sex ratios. An increase in the proportion of stallions may have a greater impact when water resources are limited and bands are more concentrated." The quoted text above implicitly acknowledges that this technique may not be appropriate in very small herds. It also acknowledges that there may be impacts to social interactions. However, acknowledging that there may be impacts is not the same as precluding the use of this management tool. Most importantly for this EA, the

	will be expected to fend for themselves and live in often-harsh conditions. In fact, the impacts cannot only affect these animals' physiology and ability to survive but also their behavior and therefore their influence on or relationship to the herd. Dr. Allen T. Rutberg, a faculty member at the Tufts/Cummings School of Veterinary Medicine and a wildlife biologist and researcher who has extensively studied wild horse behavior, describes the detrimental effects of sterilization on the natural free-roaming and social behaviors of these herds Wild horses typically live in reproductive bands consisting of adult mares, their dependent offspring, and one or more stallions who lives revolve around trying to protect mares from harassment by other stallions and securing exclusive reproductive access to the mares for themselves; …Mares, meanwhile, simultaneously bond to one another and compete with each other for access to water, food, and other resources for themselves and their foals. Neither geldings nor spayed mares participate in these fundamental processes of wild horse behavior. (Attachment 7) Dr. Bruce Nock, faculty member at Washington University School of Medicine and an expert in the physiological effects of stress, suggests that gelding may compromise a horse's ability to survive on the range. He writes, …a gelded horse lacks the capacity to regulate the transcription of significant genetic information. All of the physiological and structural processes mentioned above are compromised … not just his capacity to reproduce. He lacks androgen-dependent biochemical, physiological and anatomical advantages that evolved over millions of years to allow him to 1) survive without undue suffering, and 2) reproduce. Anyone who would ask a gelded horse to negotiate the challenges of a natural	Antelope complex herd and the Triple B complex herd are larger than the low herd size threshold suggested above (150). The commenter here has taken several other BLM decisions out of context. BLM offices have rejected sex ratio skewing as a management tool in cases where its use was not warranted, in light of BLM-wide guidelines from the handbook. Specifically: - In the 2015 Cold Springs EA, 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 Stinkingwater EA, BLM clearly identified that sex ratio skewing was not appropriate because the herd size was only 40 animals. ("*Adjusting sex ratios to favor males is a possible management tool. However, this management option should be considered in HMAs and complexes where the low end of AML is greater than 150 animals* as it may affect social structure, herd interactions (e.g., band size), and genetic health (h-4700-1).") - In the 2009 Beatys Butte EA, the alternative that included a 60:40 sex ratio skewing and gelding was not selected. The text quoted by the commenter was from the section that outlined potential impacts of that alternative. Such impacts are possible results of sex ratio skewing and inclusion of geldings. Ultimately, though, the alternative would not have been appropriate, given the guidance for herd size, as the target herd size was only 50 mares and 50 studs. - In the 2012 Black Mountain and Hardtrigger EA, the pre-

	environment and lifestyle is either callus or has only a superficial knowledge of the impact of castration on an individual. There is extensive scientific literature pertaining to the role of androgens in physiology and behavior. There is no justification for releasing gelded horses back into a natural environment. There is already sufficient evidence indicating it is likely to cause unwarranted suffering. If I were to propose such an experiment as part of a grant application, the federal government would require that I get institutional approval for the project based on the judgement of the Institutional Animal Care and Use Committee — a panel comprised of 14 full- time faculty investigators, a veterinarian, one layperson not affiliated with Washington University School of Medicine, and one non-scientific member. That committee is charged with assuring animals are humanely treated and, importantly, that experiments with animals provide significant new information that is not already available and cannot be acquired by means other than animal experimentation. When managing horses and proposing research projects (i.e., Antelope and Triple B Complexes Gather Plan, part 2.2.3.3.), the federal government should be held accountable to the same standards it rightfully imposes on others. (Attachment 8) The late Dr. Jay Kirkpatrick, founder of the Science and Conservation Biology at Zoo Montana and a foremost authority on wildlife reproductive biology, focuses his comments on how gelding effects of the herd: The very essence of the wild horse, that is, what makes it a wild horse, is the social organization and social behaviors. Geldings (castrated male horses) no longer exhibit the natural behaviors of non-castrated stallions. We know this to be true from hundreds of years experience with gelded domestic horses. Furthermore, gelded stallions will not keep their bands together, which is an integral part of a viable herd. These social dynamics were molded by millions of years of evolution, and will be destroyed if the BLM returns castrated horses to the HMAs…Castrating horses will effectively remove the biological and physiological controls	gather herd was estimated to include 59% females, and 41% males. The goal of the action was to achieve 50:50 sex ratio. The post-gather herd size was expected to be about 100 animals (48 female, 48 male); a 60% male to 40% female sex ratio was not even considered. While the commenter has correctly quoted text from the 2009 EA released for the South Steens HMA,Revisiting that text in light of available scientific knowledge indicates that the statement about infanticide was speculative, lacking in any evidentiary support and was not based on any scientific study. BLM today does not regard that quoted text as an accurate representation of impacts that would be expected from 60:40 sex ratio skewing. BLM is not aware of any study that has documented increased levels of infanticide in herds with 60% male and 40% female wild horses. The 2010 BLM handbook text, quoted above, clarifies the current understanding about the application of this management technique. BLM notes that the 2013 National Academies of Sciences report did not advocate against the use of sex ratio skewing. The authors there merely cautioned that (emphasis added here) “Sex ratio typically is somewhat adjusted after a gather in such a way that 60 percent of the horses returned to the range are male….If more aggressive sex-ratio adjustments are initiated by drastically altering the number of females relative to males beyond a 40:60 ratio, care should be taken **to assess** possible additional consequences.”

	that prompt these stallions to behave like wild horses. This will negatively impact the place of the horse in the social order of the band and the herd. (Attachment 9) In fact, after describing an extensive search of the literature, the EA itself explicitly states that Very few studies have been conducted on techniques for reducing male fertility. (p. 137) and …very few of the resulting papers were relevant to the question of the effect of gelding on the behavior of male horses in the wild. Despite livestock being managed by castrating males for centuries, there has been remarkably little research on castrates (Hart and Jones 1975, Jewell 1997). It is therefore unknown exactly what effect gelding an adult stallion and releasing him back in to a wild horse population will have on his behavior and that of the wider population, and can only be hypothesized from the scarce existing literature. (p. 138) The question remains: Given all that current evidence that establishes gelding as both dangerous and having negative consequences on natural behaviors, why then is the BLM still pursuing it as a means of population control in wild herds? By reference, AWHC includes the expert statements at Attachments 7, 8, and 9 regarding the negative impacts of gelding with these comments[SR4] . Finally, according to the Oregon BLM's 2010's gather plan for the South Steens HMA, returning geldings to the range could increase damage to water on the range: Under this alternative effects and duration would be similar to those of the Proposed Action. However, while numbers of horses and reproductive capacity would be reduced, it could be expected gelding bands may create a situation in which more localized impacts may be	

	seen in riparian areas. Geldings tend to congregate in larger numbers than stallion/mare bands. (Attachment 10) So why then is the BLM Elko District Office considering it as part of its Proposed Action? GonaCon GonaCon is an experimental fertility control vaccine that interferes with the production of reproductive hormones, which drive natural behaviors in wild horses. It may alter natural behaviors and therefore have significant negative impacts on wild horses. The NAS concluded that "Further studies of its behavioral effects are needed" before GonaCon is used by the BLM. (Attachment 1) This experimental fertility control drug is not appropriate for field use and should be dropped from consideration. (Attachment 11) Sex Ratio Skewing AWHC asks that the establishing a 60% male/40% sex ratio as part of the management plan for the Antelope and Triple B Complex be eliminated from the Proposed Action. Skewing of sex ratios has is not reasonable given that 50% of the returned male horses will be gelded, and it is not scientifically supported. In fact, the Oregon BLM detailed the negative impacts of sex skewing in its 2015 Cold Springs HMA and 2017 Stinkingwater HMA Population Management Plans and rejected it out of hand: Wild horse populations will produce roughly equal numbers of males and females over time (4700 WHB Handbook, 4.4.1). Re-establishing a 50/50, male to female, sex ratio is also expected to avoid consequences found to be caused by skewing the ratio in either direction. Sex ratio typically adjusted in such a way that 60 percent of the horses are male result in slightly reduced populations (Bartholow 2004), implying that	

	ratios would need to be adjusted even further to account for a significant slowing of population growth. In the Pryor Mountain Wild Horse Range, Singer and Schoeneker (2000) found that increases in the number of males on this HMA lowered the breeding male age but did not alter the birth rate. In addition, bachelor males will likely continue to seek matings, thus increasing the overall level of male-male aggression (Rubenstein, 1986). (Attachment 3a, p. 25 and Attachment 3b, p. 21) And the BLM's 2009 Beatys Butte EA DR FONSI states: If selection criteria leave more studs than mares, band size would be expected to decrease, competition for mares would be expected to increase, recruitment age for reproduction among mares would be expected to decline, and size and number of bachelor bands would be expected to increase. (Attachment 12) As well as the EA for the 2010 South Steens Wild Horse Gather Skewing the sex ratio of stallions v. mares would result in a destabilization of the band (stallion, mare and foal) structure moving it from five to six animals to three animals. Social band structure will be lost resulting in combative turmoil as surplus stallions attack a band stallion trying to capture his mare. This could result in the foal being either killed or lost. The mare and foal will not be allowed to feed or water naturally as the stallion tries to keep them away from the bachelor bands of stallions, resulting in stress to the mare during her lactation condition. (Attachment 13) and the BLM Boise District Office's 2012 Black Mountain and Hardtrigger HMA Wild Horse Capture, Treat, Release, and Removal Plan PEA: Despite this lack of understanding, science and data the acknowledges that, "competition for mares would be expected to increase, recruitment age for reproduction among mares would be expected to decline	

	[meaning younger mares would begin breeding] ... Fighting between band stallions and surplus stallions could result in the mares and foals not being allowed to feed and water naturally as the herd stallion tries to keep them away from bachelor bands. (Attachment 14) Instead of using sterilization, GonaCon, or sex ratio skewing, AWHC argues that the BLM should implement a comprehensive fertility control program only with PZP to achieve population growth suppression but NOT to maintain a core breeding population of just of 227 wild horses for the Antelope Complex (53% of the low end of AML) and 272 wild horses for the Triple B (63% of the low end of AML).	
41.	The BLM Fails to Give a Hard Look at Alternatives instead of analyzing the full range of alternatives to the Action Alternative, as required by the NEPA, the BLM rejected viable alternatives including: A. Eliminating the Multiple Gathers and Removals and Immediately Implementing a PZP Fertility Control, Pursuant to NAS Recommendations As mentioned, PZP the vaccine has a 30-year history of safe and effective use in wild horses and other wildlife species. The 2013 NAS report found that it was one of the most promising methods of fertility control for wild horses and burros. Besides being inexpensive and reversible, it is safe for pregnant mares and can be used long term without compromising their health or any future offspring. It also maintains wild horse family bands and social behaviors – important for these wild animals living in rugged environments with extreme desert weather. The NAS concluded that it was “a more affordable option” than removing wild horses from the range and stockpiling them in holding facilities. (Attachments 16,17, 18, and 19) The BLM needs to consider a comprehensive PZP program on the Antelope and Triple B Complexes because it is in line with the NAS recommendations that Removals are likely to keep the population at a size that maximizes population growth rate, which in turn maximizes the number of animals that must be removed and processed through holding facilities. (p. 94) and Most promising fertility-control methods for free-ranging horses or burros are porcine zona pellucida (PZP) vaccines and GonaCon™ vaccine for females and chemical vasectomy for males. This	See Section 2.0 of the EA Which utilize PZP and GonaCon for fertility control treatments. See Section 2.6 of the EA Alternatives considered but eliminated form detailed analysis.

	conclusion is based on criteria such as delivery method, availability, efficacy, duration of effect, and potential for side effects. Although	
42.	The plan to treat all mares with fertility vaccines does not take into account who to treat and when, treating all mares as though they are the same.	See response to comment #8 above.
43.	Second, the BLM's refusal to consistently use humane fertility control to maintain wild horse populations at sustainable numbers without removals is inexplicable as it is economically irresponsible and inhumane. The agency's endless removal of wild horses from these Complexes – and other HMAs– not only contributes to the millions of taxpayer's dollars that it costs to stockpile wild horses in short- and long-term holding facilities but also seriously compromises the welfare of these animals, especially in light of the BLM's request to Congress to lift the ban on destroying healthy wild horses and burros or selling them for slaughter. Further, continuing to roundup and remove wild horses only makes the problem worse because it just fuels high population rates for horses left on the range. As the 2013 NAS report has found "Removals are likely to keep the population at a size that maximizes population growth rate, which in turn maximizes the number of animals that must be removed and processed through holding facilities. (Attachment 1, p. 94)	See Section 2.of the EA. Use of fertility control only without removal of excess wild horses would be inconsistent with the WFRHBA because it would not allow for achievement of AML or result in a thriving natural ecological balance.
44.	BLM must consider the social, behavioral, and physiological impacts of population growth control measures on wild horses. Friends of Animals urges BLM to review and consider recent scientific research and disclose the actual impacts of population control on wild horses. Specifically, the Roundup EA does not take a hard look at the impacts of PZP and GonaCon. Under the Proposed Action, BLM would return to the HMA "as needed" to inject horses with these chemical fertility control drugs. Although BLM references different studies about the negative impacts of PZP, it concludes that PZP contraception appears to be temporary and reversible, and does not appear to cause out-of-season births.26 However, even the studies cited by BLM indicate that repeated applications of PZP may cause irreversible sterility in mares. Moreover,	See Section 3.2.12 of the EA. The WFRHBA requires BLM to maintain herds at a level that will achieve a thriving natural and ecological balance, mandating that excess horses be removed from the range. The extensive literature reviews on potential effects of PZP and of GonaCon in the final EA section 3.2.12 address the concerns listed in this comment (potential long-term sterility, out-of-season births, effects on ovaries, potential evolutionary effects of immunocontraception, and abscessing at injection site). However, as noted by the NAS Report, based on decades of use and available research, the likelihood of serious adverse impacts from PZP is low, and the application of fertility controls has to be balanced against the alternative of

	the most recent and reliable data indicate that it also causes out of season births and comes with a host of other detrimental impacts. For example, Knight (2014) found that three to four years of fertility control applications may lead to permanent sterility. Bechert et al. (2013) found that ovarian function was affected, and Nunez (2010) found that PZP caused mares to foal later, which could impact foal survivorship and decrease band stability. Ransom et al. (2013) confirmed PZP could cause a shift in reproductive timing. The Roundup EA also cites three studies to support the theory that PZP could lead to a general decline in immune function.27 BLM concluded "[u]nfortunately, 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." This is precisely the situation the warrants further analysis in an EIS, and an examination of the relevant factors. However, BLM does not look at those factors. BLM must take a hard look at the abundance of concerns associated with PZP, including behavioral changes, the potential of late foaling dates, an unknown effectiveness period, and poor immune response in horses treated multiple times. BLM should also take a hard look at the negative impact of GonaCon, including frequent abscesses at the injunction site, negative impacts on organ systems outside the reproductive system, and long-term health effects. Given the controversial, unknown, and potentially adverse impacts of PZP and GonaCon, BLM must conduct further analysis before proceeding with any action that includes the use of fertility controls.	unregulated population growth that leads to the permanent removal of much greater numbers of wild horses from the range and to greater levels of rangeland degradation.
45.	I oppose the Proposed Action to geld up to 50% of the returned stallions. The Wyoming BLM has rejected this option because research on its impacts is inadequate;	Thank you for your comment. It should be noted that the gelding component in the Proposed Action would result in the permanent removal of fewer total horses and allow for a larger total population to remain on the range under the gather plan (at mid-AML instead of low end AML) because geldings that would otherwise be permanently removed from the range could be

		released back into the HMAs to resume their free-roaming behaviors.
46.	The proposed gather and gelding/fertility treatments in the Antelope and Triple B Complex will leave no breeding animals.	See Sections 2.2.1 and 3.0 of the EA. Clarification that many breeding animals will remain on both complexes.
47.	The plan to geld the stallions in corrals or in the field risks having the animals die a painful death from medical complications, as there is no way to accurately monitor their health once they are released back to the range.	See Section 3.2.12 of the EA. Addresses the potential complications of gelding and timeframes in which any complications are usually seen.
48.	Gelding to reduce population growth has not been researched and there is no proof that gelding does reduce population growth.	Gelding a fraction of the stallions and skewing the sex ratio are management tools utilized to assist with lowering population growth and arein accordance with the WFRHBA of 1971 section 3 (b-1) and the 4700 wild horses and burros management handbook. In the Proposed Action, the gelding component provides a means of managing for more horses on the range (i.e., at mid-range AML rather than low-range AML) and allows some geldings that would otherwise be permanently removed from the range to be released back into the HMAs.
49.	Gelding 50% of the herd interferes with natural selection and natural horse behavior, reduces genetic variation and continued viability, and is a waste taxpayer money.	Some gelded horses that would otherwise be excess animals permanently removed from the range and sent to holding facilities for adoption/sales or long-term holding, 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. See Section 3.2.12 of the EA which addresses the potential behavioral effects of gelding. There should be little or no impact on genetic variation and continued viability since geldings would be in addition to a core breeding population (stallions and mares) of 899 horses, and those geldings would otherwise be permanently removed from the range (as in Alternative B). The WFRHBA specifically allows for the use of sterilization

		as a management tool.
50.	**Geldings Are Not Normal in Nature** Surgical sterilization would effect a permanent change in character for a wild horse. That is not natural or normal. But BLM is itching to geld, even though the EA admits that the study it cites — by Garrott and Siniff — says "not effective" unless 85% of the males are castrated, and even then, within 2 years, a new crop of males is born. **Gelding Would Severely Impact Genetic Diversity** No problem, BLM says. The agency would solve that by trucking in new stallions, mares, or both. Don't be ridiculous. Herds are, by Law, to be self-sustaining, free from BLM-meddling.	The WFRHBA specifically allows for the use of sterilization as a management tool. As discussed in Section 2.0 of the EA, genetic monitoring will be conducted in accordance with the 4700 Wild Horses and Burros Management Handbook and IM 2009-062 to ensure that the herds maintain adequate genetic diversity. The National Academies of Sciences (NRC 2013) encouraged BLM to manage wild horses as metapopulations of interacting herds, across multiple herd management areas. The commenter seems to imply that BLM should manage each HMA as a genetically isolated population; that is not a requirement of the WFRHBA.
51.	Impacts of Proposed Action on Genetic Viability Have Not Analyzed The Proposed Action to manage for a core breeding population of just of 227 wild horses for the Antelope Complex (53% of the low end of AML) and 272 wild horses for the Triple B (63% of the low end of AML) must be analyzed from both genetic perspectives and kinship-breeding. Regarding genetics, the EA states, 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 427-789 on the Antelope Complex and 472– 889 on the Triple B 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 a large number of other HMAs could be used as sources for fertile wild horses that could be transported into the HMA of concern. (p. 167) This statement is problematic for several reasons. First it is untruthful in that it does not acknowledge that Proposed Action's intent is to manage for a core breeding population of just of 227 wild horses for the Antelope Complex – 53% of the low end of AML – and just 272 wild horses for the Triple B –63% of the low end of AML, numbers far different than full ALM ranges. Second, it does not specify how the BLM would	See Section 2.0 of the EA. Genetic monitoring will be conducted in accordance with the 4700 Wild Horses and Burros Management Handbook and IM 2009-062 to ensure that the herds maintain adequate genetic diversity The AML for these complexes is rather high. Including some number of geldings in among the breeding population, or including a slightly elevated ratio of males to females, is not expected to cause substantial loss of genetic diversity, as the genetic effective population size will remain high. The expected per-generation (~10 years) loss of genetic diversity is expected to be proportional to the inverse of 2 times the genetic effective population size. Thus, for example, if the genetic effective population size is 200, then only 0.25% of genetic heterozygosity would be expected to be lost per generation. That is a negligible amount, and could be compensated for by the periodic introduction of new breeding individuals from other areas, if genetic monitoring indicates that is warranted.

	determine if genetic diversity is low. In fact, the EA is critically flawed because although it makes references to genetic analysis or genetic health of the horses in the two Complexes, nowhere goes it state how, when, or who conducted past analysis or when, how, or who will conduct future analysis. For example, it states While in the chute the horses would be identified for removal or release due to age, gender and/or other desirable characteristics. A hair sample would be collected from a minimum of 25 horses or 25% of the released population from an HMA. No more than 100 hair samples would be collected per HMA. Samples would be collected for genetic analysis to assess the current genetic health within the Complexes. (p.13) and Genetic baseline data would be collected to monitor the genetic health of the wild horses within the combined project area. (p. 21) Stallions selected for release would be released to increase the post-gather sex ratio to approximately 60% stallions in the remaining herds. Stallions would be selected to maintain a diverse age structure, herd characteristics and body type (conformation). It is expected that releasing additional stallions to reach the targeted sex ratio of 60% males would result in smaller band sizes, larger bachelor groups, and some increased competition for mares. With more stallions involved in breeding it should result in increased genetic exchange and improvement of genetic health within the herd. (p. 136) and It is true that geldings are unable to contribute to the genetic diversity of the herd, but it does not lead to an expectation that the Complexes would experience inbreeding. 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, or have already passed 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 herd in which the proposed action is to take place is not at immediate 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. The Antelope and Triple B Complexes are 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 Complexes population and other populations that interact with it genetically, then future management of the Complexes population could include genetic augmentation, by bringing in additional stallions, mares, or both. (p. 142) The EA for this Proposed Action must disclose and analyze all the genetic data for the Antelope and Triple B Complexes. The EA must also have a geneticist calculate the projected genetic variability given the proposed removal of horses from the range, the sterilization of the stallions, and the use of contraception of returned mares and determine the short- and long-term genetic outlook for the herd without the introduction of horses from other HMAs. Moreover, managing wild horses based on genetic diversity is an outdated management approach given that once genetic variability begins to be reduced, the genetic problem has already been established. Rather managing for kinship – ensuring that fathers do not breed with daughters and sisters do not breed with brothers – establishes a more responsible management approach which then eliminates the possibility for the loss of genetic variation. (Attachment 15) AWHC argues that maintaining low AMLs with a core breeding population of population of 227 wild horses for the Antelope Complex and 272 wild horses for the Triple B is insufficient to prevent inbreeding; further, introducing 50% of geldings into Complexes can certainly force the inbreeding of horses. These numbers are not sufficient to responsibly manage the herds based on kinship. Therefore, the Proposed Action fails entirely to consider the effects on long-term genetic viability of the populations. Once again, AWHC must reiterate that there is better path: fertility control in the form of PZP. As Dr. Kirkpatrick states about PZP, 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. (p. 150)	
52.	The BLM Must Consider Recommendations from the NAS The BML fails to incorporate the findings of the 2013 NAS review of the BLM Wild Horse and Burro Program in the EA. These include • Current management approach is fueling high population growth rates; • AMLs lack scientific basis, transparency, andequity; • PZP is the only currently available, proven form of fertility control; • Gelding will result in reduction or complete loss of the male type behaviors necessary for maintenance of social organization, band integrity, and expression of a natural behaviors; • More affordable tools exist to address BLM challenges; and • BLM should engage with the public in ways that allow public input to influence agency decisions, develop an iterative process between public deliberation and the public	This comment misconstrues the conclusions of the 2013 National Academies of Sciences report. - The preferred alternative under this EA would make significant progress toward reducing the population growth rates on the two complexes considered. - The NAS report did not conclude that PZP was the only available, proven form of fertility control. It also commended GonaCon and one form of male sterilization. - With regards to gelding, the report noted that its effects could not be entirely predicted ("The effect that gelding a portion of the males in a herd would have on reproduction and behavior could not be predicted at the time this report was prepared."), so the comment here is not supported by that report.
53.	**BLM should consider the impacts of castrating (gelding) wild stallions.** BLM's proposed action includes castrating approximately fifty percent of released stallions. BLM claims that this is consistent with management at the minimal level necessary.[29] However, there is no analysis to support this statement. Moreover, BLM failed to take a hard look at the impacts of castrating wild stallions. First, BLM admits that "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."[30] Here, BLM is not proposing to treat all wild horses. Moreover, to do so would be inconsistent with its obligations under the WHBA and applicable RMPs. Given that it is not effective, it is unclear why BLM would proceed with any action that includes castrating stallions. Moreover, it is known to cause several detrimental impacts to wild horses' health and wild free-roaming nature. In 2013 the National Academy of Sciences report on BLM's wild horse program,	See Section 3.2.12 of the EA. The EA text includes a literature examining what could be reasonably predicted outcomes from castration, and from including geldings as a portion of the herd. As noted in the previous comment, the NAS report (2013) was unable to make a definitive conclusion about what will be the effects on herd dynamics by including some number of geldings (""The effect that gelding a portion of the males in a herd would have onreproduction and behavior could not be predicted at the time this report was prepared.") No alternative in this EA includes the gelding of all stallions. Some fraction of stallions – enough to retain a core breeding population will remain intact. Therefore, the concern over a complete loss of stallions' social behaviors or a concern that horses in this herd will no longer have typical band structures with stallions, mares, and foals is unwarranted. The EA acknowledges that there are risks to individual

	specifically noted the social and behavioral impacts of castration as a form of fertility control: A potential disadvantage of both surgical and chemical castration is loss of testosterone and consequent reduction in or complete loss of male-type behaviors necessary for maintenance of social organization, band integrity, and expression of a natural behavior repertoire.[31] In addition, wild horse experts have informed BLM regarding the impacts of gelding wild horses. For example, Dr. Anne Perkins, who holds a Ph.D. in Animal Behavior with extensive research experience regarding wild horses, including a five-year study of "age characteristics and fertility control of feral horses in the Pryor Mountains, stated: "[w]e have repeatedly observed in domestic situations that geldings behave quite different from stallions. Castration . . .harms individual horses by altering their natural behavior and changing their social standing within the herd."[32] While BLM states that surgical complications from gelding are "rare," the 2013 NAS Report noted the significant complications of surgical gelding: Complications can occur at a rate of about 10 percent, including hemorrhage from the spermatic artery if not properly crushed; inadequate postoperative drainage that results in swelling, infection, or hydrocele (fluid accumulation); or even evisceration in rare cases (Blodgett, 2011).[33] BLM's own records indicate that gelding at BLM holding facilities presents a significant risk to the castrated stallions; before BLM authorizes the castration of any more wild horses, information regarding stallion deaths from the complications of castration must be analyzed and disclosed to the public. BLM provided data regarding the causes of death of 575 horses at BLM facilities from 2008-2013, and the results are troubling:	stallions as a result of surgical castration, including stallions that are more than 1 year old. Geldings that would be released back into the HMAs under the Proposed Action would still be gelded but would be permanently removed from the range in the absence of a gelding component. Fewer wild horses would be able to remain on the range in order to achieve a thriving natural ecological balance without release of geldings under the Proposed Action.

	• In 2008, a 4-year old male was euthanized due to: "gelding complications: evisceration (COULD NOT FIND TESTICLE)." • Also in 2008, an 18-year old male was euthanized for evisceration (i.e., disembowelment) because the horse "CANNOT RETRACT PENIS." In 2009, four Nevada wild horses were euthanized for evisceration as a complication of gelding. • In 2010, three Wyoming wild horses were euthanized due to gelding complications, including two horses who were eviscerated. • In 2011, two horses died of evisceration from gelding. According to BLM records, between 2008 and 2013, eleven horses died specifically from the surgical complications of castration. However, BLM horse fatality records reflect that gelding horses may involve other fatal complications. For example, in September of 2012, four young (aged 1-3 years) geldings died of "severe diarrhea." Also in 2012, nineteen geldings were euthanized for "Whorled Milkweed Toxicity." These horses, all three years old, were captured from four different states (Wyoming, Colorado, Nevada, and California) between 2009 and 2012, but they were all poisoned in a BLM holding facility, on December 3-4, 2012. The Roundup EA includes no discussion of BLM's extensive experience with gelding horses. That information is critical to the public's understanding of the actual impacts of a proposed action that includes gelding. Without reliable statistics about the actual impacts of surgical gelding on wild horses under the agency's care, the Roundup EA violates the agency's obligations under both NEPA and the WHBA. BLM also must disclose the risks of castrating older wild horses.	

	BLM proposes to castrate "stallions between 5 and 20 years of age."[34] Castrating older horses is more difficult and more risky than castrating younger horses. For example, Dr. Anthony Blikslager, DVM, PhD, professor of equine surgery at North Carolina State University, "prefers to castrate young stallions when they are about 1 year old" because "the surgery is usually simpler and poses less risk for complications than when the horse is older. Mature stallions have larger testicles and blood vessels, which can make the procedure problematic."[35] In addition, "Most veterinarians will agree that castrating horses at a young age (less than one year old) is ideal. Male horses at that age have smaller testicles that are easier to remove and have less of a chance of severe bleeding post-operatively."[36] Other veterinarians prefer to geld younger animals because: ▪ As your colt ages, there is more testicular tissue development, as well as increased blood supply to the testicular region. The chances of increased bleeding and other secondary complications are smaller when your geld at a younger age. ▪ Most castrations are completed with your horse under general anesthesia. When it comes to recovering your horse from the anesthesia, there is less risk with younger horses. Older horses carry more risk of injuring themselves or their handlers when standing and recovering from anesthesia. ▪ Finally, as with people, the younger the patient, the faster the healing times. Younger colts have less testicular tissue and a smaller scrotum, which requires less time to heal.[37] As discussed in detail above, BLM's analysis of the impacts of population control methods proposed for the Roundup EA is woefully deficient. Information from BLM's own horse fatality records is contradictory and therefore unreliable. Yet analysis of the actual impacts of castration, including the rate of surgical complications that cause evisceration and death, is essential to determining the actual impacts of castration on the stallions in the	

	Antelope and Triple B Complexes. The Roundup EA provides no information regarding the impacts of castration on stallions, including why BLM is choosing to castrate horses as old as 20 years of age, in spite of the recommendations of equine veterinarians that castration poses greater risk for older horses. BLM's proposal to castrate 50% of the stallions it returns to the HMAs in the Antelope and Triple B Complex will have multiple severe and clearly significant impacts not disclosed in the Roundup EA. BLM is obligated to provide a thorough analysis of these impacts in an EIS, and this action must not proceed until BLM does so.	
54.	Leave the horses alone.	Comment noted.
55.	I oppose the roundup!	Comment noted.
56.	Stop the gather!	Comment noted.
57.	Please selection the No Action Alternative	Comment Noted.
58.	You have failed to present a reasonable choice of alternative proposals for the protection, preservation, and management of these wild horse herds. For this reason, I would favor the No Action Alternative. Though I have earlier presented to you a Reserve Design alternative that would do justice to these unique and valuable wild horse populations, the merits of this Reserve Design strategy were not seriously recognized in your EA. For this and other reasons, I request a full Environmental Impact Study be conducted, chiefly because of the major detrimental impact that your proposed action would have on these wild horses themselves, both individually and as concerns their social units, both harem-type bands and the closely interbreeding collection of bands known as herds, or populations.	The EA analyzes a No Action Alternative, but this alternative is not consistent with the WFRHBA and is not consistent with the existing RMPs
59.	The round-ups should be halted until a better adoption program can be implemented.	Outside the scope of this analysis and this would not be consistent with the WFRHBA.
60.	BLM's population-growth figures are deemed invalid. Even if the "data" represented only the birth rates, they would, in many instances be higher than the normal birth rate. Multiple over-counts, along with normal roaming behavior, migratory flux among HMAs, and erroneous assumptions are likely factors to blame. Nevertheless, BLM knows the numbers have to be false. Therefore, by posting false and misleading	BLM aerial surveys are conducted in accordance with agency policy (IM 2010-057). Management decisions are made with reference to the best available estimates on population size.

	information, and by proposing to manage per that false and misleading information, BLM is perpetuating a fraud. In light of these fictitious figures, the No Action Alternative – is and must be the correct choice.	
61.	We conclude that the BLM should not proceed with this Proposed Action to manage the wild horse populations in the Antelope and Triple B Complexes with unprecedented, largely untested, and controversial population control methods in the form of GonaCon for mares and sterilization of stallions by gelding as well as sex ratio skewing. Further, the Proposed Action will have devastating results on the wild horses living in the Antelope and Triple B Complexes as it will reduce the population of breeding animal to below AML – allowing only 227 reproductively-intact horses in the Antelope Complex and 272 reproductively intact horses in the Triple B Complex.	The proposed management actions are not controversial. Potential impacts of the prospective use of GonaCon and gelding were analyzed in the EA with literature reviews. Sex ratio skewing at the levels that are proposed is an established management tool in wild horse management. It use is discussed in the Wild Horses and Burros Management Handbook (BLM 2010). It is not required by law or policy that all animals present in an HMA or complex be breeding adult animals for them to count toward AML.
62.	The Action Alternative Is Experimental; Therefore, the EA Cannot Analyze Its Impacts Because They Are Unknown While the EA cites the possible use of Porcine Zona Pellucida (PZP) as a management method for an unspecified number of mares in this Proposed Action, it also includes the use of gelding and unspecified number of stallions to retain a core breeding population of just 227 wild horses on the Antelope Complex (approximately 53% of low AML) and just 272 wild horses on the Triple B (63% of low AML). In the past 30 years, a growing body of research has determined that PZP is a safe and efficient means of fertility control for wild mares. However, research on the use of gelding in wild equine populations – specifically surgical procedure, safety, and effects	BLM does intend to observe and monitor the wild horses under its management purview after management actions, including gelding, use of GonaCon, sex ratio skewing, or PZP application, but those observations would be a normal part of management activities, not part of any planned or prospective research study. The proposed actions are not an experimental study; they would merely apply well-established management techniques. It is standard practice that BLM monitor the results of management actions, but this does not make those actions experimental. Monitoring and learning from actions is an essential part of effective land management. However, to be more clear, BLM has removed wording that could be construed a part of any experimental study plan. The inclusion of the words “our study” in the preliminary EA were an unintended mistake – they are not part of any plan to make this into a scientific study. There is no affiliation with any research institution to conduct any such study as part of the proposed management actions.

	on behavioral – is minimal at best. In fact, on page 15, the EA states that the BLM will be using information collected during the early release of geldings to determine how to manage gelding in the future: > By implementing the phased-in approach, BLM would be able to collect information regarding future management of geldings in other HMAs and Complexes. This information would allow BLM to determine whether it is feasible to leave more wild horses on the range through the release of sterilized animals without adversely impacting rangeland resources. Such information would also allow BLM to determine whether management of gelding bands could allow wild horses to remain in areas with severely limited resources (e.g., water) that are otherwise unacceptably degraded by horse populations with a positive growth rate. Further, on page 143, the EA acknowledges that the Proposed Action is a research project: > These findings are important because treated males in **our study** will be returned to the range in the presence of pregnant mares and mares with foals of the year. The BLM cannot gather scientific information on these untested	Geldings would either be able to be released back on to the range as geldings, or would be permanently removed (still as geldings) in the absence of a gelding component.

	methods in the absence of an affiliation with an academic research institution, a scientifically sound and approved research protocol, and approval from an IACUC. Given the use of these controversial contraception and surgical sterilization procedures as well as questions about their effects on wild equid behavior, it's clear that the BLM is proposing a research experiment on wild horses rather than an established management program that will safely, humanely, and effectively control their population in the Antelope and Triple B Complexes. Therefore, because the EA is describing an experiment, according to the federal Office of Research Integrity, "An institutional animal care and use committee (IACUC) is required by federal regulations for most institutions that use animals in research, teaching, and testing. (https://ori.hhs.gov/education/products/ncstate/iacuc.htm) The IACUC must approve protocols utilizing animals to ensure that the "animals selected for a procedure should be of an appropriate species and quality and the minimum number required to obtain valid research results." The IACUC must also ensure the "proper use of animals**, including the avoidance or minimization of discomfort, distress and pain** when consistent with sound scientific practices." (http://grants.nih.gov/grants/olaw/references/phspol.htm#USGovPrinciples) Because the EA proposes to use wild mares as well as stallions in procedures that are widely acknowledged in the veterinary community to be painful and that the BLM agency proposes to use large numbers of horses in this experiment, there is a strong likelihood that the IACUC could impose changes to the	

	Action Alternative, as described in the EA. Therefore, the EA both describes actions that are illegal due to the lack of necessary approvals for an animal experiment, and incomplete because it cannot analyze the impacts of the actions because components of the them are untested and experimental so the impacts are unknown. Until the BLM acknowledges that the Proposed Action is really a thinly disguised research experiment; takes action to implement the experiment only as part of a well-designed, rigorously-controlled and documented scientific study conducted in conjunction with a reputable scientific institution; and then receives IACUC approval from that institution, it cannot accurately describe the Action Alternative or analyze its impacts. Therefore, the EA cannot be considered complete.	
63.	AWHC strongly urges the BLM to prepare an EIS for this controversial action and to engage in a meaningful analysis of the reasonable alternatives to, and impacts of, the permanent removal from the range of approximately 6,737 wild horses residing in the Antelope and Triple B Complexes in Fall 2017 as well as the use of gelding, GonaCon, and sex ratio skewing to reach and maintain low AML.	BLM has analyzed a reasonable range of alternatives and has determined that there will be no significant impacts from implementation of the Proposed Action that trigger the need for an EIS.
64.	It’s clear that the BLM is required to prepare an EIS for this Proposed Action because a more cursory EA will be legally insufficient under the circumstances. The BLM has chosen to utilize an EA to consider and analyze the environmental impacts of, and reasonable alternatives to, another roundup and permanent removal from the range of approximately 6,737 additional wild horses as well as gelding up to 50% of the returned stallions, skewing the sex ratio of the wild horse populations, and treating all returned mares with PZP or GonaCon. However, the BLM’s decision to prepare an EA here, in lieu of an EIS, is contrary to NEPA and its implementing	BLM has not identified any significant impacts that would trigger the need for an EIS. While the Wild Horse and Burro Act describes wild horses as " *living symbols of the historic and pioneer spirit* of the West" this does not describe or define them as cultural resources. Wild horses as a 'symbol' do not meet the requirements for a historic property or archaeological, historic, or paleontological site. Further, the purpose of the NHPA is to address the *cultural* landscape as opposed to the *natural* landscape. As a part of the NEPA process, this means identifying, evaluating, and determining potential project effects to the cultural landscape. Since wild horses

	regulations. Indeed, although the presence of *only one* significance factor *requires* preparation of an EIS, several of the NEPA "significance" factors are triggered by the Proposed Action. *See Pub. Citizen v. Dept. of Transp.*, 316 F.3d 1002, 1023 (9th Cir. 2003) ("If the agency's action is environmentally 'significant' according to any of these criteria [set forth in 40 C.F.R. 508.27], then DOT erred in failing to prepare an EIS."); *Humane Soc'y of the U.S.* v. *Johanns*, 520 F. Supp. 2d 8, 20 (D.D.C. 2007) (explaining that "courts have found that the presence of one or more of [the CEQ significance] factors should result in an agency decision to prepare an EIS") (citations omitted); *Fund For Animals* v. *Norton*, 281 F. Supp. 2d 209, 218 (D.D.C. 2003) (same). The following significant factors are triggered here. Accordingly, the BLM is required to prepare an EIS on the Proposed Action. **40 C.F.R. § 1508.27(b)(3)** – This factor is triggered where the Proposed Action will affect "[u]nique characteristics of the geographic area such as proximity to *historic or cultural resources*, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas." (Emphasis added) According to the EA, the BLM is planning to place corral, traps and other facilities in previously disturbed areas whenever possible. If it needs to utilize a new area, an inventory of cultural resources would be conducted and cultural resources would be avoided to prevent adverse effects to any properties potentially	are defined as components of the natural landscape, they are not considered under the NHPA. Research regarding the wild horse as part of the historic cultural landscape revealed that wild horses are not discussed in historic and pioneer journals, indicating their presence and impact on that environment and the lives of pioneers, ranchers, miners, etc. was minimal, if present at all. Additionally, wild horses do not contain the values needed for consideration as part of a Traditional Cultural Property. Therefore, wild horses will not be considered as cultural resources for consideration in the current NEPA document. The WFRHBA specifically recognizes sterilization as a viable management tool and the EA analyzes the potential impacts of sterilization in section 3.2.12.2.

eligible to the National Register of Historic Places (NRHP). (pp. 43-44) But the BLM must do more than limit its analysis to cultural resources of archaeological, historical or paleontological value. The Council of Environmental Quality regulations certainly do *not* do so. To the contrary, the regulations focus broadly on whether there will be effects to "*historic or cultural resources*," which most certainly includes federally protected wild horses which Congress itself has formally determined "are *living symbols of the historic and pioneer spirit* of the West," "*contribute to the diversity of life forms within the Nation and enrich the lives of the American people*," and must "be considered in the area where presently found, as *an integral part of the natural system of the public lands*." 16 U.S.C. § 1331 (Emphases added.)

Given Congress' findings on wild horses' special status as historic and cultural resources that are protected by federal law, and in light of the dramatic impacts that this roundup will have on bringing wild horse population to low AMLs on *public* lands allocated for their protection and management as another step toward eliminating the from these lands entirely, this significance factor is triggered and therefore warrants a fuller analysis in an EIS.

40 C.F.R. § 1508.27(b)(4) – This factor addresses "[t]he degree to which the effects on the quality of the human environment are likely to be highly controversial."

The BLM cannot credibly assert that the Proposed Action is not controversial for several reasons**.** First, the EA does not consider the public controversy surrounding this Proposed Action. As stated earlier, nearly 8,000 of citizens submitted comments for this EA, urging the BLM to seek alternatives to the mass roundup,

	removal, and eradication of wild horses from the Antelope and Triple B Complexes. The content of these comments and their sheer number are testimony to the high level of public interest and controversy surrounding the BLM's management of wild horses in these Complexes. Yet the BLM stubbornly refuses to listen to them and change course in its management of our wild herds. Second, the EA does not acknowledge the scientific controversy surrounding the management options in this Proposed Action that are either 1) specifically recommended *against* by the NAS or 2) not recommended for field application in the absence of further research into their effects. Further, specific methods being pursued here (gelding and sex ratio skewing) by the Nevada BLM have been rejected by the BLM in other states due to their negative impacts or lack of research on their impacts. This is additional evidence of the scientific controversy surrounding the experiments. It must be noted that the Proposed Action cannot be construed as a research project regarding gelding, as no valid research can be conducted in the absence of an approved research protocol, an academic affiliation and approval by an Institutional Animal Care and Use Committee (IACUC). . For these reasons, this action is highly controversial as defined by NEPA and therefore requires consideration in an EIS. □ **40 C.F.R. § 1508.27(b)(6)** – This factor addresses "[t]he degree to which the action may establish a precedent for future Action with significant effects or represents a decision in principle about a future consideration."	

	With this Proposed Action, the BLM is adopting a new approach that could set a precedent for how future actions proceed (whether or not they are subject to separate NEPA review) in numerous regards: o The release of geldings. The BLM has never before released geldings to the range as a population management strategy. Research on the impacts to the environment and to the horses of this action has not been completed. This untested action could set precedent for the management of wild horses in Nevada – where more than half of the nation's federally-protected wild horses reside, and in other areas of the West; o The reduction in the number of wild free-roaming, reproductively intact horses to below AML and the management of that population below AML. This has never before been done in an HMA, there is no research regarding the impacts of the plan to maintain a significant portion of the wild horse population as non-reproducing, and the action will set a precedent for the management of wild horses in Nevada – where more than half of the nation's federally-protected wild horses reside, and in other areas of the West; and o Potential use of GonaCon as a management tool in a BLM herd before research documenting its behavioral effects is completed. Besides being counter to scientific recommendations, these decisions, individually and combined, could set dangerous precedents for management of federally protected horses across the west.	

	□ **40 C.F.R. § 1508.27(b)(10)** – This factor is triggered if "the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment. AWHC has previously sued the BLM over plans to sterilize wild free-roaming horses, maintaining that such action violates the Wild Free-Roaming Horses and Burros Act. In the face of these lawsuits, BLM has cancelled plans to geld wild stallions in the Pancake HMA in Nevada. In the latter case, U.S. District Court Judge Beryl A. Howell (Attachment 6) warned the BLM that it "may not simply remain **studiously ignorant of material scientific evidence** well known to the agency and brought directly to its attention in timely-filed comments." The scientific evidence that BLM attempted to ignore was in the form of expert declarations attesting to the harmful impacts of castrating wild free-roaming stallions and why such action violated the Wild Free Roaming Horses and Burros Act. Because at least four of the significance factors are present here, the BLM is required to prepare an EIS before implementing this Proposed Action.	
65.	BLM should circulate an Environmental Impact Statement (EIS) or new Environmental Assessment (EA) that analyzes additional alternatives, including adjusting the Appropriate Management Level (AML) in the Antelope and Triple B Complexes' herd management areas to support additional wild horses and reducing the amount of forage allocated to private ranchers for grazing their domestic cattle and sheep within the HMA.	See Section 2.6 of EA which considers but eliminates these alternatives from further consideration.
66.	Reduction in Livestock Grazing pursuant to 43 C.F.R. 4710.5(a); and 4710.6.	See Section 2.6 of EA, which considers but eliminates this alternative from further consideration..

		Outside the scope of this analysis. This action is not setting or adjusting livestock grazing levels. **Livestock grazing can only be reduced or eliminated if the BLM follows regulations at 43 CFR § 4100** and must be consistent with multiple use allocations set forth in the land-use plan. Forage allocations are addressed at the planning level. Such changes to livestock grazing cannot be made through a wild horse gather decision or through 4710.5(a), and are only possible if BLM first revises the land-use plans to allocate livestock forage to wild horses and to eliminate or reduce livestock grazing. There is no requirement of the WFRHBA or the regulations to reduce or eliminate livestock as a means to restore thriving natural ecological balance. **Administration of livestock grazing on public lands fall under 43 CFR Subpart D, Group 4100**. Additionally, livestock grazing is also managed under each Districts respective RMP. Livestock grazing on public lands is also provided for in the Taylor Grazing act of 1934. Removal or reduction of livestock would not be in conformance with the existing RMPs, is contrary to the BLM's multiple-use mission as outlined in the FLPMA and PRIA, and would be inconsistent with the WFRHBA, which directs the Secretary to immediately remove excess wild horses. Additionally this would only be effective for the very short term as the horse population would continue to increase. Eventually the HMA and adjacent lands would no longer be capable of supporting the wild horse populations. By law, BLM is required to manage wild horses in a thriving natural ecological balance and multiple use

	Designating such area to be managed principally for wild horse herds under 43 C.F.R. 4710.3-2	relationship on the public lands and to remove excess immediately upon a determination that excess wild horses exist. BLM cannot use regulations at 43 CFR 4710.5 to manage wild horses and livestock in a manner that is inconsistent with the RMPs. A land-use plan amendment or revision would be necessary to reallocate use in this manner between livestock and wild horses. Removal or reduction of livestock would not be in conformance with the existing RMPs, is contrary to the BLM's multiple-use mission as outlined in the FLPMA and PRIA, and would be inconsistent with the WFRHBA, which directs the Secretary to immediately remove excess wild horses. Additionally this would only be effective for the very short term as the horse population would continue to increase. Eventually the HMA and adjacent lands would no longer be capable of supporting the wild horse populations. The BLM understands the opinion of members of the public who would like to see an increase in wild horse AMLs and decrease in livestock grazing. The purpose of the EA is not to adjust livestock use, or increase the level of AML for these HMAs, which was discussed in Section 2.6.6 and 2.6.7 of the EA. Adjustments to livestock grazing cannot be made through a wild horse gather EA. A land-use plan amendment or revision would be necessary to reallocate use between livestock and wild horses. Only the BLM Director or Assistant Director (as per BLM Manual 1203: Delegation of Authority), may establish a Wild Horse and Burro Range after a full assessment of the impact on other resources through the land-use planning process. Neglecting to manage HMAs as multiple use area

		would not be in conformance with the existing Land Use Plan and is contrary to the BLM's multiple-use mission as outlined in the 1976 Federal Land Policy and Management Act (FLPMA), and also would be inconsistent with the WFRHBA and the Public Rangelands Improvement Act of 1978 (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 and sustainability among 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 (emphasis added). 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." The law's language stating that public lands where wild horses and burros were found roaming in 1971 are to be managed "principally but not necessarily exclusively" for the welfare of these animals relates to the Interior Secretary's power to "designate and maintain specific ranges on public lands as sanctuaries for their protection and preservation" -- which are, thus far, the Pryor Mountain Wild Horse Range (in Montana and Wyoming), the Nevada Wild Horse Range (located within the north central portion of Nellis Air Force Range), the Little Book Cliffs Wild Horse Range (in Colorado), and the Marietta Wild Burro Range (in Nevada). The "principally but not necessarily exclusively" language applies to specific Wild Horse Ranges, not to Herd

		Management Areas in general. The Code of Federal Regulations (43 CFR, Subpart 4710.3-2) states: "Herd management areas may also be designated as wild horse or burro ranges to be managed principally, but not necessarily exclusively, for wild horse or burro herds."
67.	This could include options for private or public compensation of permitees for non-use or reduced use of AUMs as well as working with permittees to help with the application of fertility control;	Outside the scope of this analysis.
68.	Many factors are involved in AML. BLM cannot rely on its old, livestock-biased AML, or the deficient RMP for this process. Fresh analysis MUST occur that includes setting a new and fair AML that balances wild horse, and livestock uses based on a full and fair carrying capacity, capability and suitability study. Plus -How is there water for livestock grazing here, and what demand are livestock placing on stressed resources? What number of livestock are grazed at each water source? Where are they watered? How much water do they consume, trample, foul with manure, etc.? Will BLM truck livestock elsewhere and dump them out if there are too many at a water source? What number would too many be? Hasn't BLM incrementally built a whole maze of fences, and also new water developments – so we cannot understand why horses are being rounded up to a high degree, but not a single livestock AUM has been ordered to be removed from these very same public lands.	Outside the scope of this analysis. This action is not setting or adjusting AMLs. See Section 2.6 of the EA. AMLs were established through prior separate decision-making processes. See Section 1 of the EA, refer to the Purpose and Need Section 1.5 of the EA. Available data confirms that wild horse numbers are currently in excess of the level at which a thriving natural ecological balance can be maintained and the data does not support an increase in the wild horse AMLs. An AML range was established for the HMAs, where the upper number represents the maximum population for which thriving natural ecological balance would be maintained. The lower range represents the number of animals to remain in the HMAs following a wild horse gather in order to allow for a four year gather cycle and prevent the population from exceeding the established AML between gathers. “We interpret the term AML…to mean that “optimum number” of wild horses which results in a thriving natural ecological balance and avoids a deterioration of the range” (109 IBLA 119 API 1989). Monitoring since establishment of AMLs indicates that these AMLs continue to be valid and no data exists to indicate that increases to the AMLs are warranted at this time.

	The wild horse Appropriate Management Levels in four of the eight HMAs do not begin to meet the minimum standards for genetic diversity	Wild horses within the Complexes move freely within the HMAs. The population within the Complexes is a meta-population.
69.	Provide an explanation for the changes in acreage in the Herd Management Areas over the years, and why, if the ranges increase in acreage, there is no increase in the AML	Cherry Springs WHT A review of the Forest Service online database, INFRA and has the total area of 23,187 (23053 NFS) acres that was corrected in 20 Oct 2005. AMLs have not changed since the original NEPA but there is a range of high and low. The acres listed for the four HMAs in the Preliminary EA are not consistentwith HMA acres established in the Wells Resource Management Plan Wild Horse Amendment and have been corrected accordingly.. **See Appendix IX for a discussion of when and how the discrepancies first occurred and why those discrepancies do not affect the Proposed Action or alternatives.**
70.	How much of a toll does domestic livestock grazing of grass/forbs and browsing of shrubs take on wild horse herd resources and wildlife habitats? Where are all wintering areas for wild horses and wildlife? How can BLM ameliorate and mitigate conflicts by reducing livestock use and disturbance in critical use areas and habitats – especially during "crunch" times? How much forage, browse and water have already been removed from these areas in 2017 by domestic livestock? How much more will be removed under the greatly excessive cattle and often overlapping sheep use? What has the forage production been, and what percentage is being removed by livestock, and/or is projected to be removed by livestock?	Monitoring data specific to these Complexes currently available to BLM shows that excess numbers of wild horses are present in the HMAs and that this overpopulation of wild horses is adversely impacting forage and water resources. In many areas with heavy or severe utilization, utilization is attributable solely to wild horses because there has been no livestock grazing.
71.	It is essential that BLM conduct a revision of the Resource Management Plan with the goal of converting the existing Herd Management Areas into designated Wild Horse Ranges, which would entail a reduction in livestock. BLM declined to include this alternative in their	Outside the scope of this analysis.
72.	Why has not current adequate and accurate FRH analysis been conducted for the HMAs? Isn't that a valid first step towards establishing	Outside the scope of this analysis as these resource allocations have been determined through prior decision-

	and implanting a valid AML post-Range Reform? Critical ecological and biological information must be used in setting any AML. BLM cannot just point to numbers being above some artificial cap set by long-outdated "carrying capacity" overwhelmingly weighted toward livestock – or some other sleight of hand – to manage wild lands. BLM's seemingly separate FRH process for horses is greatly flawed – and does not address fundamental ecological factors whose analysis is required to comply with the FRH, and actually understand land health.	making processes that are still in effect. Monitoring data specific to these HMAs indicates that the excess number of wild horses is a causal factor in not meeting rangeland health standards
73.	The EA also fails to consider the fact that horses utilize the environment, including water holes and stream/riparian areas, differently from cattle	See Sections 3.2.11 and 3.2.12 of the EA. The rangelands of Nevada are extremely arid and easily damaged by overuse. When a wild horse population increases to the point that lack of forage and water cause the population to be limited, widespread, irreparable damage to the rangelands results, and widespread suffering of horses occurs, affecting mares and foals most severely. This is not representative of Thriving Natural Ecological Balance as required by the WFRHBA, constitutes inhumane treatment and would impede or preclude management of healthy wild horses and healthy rangelands into the future. Analysis of monitoring and other data demonstrating that there is insufficient water and forage for the current overpopulation of wild horses, and that the excess wild horses are causing resource impacts.
74.	Utilize only least intrusive capture methods, such as bait- and water-trapping that are much less expensive and traumatic for the horses than roundups.	Water and Bait gather methods are discussed in Chapter 2.2 of the EA.
75.	If a helicopter roundup is needed to capture most of the horses in the herd, then wild horse bands should be brought in discretely, with a sorting process to keep the bands intact.	Gather efficiencies in these Complexes rarely exceed 80% of the population. BLM will follow SOPs.
76.	BLM should consider the ethical impacts of its actions, including consideration of the physical, social, and behavioral impacts of the proposed roundup, and subsequent captivity, on wild horses. BLM acknowledges that roundups can be stressful for wild horses and indirect impacts could include social displacement or increased conflict between studs. However, BLM fails to acknowledge or discuss the	See Section 3.2.12 of the EAText in the EA acknowledges that capture and aspects of handling can cause transient stress to individual animals, and includes measures that BLM will take to reduce such stress.

	harmful consequences of the stress, specifically the stress caused by helicopter roundups to all horses on the range.	BLM also notes that there would be a continuation of substantial stress for animals that remain on the range if BLM fails to takeaction to reduce population size and growth rates: In section 3.2.12.1 “The wild horses thus are traveling greater distances to meet both their forage and water needs, and the distances traveled by the horses during times when water is in short supply, combined with increasing competition at the water source, can cause increased stress to the animals and can lead to emergency conditions where a failure to take action may result in the death of individual wild horses.” In section 3.2.12, “Effects of Marking and Injection” “Some level of transient stress is likely to result in captured mares, including those that do not have markings associated with previous fertility control treatments. 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).”
77.	Eliminating All Helicopter Rounds Although the EA states that the primary gather methods in this Proposed Action “would include helicopter, bait, and water trapping,” (p 12) it’s clear that the BLM has prioritized the use of helicopters in the Antelope and Triple B Complexes. On page 20, the EA states, Bait and/or water trapping may be used if circumstances require it or best fist the management action to be taken. Bait and/or water trapping generally require a longer window of time for success than helicopter drive trapping. Although the trap would be set in a high probability area for	It would not be possible to achieve the purpose and need for this gather plan by relying solely on bait and water trapping given the vast area encompassed by the HMAs within the two Complexes, topographic features and access limitations, among other factors. Bait and water trapping, however, can be effective under certain circumstances, such as removing wild horses from small site specific areas (i.e. springs) and when used in conjunction with or as a supplement to

	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 (p. 20) and The Proposed Action would decrease the existing overpopulation of wild horses in the course of successive helicopter gather operations over a period of six to ten years. (p. 134) AWHC reminds the BLM that helicopter roundups are known to inflict stress, trauma, injury, and death on wild horses and collateral damage to sensitive sagebrush, grasslands, and riparian habitat areas and disruption to other wildlife species. Bait/water trapping minimizes stress to the horses and eliminates collateral environmental damage. Therefore, AWHC asks the BLM to eliminate the use of helicopters and instead relying on waterand -bait trapping. Further, when rounding up wild horses, the BLM must begin to seriously consider other methods in addition to water- and bait trapping that would be more humane and less stressful for both individual horses and bands of horses. For example, at the April 2015 Wild Horse and Burro Advisory Meeting, Dr. Sue McDonell presented the option of positive reinforcement behavior modification, and in a 2015 article published in The Stockmanship Journal, Dr. Blake McCann details his work implementing low-stress livestock handling methods with the wild horses in the Theodore Roosevelt National Park (Attachment 22). Compared to the use of helicopters and multiple handlers on horseback, both approaches could require less investment in staffing and logistical support – and therefore significant savings.	helicopter gathers.
78.	The risks to humans, horses, and the environment posed by the use of helicopters to count and capture wild horses were fully discussed in comments I submitted to BLM-Nevada on Tuesday, June 27, 2017, when the Motorized Equipment Statewide Hearing was held.	The Ely District Office held the state-wide meeting on June 27, 2017; four public participants attended and their comments were entered into the record for this hearing. Specific concerns included: (1) whether Most were in support of the use of helicopters and the gathering of excess wild horses. Standard Operating Procedures were reviewed in response to concerns expressed by participants and no changes to the SOPs were indicated based on this review.

79.	Helicopters may spook and stress wildlife – including big game, sage-grouse, and at times raptors. What populations are vulnerable? Where?	See Sections 3.2.5, 3.2.8 and 3.2.9 of the EA.
80.	Improving Public Observation The BLM is aware of the significant public interest in the agency's management of wild horses and its roundup operations. Indeed, the NAS specifically recommended to the BLM to improve the transparency of its management of the Wild Horse and Burro Program. (Attachment 1) The treatment of the horses is paramount. Removal of wild horses from public lands negatively impacts the human environment for those who enjoy observing, photographing and researching these wild horses. Given the tremendous public interest and in fulfillment of the agency's claims to operate with full transparency, the following actions should be considered, analyzed and implemented to ensure that the Proposed Action is conducted in a manner that minimizes stress and injuries to wild horses and ensures interested parties can adequately monitor the Proposed Action: • Trap sites should be located on public lands to allow public observation of roundup activities. No trap site shall be located on private lands for which the owners will not give permission for public observation of roundup activities. • Real-time cameras with GPS should be installed on all helicopters used in roundup operations and video should be live streamed on the Internet. This will improve transparency of roundup operations and enable the BLM and public to monitor the direct impact motorized vehicle usage has on wild horses and the environment. • Real-time cameras should be installed on the trap, the corral and temporary holding pens, again, so that BLM personnel, public and media can monitor the entire roundup operation and treatment of the horses. The recommendation of real-time cameras is also supported by a report commissioned by Captor Livestock Roundup, a long-time roundup contractor hired by the BLM which states, "Video monitoring of animal operations is a good way to ensure humane handling is taking place on a daily basis. Video cameras mounted in helicopters and in the capture and holding pens can also render the activists videos as simply nothing more than proof that your business 'walks the walk' when it comes to	Refer to public observation protocol and standard operating procedures in Appendix IV. Comments requesting cameras/video stream noted.

	upholding animal welfare standards." The report was prepared by Mark J. Deesing, Animal Behavior & Facilities Design consultant for Grandin Livestock Handling System. Deesing, an assistant to the highly-regarded livestock industry consultant Dr. Temple Grandin. (Attachment 23). Video cameras will improve the transparency of roundup operations and enable the BLM and public to monitor the direct impact motorized vehicle usage has on wild horses and the environment. In addition, real-time cameras should be installed on the trap, the corral and temporary holding pens, again, so that BLM personnel, public and media can monitor the entire roundup operation and treatment of the horses. AWHC would be happy to provide technical assistance and financial assistance to establish these real-time cameras as described above.	
81.	The Department of Wildlife supports the BLMs Proposed Action (Alternative A).	Comment noted
82.	We support the gather and management alternatives as currently outlined in the EA in Alternative A (the Proposed Action) as it is a balanced approach with the greatest flexibility to ensure a Thriving Natural Ecological Balance (TNEB) as required under the Wild and Free Roaming Horse and Burro Act as amended. It is an example of the correct use of fertility controls – first, removing horses to or below low-end AML and slowing population growth to remain within AML for a long period of time. Given the budget woes, increasing gaps in time between gathers, and the importance of keeping herds at or below AML, the number of wild horses gathered must be high enough to bring the herd to numbers that will keep within AML for as long as possible. Fertility control, gelding, and implementing a higher male to female ratio will facilitate keeping numbers within the range of AML longer.	Comment noted.
83.	Fencing by cattle ranchers also restrict the movement of the horses, who in nature, "...naturally rest-rotate their foraging pressures over all seasons of the year as well as over the course of years," (Pelligrini, 1971,Downer 2005).	Outside the scope of this analysis.
84.	Have there been fencing, water projects, weed infestations, scorched earth vegetation treatments, and other actions that have impacted HMA areas. Where, when and how has the area been reduced and/or impacted	Outside the scope of this analysis.

	since the HMA was established? What conflicts with livestock may this be causing?	
85.	Please identify all livestock water facilities, fences, wells, water haul sites, and other zones of intensive livestock impacts. What monitoring has been conducted in relation to these areas? Please provide a chronology of construction of all livestock facilities, including fencing that may hinder free roaming ability of horses, or through gate closures, ranchers or others can manipulate the intensity of horse use or disrupt band behavior.	Outside the scope of this analysis.
86.	I very much object to BLM's failing to recognize the negative impact that fences and other artificial barriers within the wild horses' legal area are having upon their ability to obtain sufficient forage, water, shelter, minerals, space, and reproductive habitat requirements.	Outside the scope of this analysis. Fencing does exist within the HMAs but are open at the end of the fence and do not restrict wild horse movement throughout the HMAs.
87.	Complete listing and maps of water sources available to wild horses within each of the HMAs. Adequate information about water sources on the range, including how fencing and engineering of wells and springs for livestock grazing has impacted water availability for wild horses and other wildlife species.	The level of detailed information requested by this commenter (such as fencing and engineering of wells and springs) falls outside the scope of this analysis and is not necessary for purposes of analysis of monitoring and other data demonstrating that there is insufficient water and forage for the current overpopulation of wild horses, and that the excess wild horses are causing resource impacts.
88.	In hiking in this Complex I notice NDOW provides guzzlers for wildlife, and cattlemen provide irrigation for their livestock, fencing, and more, but what does the BLM WHB program provide for its horses…what repairs of water resources, what installs of water resources or restoring of over utilized areas. Where are the 6 working water troughs and storage tanks they were to install?	Outside the scope of this analysis.
89.	Water sources and fencing A detailed map of all water sources and fencing within the Antelope and Triple B Complexes and disclosure of water allocations for all uses in the HMA, as well as an explanation of how fencing and engineering of wells and springs for livestock grazing has affected water availability for wild horses and other wildlife species.	Outside the scope of this analysis.
90.	I take issue with the statement that "the BLM Wells Field Office has	See Section 3.2.11 of the EA.

	determined that even though there has been an above-average amount of precipitation [this past] winter and spring, there are still no known water sources in the area for wild horses to obtain water late in the spring and summer". Having visited this area, I perceive this as a bogus justification for the wild horses' over-reduction, one designed to further the near monopoly of resources, including both forage and water, by public lands ranchers as well as mining and energy companies operating in the area.	While there may be water **on private lands**, water on public lands is **very limited** in the Complexes during the summer/fall months. Analysis of monitoring and other data demonstrate that there is insufficient water and forage for the current overpopulation of wild horses, and that the excess wild horses are causing resource impacts. The BLM does not control water rights and cannot mandate how ranchers use their vested or appropriated water rights.
91.	Ranchers fence off water sources.	Outside the scope of this analysis. The BLM does not control water rights and cannot mandate how ranchers use their vested or appropriated water rights.
92.	If there is a an issue with lack of water on an HMA, consider water catchment systems, as found in the Pryor Mountain HMA and Spring Creek HMA	Outside the scope of this analysis. The process to improve water availability for wild horses (by installing wells, etc.) would require site specific NEPA analysis, funding approval and efforts to obtain water rights for water development projects- a process which could take many years to complete, assuming there is water available for appropriation at sites where water developments could occur. This would not meet the objectives to manage for a thriving natural ecological balance and would not maintain wild horse herd health within HMAs. Guzzlers require extensive maintenance to keep them functioning properly and have to be placed in areas that receive adequate moisture. With Nevada being the driest State in the Union, guzzlers would only be able to supply a small portion of water needs. The WFRHBA requires BLM to manage horses in a manner that is designed to achieve and maintain a thriving natural ecological balance on public lands (16 USC 1333(a)). Wild

		horse & Burro (WH&B) Manual Sec: 4.1.1 Self-Sustaining states: "WH&B shall be managed as self-sustaining populations of healthy animals in balance with other uses and the productive capacity of their habitat." Sec: 4.1.4 Minimum Feasible Level of Management (2)" It is not consistent with management at the minimal level to provide supplemental feed or rely on water developments that require frequent maintenance…"
93.	How could there not be water and forage available for wild horses in the HMA if there is enough water and forage for times their AUMs in livestock	Grazing permittees have vested or appropriated water rights for their livestock grazing. The BLM does not control those water rights and cannot mandate how ranchers use their vested or appropriated water rights.
94.	The EA is replete with water related issues. However the EA never clarifies how wild horses are or are not accessing water according to Nevada Water Law and how this has bearing on the need for a gather to ensure consistency with state law and BLM regulation and policy. We argue that the horses are, in many cases, using fully appropriated water sources in which there is no appropriated right by BLM. In response to this issue by BLM to us previously, BLM asserted that wild horses are able to have "customary" access to water sources since they are considered wildlife under Nevada law. First, "customary" access only applies to surface water sources and only applies to new appropriations of surface water. The allowance for customary access to groundwater sources is not in the law. NRS 533.367, which was not adopted until 1981, states that "Before a person may obtain a right to the use of water from a spring or water which has seeped to the surface of the ground, the person must ensure that wildlife which customarily uses the water will have access to it" (emphasis added). Any surface waters that exist in the area were fully appropriated decades before horses became protected in 1971 and most, if not all, before the customary access statute was put into existence. Even if the statute were to apply to wild horses, wild horses are not wildlife under State law. NRS 501.097 defines wildlife as "any wild	This issue is outside the scope of this analysis. As a practical matter, wild horses will make use of any available waters they can access throughout the HMAs (on both BLM and Private lands). As indicated in Section 3.2.12, the number of wild horses on the range is in excess of available resources, including water.

	mammal, wild bird, fish, reptile, amphibian, mollusk or crustacean found naturally in a wild state, whether indigenous to Nevada or not and whether raised in captivity or not." BLM has argued that this means wild horses are considered wildlife in Nevada. However, BLM failed to read the statute in context where NRS 501.110 requires the classification of wildlife, in which the State has never classified wild horses. It reads: 1. For the purposes of this title, wildlife must be classified as follows: (a) Wild mammals, which must be further classified as either game mammals, fur-bearing mammals, protected mammals or unprotected mammals...2. Protected wildlife may be further classified as either sensitive, threatened or endangered. 3. Each species of wildlife must be placed in a classification by regulation of the Commission and, when it is in the public interest to do so, species may be moved from one classification to another (emphasis added). Wild horses have never been classified based on this statute and are therefore not wildlife in the State of Nevada, and cannot receive a water right under the guise of being wildlife according to NRS 533.367. We strongly request BLM cease with the unlawful use of water and clarify this issue in the EA. This alone provides the impetus for BLM to reduce the herd to AML and do a valid assessment on the efficacy of the HMA providing a TNEB.	
95.	We recommend that BLM consider the long--term effects of water usage to ensure water availability into the future —not just for the preservation of wild horses but for all users, be they other wildlife, livestock, or humans.	See the affected environment. AMLs were established through prior separate decision-making processes.
96.	Some species thought to compete actually facilitate on another's well-being…BLM sees "competition" were there is really commensalism…Wild hoses drink and leave. There is no on-going blockade. Wild horses actually create little water-catchments.	See response to comment #73 above Horses and cattle have 70-80% dietary overlap (Krysl et al. 1984).
97.	The National Academy of Sciences criticizes the BLM over its population estimates based on your unsubstantiated estimates of population growth. Your estimates are based on partially completed census data plus you have arbitrarily added 20% to the population.	See Section 3 of the EA. The BLM has historically employed the "direct count" method for conducting wild horse inventory. It has become well accepted that this method results in observers not

		seeing and therefore counting all of the horses, due to tree cover, terrain, and overall visibility factors. Without a statistical/scientific way to determine the number of "missed" horses, most BLM offices have not added correction factors to the direct flight results. The flight and gather data has continually shown that direct count flights undercount wild horses on the range. The Government Accountability Office (GAO) concluded through their review that "research and experience have shown that BLM's on-the-range population estimates are too low", and stated that "regardless of which method is used, counting wild horses and burros can be challenging, particularly when the animals are obscured by trees or when the rangeland is covered with snow" (GAO 09-77). In order to improve inventory methods and results, the USGS has been working with BLM for many years to study existing and potential methods that could be implemented. The BLM has implemented methods developed by USGS. Specifically, the EKDO in 2009 began using the Simultaneous Double Count technique, which is considered among the most accurate methodologies currently available. The results are analyzed by a statistician using multiple parameters that affect the sightability of the horses, and sighting accuracy of the observers. The outcome will be an estimated population range. You can read more about the work of USGS and these methods at this website. http://www.fort.usgs.gov/WildHorsePopulations/Counting.asp The BLM may employ both a direct count and a simultaneous double count method to determine the population of wild horses during helicopter inventory. For the direct counts, the BLM uses no correction factor or

		extrapolation to correct for any wild horses or area that may have missed. During inventories the BLM maintains Best Management Practices to ensure the highest quality data and most accurate inventory. On most flights, three experienced BLM observers participate, in addition to the pilot, who is also very skilled at completing wild horse inventory. Inventory flights are conducted at low altitude (below 100' at times) and low speeds, with trained WHB Specialists and oftentimes Wildlife Biologists or other Resource Specialists. It is very easy to distinguish wild horses from livestock, and even more so from wildlife. The helicopter pilot records the location of the horses with an onboard GPS, which also records the flight path. The flight area boundaries are also viewed by the pilot on the onboard computer screen to ensure the entire area is covered. The location of previously observed wild horses is also verified on the onboard computer screen if needed. BLM staff record wild horses on 1:100,000 maps, and the number and description of bands observed are recorded on data sheets. As the flights progress, natural landforms or barriers are used to ensure movement of wild horses doesn't occur between the areas as they are completed. Observers take great care to document characteristics of groups of horses encountered such as color, leg markings, face markings, and direction of travel, so as to decrease the chance of counting any bands or horses twice.
98.	The birth-rate is not the same as - and should not be equated to – the population growth-rate. The birth-rate will necessarily be higher than the herd-growth rate…the effective foal-to-yearling survival rate is just 10%. By failing to adjust the population-estimates per expected foal mortality, BLM inflates the figures.	Ransom et al. recently published a review of literature summarizing population growth rates for feral horse populations (Ransom et al. 2016. Wild and feral equid population dynamics. Chapter 6 in Ransom and Kaczensky, eds. Wild Equids; ecology management and conservation. Johns Hopkins University Press, Baltimore, Maryland). In

	So, it is a reasonable and conservative estimate that at least 5% of wild horses other-than-foals perish annually out on the range. The number is probably much higher. By failing to factor in adult-wild-horse mortality, BLM further exaggerates the population-estimates	light of that review, this comment is not credible. The average foal survival rate reported in the Ransom et al. (2016) book chapter is 84% -- more than 8 of 10 foals survive the winter.
99.	An independent study (Gregg, LeBlanc, and Johnston, 2014) reviewed BLM roundup-records of four representative herd management areas with a robust sample-size of 5,859 wild horses. While the researchers found an overall birth rate of just under 20 percent, they also found that half of foals perish before their first birthday. Thus, the 20% foaling rate is merely a temporary "blip" in the data. The effective foal-to-yearling survival rate is just 10%. By failing to adjust the population-estimates per expected foal mortality, BLM inflates the figures.	BLM is in possession of the self-published report by Gregg, LeBlanc, and Johnson. It does not appear to have been peer reviewed, nor is itpublished in any scientific literature outlet. With reference to management decisions, this document does 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, K, S Cohn, R Falise, H Hadley, M Herder, K Libby, K Muller, T Murphy, M Preston, MJ Rugwell, and S Schlanger. 2015. Advancing science in the BLM: an implementation strategy. Department of the Interior, BLM, Washington DC.). The conclusions in this self-published report are not sufficiently reliable to warrant its use in this EA, and is contradicted by a large number of scientifically robust and peer-reviewed work that spans decades.
100.	When a count produces results that disagree with the known reproductive limitations of a species, the count must be deemed invalid. We know mares have a long gestation, and that they produce one foal per year. The normal annual herd-growth rate is 5% - not 122% or 164% - which are among the rates that your official data reported for herd in the Complexes. A 20% growth rate would be 4 times the norm.	With regards to the Ransom et al. (2016) published book chapter that summarized a number of scientific studies on feral horse population dynamics, average annual growth rate reported there was 1.18, or an increase of 18% per year. BLM's population counts and amount of population growth observed post-gather operations support the BLM's estimate of a 20-25% average annual population growth rate within the Complexes.
101.	BLM's wild-horse population figures are without merit. They are false and misleading. Making false and misleading representations fraud, which violates Title 18 USC 1001 of the Federal criminal code.	See responses to comment #60 above.
102.	The census numbers provided by the BLM are confusing and contradictory, but it appears that as of March 2017, the agency estimates about -7,770 horses live in the two Complexes. (Note: this population	See Section 1.1 of the EA. Inventory data and estimated populations within the Complexes can be found in Section 1.1 of the EA.

	estimate is based on an unsubstantiated projection of an annual growth rate of 20 % to 25% for wild horses. (p. 6))	
103.	BLM must post scientific, truthful data regarding wild horses' herd-growth rates.	See responses to comment #60 above.
104.	From page 6 of the EA, by its own admission, the BLM has not yet received the statistical analysis of the 2017 wild horse survey of the Antelope Complex concerning the foals born and their survival/mortality rates. I therefore strongly object to BLM proceeding to include the 2017 "foal crop". This ignores natural and human-caused mortality of foals that is often very high, even to 50% or more.	See Section 1.1 of the EA for the 2017 inventory data.
105.	the AMLs are invalid because they do not meet the minimum-viable population (MVP) as determined by the International Union for the Conservation of Nature for wild equids.	See response to comment #68 above. Per WHB Handbook 4700-1: "*A minimum population size of 50 effective breeding animals (i.e., a total population size of about 150-200 animals) is currently recommended to maintain an acceptable level of genetic diversity within reproducing WH&B populations (Cothran, 2009). This number is required to keep the rate of loss of genetic variation at 1 percent per generation. Animal interchange between adjacent HMAs with smaller population sizes may reduce the need for maintaining populations of this size within each individual HMA.* Under the Proposed Action and alternatives, the minimum breeding population size would be greater than needed to maintain an acceptable level of genetic diversity for each Complex. As described in Section 3.2 and Appendix B, movement between the HMAs likely occurs. Monitoring efforts identified under the Proposed Action may help to increase the knowledge of such movement patterns.
106.	The EA has failed to establish that: • The low AML's are appropriate for over 3 million acres public	Data currently available to BLM shows that excess numbers of wild horses are present in the HMAs and that this overpopulation of wild horses is adversely impacting forage and water resources.

	land area • Alleged range damage is caused by wild horses as opposed to the far larger numbers of livestock grazing in the area • There is an appropriate and fair distribution of resources between livestock, wild horses and other wildlife species in these federally-designated Herd Management Area. • The removal of horses is necessary and goals cannot be accomplished through alternatives for on-the-range management of wild horses – measures which the BLM has not implemented	See Responses to Comment #105 The AMLs for Antelope Valley, Goshute, Maverick Medicine and Spruce-Pequop HMAs were established through Final Multiple Use Decisions (FMUDs) issued by the Elko District following completion of Allotment Evaluations or Rangeland Health Assessments and EAs. The AML for the Antelope and Triple B HMAs was established through an in-depth analysis of habitat suitability and monitoring data as set forth in the Ely Proposed Resource Management Plan/Final Environmental Impact Statement, Table 3.8-2 and Page 4.82 (2007) These AMLs were established following the collection, analysis, and interpretation of many years of monitoring data, which included precipitation, use pattern mapping, trend, production, census/inventory, and carrying capacity analysis, and following a public decision-making process. The monitoring methods used are well established and documented within the Technical References used by the BLM as well as other land management agencies for vegetation monitoring and assessment. BLM specialist have collected monitoring data and photographic evidence showing use and impacts by wild horses. Evidence of range degradation has been observed even where there has been no livestock grazing and where over-utilization of forage can be directly attributed to wild horse use. BLM's monitoring data indicates that wild horses are relying on water sources that are producing limited water relative to wild horse population needs, and that wild horses are concentrating at certain water sources and adversely

		impacting those waters and surrounding forage and vegetation.
107.	BLM should consider the positive impact of wild horses. The BLM should not ignore the positive impacts of wild horses. The BLM should consider adjusting the AML for the Antelope and Triple B Complexes' HMAs and instead of condemning the wild horses to a life of captivity, allowing the horses to be self-sustaining.	See Section 2.6 for a discussion of a proposed alternative to increase AML, which alternative was considered but eliminated from further consideration.
108.	BLM should consider reasonable alternatives to the proposed action. BLM should consider reasonable alternatives to achieve a thriving natural ecological balance in the Antelope and Triple B Complexes including adjusting the current AML, adjusting forage allocated to cattle sheep, and allowing natural controls. To the extent that BLM argues that the purpose and need of the action is limited to removing wild horses it has defined the purpose and need in unreasonably narrow terms.	See Section 2.6 discussing alternatives considered but eliminated from further consideration.
109.	The BLM should consider re-evaluating the current AML to support additional wild horses in the HMA. There are several problems with the BLM's analysis. First, BLM's duty to remove wild horses is not implicated because it has not properly determined that there are excess horses and that removal is necessary. BLM is prohibited from removing wild horses unless it has first made a determination that: (1) "an overpopulation [of wild horses] exists on a given area of the public lands," and (2) "action is necessary to remove excess animals."[47] Here, BLM has failed to adequately make this determination and ignored its own guidelines. Nor has BLM indicated why it should depart from its guidelines. Second, BLM's reliance on the AML in the 1985 RMP and the 2008 Ely RMP is flawed because both RMP's require BLM to re-evalute the AMLS. Third, there is no indication that the extremely low AMLs for over three million acres of land creates a thriving natural ecological balance. The Draft EA does not disclose any information about how the AMLs were calculated. Instead, the Draft EA simply references the 1985 Wells and 2008 Ely RMP, and does not disclose data about	See response to comment #68 above. See Section 2 of the EA. AMLs were established through prior separate decision-making processes. See Section 1 of the EA, refer to the Purpose and Need Section 1.3 of the EA. Available data confirms that wild horse numbers are currently in excess of the level at which a thriving natural ecological balance can be maintained and the data does not support an increase in the wild horse AMLs. The Ely RMP, Wells RMP and the Wells Wild Horse Amendment are still the guiding documents.

	current range conditions or how it distinguished the impacts of wild horses from the impacts of other uses in the HMA. Finally, BLM's reliance on the AML in the Wells and Ely RMP to justify rounding up wild horses in 2017 is not supported by the law. According to its own legally binding commitments in the Ely RMP and Record of Decision, BLM should formally evaluate the RMP at least every five years. BLM should adjust AML's based on monitoring data, and should perform adjustments typically, but not exclusively, in conjunction with watershed analysis process. BLM should also preform aerial counts of the herds at least once every three years. The RMP also indicates that BLM is authorized to adjust wild horse management without amending the RMP as long as it is in conformance with the Approved Plan. According the RMP, wild horse herds should be managed for herd viability and sustainability and will consist of healthy animals that exhibit diverse age structure, good conformation, and any characteristics unique to the specific herd. Additionally, the Wells RMP and Record of Decision state that the it will be reviewed on a minimum of five years intervals for currency and adequacy. In this case, BLM failed to provide current analysis on range conditions for all HMAs and failed to provide any history of monitoring of the range conditions and basis for AMLS. BLM has not indicated that it has performed the monitoring and re-evaluations required by the RMPs. Thus, BLM has an obligation to reevaluate the AML. In addition, it constitutes a reasonable alternative that BLM should consider and analyze in an EA or EIS.	
110.	Adaptive Management Strategy The Interior Secretary Order No. 3270 issued March 9, 2007, established agency policy to incorporate Adaptive Management into agency management programs. Under this policy, land use decisions can be adjusted to meet environmental, social and economic goals; to increase scientific knowledge; and to decrease tensions among stakeholders. There are numerous reasons why the BLM should apply its adaptive	The WFRHBA requires BLM to remove excess horses when it determines this necessary to ensure a thriving natural ecological balance – regardless of whether some members of the public oppose such removals. The Proposed Action would help minimize the number of excess wild horses that would need to be removed over the next 10 years by implementing fertility controls and a gelding component,

	management policy to the management of the Silver King HMA: • The BLM understands the high economic costs associated with the proposal to removal horses from the range and keep them in short-/long-term government holding facilities. Indeed, the BLM has repeatedly emphasized that the agency practice of rounding up and warehousing wild horses is not fiscally sustainable • The BLM must consider and analyze the societal opposition to the removal of horses. Over the past few years, the BLM has received hundreds of thousands of letters from American citizens opposing roundups and in favor of reform of the Wild Horse and Burro Program, including a shift away from roundup and removal toward on-the-range management of wild horses, as well as in favor of re-apportioning the resource allocation pie to give horses an appropriate share of resources by decreasing or eliminating livestock grazing in HMAs. (Attachment 1) Because the EA does not disclose, consider, or analyzes information related to adopting an Adaptive Management Strategy, it is inadequate.	along with removal of excess wild horses.
111.	AWHC argues that this Proposed Action is problematic on several fronts. First, as the NAS confirmed in its 2013 report, the BLM's claims about overpopulation are based on the agency's self-imposed population limits and its determination of AMLs lacks a "science-based rationale." Therefore, it is not a legitimate basis on which to assess whether "excess" horses are present and must be removed. The NAS also found that these population limits "are not transparent to stakeholders, supported by scientific information, or amenable to adaptation with new information and environmental and social change." (Attachment 1, p. 11)	See response to comments #68 and 110 above. Monitoring data confirms that the current overpopulation of wild horses is resulting in resource damage directly attributable to this overpopulation.
112.	We have evidence and local observations of horses from the Triple B Complex moving to-and-from the Diamond Complex and the horse-free area on the east slope of the Diamond Range and the west end of Newark Valley and the south end of Huntington Valley. The project area in the EA must be expanded to gather horses outside of the Triple B Complex but that "belong" to this Complex. We believe the "leakage" of horses from Triple B explains why there were unanticipated horses counted on the Diamond Complex after the gather there in early-	There may be minimal levels of interchange with HMAs outside of the Complexes however; there is no data showing significant interchange. There are natural and manmade barriers preventing large movement between the areas as well.

	2013. BLM gathered 792 horses (more than originally planned) and estimated 78 horses remained on the entire Diamond Complex after the gather (which is over 70 more than they had first estimated were there). BLM "warehoused" 30+ horses in Carson City over the winter with the intention of turning these horses back out on the Complex in the late spring/early summer 2013. BLM was finalizing plans to turn these horses back out and completed a census flight in July 2013 to determine the horses still on the Complex before the 30+ horses were turned out. BLM counted at least 450 horses with 200+ being outside of the HMA in the "horse free" area on the east side of the Diamond Range. A March 2016 flight resulted in a direct count of 506 horses (241% of high-end AML) with 96 being outside of the HMA in the same area. Many of these "unexpected" horses are from the Triple B Complex.	
113.	We support the gather and management alternatives as currently outlined in the EA in Alternative A (the Proposed Action) as it is a balanced approach with the greatest flexibility to ensure a Thriving Natural Ecological Balance (TNEB) as required under the Wild and Free Roaming Horse and Burro Act as amended. It is an example of the correct use of fertility controls – first, removing horses to or below low-end AML and slowing population growth to remain within AML for a long period of time. Given the budget woes, increasing gaps in time between gathers, and the importance of keeping herds at or below AML, the number of wild horses gathered must be high enough to bring the herd to numbers that will keep within AML for as long as possible. Fertility control, gelding, and implementing a higher male to female ratio will facilitate keeping numbers within the range of AML longer.	Comment noted.
114.	A glance at the map of the HMAs in question reveals that they are contiguous, and public lands are interspersed with private lands. How easy it would be for a profit-motivated helicopter pilot to "poach" wild horses from strictly public lands by driving them into target-areas.	This speculation falls outside the scope of this analysis.
115.	Visitor horses are not permanent residents, but they likely get counted as such – and counted multiple times – in a census that does not take horse-movement into consideration.	See response to comment #112 above.

116.	All proposed actions are contraindicated because fraud was the basis for the finding of “overpopulation”. BLM must not be rewarded for unethical, criminal behavior.	This opinion falls outside the scope of this analysis.
117.	the EA fails to consider migration to and from nearby HMAs – such as Diamond, Diamond Hills North, Diamond Hills South, Fish Creek, Pancake, and Whistler Mountain.	There may be minimal levels of interchange with HMAs outside the Complexes however; there is no data showing significant interchange. There are natural and manmade barriers preventing large movement between the areas as well.
118.	But as has been pointed out to the BLM previously, the “mark-resight: and the “simultaneous double-count” methods, conducted by helicopter, over count the population. When more horses are “seen” than could possibly exist, the method is faulty and likely fraudulent. Finally, I note the absence of photographs taken from a Go-Pro camera mounted on the aircraft.	The simultaneous double-observer method used to survey horses has passed peer-review in scientific literature (Lubow and Ransom, 2016, Practical bias correction in aerial surveys of large mammals: validation of hybrid double-observer with sightability method against known abundance of feral horse (Equus caballus) populations. PLoS ONE 11(5): e0154902. doi:10.1371/journal.pone.0154902.). During surveys, crews make all efforts to avoid counting any group of horses twice, by taking photographs and noting coloration of individual horses as well as group composition of foals and adults; if there is any doubt about a group of horses having been seen before, BLM standard operating procedures call for these groups to be excluded from the population estimate. Indeed, aerial surveys tend to underestimate true wildlife abundance because a proportion of animals go unseen by observers (NAS 2013). Simultaneous double-observer analyses can account for some of those unseen animals, but even that method tends to underestimate actual abundance unless all sources of sighting heterogeneity are accounted for (Griffin et al. 2013. A hybrid double-observer sightability model for aerial surveys. The Journal of Wildlife Management 77(8): 1532-1544). Finally, observers take still photographs of horse groups using high definition SLR cameras; Go-Pro cameras mounted to the aircraft at a fixed angle and fixed focal width would produce much lower quality images, and would miss

		many horse groups detected far from and to the side of the aircraft.
119.	It is curious that instead of providing recent use-figures that the BLM went to the trouble of computing a 10-year average for each of the many allotments involved. What were you trying to hide?... Then, obviously, the permittees don't need all those authorized AUMs, and it is entirely appropriate to whom they belong: wild horses.	Actual Use is summarized in Section 3.2.4 of the EA.
120.	The 2011 Triple B Complex EA indicated 2705 horses were on the range – was the actual number on the range closer to 1583, with the number left on the range below AML?	This comment is not relevant to the current estimated population which is based on more recent population inventory data.
121.	The BLM numbers for this complex vary from the numbers found in the National Statistics – BLM numbers for Antelope Valley correlate with National Statistics number, but the numbers for Goshute and Spruce – Pequop do not agree with National Statistics, and the disparity needs to be explained.	Table 1 in Section 1.1 of the EA has been updated to include the 2017 Inventory data.
122.	The plan to gather, remove, sterilize and vaccinate seems unrealistic and potentially devastating to the horses in this complex, as it leaves 427 horses on 1,324,745 acres (1horse/3102 acres)	The acres of the Complexes are not indicative of the number of wild horses that the area can support year round and ensure that degradation of the range does not occur and that wild horses continue to thrive. The Proposed Action would leave a core breeding population of 427 wild horses in the Antelope Complex plus an additional gelding component that would bring the total population to mid AML for the Antelope Complex. The Proposed Action would leave a core breeding population of 472 wild horses in the Triple B Complex plus an additional gelding component that would bring the total population to mid AML for the Triple B Complex.
123.	Antelope and Antelope Valley barely have a sufficient number of horses to ensure continued genetic viability for the short-term, and Goshute and Spruce Pequop don't have sufficient numbers. This EA suggests that the horses from these two complexes will mix, but there is no scientific research available to verify that claim.	See Section 3.2.12 of the EA. There is interchange of wild horses within the Complexes, ensuring genetic viability. There are no fences to restrict movement of wild horses in the HMAs.
124.	BLM has failed to require that livestock meet conservative modern day use standards that would provide residual nesting cover for sage-grouse, or to protect the structure of the shrubs required by	Outside the scope of this analysis.

125.	How is livestock grazing and trampling disturbance currently adversely impacting (direct, indirect and cumulative impacts) habitats and populations of sage-grouse? Pygmy rabbits? Rare, sensitive and other migratory birds?	Outside the scope of this analysis.
126.	It is critical that the full direct, cumulative and indirect effects of livestock grazing –including on all the affected public lands values, be addressed.	Outside the scope of this analysis.
127.	Please provide a detailed map showing where - and in what pattern – all livestock grazing and herding occurs here. An easy and simple way to reduce stress on watersheds, wildlife habitats, and wild horse herds would be for BLM to require sheep and/or cattle be trucked –rather than herded or trailed to destinations. That way, they would not degrade soils, waters, watersheds, and remove “forage” or displace wildlife and wild horses due to the severe disturbance caused by inundating lands with herders, dogs, and thousands of animals stripping and devouring forage in their wake – like herds of hooved locusts – as domestic sheep have been called by some.	Outside the scope of this analysis.
128.	Improve management of cattle and sheep on the horses grazing land to prevent overgrazing.	Outside the scope of this analysis.
129.	We also stress that some of the livestock herds - domestic sheep – that are imposed on these HMAs also jeopardize the viability of bighorn sheep. The full adverse footprint of the domestic sheep and other operations here also impacting horses must be fully examined. It never has been.	Outside the scope of this analysis.
130.	Year-round overutilization by wild horses in excess of upper AML, continues to degrade rangelands across the West.	Comment noted.
131.	Such over-utilization compromises all users of the Multiple Use Doctrine, including the wellbeing of the horses themselves.	Comment noted.
132.	The Department of Wildlife has witnessed first-hand how this overutilization by wild horses impacts wildlife through competition for resources (forage and water) and how it negatively affects the long-term stability of the ecosystem.	Comment noted.
133.	Historical sheep and cattle grazing data is essential to analyze which species have done the damage historically	Data currently available to BLM shows that excess numbers of wild horses are present in the HMAs and that this overpopulation of wild horses is adversely impacting forage

		and water resources.
134.	Horses are blamed for degrading water resources & the over-utilization of forage, but this statement isn't quantified.	See Section 3 of the EA. BLM specialist have collected monitoring data and photographic evidence showing use and impacts by wild horses. Evidence of range degradation has been observed even where there has been no livestock grazing and where over-utilization of forage can be directly attributed to wild horse use. BLM's monitoring data indicates that wild horses are relying on water sources that are producing limited water relative to wild horse population needs, and that wild horses are concentrating at certain water sources and adversely impacting those waters and surrounding forage and vegetation.
135.	BLM states that if the population of horses were decreased, then perennial forage will return.	BLM specialist have collected monitoring data and photographic evidence showing use and impacts by wild horses. Evidence of range degradation has been observed even where there has been no livestock grazing and where over-utilization of forage can be directly attributed to wild horse use.
136.	Imagine if livestock were held to the same stocking density. The sparse and widely-dispersed population imposed by the AML evidences bias. It also evidences violation of the Wild Free-Roaming Horses and Burros Act.	Opinion
137.	Although the BLM alleges "competition" between mustangs and livestock over forage, one of the dominant herbivores on the range are lagomorphs – jackrabbits, hares, and cottontails.	See response to comment #72 above.
138.	What are the livestock use standards, and actual use stocking for all units of pastures in the HMA? What does monitoring over the past decade show? Where is monitoring conducted? Where is wild horse impact monitoring conducted? How does BLM separate this from other uses?	See Sections 3.2.4 and 3.2.10 of the EA.
139.	Instead of scapegoating wild horses for forage likely eaten by a different species, BLM needs to conduct a Ecological Site Inventory to determine	See response to comment #72 above.

	actual use – including trespass use. The inventory must pro-rate actual use by each animal-species present, including rodents and insects, including even creatures such as lagomorphs.	
140.	In normal times, locusts – grasshoppers and crickets – consume 20-to-25% of the forage in areas where they are present. However, in times of outbreaks, they can eat nearly all of the green biomass…An Ecological Site Survey would reveal the extent of forage-consumption by insects – such as locusts – in the project area.	Outside the scope of this document. See response to comment #72 above.
141.	But because actual use is whatever the permit-holders self-report on Form 4130-5, and because BLM essentially takes the permit-holders' at their word and bills accordingly…the actual-use number is unverified and likely under-reported. Thus, grazing-use is a self-reporting system, self-certifying system that is rarely verified. BLM needs to revisit and reform how it assesses forage-usage for cattle versus wild horses. Cattle need an AUM surcharge; wild hoses need an AUM discount that reflects less-than-one AUM per horse, giving BLM the flexibility to place more wild horses on the range	Outside the scope of this analysis.
142.	Your plan allows no public access to witness this roundup, and is against our First Amendment rights. Why?	This is inaccurate. Refer to public observation protocol and standard operation procedures in Appendix IV.
143.	In legitimate instances of straying, BLM should first encourage the wild horses to return to their proper place, then address those factors that caused the animals to leave home. BLM should specify preventive and reactive measures in this regard as part of its management approach. Return outsiders to the HMAs, reward that return (hay, mineral-licks, guzzlers), and encourage their "retreat" from "outside" areas (aversive techniques).	The majority of wild horse movement out of an HMA is due to increased population size and limited resources (forage, water, space, etc.). BLM shall take action when the non-HMA animals (i.e. excess wild horses) are creating a nuisance on private lands, impacting habitat, or creating safety problems (CFR 4720.2-1). These horses have established a new "home range" outside the HMA boundaries.
144.	Would palatable plantings draw the wild horses to the areas BLM wants them to use?	Outside the scope of this analysis. . Available data indicates there are excess wild horses that need to be removed from the range to ensure a thriving natural ecological balance.
145.	What about siting mineral licks deep inside the HMAs, away from the outskirts?	Outside the scope of this analysis. . Available data indicates there are excess wild horses that need to be removed from

		the range to ensure a thriving natural ecological balance.
146.	Aversive conditioning could also be employed to shoo the wild horses into the solid-block public lands. Certainly, positive reinforcement coupled with aversive conditioning would be an effective and cost-effective solution.	Outside the scope of this analysis. . Available data indicates there are excess wild horses that need to be removed from the range to ensure a thriving natural ecological balance.
147.	BLM should specify preventive and reactive measures in this regard as part of its management approach. Return outsiders to the HMAs, reward that return (hay, mineral-licks, guzzlers), and encourage their "retreat" from "outside" areas (aversive techniques).	Outside the scope of this analysis. . Available data indicates there are excess wild horses that need to be removed from the range to ensure a thriving natural ecological balance.
148.	To also dismiss the ability of nature to control the population number of wild horses, as presented in 2.6.8, “flies in the face” of the true and core intent of the WFHBA.	Outside the scope of this analysis. Refer to Section 2.6.8 of the EA which discusses why self-regulation is not a viable option. The rangelands of Nevada are extremely arid and easily damaged by overuse. By the time a wild horse population increases to the point that lack of forage and water causes the population to crash, it it too late because widespread, irreparable damage to the rangelands will have occurred, and there will be widespread suffering of individual horses affecting mares and foals most severely. This is not consistent with the mandate that BLM manage for a Thriving Natural Ecological Balance as required by the WFRHBA, constitutes inhumane treatment and would impede or preclude management of healthy wild horses and healthy rangelands into the future. Predators are managed by the State of Nevada and Wildlife Services.
149.	BLM must conserve predators in the HMAs for a thriving, natural, ecological balance.	Outside the scope of this analysis. Hunting is regulated by the State and falls outside BLM’s management authorities. The Action Alternatives do not include any hunting or killing of predators, nor does the BLM manage any programs to hunt or kill predators. The BLM is responsible for managing wildlife habitat on public lands in cooperation with state wildlife agencies. The

		Nevada Department of Wildlife is the state wildlife agency that regulates the hunting and trapping of wildlife species. The United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) Wildlife Services (WS) are the Federal agencies that would engage in any wildlife or predator control activities that are determined to be necessary.
150.	The Department of Wildlife supports the BLMs Proposed Action (Alternative A).	Comment noted.
151.	Noted is aggressive horses are blamed for the shortage of wildlife but then wildlife numbers appear normal.	It has been established in the scientific literature that wild horses can displace other wild ungulates at water sources (i.e., Perry et al. 2015. Dominance of a natural water source by feral horses. The Southwestern Naturalist 60:390-393; Hall et al. 2016. Influence of exotic wild horses on the use of water by communities of native wildlife in a semi-arid environment. Journal of Arid Environments 127:100-105.)
152.	I strongly object to the hasty dismissal by BLM officials of inputs contained in Sections 2.6.5, 2.6.6, 2.6.7, 2.6.8, and 2.6.9.	Consistent with NEPA regulations, BLM identifies and analyzes alternatives that were considered but eliminated for further review.
153.	Section 6 of the WFHBA authorizes cooperative agreements with landowners and state and local governments to better accomplish the goals of the WFHBA, such as providing complete and unimpeded habitats for long-term- viable wild horse and wild burro populations.	Outside the scope of this analysis. Available data indicates there are excess wild horses that need to be removed from the range to ensure a thriving natural ecological balance.
154.	There are likely other permittees in Nevada emulating Bundy, Borba, and Filippini. Wild horses must not lose their freedom merely so that the BLM can placate greedy and rebellious elements in the human population.	Comment noted. Available data indicates there are excess wild horses that need to be removed from the range to ensure a thriving natural ecological balance
155.	I would just like to comment that the feral horse population control is ultimately your responsibility. Ideally, they should probably be treated as an invasive species, and the populations eliminated, but if you insist on keeping some as “National Pets", you absolutely need to manage their numbers. If nothing else, I might suggest a licensed hunting season.	Comment noted. The WFRHBA does not authorize hunting of wild horses.
156.	Please consider strongly working closely with the horse advocacy groups which monitor these horses continuously and which are more than willing to cooperate and help the BLM to come up with humane	Outside the scope of this analysis.

	and manageable solutions.	
157.	We understand that the wild horse issue is often misunderstood by a passionate lobby that feels non-management is beneficial for the wild horse herds. Unfortunately, such practice injures the horses, the environment and the local economy when we allow unchecked activity to occur. Elko County supports wise wild horse management and public education regarding the negative impacts of wild horse non-management activities.	Comment noted.
158.	There is no analysis of the proposal in front of congress to euthanize all the horses in BLM holding, which is where these horses will nearly all end up. Please fully assess all impacts of this potential action.	Outside the scope of this analysis.
159.	There is significant mining activity occurring in the region that must be fully assessed, and potentially much more occurring, as well. What effect is mining, energy or other exploration or development having (or proposed to have) on ground and surface waters? On wildlife? On patterns of disturbance in and through the HMAs? What studies have been done? How are HMAs being impacted by mining exploration, mining development traffic, blasting, other activities and their effects – including de-watering/aquifer drawdown?	Outside the scope of this analysis.
160.	Reports of starving horses are false. And if the range becomes stressed enough that grass is at a premium, run fewer cattle! Cattle already dominate the wild horses at a 100:1 ratio.	Opinion noted. Available data indicates there are excess wild horses that need to be removed from the range to ensure a thriving natural ecological balance.
161.	On pages 32 and 34 of the EA, BLM disingenuously conflates "principal use" with "single use," and claims to quote from a Senate Conference Report that single use was not intended. Who said it was? We are talking about principal use, not single use. Indeed, the WFRHBA was forward-looking for its time, anticipating the multiple-use concept while providing for principal use for wild-horses in their habitats. This inversion must be righted, and BLM must employ the right mechanisms to do so. First, BLM needs to rescind this EA. Then, it must amend the Land-Use Plans (LUPs), Resource Management Plans (RMPs), Final Multiple-Use Decisions (FMUDs), and Herd Management Area Plans (HMAPs) to conform with the Law regarding principal use.	Neither the WFRHBA nor FLPMA require the equal allocation of forage to wild horses and livestock on public lands, or greater allocation to wild horses. It is not a matter of choosing to manage wild horses and burros rather than domestic livestock or native wildlife. By law, BLM is required to manage wild horses in a thriving natural ecological balance and multiple use relationship on the public lands and to remove excess wild horses immediately upon a determination that excess wild horses exist and their removal is necessary. Excess wild horses are being removed as required by the WFRHBA in order to maintain healthy herds of wild horses on public lands, not for the benefit of livestock. Section 3.3.2.4 in the EA discusses relevant

		information regarding livestock grazing in the Complexes. Changes to the overall multiple use relationship and allocations of forage between wild horses; livestock and wildlife would need to be addressed through the land-use planning process and any future land-use plan amendments. Until such time as the RMP is amended, BLM is required to manage the wild horses within the Complexes in conformance with the applicable land-use plans. 43 C.F.R. § 4710.1.
162.	Moreover, multiple-use does not mean every-conceivable use. Incompatible uses should be excluded…HMAs should be designated "no surface occupancy" (NSO) areas… HMAs should also be declared "off-limits" to off-highway-vehicles (OHVs)…	Outside the scope of this analysis.
163.	There is not any socioeconomic analysis or discussion in the EA. This is disingenuous and wrong. BLM must include the analysis providing the socioeconomic impacts to the local residents and economy due to the overpopulation and overuse by the horses of the forage allocated for wildlife and livestock.	Outside the scope of this analysis. This type of cost data was not developed for this EA, is not part of the mandates under the WFRHBA and therefore has no bearing on the action alternatives and need and purpose. The WFRHBA does not authorize a cost-based decision-making process if excess horses are present. "Proper range management dictates removal of horses before the herd size causes damage to the range land. If the record establishes current resource damage or a significant threat of resource damage, removal is warranted". (118 IBLA 75).
164.	Given that the Proposed Action for the Antelope and Triple B Complexes have no other comparable Action Alternatives in terms of scope, and no specificity in description of proposed actions, it is impossible to analyzes its real welfare, economic, environment, and social impacts. In the absence of specific information and analysis, this EA cannot be deemed as adequate under any construction of NEPA.	Refer to Sections 2.0, 3.0 and 4.0 of the EA.
165.	… older animals (those removed over 5 years of age) could be sold	This would not meet the Purpose and Need.

	without limitation if the President's Budget is implemented…remove only young horses that have an opportunity to become human partners	If Congress were to lift the current appropriations restrictions, then it is possible that excess horses removed from the HMA over the next 10 years could potentially be euthanized or sold without limitation consistent with the provisions of the WFRHBA.
166.	Once any adoptable young horses are removed from the band, the remainder of the band will be released intact…	Outside the scope of this analysis. Given the current overpopulation, monitoring evidence and lack of sufficient water and forage, this approach would not be an adequate means of bringing the wild horse population back to the level necessary to achieve a thriving natural ecological balance because adoption demand would not be sufficient to bring the population back to a thriving natural ecological balance.
167.	The process of habituating wild horses and burros to the presence of humans needs to begin now.	Outside the scope of this analysis.
168.	All horses returned to the HMAs will be cataloged in their bands and photographed with data entry by volunteers… All data will be entered into HorseBase…	Outside the scope of this analysis.
169.	We suggest that a plan be devised for each herd in the complex similar to the Beaty's Butte model…horse gentlers will compensated as in the TIP program…	Outside the scope of this analysis.
170.	The Mustang Heritage Foundation should be consulted on how they can help in this endevour…	Outside the scope of this analysis.
171.	Where in the affected landscape has BLM conducted any vegetation or other "treatments" – and what have been the results? We have observed a profusion of cheatgrass in the "treatments" conducted by BLM in this area.	Outside the scope of this analysis.
172.	What livestock forage seedings have been conducted – over any periods of time? What is their current condition? Where have all fires taken place and what rehab has occurred?	Outside the scope of this analysis.
173.	Range improvements, involving seed dissemination, rest-rotation grazing and other methods that allow range areas in poor condition to recuperate, should also be considered.	Outside the scope of this analysis. BLM manages wild horses under a free roaming nature and does not manage wild horses in the same manner as

		domestic livestock, where measures such as rest rotation grazing or non-use can be implemented.
174.	BLM cannot rely on the woefully deficient Wells RMP that is so old and outdated that it fails to provide an adequate current inventory of the public lands The RMP fails to adequately balance wild horse and livestock grazing.	The Wells RMP and the Wells Wild Horse Amendment are still the guiding documents for the Wells Field Office until such time as a new land-use plan is issued.
175.	Lunch Valley in White Pine County has quite a number of wild horses. Please consider including Lunch Valley in your Fall roundup.	Outside the scope of this analysis. Lunch Valley is not within either of the two Complexes.
176.	Issue fewer oil and gas permits.	Outside the scope of this analysis.
177.	It is our belief that an action with the scope and longevity of this one requires examination within the thorough analysis of a Resource Management Plan (RMP).	Outside the scope of this analysis.
178.	I would like to see regular gathers of horses on all HMA's, including the Antelope Complex and the Triple B Complex, to bring them down to low-AML.	Comment noted.
179.	I would prefer that horses be gathered as close to 100% as possible on all gathers, and that mares and fillies that are going to be released be treated with contraception…preferably one that will be long acting.	Comment noted.
180.	I would like older mares, and any mares that have genetic faults that should not be reproducing, (such as club feet, long backs, poor vision or crooked legs), be given permanent contraception or be humanely	Opinion noted. BLM's euthanasia policy is limited to old, sick or lame horses that meet the necessary criteria for euthanasia.
181.	Per the EA, rangeland disturbance response groups (DRGs) were evaluated per the Key Forage Plant (KFP) Method. However, KFP is obsolete, having been replaced by a new method – Landscape Appearance (LA) Method in 1996.	The Key Forage Method was not "replaced" by the Landscape Appearance Method, it was renamed the Landscape Appearance Method and slightly modified in 1996. Both methods are extremely similar to each other.
182.	BLM fails to consider another factor limiting herd growth – stochastic events – which are random catastrophes such as wildfires or contagious diseases or pesticide treatments that suddenly wipe out mass-numbers of herd members. There was such an event recently in Kazakhstan, where 120,000 endangered Saiga antelope — half the world's population — died off suddenly and inexplicably. • http://www.latimes.com/science/sciencenow/la-sci-sn-saiga-	It is expected that wild horse herds at AML will have a dramatically reduced impact on available vegetation, as noted in Section 3.2.10 of the EA. In the event of a climatic disaster, one would expect that horses would have a much higher survival rate if there is more available forage and water per horse. Therefore, BLM actions that reduce wild horse herd size to AML are expected to increase the long-term resilience of the herds that remain on the range and to reduce the suffering or death of individual animals, in the face of the types of unforeseen events noted by the

	antelope-die-off-20150531-story.html Stochastic events can result in no-growth or even negative growth…BLM must proactively manage the herds per IUCN guidelines, if only in case of stochastic events.	commenter here.
183.	I just published an article in West Newsmagazine about the Pathfinder Initiative program. Please think about this and consider my idea.	Outside the scope of this analysis.
184.	Stop the gather!	Comment noted.

15. APPENDIX X DISCUSSION OF ACREAGE/BOUNDARY DISCREPANCIES IDENTIFIED FOR FOUR HERD MANAGEMENT AREAS

During the public comment period for the Antelope and Triple B Complexes Gather Preliminary EA, one commenter pointed out discrepancies between some Herd Management Area (HMA) acres provided in the gather plan and HMA acres established in the Wells Resource Management Plan Wild Horse Amendment (WRMPWHA). BLM has carefully reviewed the record for each HMA in the Antelope and Triple B Complexes. This review confirms that the acreage figures used in the draft EA were higher than – and inconsistent with – the HMA acres established in the WRMPWHA for four HMAs:

(1) Antelope Valley HMA;
(2) Goshute HMA;
(3) Maverick-Medicine HMA; and
(4) Spruce-Pequop HMA.

Regulations at 43 C.F.R. § 4710.1 mandate that, "Management activities affecting wild horses and burros, including the establishment of herd management areas, shall be in accordance with approved land use plans." BLM's management of wild horses must therefore conform to the acres and boundaries established in the WRMPWHA, which is the approved land use plan for this area. This means that public lands outside the HMA boundaries established in the WRMPWHA are not managed for wild horses and BLM has corrected the Final EA to reflect the same acreage and boundaries for each of the four HMAs as was established in the land-use plan. BLM will also update its Geographical Information System (GIS) data to be consistent with the land-use plan.

BLM's record indicate that the error in acreage for the four HMAs first occurred in the mid-1990s when incorrect boundaries were shown in GIS layers used for inventory purposes, and this error was carried forward in subsequent wild horse gather or management documents. While the correct acreage and boundaries were usedfor the establishment of the current AML for the Spruce-Pequop HMA, this is not the case for the other three HMAs where the documents establishing the AMLs indicated a larger acreage (ranging from 6% to 17% higher depending on the HMA) than was established in the WRMPWHA. It is not clear whether this difference in acreage had any impact on the AMLs for those three HMAs.

Even if the slightly higher acreage value given for the Antelope Valley, Goshute and Maverick Medicine HMAs at the time the AMLs were established resulted in proportionally higher AMLs for those HMAs, this would not affect the proposed action and gather plan described in the Final EA. Even if the AML range were adjusted proportional to the acreage discrepancy, the gather plan would still result in the wild horse population being brought to the lower end of AML. For example, for the Antelope Valley HMA, the current AML range of 155-259 would be 142-238 wild horses if an 8% reduction were applied, and the goal to reduce the wild horse core breeding population to 155 horses under the gather plan remains within the low AML range. For Goshute

HMA, the current AML range of 73-124 would be 68-115 wild horses if a 6% reduction is applied, and the goal to reduce the wild horse population to 73 horses under the gather plan remains within the low AML range; while for Maverick-Medicine HMA, the current AML range of 166-276 would be 138-229 wild horses if a 17% reduction is applied and the goal to reduce the wild horse population to 166 horses under the gather plan remains within the low AML range.

Based on the relatively small acreage discrepancies, the current AML range provides leeway to absorb this discrepancy without affecting the proposed action. Given the large numbers of excess horses that will have to be removed from within and outside of HMA boundaries over the next 6-10 years to reach the AML target in the gather plan, BLM has determined that the BLM's use of incorrect acreage values for the four HMAs does not require any changes to the proposed gather plan. The acreage error does not change the need to remove the significant number of excess wild horses from throughout the gather area (which includes public lands within and outside the HMAs) and to bring the wild horse core breeding population to low AML by removing excess wild horses and applying fertility controls to slow reproductive growth over a 10-year period. The addition of a phased in gelding component under the Proposed Action would also result in a final population that falls within the mid-range of a proportionally adjusted AML for the three HMAs. Furthermore, the phased approach required to reach AML will provide BLM with an opportunity to determine whether any expansion of the HMA boundaries (through a land-use plan amendment) or changes to AML (through a decision-making process) is necessary as a result of the identified error in the HMA boundaries that have been carried forward for the past two decades.

The following tables provide information on when the error in HMA acres first occurred for these four HMAs and whether it was carried forward in establishing the AML. This Appendix also includes maps for the four HMAs showing the HMA boundary established in the WRMPWHA as compared to the acreage values that have been carried forward in BLM documents since the mid-1990s.

Antelope Valley HA/HMA

Since the mid-1990s, BLM has been using a figure of 502,909 acres for the Antelope Valley HMA, instead of the correct 463,540 acres established in the WRMPWHA, which represents approximately an 8% larger area. The 2001 decision document that last reduced the AML for the Antelope Valley HMA shows the incorrect number of acres for this HMA.

Wells Field Office Antelope Valley HA/HMA		
Year	**Document**	**Explanation**
1971	Wild Free Roaming Horse and Burro Act	Herd Areas to be established whe
1975	Inventory Memo	Elko District begins horse invento
1978	Inventory Memo	Inventories are used to establish b horses are observed in the Antelo

Wells Field Office Antelope Valley HA/HMA		
Year	**Document**	**Explanation**
		(Antelope Valley).
1985	Wells Resource Management Plan (RMP)	The Wells RMP lists six HAs in t Antelope Valley HA; (North) Che HA; Maverick-Medicine HA; Spr Toano HA. The RMP lists a cumu animals for all HAs in the Wells I
1993	Wells RMP Wild Horse Amendment (WRMPWHA) to establish HMAs	To solve problems with checkboa identify habitat requirements and establish initial herd size, develop herd size, identify constraints on c combine herd areas for the purpos management of wild horses, the V HMAs, identifies acres by HMA a size for the HMAs. The land use to list acres for HA/HMAs. The RMP Amendment incorporat (North) Herd Area into the Antelo Medicine HMAs, and establishes Antelope Valley HMA at 463,540
1994	Antelope Valley Evaluation and Final Multiple Use Decision (FMUD)	Maintains wild horses in the Ante initial herd size of 240 animals es WRMPWHA. RMP map is used.
1994-present	Inventory flights and monitoring	BLM prepares inventory maps us flights and monitoring. The inver boundaries of the HMA by almos
1995-1998	Spruce Evaluation and Final Multiple Use Decision (FMUD)	Adjusts the Initial Herd Size in A 299 wild horses using map simila
1998	Badlands Evaluation and Final Multiple Use Decision (FMUD)	Maintains AML of 299 for Antelo
2001	Maverick-Medicine Evaluation and Final Multiple Use Decision (FMUD)	Adjusts AML for the Antelope Va horses using inventory map.
2001	Sheep Allotment Complex Evaluation and Final Multiple Use Decision (FMUD)	Maintains AML of 259 wild horse
2001	Antelope Complex Gather Plan EA	Gather Plan EA does not show ac Valley HMA
2004	Antelope Complex Gather Plan EA	Gather Plan EA shows Antelope V acres. Inventory map used.[1]
2010	Antelope Complex Gather Plan EA	Gather Plan EA shows 502,909 ac Valley HMA in the Complex EA.
2013	Three HMA Gather Plan EA	Gather Plan EA shows 502,909 ac Valley HMA in the Complex EA.

[1]There is a slight but insignificant difference in acres between the inventory map and the acres listed in the EA documents.

HMA	Wells RMP Amendment Acres		Subsequent Gather Plan EA Acres
Antelope Valley	463,540		502,909
Acres Difference			+39,369

Goshute HA/HMA

Since the mid-1990s, BLM has been using a figure of 267,267 acres for the Goshute HMA, instead of the correct 250,800 acres established in the WRMPWHA, which represents approximately a 6% larger area. The 2002 decision that last reduced the AML for the Goshute HMA shows the incorrect number of acres for this HMA.

Wells Field Office Goshute HA/HMA Documents		
Year	**Document**	**Comment**
1971	Wild Free Roaming Horse and Burro Act	Herd Areas to be established whe
1975	Inventory Memo	Elko District begins horse invento
1978	Inventory Memo	Inventories are used to establish b horses are observed in the Goshut
1985	Wells Resource Management Plan	The Wells RMP lists six HAs in t Antelope Valley HA; (North) Che HA; Maverick-Medicine HA; Spr Toano HA. The RMP lists a cumu animals for all HAs in the Wells F
1992-1993	Wells RMP Wild Horse Amendment (WRMPWHA) to establish HMAs	To solve problems with checkboa identify habitat requirements and establish initial herd size, develop herd size, identify constraints on c combine herd areas for the purpos management of wild horses, the W HMAs, identifies acres by HMA a size in HMAs. The WRMPWHA acres for HA/HMAs. The RMP Amendment establishes 250,800 acres and the initial herd at 160 wild horses.
1994-present	Inventory flights and monitoring	BLM prepares inventory maps us

Wells Field Office Goshute HA/HMA Documents		
Year	**Document**	**Comment**
		flights and monitoring. The inver boundaries of the Goshute HMA acres.
1995-1998	Spruce Evaluation and Final Multiple Use Decision (FMUD)	Initial Herd Size in the Goshute H horses and uses maps similar to in
2001	Sheep Allotment Complex Evaluation and Final Multiple Use Decision (FMUD)	Adjusts AML for the Goshute HM using inventory map.
2001	Antelope Complex Gather Plan EA	Gather Plan EA does not show ac HMA
2001-2002	Big Springs Allotment Evaluation and Final Multiple Use Decision (FMUD)	Maintains AML of 123 wild hors using inventory map boundaries.
2004	Antelope Complex Gather Plan EA	Gather Plan EA shows Goshute H Inventory map used.
2010	Antelope Complex Gather Plan EA	Gather Plan EA shows 267,267 ac Inventory map used.

HMA	Wells RMP Amendment Acres		Subsequent Gather Plan EA Acres
Goshute	250,800		267,267
Acres Difference			+16,645

Maverick-Medicine HA/HMA

Since the mid-1990s, BLM has been using a figure of 337,134 acres for the Maverick-Medicine HMA, instead of the correct 286,460 acres established in the WRMPWHA, which represents approximately a 17% larger area. The documents that reduced AML after 1994 show the incorrect number of acres for this HMA.

Wells Field Office Maverick-Medicine HA/HMA Documents		
Year	**Document**	**Comment**
1971	Wild Free Roaming Horse and Burro Act	Herd Areas to be established whe
1975	Inventory Memo	Elko District begins horse invento
1978	Inventory Memo	First Inventory completed in Mav Inventories are used to establish b horses observed in the Maverick-l HAs.
1985	Wells Resource Management Plan	The Wells RMP lists six HAs in t Antelope Valley HA; (North) Che HA; Maverick-Medicine HA; Spr Toano HA. The RMP lists a cumu animals for all HAs in the Wells F
1992-1993	Wells RMP Wild Horse Amendment (WRMPWHA) to establish HMAs	To solve problems with checkboa identify habitat requirements and establish initial herd size, develop herd size, identify constraints on c combine herd areas for the purpos management of wild horses, the W HMAs, identifies acres by HMA a size in HMAs. The WRMPWHA acres for HA/HMAs. The RMP Amendment incorporat (North) Herd Area into the Antelo Medicine HMAs and establishes t HMA at 286,460 acres and the ini horses.
1994	West Cherry Creek Evaluation and Final Multiple Use Decision	Adjusts AML for Maverick-Medi horses based on the RMP Map.
1994-present	Inventory flights and monitoring	BLM prepares inventory maps us flights and monitoring. The inven boundaries of the Maverick-Medi approximately 50,000 acres.
1995-1998	Spruce Evaluation and Final Multiple Use Decision	Adjusts Initial Herd Size in Mave map similar to inventory map.
2000	Maverick-Medicine Evaluation and Final Multiple Use Decision	Adjusts AML for the Maverick-M horses using inventory map.

Wells Field Office Maverick-Medicine HA/HMA Documents		
Year	**Document**	**Comment**
2005	Triple B Complex Gather Plan EA.	Gather Plan EA uses 337,134 acre Medicine HMA based on invento
2011	Triple B Complex Gather Plan EA	Gather Plan EA uses 337,134 acre Medicine HMA based on invento
2013	Three HMA Gather Plan EA	Gather Plan EA uses 337,134 acre Medicine HMA based on invento

HMA	RMP Amendment Acres		Subsequen
Maverick-Medicine	286,460		337,134
Acres Difference			+50,674

Spruce-Pequop HA/HMA

The BLM has been using a figure of 223,569 acres for the Spruce-Pequop HMA in gather plans since 2004, instead of the correct 138,000 acres established in the WRMPWHA. However, the correct acres and boundaries were used to establish the current AML for the Spruce-Pequop HMA in the mid-1990s.

Wells Field Office Spruce-Pequop HA/HMA Documents		
Year	**Document**	**Comment**
1971	Wild Free Roaming Horse and Burro Act	Herd Areas to be established whe
1975	Inventory Memo	Elko District begins horse invento
1978	Inventory Memo	First Inventory completed in HA's was not flown.
1985	Wells Resource Management Plan	The Wells RMP lists six HAs in t Antelope Valley HA; (North) Che HA; Maverick-Medicine HA; Spr Toano HA. The RMP lists a cumu animals for all HAs in the Wells F
1992-1993	Wells RMP Wild Horse Amendment (WRMPWHA) to establish HMAs	To solve problems with checkboa identify habitat requirements and establish initial herd size, develop herd size, identify constraints on c combine herd areas for the purpos management of wild horses, the W HMAs, identifies acres by HMA a size in HMAs. The WRMPWHA acres for HA/HMAs. The RMP Amendment establishes at 138,000 acres and the initial he
1994-present	Inventory flights and monitoring	BLM prepares inventory maps us flights and monitoring. The inven boundaries of the Spruce-Pequop 85,000 acres.
1995-1998	Spruce Evaluation and Final Multiple Use Decision (FMUD)	**Establishes AML for Spruce-Pe horses. The decision uses the co Spruce-Pequop HMA and corre WRMPWHA.**
2001	Antelope Complex Gather Plan EA	The Gather Plan EA does not sho
2004	Antelope Complex Gather Plan EA	The Gather Plan EA lists the Spru 223,569 acres. Inventory map use
2010	Antelope Complex Gather Plan EA	The Gather Plan EA shows Spruc acres. Inventory map used.

HMA	RMP Amendment Acres*		Gather Plan EA
Spruce-Pequop	138,000		223,569
Acres Difference			+85,569

* The AML is based on the HMA acres established in the RMP Amendment, not the higher acreage listed in more recent gather plans.

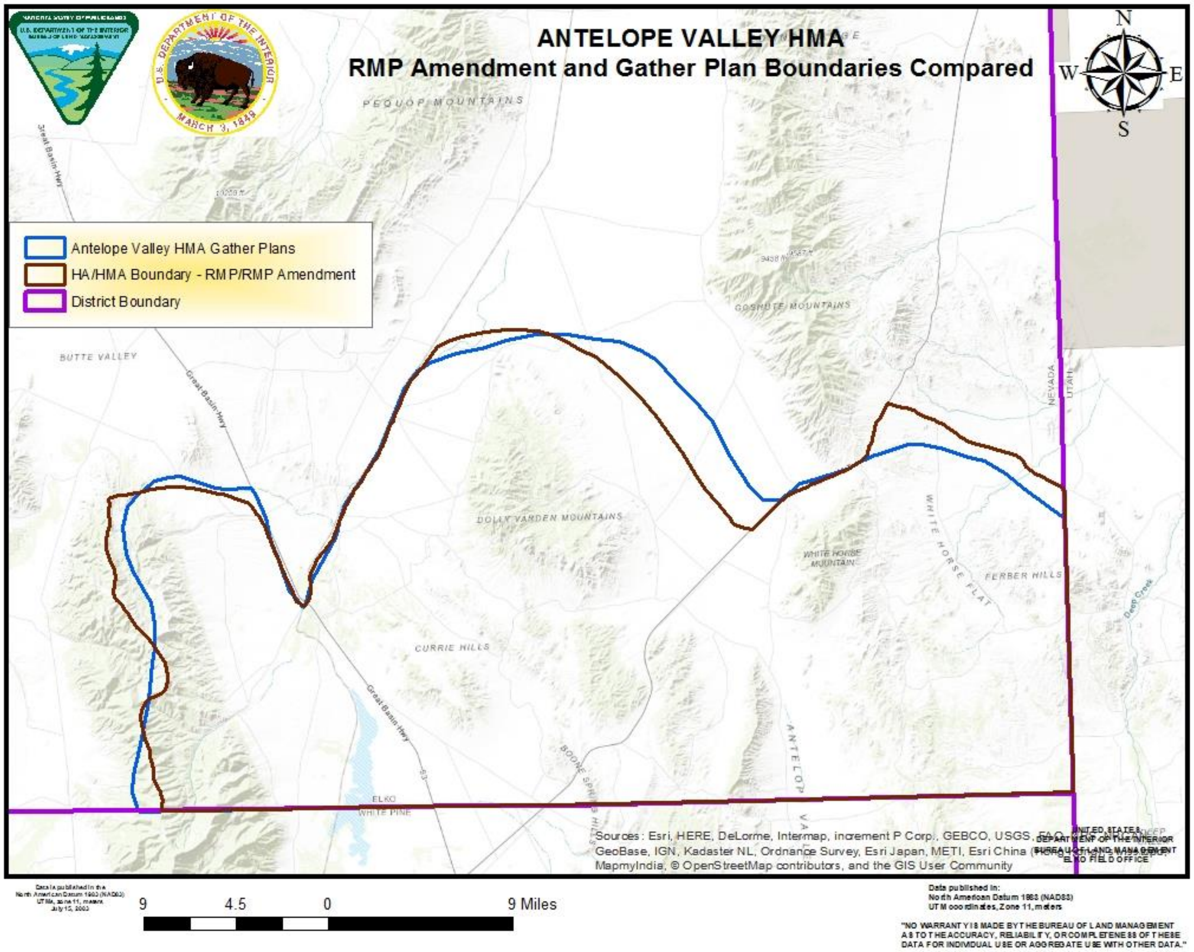


Figure 1. Antelope Valley HMA RMP Amendment and Gather Plan Boundaries Compared.

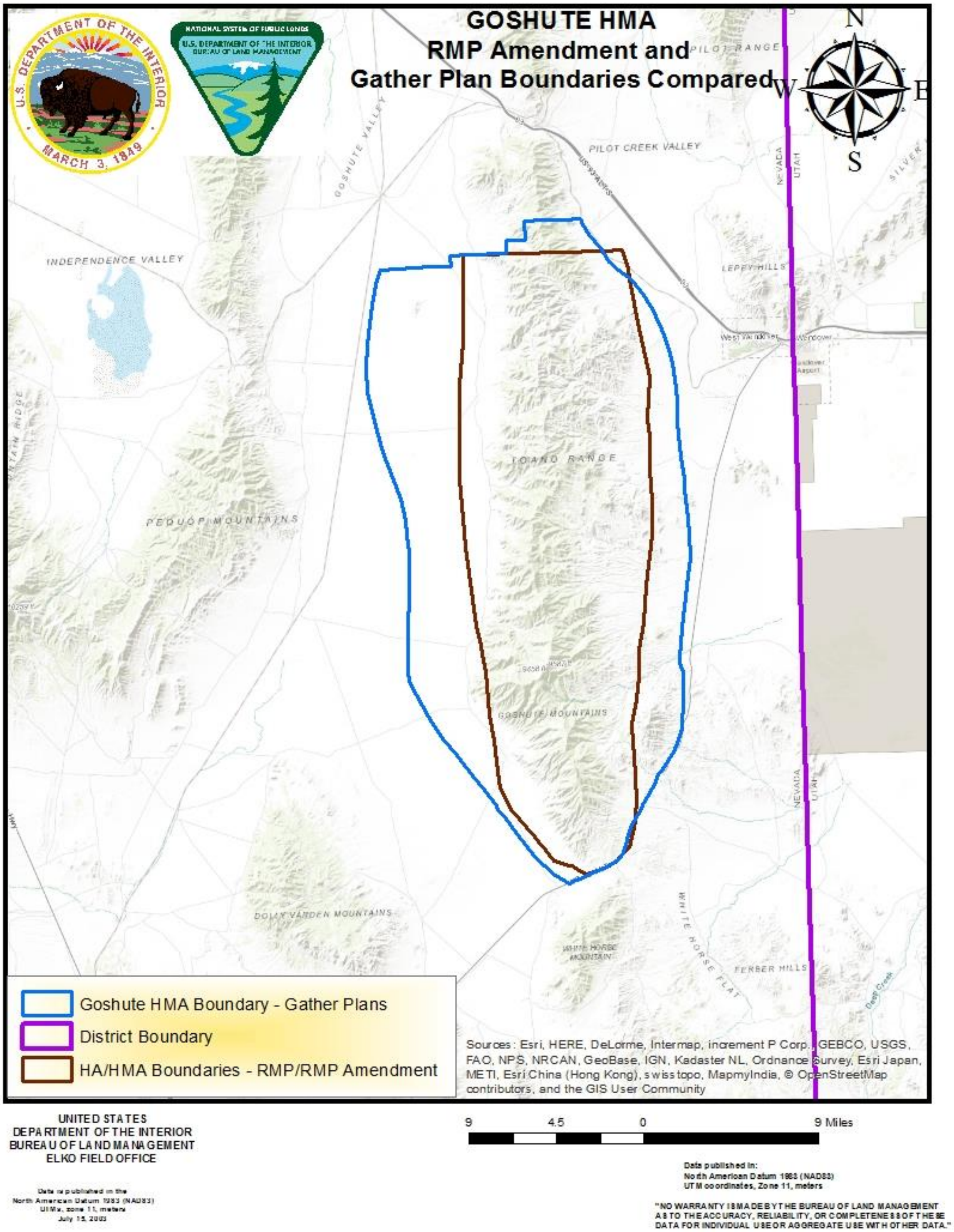


Figure 2. Goshute HMA, RMP Amendment and gather Plan Boundaries Compared.

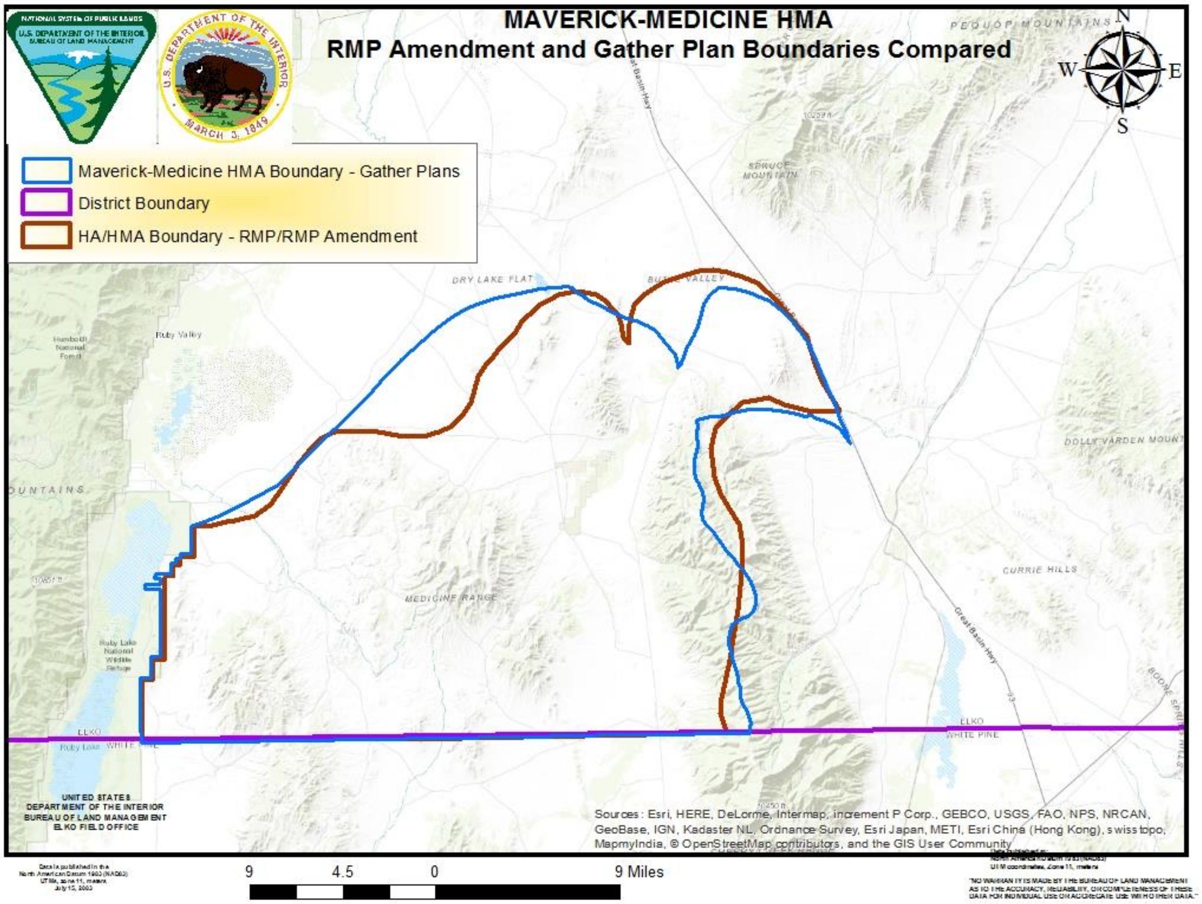


Figure 3. Maverick-Medicine HMA RMP Amendment and Gather PLan Boundaries Compared.

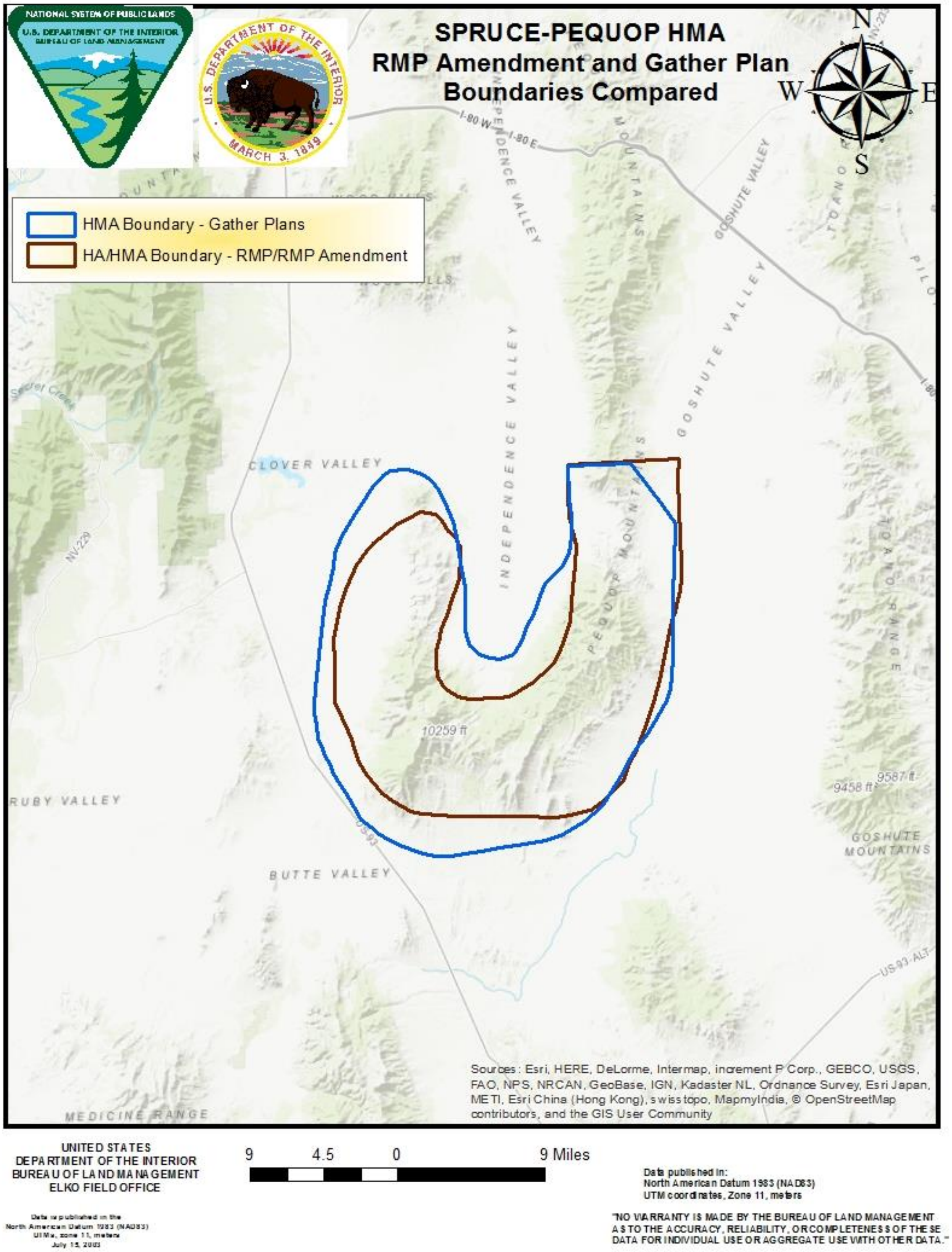


Figure 4. Spruce-Pequop HMA RMP Amendment and Gather Plan Boundaries Compared.