BLM
Sierra Front Field Office, Nevada

Pine Nut Mountains Herd Management Area Plan

ENVIRONMENTAL ASSESSMENT

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It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

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1.0 Purpose of Pine Nut Mountains HMAP Environmental Assessment

1.1 Introduction

This Environmental Assessment (EA) has been prepared to analyze the Bureau of Land Management (BLM) Sierra Front Field Office (SFFO) proposal to prepare a 10 year Herd Management Area Plan (HMAP) for the Pine Nut Mountains Herd Management Area (HMA) starting with an initial gather to remove excess wild horses from within and outside the Pine Nut Mountains Wild Horse HMA .

The Pine Nut Mountains HMAP would establish short and long term management and monitoring objectives for the wild horse herd and their habitat. These objectives would guide management for this HMA. This EA is a site-specific analysis of the potential impacts that could result from the implementation of the HMAP (Proposed Action) or alternatives to the Proposed Action. The EA assists the BLM SFFO in project planning, ensuring compliance with the National Environmental Policy Act (NEPA), and in making a determination as to whether significant impacts could result from the analyzed actions. An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a statement of "Finding of No Significant Impact" (FONSI).

1.2 Background

The HMA is situated in the northern portion of the Pine Nut Mountains, in Douglas, Lyon and Carson City counties, Nevada (Project Vicinity, Figure 1; Project Area, Figure 2). All figures and maps are located in chapter 8.The Pine Nut Mountains Herd Area (HA; Figure 3) and Pine Nut Mountains HMA (Figure 4) are located within the Pine Nut Mountains.

The communities of Carson City, Minden, Gardnerville, Wellington, Smith and Dayton are spread around the edge of the Pine Nut Mountain range. The range, which runs north-south for 38 miles, includes approximately 397,899 acres of mixed ownership (public land, private land, and Indian trust land). The established boundary of the HMA encompasses approximately 90,900 acres of public lands and 14,692 acres of private lands. When the HMA was originally delineated, a large area was delineated around areas where wild horses resided in 1971, and in some cases the area included private lands, such as in the case along the northern edge of the HMA.

The Appropriate Management Level (AML) was established for the Pine Nut Mountains HMA in 1995, in the Final Multiple Use Decision (FMUD). The FMUD established the AML for wild horses by individual grazing allotments within the HMA. The combined total AML for the HMA is between 118-179 animals. The most recent inventory was conducted in 2016 and summarized in Table 1.

A Herd Management Area Plan (HMAP), has not previously been prepared for the Pine Nut Mountains so it is managed in accordance with the current policies and regulations for wild horses, but does not have management objectives specific to the HMA.

Table 1. Wild Horse AML by Grazing Allotment within the Pine Nut Mountains HMA.

Allotment	% in HMA	Wild Horse AML[1]	Wild Horse AUMs (at upper AML)	Animals observed during April 2016 aerial survey (April 2016)
Buckeye	12	27 – 41	493	NA[2]
Churchill Canyon	18	9 – 13	154	8
Clifton	77	24 – 37	444	162
Eldorado Canyon	79	15 – 22	270	92
Hackett Canyon	88	10 – 15	187	24
Mill Canyon	43	17 – 25	296	22
Rawe Peak	100	3 – 5	54	NA[2]
Sand Canyon	85	5 – 8	95	4
Sunrise	97	9 – 13	159	2[3]
Outside of HMA	0	0	0	222

The numbers of horses observed in April 2016 within each of the designated allotments is noted at right -- those do not include horses that were present but not detected. Based on the 536 horses seen in the entirety of the area surveyed, the total estimated herd size for the area surveyed was 579 (90% confidence interval from 543 to 649).
[1] Source: 1995 MUD, BLM 2010.
[2]Not available: These areas have substantial forest cover, small numbers of wild horses were likely present but not observed.
[3] This area has substantial forest cover so additional small numbers of wild horses were likely present but not observed.

The last gather of the Pine Nut Mountains HMA occurred in December 2010, and involved a gather to remove excess horses and to apply fertility control treatment to release mares. Approximately 45 mares were gathered, treated with PZP-22 (a contraceptive which is effective for up to 22 months), freeze marked, and then released back to the HMA. Sixty-five excess wild horses that were residing outside the HMA were removed during this gather (BLM 2010a). Table 2 lists the population inventories and horse removals in the Pine Nut Mountains since 2000.

Between 2012 and 2016 the wild horse population inside and outside of the HMA has increased an average of 17 percent per year. The most recent inventory was conducted April 2016. During this inventory, 536 wild horses were observed in the Pine Nut Mountains (Figure 7). Based on those observations and an analysis of the double-observer (Lubow and Ransom 2016) data from the survey, the estimated number of horses present in the surveyed area during the survey was 579, with a 90% confidence interval of between 543 - 649 horses. Horses outside of the HMA were included in this calculation as horses can move between the HMA and areas outside of the HMA. The current population estimate for 2017, is 694 wild horses, this number includes the estimated population increase for 2017.

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.

In the 2013 National Academy of Science's (NAS) report *"Using Science to Improve BLM Wild Horse and Burro Program"*, the committee's judgment was that the reported annual population statistics are probably underestimates of the actual number of equids on the range inasmuch as most of the individual HMA population estimates are based on the assumption that all animals are detected and counted in population surveys. A large body of scientific literature on techniques for inventorying horses and other large mammals clearly refutes that assumption and suggests that the proportion of animals missed on surveys ranges from 10 to 50 percent. An earlier National Research Council committee and the Government Accountability Office also concluded that reported statistics were underestimates.

A portion of the Pine Nut Mountains HMA contains habitat for the Bi-State Distinct Population Segment (DPS) of the Greater sage-grouse (sage-grouse). The DPS was proposed as threatened under the Endangered Species Act by the U.S. Fish and Wildlife Service (USFWS) in the Federal Register on October 28, 2013. On April 23, 2015 the USFWS withdrew the proposed listing due, in part, to commitments by multiple Federal and state agencies to continue conservation measurements outlined in the *Bi-State Action Plan for Conservation of the Greater Sage-grouse Bi-State Distinct Population Segment* (Bi-State Action Plan). USFWS will continue to monitor the status of the DPS and if, at any time, new information indicates declining implementation of the Bi-State Action Plan, they can initiate listing procedures (USFWS Federal Register, 2015). The sage-grouse is currently considered a Nevada Species of Special Concern. Portions of the HMA include formerly proposed critical habitat for the sage-grouse. The Bi-State Action Plan identifies this area as a priority area for maintaining wild horse numbers at AML and within designated herd boundaries to minimize the risk of excessive use levels to upland and riparian areas, and range expansion thus further impacting sage-grouse habitat.

Table 2. Population Inventory and Horse Removals Since 2000.

Year	Action	Number of Horses*
2000	Removal	40 nuisance horses outside the HMA, Fish Springs area
2000	Population Inventory	329
2000	Removal	40 nuisance horses outside of the HMA, Dayton
2003	Removal	232 horses inside and outside HMA
2003	Population Inventory	118
2006	Removal	25 nuisance horses outside the HMA, Fish Springs area and Dayton
2007	Removal	14 nuisance horses outside the HMA, Fish Springs area
2008	Removal	2 nuisance horses outside the HMA
2008	Population Inventory	177
2009	Removal	10 nuisance horses outside the HMA, Fish Springs area
2010	Population Inventory	206
2010	Removal	46 excess horses removed from outside the HMA; 43 mares treated with Porcine Zona Pellucida (PZP-22), and returned to the HMA
2011	Removal	4 aggressive stallions, Carson City
2012	Removal	2 aggressive stallions, Carson City
2012	Population Inventory	293
2012	Removal	1 injured horse, 7 nuisance horses Dayton and Minden
2013	Removal	19 (13 nuisance and 6 aggressive horses) outside the HMA, Carson City and Fish Spring areas
2014	Removal	6 nuisance horses, Gardnerville
2014	Population Inventory	271 seen (This was an incomplete survey with inadequately-spaced flight lines; many horses were missed, due to tree cover).
2016	Population Inventory	579 estimated (536 seen), 357 inside the HMA, 222 outside the HMA

* Removal of nuisance/aggressive horses is in response to complaints from private land owners, or to provide for public safety.
Source: Modified from BLM 2014a.

1.3 Pine Nut HMA Final Summary of Current Conditions

In June of 2016, the BLM issued a final *Summary of Current Conditions* (Summary) that assessed the factors affecting the Bureau of Land Management's (BLM) ability to achieve and maintain a thriving natural ecological balance and multiple-use relationship on the public lands and protect the range from the deterioration associated with an overpopulation of wild horses (*Equus callabus*). The Summary took into consideration resource management goals, objectives, natural resource conditions and trends. It covered the period from the Final Multiple Use Decision (FMUD; 1995) which established stocking levels, use limits, and management objectives for wild horses and burros, livestock and wildlife to the present. Emphasis was placed on management and rangeland conditions from 2006 to 2016.

The Summary reviewed current conditions of the HMA, identified resources that are not meeting management objectives, determined the cause(s) of not meeting management objectives, and

identified solutions to correct the problems identified. The Summary made the following conclusions and recommendations:

> Monitoring indicates the health of upland areas are primarily trending downward (see photos in Appendix D *of the Summary*). In the north and northeast portion of the HMA, the downward trend of upland vegetative communities coincides with wild horse use levels on perennial grass species in excess of 55 percent. Horse use in this portion of the HMA has been identified as a causal factor contributing to the recent downward trend. Utilization refers to the proportion of the current year's forage production that is consumed and or destroyed by grazing animals. The FMUD established a maximum utilization rate of 55 percent for the combined use by livestock and wild horses.
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> Recommended utilization levels are established depending upon how fully each forage species in the plant community can be defoliated and still maintain or improve in vigor. In 1995 when the FMUD was issued the number of palatable perennial grasses was declining. The FMUD established stocking levels for both wild horses and livestock based on the available forage, and modified livestock grazing seasons to reduce the number of grazing animals during vegetative growth and reproductive periods. With the exception of the Churchill Canyon and Sunrise allotments, virtually no livestock use has occurred within the HMA since 1995, however, as horse numbers have exceeded the AML, their grazing use has exceeded the 55 percent use limit even when there has been no livestock grazing. Palatable perennial grasses (needle grass and rice grass) are continuing to decline within the HMA. Rangeland health data indicates the biotic component of the upland plant communities have moderately departed from the reference conditions due to the absence or reduction of palatable perennial grass species. Holechek (2004) recommends a utilization rate of 30-40 percent for ranges in poor condition. If wild horse use continues to be high or increases, the downward vegetative trend is expected to accelerate further, compromising the HMA's ability to support multiple uses including wildlife and livestock. As a result of overgrazing by wild horses, the rangeland condition is further deteriorating. To address the overuse and loss of perennial grass plants the wild horse population needs to be adjusted to the established AML. Since the AMLs were established by allotment and calculated to maintain or improve rangeland condition, wild horse removals to achieve AML would be carried out and adjusted by grazing allotment.
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> RFAs *(Riparian Functional Assessments)* indicate the health of riparian areas within the HMA are primarily trending downward (see photos in Appendix D *of the Summary*). Of the 26 riparian areas assessed, 23 percent are in PFC *(Proper Functioning Condition)*; 19 percent of the riparian areas are rated FAR *(Functioning-at-Risk)* with a downward trend; and 58 percent of the riparian areas assessed are NF *(Non- Functioning)*. In the northeast portion of the HMA, the riparian areas are rated at FAR and NF primarily due to wild horse impacts, as these areas overlap with the highest wild horse inventory numbers and wild horse use. The exception is Hercules Spring which is in PFC because wild horses do not have access to the riparian zone due to fencing. The other five riparian areas rated PFC have no documented horse use or are reaches of larger systems where the specific reaches do not show evidence of wild horse pressures. Of the 19 percent rated FAR (i.e.,

5 riparian areas), 80 percent have a downward trend due to excessive grazing and hoof action impacting riparian values: four riparian areas have documented impacts from wild horses and one riparian area has documented impacts from livestock (cattle) grazing with no sign of wild horses. Of the 58 percent rated NF, the impacts most commonly are from excessive horse use which has degraded riparian functionality. A few NF riparian areas are showing a drying trend over time, but data is not available to determine the exact causes of loss of riparian functionality, e.g. soil compaction; groundwater draw down from surrounding valleys; or climate change. By adjusting the wild horse population to the established AML for each grazing allotment, pressure on the springs and seeps would be substantially reduced, however, some of the lesser producing springs and seeps may need to be fenced for improvement to occur. Even a small number of horses can adversely impact small riparian areas as a result of compaction due to concentrated hoof action. Compacting wet soils can further decrease flows and prevent riparian vegetation from growing, which can result in the further loss of soils. Actions to restore the ecological balance include gathering and initially removing a sufficient number of excess wild horses to achieve the low AML of each grazing allotment within the HMA, and applying population control treatments to slow the growth of the wild horse population. Additional management actions including continued fertility control treatments and limited or targeted removals would carried out over the [10-year] period of the HMAP. Fencing of some riparian areas may be necessary to allow for recovery to occur, and would be addressed through a separate decision-making process.

Sustainable use requires achieving and maintaining a thriving natural ecological balance and multiple-use relationship between the wild horse population, wildlife, livestock and plant communities within and outside the HMA. Due to the overpopulation of wild horses, removals combined with other management actions are necessary to bring the population back to AML, to prevent further deterioration of rangeland resources, and to allow for the recovery of those rangeland resources. Genetic data would be collected to ensure that acceptable genetic diversity is maintained within the remaining herd. If necessary, a few horses from a different HMA would be released into the HMA to increase genetic diversity.

1.4 Purpose and Need for Action

The Proposed Action (the Pine Nut Mountains Herd Management Area Plan) is designed to, over the next 10-years, achieve and maintain a population size within the established AML, establish short and long term management and monitoring objectives for the wild horse herd, protect rangeland and riparian resources from further degradation, and allow for their recovery to a healthy condition. Initiation and continuance of population control treatments as part of the wild horse management actions will help to slow the growth of the wild horse population, allow for vegetative and habitat recovery and extend the time between large gathers.

The purpose of the Herd Management Area Plan (HMAP) is to restore a thriving natural ecological balance and multiple use relationship on public lands in the area consistent with the

provisions of Section 3(b)(2) of the *Wild Free-Roaming Horses and Burros Act* of 1971 (WFRHBA).[1]

The need arises from resource impacts caused by the current overpopulation of wild horses. Over use has caused soil compaction, removal of vegetation in riparian areas, reduction of perennial grasses and forbs, and an increase in bare soil. There is a need to reduce the amount of bare soil in order to decrease erosion potential. There is a need to increase perennial grass and forb cover to improve habitat and forage for Bi-State sage-grouse and other wildlife. Additionally, there is a need to manage for proper functioning conditions of riparian areas for water resources and habitat values.

Rush Spring, Clifton Allotment: over use by wild horses have compacted the soils at the source, likely decreasing the spring flow, though other factors have likely also contributed to the substantial flow reduction.

Rush Spring, July 21, 2015, the depression filling most of the foreground was the pond, now supporting sagebrush.

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 vs. Clark, supra at 594, the 'benchmark test' for determining the suitable number of wild horses on the public range is 'thriving natural ecological balance.' In the words of the conference committee which adopted this standard: 'The goal of WH&B management should be to maintain a thriving ecological balance (TNEB) between WH&B populations, wildlife, livestock and vegetation, and to protect the range from the deterioration associated with overpopulation of wild horses and burros.'"

Rush Spring May, 1990. This large pool seen to the left in this 1990 photograph has been complety dry for at least the past five years and the flow is now substantially less than one gallon per minute.

Rush Spring, May 1990, a portion of the pool is visible in the upper right.

Urrutia Spring, Clifton Allotment: over use by wild horses has removed all riparian vegetation and thistles are becoming established. The soils have been compacted by overuse.

Urrutia Spring, February 3, 2015.

Urrutia Spring, 1990.

Egus Spring, Clifton Allotment:

Egus Spring July 2013. A second band of horses waiting for the first band of horses to leave the seep. This is one of six low producing seeps in the area where horses may wait hours in the summer for water. Fights between horses are not uncommon in these situations and often the stallions force their band to leave the spring before all of the animals have had an adequate drink. Wildlife undergo stress as they cannot obtain water while the horses wait for the small depressions to fill.

When native bunch grasses are over used (i.e., overgrazed), they will lose vigor, which affects their ability to reproduce. If the over use is at a sufficient level and duration they will eventually die and may be replaced by less palatable or non-native invasive species or noxious weeds. The following are pictures of over used grasses within the HMA.

Over used Indian rice grass in Clifton Allotment, heavy use of 2014 growth March 19, 2015.

Over used *Poa*, Clifton Allotment, March 19, 2015.

Over used needlegrass in Clifton Allotment July 21, 2015.

1.5 Land Use Plan Conformance

This EA is in conformance with the Carson City Field Office Consolidated Resource Management Plan (CRMP), May 2001:

- WHB-1, #2. "Remove excess wild horses from public land to preserve and maintain a thriving ecological balance and multiple-use relationship."
- WHB-2, Desired Outcomes #2 – "Maintain sound thriving populations of wild horses within herd management areas."
- WLD-2, Desired Outcomes #4 – "Maintain and improve wildlife habitat, including riparian/stream habitats, and reduce habitat conflicts while providing for other appropriate resource uses."
- WLD-2, Desired Outcomes #6 – "Maintain or improve the condition of the public rangelands so as to enhance productivity for all rangeland values (including wildlife)."

The Greater Sage-Grouse Bi-State Distinct Population Segment Forest Plan Amendment and Record of Decision (BLM 2016a) outlines certain habitat conditions and restrictions on activities which would impact the management of wild horses in Bi-State habitats.

- B-WHB-S-01: "Appropriate management levels in territories and herd management areas with habitat shall be based on the structure, condition, and composition of vegetation needed to achieve Bi-State DPS habitat objectives."

1.6 Relationship to Laws, Regulations, and Other Plans

The Proposed Action and Alternatives are in compliance with the following federal, State, and local plans to the maximum extent possible:

Federal Land Policy and Management Act (FLPMA) of 1976 (43 U.S.C. 1701 et seq.);

Fundamentals of Rangeland Health (43 CFR 4180);

- Migratory Bird Treaty Act (1918 as amended) and Executive Order 13186;
- National Environmental Policy Act of 1969 (as amended);
- National Historic Preservation Act of 1966, as amended;
- Public Rangelands Improvement Act of 1978;
- State Protocol Agreement between the BLM, Nevada and the Nevada Historic Preservation Office (2009);
- Special Status Species Manual and Direction for State Directors to Review and Revise Existing Bureau Sensitive Species Lists (IM No. NV-2011-059);
- Taylor Grazing Act of 1934 (as amended);
- Wild Free-Roaming Wild horses and Burros Act of 1971 (as amended);
- Wild horses and Burros Management Handbook (H-4700-1);
- Record of Decision and Land Use Plan Amendment for the Nevada and California Greater Sage-Grouse Bi-State Distinct Population Segment in the Carson City District and Tonopah Field Office 2016.

The Proposed Action and action alternatives are consistent with the applicable regulations at 43 CFR 4700 and are also consistent with the WFRHBA, which mandates that BLM "*prevent the range from deterioration associated with overpopulation,*" and "*remove excess wild horses in order to preserve and maintain a thriving natural ecological balance and multiple use relationships in that area.*" Additionally, federal regulations at 43 CFR 4700.0-6 (a) state that, "*Wild horses shall be managed as self-sustaining populations of healthy animals in balance with other uses and the productive capacity of their habitat*."

WFRHBA 1333 (b) (2) (iv) states that once the Secretary determines "…that an overpopulation exists on a given area of the public lands and that action is necessary to remove excess animals, he shall immediately remove excess animals for the range so as to achieve appropriate management levels."

Regulations at 43 CFR 4700.0-6 (a) also direct that wild horses be managed in balance with other uses and the productive capacity of their habitat. 43 CFR 4700 regulations governing the management of wild horses include:

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

- 43 CFR 4710.3-1: Herd management areas. "Herd management areas shall be established for the maintenance of wild horse and burro herds. In delineating each herd management area, the authorized officer shall consider the appropriate management level for the herd, the habitat requirements of the animals, the relationships with other uses of the public and adjacent private lands, and the constraints contained in 43 CFR 4710.4. The authorized officer shall prepare a herd management area plan, which may cover one or more herd management areas."

  Although 43 CFR 4710.3-1 states that the BLM shall prepare a herd area management plan, this regulation does not set a timeframe to complete such plan, nor does the regulation require that a plan be in place in order for the BLM to complete a gather plan.

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

- 43 CFR 4720.1: "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."

1.7 Decision to be Made

The authorized officer would determine whether to implement all, part, or none of the proposed action as described in Section 2.1 to manage wild horses within the HMA. The authorized officer's decision would not adjust livestock use within HMA, as this was set through previous decisions and any grazing management adjustments would be undertaken in conformance with applicable regulations

The BLM is not proposing to re-evaluate the AML at this time. Currently the wild horse population is so far above the AML that an accurate determination of the carrying capacity of the HMA could not be made. Current monitoring data suggests that the current carrying capacity is approximately half of what it was when the AMLs were set. This has resulted from decades of overgrazing that have substantially reduced the amount of native grass plants. The proposed action would adjust the number of wild horses to the low AML by grazing allotment and monitor the response of the native grasses to determine if an adjustment of the AML is necessary in the future.

1.8 Scoping and Identification of Issues

Public Involvement was initiated on this Proposed Action on September 8, 2015 when the BLM released the *Pine Nut Mountains HMA Draft Evaluation* for 45-days, detailing the BLM's monitoring of the conditions in the HMA (BLM 2015a). The document was a synthesis of monitoring and trend data collected by the BLM. On September 8, 2015 the BLM issued a press release providing public notification of the availability of the draft Evaluation and maps. Notification was also made to 94 individuals or organizations on the Carson City District wild horse mailing list, and 27 individuals or organizations on the BLM Nevada State Office wild horse mailing list. On September 10, 2015 the announcement was published in *The Horse* (website), and September 11, 2015 in *The Record-Courier* (newspaper). On September 16, 2015 an article appeared in the *Nevada Appeal* (newspaper; with a statement that the input period had been extended until October 22, 2015). On September 19, 2015 the press release was published on the *Protect Mustangs* website. On September 21, 2015 the BLM issued a second press release announcing the extension of the input period from September 22, 2015 until October 20, 2015. Articles on the public input extension appeared on September 22, 2015 in *The Horse* (website) and *Carson Now* (website), and in the *Reno-Gazette Journal* (newspaper) on September 26, 2015. Although there was an error in the second press release, the BLM on its website stated that input would be accepted until October 22, 2015.

On June 6, 2016 the BLM released a press release announcing a 30-day public scoping period. Notification by email or letter was also made to 94 individuals or organizations on the Carson City District wild horse mailing list, and 27 individuals or organizations on the BLM Nevada State Office wild horse mailing list. On June 6, 2016 the announcement was published in the *Elko Daily News* (newspaper), *KTVN-Reno Channel 2* (internet), *News Locker* (website), *NEWSbout* (website), Topix (website) and the *Record-Courier* (newspaper). The announcement was published in *The Horse* (website) on June 7, 2016 and Virginia City News (newspaper) on June 10, 2016. Posts of the news release were also published on the *American Wild Horse Preservation Campaign, Return to Freedom, Wild Horse Advocates* and *Protect Mustangs* Facebook pages. The public scoping period ended on July 7, 2016. The BLM received 91

unique scoping emails containing comments from individuals and, 4,469 electronically generated mass emails through American Wild Horse Preservation Campaign containing the same comments and two faxes. All unique scoping comments were read, reviewed, and summarized in the scoping report.

Based on internal scoping and experience with previous HMAPs, and gathers, the following issues have been identified:

1. Sustain Healthy Populations of wild horses:
    - Sex ratios
    - Age Distribution
    - Genetic mix (diversity)
    - Population control
    - Gather and Handling Methods

2. Healthy wild horse habitat. Measurement indicators for this issue include:
    - Rangeland Health
    - Potential impacts to vegetation/soils and riparian/wetland resources.
    - Disperse Wild Horse Use (forage utilization).

3. Impacts to individual wild horses and the herd. Measurement indicators for this issue include:
    - Projected population size and annual growth rate (Win Equus population modeling);
    - Expected impacts to individual wild horses from stress due to handling;
    - Expected impacts to herd social structure;
    - Expected effectiveness of proposed fertility control applications;
    - Potential effects to genetic diversity; and
    - Potential impacts to animal health and condition.

4. Impacts to wildlife, migratory birds, and threatened, endangered, and special status species and their habitats. Measurement indicators for this issue include:
    - Potential for temporary or prolonged displacement or disturbance of wildlife species;
    - Potential for trampling of wildlife species, nests, or habitats;
    - Potential competition for forage and water over time;
    - Inadequate or poorly maintained water sources to aid in dispersal of wild horses throughout the HMA.

2.0 Proposed Action and Alternatives

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

2.1 Management Actions Common to Alternatives A, B and C

The Proposed Action and Alternatives B and C are the development and adoption of a Pine Nut Mountains Herd Management Area Plan (HMAP) that would be implemented to manage wild horses in the Pine Nut Mountains HMA over the next 10 years. The Pine Nut Mountains HMAP would establish short and long term management and monitoring objectives for the wild horse herd and their habitat guiding management for the Pine Nut Mountains HMA; establish targets and triggers for adaptive management; and implement policies and Standard Operating Procedures for management of wild horses and their habitat with the Pine Nuts using a range of management tools that include removal of excess horses and use of fertility controls (except for Alternative B) to slow down the rate of reproduction. The HMAP includes:

- Habitat Objectives
- Herd Population Objectives
- Routine Monitoring, Evaluation, and Triggers for Management Actions
- Methods and Procedures for Gather and Removal of Horses to include helicopter capture, bait and/or water trapping.
- Use of Fertility Controls in the form of PZP and related formulations, or GonaCon, administered by injection or darting, or other Population Control Methods (except for Alternative B)
- Range Improvements
- Water Hauling
- Partnerships
- Public Information & Education
- Evaluate at 10 years.

The Proposed Action would authorize management of the Pine Nut Mountains HMA consistent with the HMAP and begins in the first year of the Proposed Action with an initial gather of approximately 600 or more horses from the Pine Nuts, in order to remove a sufficient number of excess wild horses to reach low end AML by grazing allotment, as a corrective action to address current degraded habitat conditions and downward habitat trend. The initial gather would take place in Fiscal Year 2018 and will be conducted in the Clifton, Eldorado Canyon, Mill Canyon and Hackett Canyon grazing allotments within the HMA, and in areas outside of the HMA. BLM would gather as many wild horses as can be captured in those areas in order to remove excess wild horses to reach low AML by allotment and to release selected horses back into the HMA after applying fertility controls (except for Alternative B, which would not apply contraceptives) to released mares. Initial gather activities would not include the Buckeye, Churchill Canyon, Rawe Peak, Sand Canyon and Sunrise grazing allotments, as they were within AML for their respective allotment when the last inventory was completed.

Habitat improvement projects such as riparian and spring protection exclosures would be evaluated in a separate EA.

- Gather operations involve areas beyond the HMA boundaries.
- Gather operations would be conducted in accordance with the Comprehensive Animal Welfare Program (CAWP) for Wild Horses and Burro Gathers, which includes provisions of the Comprehensive Animal Welfare Program (BLM Instructional Memorandum 2015-151). A combination of gather methods may be used to complete the management actions and will depend on the needs of the specific actions to which method will be used. This EA and decision would address management needs in regards to public safety, emergency situations and private land issues.
- Trap sites and temporary holding facilities would be located in previously used sites or other disturbed areas whenever possible. Undisturbed areas identified as potential trap sites or holding facilities would be inventoried for cultural resources. If cultural resources are encountered, these locations would not be used unless they could be modified to avoid impacts to cultural resources.
- Decisions to humanely euthanize animals in field situations would be made in conformance with BLM policy (Washington Office Instruction Memorandum 2015-070). Current policy reference:
  http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2009/IM_2009-041.html
- Data including sex and age distribution, condition class information (using the Henneke rating system), color, size and other information may also be recorded, along with the disposition of the animal (removed or released).
- Hair samples would be collected from a minimum of 25 animals returned to the range from each HMA to assess the genetic diversity and pedigree of the herds. Samples would also be collected during future gathers as needed to determine whether BLM's management is maintaining acceptable genetic diversity (avoiding inbreeding depression).
  If at any time in the future the genetic diversity there 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 throughout the Ely Districts other HMAs.
- A BLM contract Veterinarian, Animal and Plant Health Inspection Service (APHIS) Veterinarian or other licensed Veterinarian would be on call or on site as the gather is started and then as needed for the duration of the helicopter gather to examine animals and make recommendations to the BLM for the care and treatment of wild horses, and ensure humane treatment. Additionally, animals transported to a BLM wild horse facility are inspected by facility staff and the BLM contract Veterinarian, to observe health and ensure the animals have been cared for humanely.
- Noxious weed monitoring at gather sites and temporary holding corrals would be conducted following the gather by BLM.
- Monitoring of rangeland forage condition and utilization, water availability, aerial population surveys and animal health would continue.
- A comprehensive post-gather aerial population inventory would occur within 12 months following the completion of the gather operation.

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

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

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

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

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

When actively trapping wild horses, the trap would be staffed or checked on a daily basis by either BLM personnel or authorized contractor staff. Horses would be either removed

immediately or fed and watered for up to several days prior to transport to a holding facility. Existing roads would be used to access the trap sites.

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

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

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

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

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

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

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

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

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

Euthanasia or Sale without Limitations
Under the WFRHBA, healthy excess wild horses can be euthanized or sold without limitation if there is no adoption demand for the animals. However, while euthanasia and sale without limitation are allowed under the statute, these activities have not been permitted under current Congressional appropriations for over a decade and are consequently inconsistent with BLM policy. 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 WFRHBA.

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

Public Viewing Opportunities
Opportunities for public observation of the gather activities on public lands would be provided, when and where feasible, and would be consistent with WO IM No. 2013-058 and the Visitation Protocol and Ground Rules for Helicopter WH&B Gathers. This protocol is intended to establish observation locations that reduce safety risks to the public during helicopter gathers (see Appendix II).

2.2 Management Actions Common to Alternatives A, and C

BLMs Use of Contraception in Wild Horse and Burro Management
Expanding the use of population growth suppression (PGS) to slow population growth rates and reducing the number of animals removed from the range and sent to long-term grassland pastures is a BLM priority. The WFRHBA of 1971 specifically provides for sterilization (section 1333.b.1). No determination 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, it merely reduces future reproduction.

Successful contraception would be expected to reduce the frequency of horse gather activities, 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 is done in a way that entails capturing and handling horses, the risks and costs associated with capture and handling of horses may be comparable to those of gathering for removal, but with expectedly lower adoption and long-term holding costs. Population suppression becomes less expensive if fertility control is long-lasting (Hobbs et al. 2000). Although contraceptive treatments may be associated with a number of potential physiological, behavioral, demographic, and genetic effects, detailed in Chapter 4, Environmental Effects, 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).

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

PZP Vaccine

PZP vaccines have been used on dozens of horse herds by the National Park Service, US Forest Service, Bureau of Land Management, and Native American tribes and its use is approved for free-ranging wild horse herds. Taking into consideration available literature on the subject, the National Research Council (NRC) 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 produced as ZonaStat-H, an EPA-registered commercial 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) and may be used in PZP vaccines in the future. PZP vaccine 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).

The BLM currently uses two PZP formulations for fertility control of wild horse mares, ZonaStat-H (PZP Native) and PZP-22. Both current forms can safely be reapplied as necessary to control the population growth rate. Even with repeated booster treatments of PZP, it is expected that most mares would return to fertility, though some mares treated repeatedly may not (see *Chapter 4, Environmental Effects*). As other formulations are approved for use by BLM, they may be applied through future gathers or darting activities. For the purpose of this management plan, field or remote darting refers to applying the vaccine using a dart. Darting can be implemented when animals are gathered into corrals or opportunistically by applicators near water sources or along main WH&B trails out on the range. Blinds may be used to camouflage applicators to allow efficient treatment of as many mares as possible. PZP can also be applied via hand injections using plastic syringes when animals are gathered into corrals and chutes.

Native PZP (or currently most effective formulation) would be administered by PZP certified and trained applicators in the one year liquid dose inoculations by field darting the mares. Prior to actually darting, an inventory of the WH&Bs would be conducted. This would include a list of marked horses and / or a photo catalog with descriptions of the animals to assist in identifying which animals have been darted and which need to be darted.

When applying native PZP, first the primer with modified Freund's Complete adjuvant is given and then the booster with Freund's Incomplete adjuvant is given 2-6 weeks later but preferably no later than 1-2 weeks prior to the onset of breeding activity. Following the initial 2 inoculations, only annual boosters are required. In keeping with the federal registration for ZonaStat-H (EPA 2012; reg. no. 86833-1), certification through the Science and Conservation Center in Billings Montana is required to either receive and/or apply that vaccine to equids. The equine contraceptive certification class is 2.5 days and is 50% educational and 50% hands-on training, designed to provide the trainee with enough background to explain the science to supporters, critics, the general public or the press. For maximum effectiveness, PZP would be administered within the December to February timeframe. The procedures to be followed for application of PZP are detailed in *Appendix A. Standard Operating Procedures for Population-level Porcine Zona Pellucida Fertility Control Treatments.*

For the PZP-22 formulation administered during gathers, each released mare would receive a single dose of the two-year PZP contraceptive vaccine at the same time as a dose of liquid PZP vaccine with modified Freund's Complete adjuvant. The pellets are applied to the mare with a large gauge needle and jab-stick into the hip. Although PZP-22 pellets have been delivered via darting in trial studies (Rutberg et al. 2017), BLM does not plan to use darting for PZP-22 delivery in this HMA until there is more demonstration that PZP-22 can be reliably delivered via dart. Therefore, WH&Bs must be gathered for each application of this formulation.

It is anticipated that the use of darting, bait/water and periodic helicopter trapping would be necessary to continue to implement fertility control treatments to mares born on the range and re-treat previously treated mares to maintain the established AML ranges once the animals are initially reduced to the low AML, since a percent of mares will not be captured and treated future removals may be necessary, however, fewer animals would need to be removed if the contraceptive techniques are effective.

Under the Proposed Action, the BLM would return to the HMA as needed to re-apply PZP and initiate new treatments in order to maintain contraceptive effectiveness and remove excess animals. PZP can safely be reapplied as necessary. Even with repeated booster treatments of PZP, it is expected that most, if not all, mares would return to fertility (see *Chapter 4, Environmental Effects*).

GonaCon

The immune-contraceptive GonaCon-B (which is produced under the trade name GonaCon-Equine for use in feral horses and burros) was found by the NRC (2013) to be one of the most preferable available methods for contraception in wild horses and burros, 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). GonaCon-Equine has been used on feral horses in Theodore Roosevelt National Park and on wild horses in one BLM-administered HMA (BLM 2015). GonaCon-Equine can be remotely administered in the field in cases where mares are relatively approachable, using a customized pneumatic dart (McCann et al. 2017). Use of remotely delivered (dart-delivered) vaccine is generally limited to populations where individual animals can be accurately identified and repeatedly approached within 50 m (BLM 2010). As with other contraceptives applied to wild horses, the long-term goal of GonaCon-Equine use

is to reduce or eliminate the need for gathers and removals (NRC 2013). GonaCon-Equine vaccine is an EPA-approved pesticide (EPA, 2009a) that is relatively inexpensive, meets BLM requirements for safety to mares and the environment, and is produced in a USDA-APHIS laboratory. Its categorization as a pesticide is consistent with regulatory framework for controlling overpopulations of 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).

GonaCon is an immunocontraceptive vaccine which has been shown to provide multiple years of infertility in several wild ungulate species including horses (Killian et al., 2008; Gray et al., 2010). GonaCon uses the gonadotropin-releasing hormone (GnRH), a small neuropeptide that performs an obligatory role in mammalian reproduction, as the vaccine antigen. When combined with an adjuvant, the GnRH vaccine stimulates a persistent immune response resulting in prolonged antibody production against GnRH, the carrier protein, and the adjuvant (Miller et al., 2008). The most direct result of successful GnRH vaccination is that it has the effect of decreasing the level of GnRH signaling in the body, as evidenced by a drop in luteinizing hormone levels, and a cessation of ovulation (see *Chapter 4, Environmental Effects*). The lack of estrus cycling that results from successful GonaCon vaccination has been compared to typical winter period of anoestrus in open mares. As anti-GnRH antibodies decline over time, concentrations of available endogenous GnRH increase and treated animals usually regain fertility (Power et al., 2011).

Like ZonaStat-H, GonaCon-Equine vaccine is an EPA-approved vaccine (EPA, 2009a) that is relatively inexpensive, meets BLM requirements for safety to mares and the environment, and is produced in a USDA-APHIS laboratory. The intended effect of the vaccine is as a contraceptive. GonaCon is produced as a pharmaceutical-grade vaccine, including aseptic manufacturing technique to deliver a sterile vaccine product (Miller et al. 2013). If stored at 4° C, the shelf life is 6 months (Miller et al 2013).

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

The BLM would return to the HMA as needed to re-apply GonaCon-Equine and initiate new treatments in order to maintain contraceptive effectiveness in controlling population growth rates. GonaCon-Equine can safely be reapplied as necessary to control the population growth rate; booster dose effects may lead to increased effectiveness of contraception, which is generally the intent. If GonaCon is selected for use the released mares would be treated with the population growth suppression vaccine GonaCon™ instead of PZP-22. Treated animals would need to be held for a minimum of thirty days after first treatment to administer a booster shot to increase efficacy and treatment longevity. This immunocontraceptive vaccine has been shown to provide multiple years of infertility in several wild ungulate species including horses (Killian et al., 2008; Gray et al., 2010). GonaCon utilizes a gonadotropin-releasing hormone (GnRH) which is a small

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.

2.3 Alternative A: Proposed Action--Proposed HMAP

Implement HMAP with a management strategy which would include a number of population control methods, including removals and fertility control. An initial gather would occur to bring the population down to the low AML for each grazing allotment, mares released back into the HMA would receive a contraceptive vaccine, initially PZP-22, ZonaStat-H or GonaCon would most likely be used.

A number of horses outside the HMA reside in the Fish Springs area, this area is within the original HA and was removed from the HMA in 1983, as a result of complaints from private land owners and the Bureau of Indian Affairs on behalf of allotment owners. The land ownership pattern in this area is mixed between public and private with urban interface along the western edge creating management challenges as the horses move freely between these lands. Wild horses in this area have been involved in traffic accidents, acted aggressively toward the public, domestic horses and damaged landscaping. Under this alternative the wild horses in this area would be reduced down to a level as outlined in the HMAP forage utilization limits and the area evaluated for suitability and possible designation as a HMA. In the interim, volunteers would apply a contraceptive such as ZonaStat-H to prevent pregnancies. If it is determined that all the habitat requirements are present for wild horses an RMP amendment would be initiated to expand the HMA in this area (Appendix I, Fish Springs Area Interim Management). Nuisance wild horses would continue to be removed when complaints are received.

Through the life of this plan it is anticipated that subsequent gathers and removals to maintain AML would be necessary as the various contraceptive formulations are not 100 percent effective and in most cases only 80 percent of the population present can be captured. This gather efficiency leaves approximately 20 percent of the mares un-treated. In addition, 10 percent of the treated mares will not be affected by the contraceptive due to approximately 90% efficacy rate of the vaccine.

After the initial gather subsequent gathers and removals would occur to maintain AML and vaccinate and revaccinate the mares with contraceptives. Mares may also be treated utilizing remote darting by either trained volunteers or BLM personnel. Removals of nuisance animals that frequent roads or private property would occur as needed as would limited removals between larger gathers to remove concentrations of animals adversely impacting sensitive areas such as riparian areas and springs. The consistent use of contraceptives would, over time, reduce the number of excess horses that need to be removed.

2.4 Alternative B: Proposed HMAP without Contraceptives

Alternative B would implement All Gather Options in Alternative A, the Proposed Action, except that mares would not be treated with contraceptives in order to maintain AML.

2.5 Alternative C: Proposed HMAP plus Geld and Spay

Alternative C would implement All Gather and Treatment Options in Alternative A, the Proposed Action. In addition, some horses would be spayed (ovarietomy being the likely method) or gelded as an additional population control method. Older mares would be selected for spaying as they would have had a chance to contribute their genes, additionally mares that have inherited deleterious traits such as blue eyes or clubbed feet would be spayed if they appeared to be maintaining a good body condition and free of pain. Similar criteria would be used in selecting stallions for castration. The Standard Operating Procedures for Spaying and Field Castration is included in Appendix B. Under this alternative:

- Approximately 20% of the male population of the herd would be managed as non-breeding geldings.
- Approximately 50% of the female population of the herd) would be managed as non-breeding (sterile) mares. This percentage may be adjusted depending on results and population modeling.
- The balance of the herd would be managed as a breeding population.

Spaying Procedures
Spaying is proposed as a tool to assist in maintaining the AML range within the HMA. Here, and throughout this EA, the word 'spay' is used to mean ovariectomy; in dogs and cats spaying is actually more invasive. Spaying is a contraception technique that requires an animal to be handled only once, but could reduce long-term population growth rates if spayed mares are included as part of a reproducing population. Decreasing the numbers of excess WH&Bs removed while also reducing population growth rates and ensuring the welfare of WH&Bs on the range are all consistent with findings and recommendations from the National Academy of Science (NRC 2013), American Horse Protection Association (AHPA), the American Association of Equine Practitioners (AAEP), Humane Society of the United States (HSUS), GAO, OIG, and current BLM policy.

This management action is proposed to manage for a non-breeding component of approximately 50 percent of the mares, within the life of this plan this percentage may be adjusted depending on results and population modeling. If the population is projected to increase above the upper AML more mares would be spayed, if the population increases slower than expected spaying and the use of contraceptives would be reduced until the population is once again projected to increase to or above the upper AML.

The choice of safest method to use for a given mare would be at the discretion of the attending veterinarian, with consideration given to the health and safety of both horse and veterinarian (Appendix B). If it is determined that surgery is not feasible for any reason, no surgery would be conducted. Licensed veterinarians would spay mares that BLM believes to have reproduced. Mares selected for spaying would have a body condition score of 4 or above. No animals which

appear to be distressed, injured, or in failing health or condition would be selected for spaying. Mares would not be spayed within 36 hours of capture. The surgery would be performed in aseptic conditions at either a temporary holding facility at the gather location or at a BLM-managed holding center by a licensed veterinarian using appropriate anesthetic agents and surgical techniques. Specific anesthetic agents used would be determined by the on-site veterinarian. The final decision of which specific animals would be spayed would be based on the professional opinion of the attending veterinarian in consultation with the Authorized Officer. Spayed animals will be observed in holding after surgery to ensure they have recovered before release.

When spaying procedures are done in the field, mares would be released near a water source, when possible. When the procedures are performed at a BLM-managed facility, selected mares would be shipped to the facility, spayed, held in a separate pen to minimize risk for disease transmission, and returned to the range within 30 days.

For both procedures, feed would be withheld from mares for 24 hours prior to surgery for maximum evacuation of the bowels, allowing adequate room in the abdomen for surgery with minimal interference from the intestines. Holding mares off feed minimizes the potential negative impact of distended intestines near the surgical region. Water would not be withheld. Surgery would take place with horses standing in a squeeze chute, prepared as aseptically as possible. Veterinary surgeons would wear caps, masks, sterile gowns and use sterile gloves. After recovering from the procedure these mares would be released back onto the HMA.

BLM will attempt to monitor spayed animals periodically for complications for approximately 7-10 days post-surgery and release, though they will be held in pens for up to 30 days. 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 mares 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. Spayed animals may be freeze marked with an identifying marker and/or micro-chipped to minimize the potential for future recapture and to facilitate post-treatment and routine field monitoring.

Gelding Procedures

Stallions selected for gelding would be between 10-20 years of age and have a body condition score of 4 or above per the Henneke Scale. No animals which appear to be distressed, injured, or in failing health or condition would be selected for gelding. Stallions would not be gelded within 36 hours of capture. The surgery would be performed at either a temporary holding facility at the gather location or at a BLM-managed holding center by a licensed veterinarian using appropriate anesthetic agents and surgical techniques (Appendix B, Standard operating Procedures for Field Castration and Spaying). Specific anesthetic agents used would be determined by the on-site veterinarian. The final decision of which specific animals would be gelded 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, but only if the veterinarian has determined that the geldings have recovered from the 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.

BLM will attempt to monitor gelded animals 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. Gelded animals may be freeze marked with an identifying marker and/or micro-chipped to minimize the potential for future recapture and to facilitate post-treatment and routine field monitoring.

Population inventories and future gather statistics would assist BLM in determining if managing a portion of the herd as non-breeding animals, in conjunction with other population control techniques, is an effective approach to slowing the annual population growth rate and extending the gather cycle.

This alternative proposes to use gelding in conjunction with the other tools described above to meet the purpose and need. By itself, it is unlikely that sterilization (gelding) would allow the BLM to achieve its WH&B population management objectives since a single stallion is capable of impregnating multiple mares. Population modeling by Garrott and Siniff (1992) indicated that adequate reduction of population growth may only result if a large proportion of male WH&Bs in the population are sterile.

2.6 Alternative D: No Action- No Gather and Removal

Under this Alternative no gather would occur and no management actions identified in the proposed HMAP would be undertaken to control the size of the wild horse population at this time.

- Routine monitoring of utilization, forage condition, water availability, animal health and periodic population census and sampling for genetic diversity would continue.
- Existing water developments would be periodically maintained.
- Nuisance animals and those posing a risk to public safety would be removed on a case-by-case basis.

2.7 Alternatives Considered But Eliminated From Further Analysis

The following alternatives that have been proposed by members of the public for wild horse gathers in other Nevada HMAs were considered but eliminated from further analysis for the reasons stated below.

Water/Bait Trapping as the Sole or Primary Gather Method.
Water trapping as the sole capture technique within the Pine Nut Mountains HMA is impracticable due to the large area that the wild horses range, limited road access to potential trap sites, and scattered water sources to effectively achieve the purpose and need. Under all the alternatives analyzed, bait/water trapping may occur after the initial gather to remove limited or targeted numbers of excess horses, to apply fertility controls, or to achieve the initial gather objectives if a sufficient number of horses were not captured by helicopter. However, it would

not be an effective sole or primary method to achieve the Proposed Action based on the current wild horse population size and distribution. However, partial water/bait trapping was carried forward for analysis.

Designation of the HMA to be Managed Principally for Wild Horses.
This action under 43 CFR 4710.3-2 would require the amendment of the CRMP, which is outside the scope of this preliminary EA. Only the BLM Director or Assistant Director (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 a land use planning process.

Gathering Wild Horses to the Upper Limit of the AML for the HMA.
This alternative would only remove the number of excess horses necessary to achieve the upper limit of AML. A post-gather population size at the upper limit of the AML (179 animals) would likely result in the AML being exceeded following the next foaling season. The upper limit of the AML represents the maximum population at which a thriving natural ecological balance can be maintained. However, the overgrazing that has been documented and that is attributed to an overpopulation of wild horses has led to the deterioration of rangeland resources, and gathering to upper limit AML would not provide sufficient opportunity for resource recovery or address the overuse problems in the Clifton, Eldorado, Hackett Canyon, and Mill Canyon allotments. Reducing numbers to the lower limit and implementing population growth control allows for a longer interval between periodic gathers and reduces the potential for the AML being exceeded significantly during the intervening period between gathers.

Natural Population Controls.
Wild horse populations increase or decrease based on a number of natural factors such as: the nutritional value of forage consumed, weather, disease, and predation. Although some predation of young foals can occur, generally their survival rate is very high. As evidenced by the population growth rates in the HMA over the past decades, natural predation and other natural factors have not resulted in mortality rates or declines in growth rates that would maintain the wild horse population within AML and have not prevented over use and deterioration of the range due to excess wild horse numbers.

Control the Excess Wild Horse Populations with Use of ZonaStat-H and/or PZP-22 Only.
This alternative would gather a significant portion of the existing population and implement fertility control treatments only, without removal of excess wild horses. This alternative would not bring the wild horse population to AML and the wild horse population would continue to grow as PZP is not 100% effective and under most circumstances less than 80% of the population can be gathered. Thus, the population would continue to increase, albeit at a slower rate of growth. Given the level of resource deterioration that has been documented with the current overpopulation, failing to remove excess wild horses to low end AML would allow existing resource concerns to escalate and allow range resources to pass a threshold beyond which they will be unable to recover. Implementation of this alternative would also incur significant gather and fertility control costs without achieving a thriving natural ecological balance. This alternative would not meet the purpose and need for the Proposed Action and was eliminated from further consideration.

Letting Nature Take its Course.
This alternative would leave excess wild horses on the range under the view that the population would eventually self-regulate when the range can no longer sustain the existing wild horse population. The resulting starvation and / or dehydration would be another way to achieve 'natural population controls,' as noted above. However, by the time the wild horse population reaches the point of significant enough mortality from the depletion of habitat (vegetation and water), rangeland resources can be completely and irrevocably depleted beyond the point of recovery. This approach would also result in significant animal suffering, mortality and irrevocable habitat damage. Areas within the HMA have been documented as having heavy to severe grazing use by an excess of wild horses. This overpopulation has contributed to wild horses leaving the HMA to take up residence outside the HMA in their search for food and water. If the population continues to increase, this would put further pressure on vegetative and water resources – both within and outside the HMA, potentially resulting in irreversible degradation of some of these resources as well as increasing the potential for public safety concerns and impacts to private property.

Allowing continued damage to rangeland resources as a result of excess numbers of wild horses is contrary to the WFRHBA (Refer to Section 1.2). If the vegetative and water resources are inadequate to meet the needs of an overpopulation of wild horses on the range, the weaker animals -- generally the older animals, mares, and foals -- are the first to be impacted, suffering from morbidity and/or death. The resulting population could become more heavily skewed towards the stronger stallions which could lead to significant social disruption in the HMA. Under this alternative, the vegetative and water resources would likely be impacted so severely as to reach the point where they have no potential for recovery. For these reasons, this alternative was eliminated from further consideration.

Make on-the-Ground and Individualized Excess Wild Horse Determinations Prior to Removal.
This alternative would be to make on-the-ground, and individualized excess wild horse determinations prior to removal under the view that a tiered or phased removal of wild horses from the range is mandated by the WFRHBA.[2] Specifically, the BLM would first identify and remove old, sick or lame animals in order to euthanize those animals on the range prior to gather. Second, the BLM would identify and remove wild horses for which adoption demand exists by qualified individuals, such as younger wild horses or wild horses with unusual and interesting markings. Lastly, the BLM would remove any additional excess wild horses necessary to bring the population back into AML.

A tiered approach assumes that only a portion of the wild horse population is excess and that some number of horses would still remain on the range following the gather. This assumption does not apply, however, to wild horses outside the boundaries of the HMA, as all of those horses are excess and need to be removed.

[2] The view that the WFRHBA requires a tiered removal process has been litigated and rejected by Federal courts. See *In Defense of Animals v. Salazar*, 675 F. Supp. 2d 89, 97-98 (D.D.C. 2009); *In Defense of Animals v. United States DOI*, 909 F. Supp. 2d 1178, 1190-1191 (E.D. Cal. 2012), aff'd 751 F.3d 1054, 1064-1065 (9th Cir. 2014).

With respect to removal of excess wild horses from within the HMA, this alternative could be viable in situations where the project area is contained, the area is readily accessible and wild horses are clearly visible, and where the number of wild horses to be removed is so small that a targeted approach to removal can be implemented. Under the conditions present within the Project area, however, this alternative is impractical, if not impossible, as well as less humane for a variety of reasons.

The BLM does euthanize old, sick or lame animals on the range when such animals have been identified. This occurs on an on-going basis and is not limited to wild horse gathers. During a gather, if old, sick or lame animals are found and it is clear that an animal's condition requires the animal to be euthanized, that animal is separated from the rest of the group that is being herded so that it can be euthanized on the range. However, wild horses that meet the criteria for humane destruction because they are old, sick or lame usually cannot be identified as such until they have been gathered and examined (for example, to examine the horse's mouth to determine whether the horse's dental conditions would allow it to process enough forage to survive or to check whether the horse is club footed). Old, sick and lame wild horses meeting the criteria for humane euthanasia are also only a tiny fraction of the total number of wild horses to be gathered, comprising on average about 0.5 percent of gathered wild horses (BLM 2015b). Due to the challenges of approaching wild horses close enough to make an individualized determination of whether a horse is old, sick or lame, and of accessing wild horses over thousands of acres of varied topography and terrain, it would be virtually impossible to conduct a phased culling of such wild horses on the range without actually gathering and examining the wild horses.

Similarly, rounding up and removing wild horses for which an adoption demand exists, before gathering any other excess wild horses would be both impractical and much more disruptive and traumatic for the animals. The terrain challenges, difficulties of approaching the wild horses close enough to determine age and whether they have characteristics that make them more adoptable, the impracticalities inherent in attempting to separate the small number of adoptable wild horses from the rest of the herd, and the impacts to the wild horses from the closer contact necessary, makes such phased removal a much less desirable method for gathering excess wild horses. This approach would create a significantly higher level of disruption for the wild horses on the range and would also make it much more difficult to gather the remaining excess wild horses. Furthermore, if the BLM plans to apply any population controls to gathered wild horses prior to release, it would be necessary to gather more than just the excess wild horses to be removed, making a phased approach to removal both unnecessary and counter-productive. This alternative was therefore eliminated from any further consideration.

3.0 Affected Environment

This section of the EA briefly discusses the relevant components of the human environment which would be either affected or potentially affected by the Proposed Action or No Action Alternatives. Direct impacts are those that result from the management actions while indirect impacts are those that exist once the management action has occurred.

Setting

The Project area is the Pine Nut Mountains, located in Douglas, Lyon and Carson City counties, Nevada (Figure 2). The communities of Carson City, Minden, Gardnerville, Wellington, Smith and Dayton are spread around the edge of the Pine Nut Mountain range. The range, which runs north-south for 38 miles, includes approximately 397,899 acres of mixed ownership lands (public land, private land, Indian trust land[3]). The Pine Nut Mountains Herd Area (HA) (Figure 3) and Pine Nut Mountains Herd Management Area (HMA) (Figure 4) are located within the Pine Nut Mountains. The HA consists of approximately 183,186 acres of public lands and 68,504 acres of private lands. The designated boundary of the HMA (located entirely within the HA) encompasses approximately 90,900 acres of public lands and 14,692 acres of private lands. The southern portion of the range includes the 13,395 acre Burbank Canyon Wilderness Study Area. The topography of the range varies from rolling hills, approximately 5,000 feet in elevation, to over 9,000 feet in elevation at the tops of the tallest peaks. Vegetation is typical of the western Great Basin and is dominated by a mix of grasses (*Achnatherum* spp. and *Poa* spp.), sagebrush (*Artemisia* sp.), rabbitbrush (*Chrysothamnus viscidiflorus*), bitterbrush (*Purshia tridentata*), and pinyon-juniper woodlands (*Pinus monophylla-Juniperus osteosperma*). Temperatures can exceed 100 degrees Fahrenheit (°F) at lower elevations during July and August and can drop below 0 °F during December and January. Average annual precipitation is strongly influenced by elevation and varies from six to 16 inches.

Resources Considered for Analysis

The BLM is required to address specific elements of the environment that are subject to requirements in statute or regulation or by executive order (BLM 2008). Table 3 lists the elements that must be addressed in all environmental analysis and indicates whether the Proposed Action or Alternatives affect those elements. Other resources of the human environment that have been considered for analysis are listed in Table 4.

3 Trust land refers to land held in trust by the United States for an Indian tribe or an individual tribal member. This means that the United States holds legal title to that land, while the tribe or individual tribal member holds beneficial title, which means that the tribe or tribal member has the right to use the property and derive benefits from it.

Table 3. Supplemental Authorities*.

Resource	Present Yes/No	Affected Yes/No	Rationale
Air Quality, including Global Climate Change and Greenhouse Gas Emissions	Y	N	The Pine Nut Mountains are located in Carson City, Douglas and Lyon counties. All counties are in attainment status. During implementation of the Proposed Action or Alternatives, there would be negligible increases in emissions caused by motorized vehicles and aircraft. During implementation of the Proposed Action or Alternatives, there would be negligible increases in particulates caused by foot traffic, wild horses, motorized vehicles and aircraft. As these impacts would be localized, short-term and negligible, the overall air quality of the air basins would remain in attainment status.
Areas of Critical Environmental Concern	N		
Cultural Resources	Y	N	Prehistoric and historic properties occur throughout the Pine Nut Mountains. A review of previous cultural resource inventories would be conducted prior to establishing holding or trap sites. To the greatest extent possible, the holding or trap sites would be located where previous inventories have occurred and in areas previously disturbed. If during implementation, holding or trap sites are moved to other locations, a cultural resources monitor would be present to ensure than no prehistoric or historic properties are affected.
Environmental Justice	N		Resource not present.
Farm Lands (prime or unique)	N		There are no designated prime or unique farm lands in the Pine Nut

			Mountains managed by the BLM.
Floodplains	N		Resource not present.
Noxious and Invasive Weeds	Y	Y	Carried forward for analysis.
Migratory Birds	Y	Y	Carried forward for analysis.
Native American Religious Concerns	N		Notification of the Proposed Action has been made to the Washoe Tribe of Nevada and California, and Yerington Paiute Tribe. No religious concerns have been identified. Coordination with the tribes would continue through Project implementation.
Threatened or Endangered Species (animals)	Y	N	Within the Pine Nut Mountains, approximately 83 acres of critical habitat has been proposed along the Carson River for the western yellow-billed cuckoo (*Coccyzus americanus*). No Project activities would occur in or near this proposed critical habitat.
Threatened or Endangered Species (plants)	Y	N	Within the Pine Nut Mountains, approximately 14 acres of critical habitat has been designated for the Webber's ivesia (*Ivesia webberi*). No Project activities would occur in or near this critical habitat. If new populations are located outside the critical habitat, the BLM would exclude the area(s) from Project activities.
Wastes, Hazardous or Solid	N		No hazardous or solid wastes would be introduced in the Pine Nut Mountains.
Water Quality (Surface/Ground)	Y	N	The quality of surface waters in the Pine Nut Mountains would not be affected by the Proposed Action or Alternatives.
Wetlands/Riparian Zones	Y	Y	Carried forward for analysis.

Wild and Scenic Rivers	N		Resource not present.
Wilderness/WSA	Y	N	The Burbank Canyon Wilderness Study Area lies within the Pine Nut Mountains. No Project activities would occur in this area.

**See H-1790-1 (January 2008) Appendix C Supplemental Authorities to be Considered.*
Supplemental Authorities determined to be Not Present or Present/Not Affected need not be carried forward or discussed further in the document.
Supplemental Authorities determined to be Present/May Be Affected may be carried forward in the document.

Table 4. Resources or Uses Other Than Supplemental Authorities.

Resource or Issue**	Present Yes/No	Affected Yes/No	Rationale
BLM Sensitive Species (animals)	Y	Y	Carried forward for analysis.
BLM Sensitive Species (plants)	Y	Y	Carried forward for analysis.
Fire Management	Y	N	The Proposed Action or Alternatives would have no effect on fire suppression activities.
Forest Resources	Y	Y	See Vegetation section.
General Wildlife	Y	Y	Carried forward for analysis.
Human Health and Safety	Y	Y	Carried forward for analysis.
Land Use Authorization	Y	N	Various right-of-way authorizations such as overhead transmission lines and roads occur throughout the Pine Nut Mountains. These authorizations would not be affected by the Proposed Action or Alternatives.
Lands with Wilderness Characteristics	Y	Y	Lands with Wilderness Characteristics are proposed in the Pine Nut Mountains under the ongoing land use plan revision. Carried forward for analysis.
Livestock Grazing	Y	Y	Carried forward for analysis.
Minerals	Y	N	Mineral exploration occurs in the Pine Nut Mountains; however the Proposed Action would have no effect on these activities.
Paleontological	Y	N	Paleontological resources occur at the western edge of the public lands in the Pine Nut Mountains; however no Project activities would occur in these areas.
Recreation	Y	N	Dispersed recreational activities, such as sightseeing, hunting, off-highway vehicle travel, and camping occurs throughout the Pine Nut Mountains. The Proposed Action or Alternatives would have no effect on these uses.
Socioeconomics	N		Resource not present.
Soils	Y	N	During implementation of the Proposed Action or Alternatives, there would be negligible increases in surface disturbances caused by foot traffic, wild horses, and motorized vehicles and aircraft. These impacts would be localized, short-term and negligible.
Travel Management	Y	N	Travel routes existing throughout the Pine Nut Mountains. The Proposed Action or Alternatives would have no effect on public access.
Vegetation	Y	Y	Carried forward for analysis.
Visual Resources	Y	N	During implementation of the Proposed Action or Alternatives, there would be localized, short-term and negligible impacts to visual resources in the Pine Nut Mountains from gather operations and negligible increase in particulates. Wild horse management would be consistent with all Visual Resource Management classifications.
Wild Horses and Burros	Y	Y	Carried forward for analysis.

***Resources or uses determined to be Not Present or Present/Not Affected need not be carried forward or discussed further in the document.*

Resources or uses determined to be Present/May Be Affected may be carried forward in the document.

3.1 Wild Horses and Burros

The BLM estimates that approximately 72,674 wild horses and burros (*E. asinus*) reside on BLM-managed lands in the 10 Western states, based on the latest data available in March 1, 2017 (BLM 2017b). The combined AML is approximately 26,000 animals across 177 HMAs covering more than 31.9 million acres (14.7 million acres in Nevada). No burros are present on BLM-managed lands in the Pine Nut Mountains and this species is not discussed any further.

After the passage of the WFRHBA, the BLM identified HAs for BLM-managed lands with known populations of wild horses. HMAs were established later for those HAs through a land use planning process that set the initial and estimated herd size that could be managed while still preserving and maintaining a thriving natural ecological balance and multiple-use relationships for the area. An area must have four essential habitat components to be designated as an HMA: forage, water, cover and space (BLM 2010). For each HMA, the AMLs for wild horses are set; no AML is set for HAs areas outside of an HMA.

The Project area for the Proposed Action is the Pine Nut Mountains, an area encompassing approximately 397,899 acres (Figure 2). The Pine Nut HA (Figure 3) and Pine Nut Mountains HMA (Figure 4) are located within the Pine Nut Mountains. The HMA has not been designated as a "Wild Horse and Burro Range" under 43 CFR 4710.3-2.[4] Table 2 lists the population inventories and horse removals in the Pine Nut Mountains since 2000. For a more detailed description of this HMA see the *Summary of Current Conditions.*

The allocation of forage for wildlife, wild horses, and livestock was established through a Final Multiple Use Decision (FMUD), which set the AUMs for each category. The FMUD for the HMA and nine overlapping grazing allotments was approved in 1995 (Figure 8; BLM 1995). Table 1 lists the AML by individual grazing allotment within the HMA. The AML is the range within which a wild horse population can be maintained over the long-term based on habitat suitability and monitoring data (adaptive management)[5]. The AML for the HMA was established at 118-179 animals. Because areas outside the HMA are not managed for wild horses, no AML has been set for areas outside the HMA.

The wild horse population within the HMA is not distributed evenly throughout the HMA; some allotments are sustaining heavy and severe use, while others are receiving slight use (Figure 5). The distribution of horses is likely influenced by water availability and suitable grazing areas. Large tracts of closed canopy pinyon pine are present within the HMA producing very limited forage. Relocating excess horses from one allotment to another allotment would not be practical

4 There are currently four designated Wild Horse and Burro Ranges in the Western United States that are managed principally for wild horses and burros consistent with 43 CFR 4170.3-2. These include the Pryor Mountain Wild Horse Range in Montana; the Little Book Cliffs Wild Horse Range in Colorado; the Nevada Wild Horse Range and the Marietta Wild Burro Range in Nevada. 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.

5 In *Animal Protection Institute of America v. Nevada BLM*, 109 IBLA 119 (1989) the Interior Board of Land Appeals stated that the AML represents the optimum number of wild horses which results in a thriving natural ecological balance.

in this HMA as access to lower horse population density areas is very limited and the tendency of wild horses is to return to their home ranges after release. Moreover, since the essential habitat requirements may not exist in some of the low population density areas, releasing horses into these areas may be very stressful to the released animals as they search or compete for limited sources of forage and water.

3.2 Wetlands/Riparian Zones

Wetlands and riparian areas cover a relatively small amount of land in Nevada and within the Pine Nut Mountains. High quality riparian habitat can generally support more species than most other habitat types due to the presence of water and a productive nutrient-rich environment. The Pine Nut Mountains include three types of riparian ecosystems including: perennial springs/seeps; intermittent and ephemeral streams, and aspen (*Populus tremuloides*) stands (which can indicate a shallow water table).

Principal tree species in lowland riparian areas include Fremont cottonwood (*Populus fremontii* ssp. *fremontii*) and black cottonwood (*P. trichocarpa*). Principal shrub species include several species of willow, such as grey willow (*Salix exigua*), Lemmon's willow (*S. lemmonii*), and yellow willow (*S. lutea*). Grass species include creeping wildrye (*Leymus triticoides*) and a variety of wetland species, including sedges (*Carex* spp.), rushes (*Juncus* spp.), and cattails (*Typha* spp.). Multiple drainages within the Pine Nut Mountains have riparian corridors with vegetation communities that support a diversity of wildlife.

Within the HMA, the majority of riparian areas are lentic riparian-wetland areas. Lentic riparian-wetland areas are associated with still water systems. Lentic areas provide enough available water to the root zone to establish and maintain riparian-wetland vegetation. These wetlands occur in basins and lack a defined channel and floodplain. Included are permanent (i.e., perennial) or intermittent bodies of water such as lakes, reservoirs, potholes, marshes, ponds, and stock ponds. Other examples include fens, bogs, wet meadows, and seeps not associated with a defined channel. Conversely, lotic riparian-wetland areas are associated with rivers, streams, and drainage ways. Such wetlands contain a defined channel and floodplain. The channel is an open conduit, which periodically or continuously carries flowing water, dissolved and suspended material. Beaver ponds, seeps, springs, and wet meadows on the floodplain of, or associated with, a river or stream are part of the lotic wetland. There are several lotic systems within the HMA.

Lentic and lotic riparian-wetland areas are functioning properly when adequate vegetation, landform, or debris is present to:

- dissipate energies associated with wind action, wave action, and overland flow from adjacent sites, thereby reducing erosion and improving water quality;
- filter sediment and aid floodplain development;
- improve flood-water retention and ground-water recharge;
- develop root masses that stabilize islands and shoreline features against cutting action;
- restrict water percolation;

- develop diverse ponding characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, water bird breeding, and other uses; and
- support greater biodiversity.

Most areas in the Great Basin do not have the potential or require large wood to dissipate stream energy associated with high stream flows. Vegetation such as willows, sedges and rushes can dissipate energy and are therefore important in maintaining soil stability and preventing erosion.

The riparian functional assessment (RFA) (Technical Reference 1737-15 and 1737-16) is a qualitative method BLM uses for assessing the on-the-ground condition of riparian-wetland systems in order to determine how the system is functioning in its current state and current management. BLM is required to meet Proper Functioning Condition (PFC) for riparian areas on public lands as specified in the BLM 1737 Manual, Resource Advisory Councils Standards and Guidelines for Nevada and the Sage-Grouse Plan Amendment.

The RFA refers to a consistent approach for considering hydrology, vegetation and erosion/deposition (soils) attributes and processes to assess the condition of riparian wetland areas. The on-the-ground condition refers to how well the physical processes are functioning. PFC is a state of resiliency that will allow a riparian-wetland area to hold together during high wind events or overland flow events with a high degree of reliability. This resiliency allows an area to then produce desired values, such important habitat including forage for birds and other wildlife species. Riparian-wetland areas that are not functioning properly cannot sustain these values. In many cases erosion and channelization will occur in these non-functioning areas or stretches leading to the lowering of the water table and the further loss of wet meadow and riparian systems. Once erosion occurs in stream bottoms it is difficult to reverse and often leads to the lowering of the water table.

A RFA was conducted at 26 sites within the HMA over the last 15 years (Figure 11). Appendix C lists the name, location, allotment, and rating of those assessments. Of the 26 riparian areas assessed, 23 percent are in PFC; 19 percent of the riparian areas are rated functioning-at-risk (FAR) with a downward trend; and 58 percent of the riparian areas assessed in the HMA are non-functioning (NF). Of the 23 percent (i.e., 6 riparian areas) rated PFC, only one riparian area (Hercules Mine Spring) is located in the Clifton Allotment where there is documented heavy horse use, however the spring it is protected from grazing by a fence exclosure. The other five riparian areas rated PFC have no documented horse use or are reaches of larger systems where the specific reaches do not show evidence of wild horse use. Of the 19 percent rated FAR (i.e., 5 riparian areas), 80 percent have a downward trend due to excessive grazing and hoof action impairing riparian values: four riparian areas have documented impacts from wild horses and one riparian area has documented impacts from livestock grazing with no sign from wild horses. Of the 58 percent rated NF, the impacts most commonly are from excessive horse use which has degraded riparian functionality. A few NF riparian areas are showing a drying trend over time, but data is not available to identify the specific cause of the drying trend. Potential causes include soil compaction resulting from excessive hoof action; groundwater draw down from surrounding valleys; or climate change.

Riparian Functional Assessments by Allotment

Clifton

The BLM has assessment or monitoring data on 14 riparian areas in the Clifton Allotment. Thirteen RFAs were completed in the Clifton Allotment since 2002, with 11 assessments completed in the past three years. Seven of these 14 riparian assessments have multiple ratings over time, and data shows a downward trend due to excessive wild horse use.

Currently, there is one riparian area (Hercules Mine Spring) in PFC within the Clifton Allotment. Before this riparian area was fenced in 1994, it was rated as FAR. The fence, which is still in place and remains intact, has eliminated wild horse grazing pressure and allowed for the riparian area to recover to PFC. The fence was designed to exclude livestock and horses while still allowing wildlife access to the riparian area.

There are two riparian areas rated as FAR. West Barton Spring is FAR with a fence enclosure (put in place following the 2002 assessment) that has been pushed or knocked down multiple times in recent years. The riparian area was in recovery in 2013, with 25 identified species of riparian vegetation present. However, with the fence repeatedly pushed down from 2013 to present, the riparian vegetation and hydric soils have been adversely impacted. The current rating of West Barton Spring reflects a downward trend due to excessive horse use. The second riparian area, Little Nettles Spring, was FAR in 2002, with a downward trend, and the assessment documented evidence of heavy horse grazing on small willows, severe impacts to the channel banks, vegetation and water quality. Current monitoring show the system still exists in a compromised state.

The remaining 11 springs are currently rated as NF, due to excessive wild horse use causing the loss/severe reduction of riparian vegetation, soil compaction from hoof action and degradation of hydrologic function at each site. One spring is rated NF due to loss of water from a puncture in the confining layer which keeps water at the soil surface. Due to the loss of surface water this system is no longer considered a spring and the associated wet meadow is now dry.

Mill Canyon

Riparian functional assessments were conducted at two riparian sites. Greg's Cabin Meadow Spring went dry sometime between 2002 and 2013. The current rating for this riparian area is NF due to lack of water. The other site, Pony Meadow Artesian Well, is FAR due to a nick point below the anthropogenic source and wild horse hoof action causing disturbance of surface and subsurface flow patterns.

Eldorado Canyon

The middle reach of Eldorado Canyon Creek is the only assessed riparian area on this allotment. The middle reach of the creek is PFC, the armored channel is stable and able to withstand high energy storm events. The BLM has not documented wild horse impacts to the lower reach, however there is evidence of horse presence in the lower reach.

Hackett Canyon

Hackett Canyon Allotment has no riparian functional assessments on file, besides the Eldorado Canyon Creek assessments. Eldorado Canyon Creek is the boundary between the two allotments.

Buckeye

Buckeye Allotment has one riparian functional assessment on file from 2002. The Buckeye Allotment shares the upper reach of Eldorado Canyon Creek with the Sunrise Allotment. The upper reach of the creek is FAR with excessive erosion from undissipated stream flow due to road management issues. There are no known perennial water sources on public lands in Buckeye Allotment. Bull Run Spring had water in the 1980's, but was dry in 2012, with a 30-foot tall pinyon pine growing at the source, inside the enclosure.

Rawe Peak

Rawe Peak Allotment had a riparian functional assessment completed before 1995 with no supporting notes (rating PFC). Currently, the Rawe Peak North Spring, supporting the riparian area, is dry and not considered a functioning riparian area.

Sunrise

Four riparian functional assessments were completed in 2015 on Sunrise Allotment. One stream reach is PFC with stability of the system held in place topographically. One spring is PFC due to the construction of fencing which limits the amount of time grazing animals use the meadow area. One spring is FAR due to past cattle grazing and hoof action on the wet drainage which caused surface and subsurface disturbance to the hydrologic function. The fourth riparian area is in NF condition from to lack of water, most likely due to pinyon-juniper encroachment, but potentially from a puncture to the confining layer of the spring expression

Churchill Canyon

This allotment has one riparian area within the HMA. This riparian area, called Mud Spring, was rated NF in 2007, due to excessive erosion and rapid draining of the system.

Sand Canyon

No wild horses have been observed in the riparian areas in Sand Canyon. Two riparian function assessments were completed in 2000 and were rated PFC. The riparian areas include the newer Taperneck Spring, first observed after the Carson City effluent pond came on-line, and a reach of the Carson River. There were no wild horse or livestock sign at the time of assessment. There are no other known existing water sources on this allotment.

3.3 General Wildlife

Habitats
The Nevada Wildlife Action Plan describes 22 key habitat types and identifies wildlife species assemblages for each (Wildlife Action Plan Team [WAPT] 2012). The vegetation types in the Pine Nut Mountains can structurally and functionally be combined into three major wildlife habitats: sagebrush, pinyon-juniper woodlands, and cold desert shrub (scrubland; Figure 12). Riparian areas in the Pine Nut Mountains also provide habitat for wildlife species.

Sagebrush communities are important to a variety of wildlife, including sagebrush obligates such as Brewer's sparrow (*Spizella breweri*), sage thrasher (*Oreoscoptes montanus*), and sage sparrow (*Amphispiza belli*). Additionally, these communities are important to other species that may be present during certain times of the year, such as pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), ferruginous hawk (*Buteo regalis*), and loggerhead shrike (*Lanius ludovicianus*). Raptors, such as ferruginous hawks, spend most of their time hunting over sagebrush where they primarily prey on ground squirrels and jack rabbits (WAPT 2012).

Pinyon-juniper woodlands provide a variety of sheltering functions for wildlife that range from hiding cover to cavities and nest sites for birds, bats, and small mammals (WAPT 2012). A critical product of these woodlands is the pinyon nut crop, which serves as an important food source for the pinyon jay (*Gymnorhinus cyanoephalus*), Steller's jay (*Cyanocitta stelleri*), western scrub jay (*Aphelocoma californica*), and Clark's nutcracker (*Nucifraga columbiana*) (Ryser 1985). Other wildlife species associated with this habitat type include ferruginous hawk, mule deer, and black bear (*Ursus americanus*).

Ricegrass (*Achnatherum hymenoides*) and shadscale (*Atriplex confertifolia*) seeds are important food sources for wildlife in cold desert shrub habitat, and soils tend to be loose and sandy or gravelly and easily excavated by burrowing animals. Wildlife species associated with this habitat type include pale kangaroo mouse (*Microdipodops pallidus*), pallid bat (*Antrozous pallidus*), and loggerhead shrike (*Lanius ludovicianus*) (WAPT 2012). Many wildlife species use both cold desert shrub and sagebrush habitats, such as sage thrasher, sage sparrow, and Brewer's sparrow.

Riparian assessments have been conducted in the Pine Nut Mountains at various spring locations (Figure 11). The characteristics of individual springs can vary tremendously in terms of flow, water chemistry, and habitats provided for wildlife species. Many spring systems important to wildlife represent little more than seeps. In addition to their critical importance to aquatic species, they also are important for terrestrial wildlife. Springs provide a vital source of water and food for a wide range of wildlife from big game to bats. None of the riparian assessments recorded any aquatic wildlife species.

Game Species
Primary game species within the Pine Nut Mountains include mule deer, pronghorn antelope, and black bear. Other upland game species include California quail (*Callipepla californica*), chukar (*Alectoris chukar*), and band-tailed pigeon (*Patagioenas fasciata*).

The Nevada Department of Wildlife (NDOW) has identified most of the Pine Nut Mountains as year-round habitat for mule deer. The north and east side of the Pine Nut Mountains is pronghorn antelope habitat. Pronghorn use lower elevations in fall and spring but move to higher elevations in deep winter and mid-summer to escape temperature extremes. All of the Pine Nut Mountains is considered habitat for black bear. See Table 5 for distribution of large game species.

Table 5. Large Game Species within the Pine Nut Mountains.

Species	Habitat Status	Acres	% of H MA	% of Pine Nut Mountains
Black Bear	Occupied	388,299	100	98
Mule Deer	Occupied	371,953	98	93
Pronghorn	Occupied	104,341	31	26

Calculations based on public and private lands. Source: NDOW GIS data.

3.4 BLM Sensitive Species (Animals)

Species designated as BLM sensitive must be native species found on BLM-administered lands for which the BLM has the capability to significantly affect the conservation status of the species through management, and either:

1. There is information that a species has recently undergone, is undergoing, or is predicted to undergo a downward trend such that the viability of the species or a distinct population segment of the species is at risk across all or a significant portion of the species range; or
2. The species depends on ecological refugia or specialized or unique habitats on BLM-administered lands, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk.

A list of Nevada BLM sensitive species was released in 2011 (IM No. NV-2011-059 with the final list released in October 2011). Appendix D provides a list of BLM sensitive animals that may be present in the Pine Nut Mountains. BLM sensitive animal species use a variety of habitat in the Pine Nut Mountains. Habitats consist of sagebrush, pinyon-juniper woodlands, cold desert shrub, and riparian areas.

Bi-State Distinct Population Segment (DPS) of Greater Sage-Grouse

Bi-State sage-grouse are highly dependent on sagebrush for food, nesting structure, protection from predators, and thermal cover. In winter, almost 100% of their diet consists of sagebrush leaves. Bi-State sage-grouse use a variety of sagebrush species including mountain big sagebrush (*Artemisia tridentata vaseyana*), Wyoming big sagebrush (*A. t. wyomingensis*), low sagebrush (*A. arbuscula*), black sagebrush (*A. nova*), fringed sagebrush (*A. frigida*), and silver sagebrush (*A. cana*). They nest on the ground under low-growing brush enhanced with thick bunchgrass understory. Diverse plant communities, such as wet meadows or riparian areas and sagebrush

stands interspersed with perennial forbs, with abundant insects are particularly important during the early brood-rearing period; chick survival is directly linked to availability of food and cover of grasses (GBBO 2010). The availability of quality nesting habitat, brood rearing/late-summer meadow habitat, and water are likely limiting factors in the Pine Nut Population Management Unit (PMU), according to the Bi-State Action Plan.

The Pine Nut Population Management Unit has the fewest sage-grouse of all Bi-State DPS PMUs (i.e., one population ranging in size from less than 100 to 608 birds based on data collected between 2004 and 2014) (FWS 2015). A recent 10-year trend analysis between 2003 and 2012 suggests the population in the Pine Nut PMU has been stable, but because of the current small population size and the ongoing and potential future habitat impacts, the sage-grouse population in the Pine Nut PMU is at a greater risk of extirpation than populations in other PMUs within the Bi-State area (FWS 2015).

The USGS has been monitoring sage-grouse in the Pine Nut Mountains since 2011. There are three known active leks in the Pine Nut Mountains; one in the Mill Canyon area, one in the nearby northern Buckskin Range, and one in the south end of the Pine Nut Mountains on Bald Mountain. Breeding/nesting has been documented in the Mill Canyon area and, according to USGS telemetry data, most of those birds move from this area after the breeding period to brood-rearing/summer habitat around Mount Siegel and Bald Mountain in the south end of the mountain range. The habitat between the north and south ends of the Pine Nut Mountains serves as a crucial seasonal movement corridor. Sage-grouse appear to travel relatively long distances to summer and fall habitat; some going as far as the Bodie Hills near Bridgeport, California. Approximately 122,801 acres of Bi-State habitat occurs in the Pine Nut Mountains (23,816 acres within the HMA; Figures 2-1 and 3-1 *in* USFS 2015; Figure 9).

Pygmy Rabbit

Pygmy rabbits (*Brachylagus idahoensis*) are highly dependent on sagebrush to provide food and shelter throughout the year and are typically associated with tall, dense stands of big sagebrush growing in deep, loose soils in which they can construct burrows. Big sagebrush is the primary food source, but grasses and forbs are also eaten (WAPT 2012). The BLM and the NDOW have not documented pygmy rabbit habitat or their occurrence within the Pine Nut Mountains. According to the Nevada Natural Heritage Program, the Pine Nut Mountains is not within the range of this species (NNHP 2001) and there are no records for or known occurrences of pygmy rabbit within Douglas, Lyon and Carson City counties, Nevada (FWS 2010a).

3.5 Migratory Birds

In 2001, President Clinton signed Executive Order (EO) 13186 placing emphasis on the conservation and management of migratory birds. Migratory birds are protected under the Migratory Bird Treaty Act (MBTA) of 1918 and EO 13186 addresses the responsibilities of federal agencies to protect migratory birds by taking actions to implement the MBTA. The BLM policy for migratory bird management is provided in Information Bulletin (IB) No. 2010-110 and is based on the 2010 Memorandum of Understanding (MOU) between the BLM and the FWS for the conservation of migratory birds. According to the MOU, BLM Priority Migratory Birds are those migratory birds that are listed in the periodic FWS report *Birds of Conservation Concern* (FWS 2008), and those identified by the FWS Division of Migratory Bird Management as game

birds below desired condition. Bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are also protected by the Bald and Golden Eagle Protection Act (1940 as amended 1959, 1962, 1972, 1978).

Appendix D provides a list of migratory birds that may be present in the Pine Nut Mountains, of which several are also BLM sensitive species. BLM migratory birds use a variety of habitats in the Pine Nut Mountains, including sagebrush, pinyon-juniper woodland, cold desert scrub (shrubland), and riparian areas.

Sage sparrow, sage thrasher, and Brewer's sparrow distribution is closely tied with that of sagebrush. These species require tall sagebrush shrubs for nesting or song perches and an open understory of native bunchgrasses and forbs. They depend heavily on the shrub component for nesting substrate. Loggerhead shrikes also use mature shrubs for nesting structure, protection from predators, and thermal cover. Species such as pinyon jays use sagebrush habitat, but are more dependent on woodland habitat.

Multiple species of raptors likely occur in the Pine Nut Mountains. Current diversity exists because of the proximity of different habitat types that provide nesting, roosting, and foraging sites. For example, northern goshawks (*Accipiter gentilis*) nest in mature aspen stands surrounded by coniferous forest and/or shrubland for foraging. Ferruginous hawks can nest in juniper trees, but prefer open sagebrush for foraging. Ferruginous hawks and golden eagles spend most of their time hunting over sagebrush for ground squirrels, jackrabbits, and other prey. These raptors are limited by prey densities and need sagebrush habitat with a productive herbaceous understory that provides an abundant prey base (GBBO 2010).

3.6 Vegetation

The Pine Nut Mountains support a diversity of vegetation communities that may be generalized into three categories: pinyon-juniper woodlands, sagebrush, and cold desert scrub (shrubland) (Figure 12). These different vegetation communities are a result of elevation, moisture, soil substrate, aspect, and past land use practices.

Pinyon-Juniper Woodlands
This is largest vegetation community found in the Pine Nut Mountains. Pinyon-juniper woodlands are found on 164,377 acres of BLM-managed lands. Over the past 11,000 years, single-leaf pinyon pine has become a dominant species in the middle elevations of the region. The distribution of single-leaf pinyon is primarily a function of climate beginning abruptly at the Truckee River and Interstate 80 increasing in dominance southward. Throughout its distribution, single-leaf pinyon mixes with Utah juniper, which is the most common juniper species in the Pine Nut Mountains. Western juniper (*Juniperus occidentalis*) also occurs in the Pine Nut Mountains, although to a lesser extent.

Pinyon-juniper forests thrive in areas where annual precipitation ranges from 12 to 18 inches but can survive to lower extremes of eight inches in the Pine Nut Mountains. Elevation limits are determined at the lower extent by lack of moisture and at the upper limits by biotic competition, low temperatures, and excessive soil moisture. Within the Pine Nut Mountains, pinyon-juniper woodlands occupy elevations from about 5,000 to 7,000 feet.

Sagebrush
The sagebrush community is found throughout the Pine Nut Mountains at all elevations and aspects. This community is divided into two subgroups, big sagebrush and low sagebrush. The big sagebrush community includes three subspecies: the more common Wyoming sagebrush, which grows in dry, low elevation areas; mountain sagebrush, which grows in more moist areas and at higher elevations; and basin big sagebrush, which grows in deep sand often along washes at lower elevations. Plants associated with big sagebrush include other shrub species, grasses, and forbs. The low sagebrush community may include both low sagebrush and black sagebrush. Low sagebrush grows in colder, higher elevation sites with thin rocky soils, but may occupy areas similar to Wyoming big sagebrush and may intermix with this subspecies at the transition area between two adjacent ecological communities. Black sagebrush grows in similar conditions but prefers more moisture (Mozingo 1987), and this species is limited in range within the Pine Nut Mountains. Other constituents within the low sagebrush community include buckwheat species (*Eriogonum* spp.), lomatium (*Lomatium* spp.), lewisia (*Lewisia* spp.), balsamroot (*Balsamorhiza* spp.), and grasses.

Shrubland
Several different species assemblages are included in the cold desert scrub vegetative community; however, the most common are detailed below:

Inter-Mountain Basins Semi-Desert Shrub-Steppe—This system occurs at lower elevation on alluvial fans and flats with moderate to deep soils. This system is dominated by grasses, with an open shrub layer. The most typical grasses include Indian ricegrass, needle and thread grass (*Hesperostipa comata*), and Sandberg's bluegrass (*Poa secunda*). Shrubs present include fourwing saltbush (*Atriplex canescens*), rabbitbrush, Mormon tea (*Ephedra spp*.), and winterfat (*Krascheninnikovia lanata*). Although big sagebrush may be present, it would not be a dominant component of this system. This system is open and spotty, with uneven distribution of vegetation.

Inter-Mountain Basins Mixed Salt Desert Scrub—This system is extensive and is found in saline basins, alluvial slopes, and plains. This system experiences very low amounts of annual precipitation and has very open canopies. Shrub species often present include an Atriplex component, such as shadscale or fourwing saltbush. Other shrubs present include Wyoming big sagebrush (*Artemisia tridentata spp. wyomingensis*), rabbitbrush, Mormon tea, spiny hopsage (*Grayia spinosa*), and winterfat. The herbaceous layer varies greatly, being quite sparse in some areas and fairly dense in other areas. Grasses commonly include: Indian ricegrass, thickspike wheatgrass (*Elymus lanceolatus ssp. lanceolatus*), western wheatgrass (*Pascopyrum smithii*), and Sandberg's bluegrass.

Inter-Mountain Basins Greasewood Flat—This system occurs on stream terraces and flats or may form rings around more sparsely vegetated playas. The soils are typically saline, with a shallow water table and intermittent flooding. Although these sites dry out during the growing season, the water table remains high enough to maintain vegetation despite the salt accumulations. The shrub canopy is often open to moderately dense, with such shrubs as: greasewood (*Sarcobatus vermiculatus*), fourwing saltbush, shadscale, and winterfat. The grass component includes alkali

sacaton (*Sporobolus airoides*), saltgrass (*Distichlis spicata*), and some amount of basin wildrye (*Leymus cinereus*).

Vegetation Trends

Trends in vegetative attributes have been monitored at 18 key areas, utilizing frequency and photo trend plot methodologies. "Frequency" is the percentage of possible plots within a sampled area occupied by a target species. It is not based on the size or number of individual plants. The vegetation attributes monitored with frequency methods include frequency, basal cover and general cover categories (including litter), and reproduction of key species (if seedling data are collected). Frequency is a very useful monitoring method but does not express species composition, only species presence. This method does not count the number of plants of each species-instead it is only concerned with whether the target species is present or absent within each quadrat. Frequency is an index that integrates species' density and spatial patterns. There are three methods of collecting frequency data and all three consist of observing quadrats along transects, with quadrats systematically located at specified intervals along each transect. These include pace, quadrat and nested frequency. The only differences in these techniques are the size and configuration of the quadrat frames and the layout of the transect (Colson 2016). The nested frequency technique was used.

Photo plots are close-up photographs taken to provide a qualitative record of condition from year to year within a defined small area (plot). Photographs are taken from the same location and same specified height each time, providing both a permanent visual record of the past and a means to evaluate changes over time. Photo plots typically involve placing a standard-sized frame on the ground.

Monitoring locations (plots) were established to determine vegetative trends (Figure 13). Records were compiled for trend plots from 1974 to 2015. Photo trend plots were re-read in 2015. The trends for upland plant communities were primarily static to downward with the exception of two plots in the Buckeye and Churchill Canyon allotments. Some indicators of a downward trend are: 1) a reduction in the number of native perennial plant species; 2) an increase in invasive plant species; and 3) signs of soil disturbance and/or loss. Several factors influence the condition of plant communities. Some influences are wild horse grazing, livestock grazing, drought, fire, and plant community dynamics such as the expansion of pinyon and juniper woodlands.

Wild horse grazing is a contributing factor to the downward trends in upland vegetation communities within the Clifton, Eldorado Canyon, Hackett Canyon and Mill Canyon allotments. Plant species palatable to horses and livestock have declined over time and wild horse utilization of perennial grass species has exceeded recommended use levels. As no livestock use has occurred within this portion of the HMA for at least the past 20 years, the utilization is based on wild horse use, not livestock grazing. The 1995 FMUD implemented reductions in livestock and wild horse numbers and established a utilization standard of 55 percent for the combined use of both wild horses and livestock. There has been no livestock grazing in these allotments for the past 20 plus years because wild horse numbers have significantly exceeded AML resulting in utilization greater than the 55 percent established in the FMUD. Hackett Canyon has an active grazing permit, however, the permittee has taken non-use. The other three allotments do not

currently have active grazing permits although individuals have expressed interest in obtaining permits to graze in these allotments.

Vegetative Trends by Allotment

Buckeye

Vegetative trend within the portion of the HMA in the Buckeye Allotment was static to upward. Due to downward trends in 1993, the FMUD prohibited livestock use within the HMA during the vegetative growing season (April 1- July 15). A new livestock grazing permit was issued in 2006 which changed the kind of livestock, reduced the number of permitted livestock AUMs and removed the seasonal livestock use restriction within the HMA. However, since 2006, livestock have not used the portion of the allotment that falls within the HMA. Wild horse use since 2006 within this portion of the HMA was calculated from inventory data at 60 AUMs during 2013-2014. The AML for the Buckeye portion of the HMA is 493 AUMs. Because current grazing use has been below three percent utilization on upland vegetation, and the number of perennial grass plants remained static and increased at the monitoring locations between 2004 and 2015, wild horses are not negatively impacting plant community dynamics in this allotment. Livestock have not grazed the allotment for 11 years, the use is attributed to wild horses and wildlife.

Churchill Canyon

Vegetative trend within the Churchill Canyon portion of the HMA is static to upward. Livestock use from 2005 to 2014 averaged 191 AUMs per year. No livestock use occurred in 2015. Wild horse use estimated from inventory data between 2006 and 2009 also averaged 191 AUMs per year. No wild horse use was recorded from 2010 to 2014, a few horses may have been present but were not detected. Perennial grass numbers declined from three in 2007 to two in 2015 but there was a species shift toward more palatable and desirable needlegrass species from Sandberg's bluegrass. Due to its higher palatability to livestock and wild horses, establishment of needlegrass indicates grazing is not currently negatively influencing the plant dynamics at this site.

Clifton

Vegetative trend within the Clifton portion of the HMA is static to downward. No livestock use is permitted or has occurred in this portion of the HMA since prior to 1988. Wild horse use estimated from inventory data has increased from 233 AUMs in 2006 to 1,800 AUMs in 2016. The highest recorded wild horse use during this time period was 1,800 AUMs in 2016. Wild horses move between allotments within the HMA and outside of the HMA. Overall the wild horse population within the Pine Nut Mountains has increased at 17 percent annually since 2012 (population inventory data). The AML for the Clifton portion of the HMA is 444 AUMs. The FMUD indicated the amount and concentration of grazing use was resulting in the loss of grass plants in the mid and lower elevations of the allotment. Use of vegetation by wild horses has exceeded the combined recommended use for both livestock and wild horses (35 to 55% depending on habitat type). Because current wild horse grazing use shows 81 percent utilization (i.e., severe

overuse) and palatable perennial grasses declined between 1980 and 2015, horse use has been identified as a causal factor in the recent downward trend.

Eldorado Canyon

Vegetative trend within the Eldorado Canyon portion of the HMA is downward. With the exception of sheep trailing for approximately one week every year, no livestock use has occurred in this portion of the HMA since prior to 1982. Based on inventory data wild horse use increased from 117 AUMs in 2006 to 1,044 AUMs in 2016. The highest recorded wild horse use during this time period was 1,248 AUMs in 2012. The AML for the Eldorado Canyon portion of the HMA is 270 AUMs. Use of vegetation by wild horses has exceeded the combined recommended use for both livestock and wild horses (35 to 55% depending on habitat type). . Because current wild horse grazing use has resulted in 79 percent utilization (i.e., heavy use) and the number of perennial grasses is declining, horse use has been identified as a causal factor in the recent downward trend.

Hackett Canyon

Vegetative trend within the portion of the HMA in the Hackett Canyon Allotment is static to downward. Livestock use is permitted but has not occurred since prior to 1988. Based on inventory data, estimated wild horse use decreased from 417 AUMs in 2006 to 252 AUMs in 2016. The highest recorded wild horse use was 600 AUMs in 2008. Only 21 horses were recorded in the Hackett Canyon Allotment on the day of the 2016 inventory, wild horse utilization data indicates wild horses have been utilizing the allotment. Wild horse use has resulted in 73 percent utilization (i.e., heavy use) during the 2015-2016 grazing year. Palatable perennial grass numbers remained static at one monitoring location and declined at the other location. The overall number of perennial grasses at the second location increased from four plants in 1980 to seven plants in 2015, but there was a species shift from Thurber's needlegrass (more palatable – deep rooted) to Sandberg's bluegrass (less palatable – shallow rooted). Wild horse use has been identified as a causal factor in the recent downward trend.

Mill Canyon

Vegetative trend within the portion of the HMA in the Mill Canyon Allotment is downward. Livestock use is not permitted in Mill Canyon and the last livestock use occurred in 1996. Wild horse use estimated from inventory data increased from six AUMs in 2006 to 240 AUMs in 2016. Horses frequently move in and out of the HMA along the eastern boundary in the Mill Canyon area. In 2014 an estimated 528 AUM's were consumed by wild horses. Current wild horse grazing use is 73 percent utilization within the allotment and there is a decline in the number of perennial grass species at two monitoring plots and a shift from palatable (Thurber's needlegrass) to less palatable grass species (bottlebrush squirreltail) at one monitoring plot between 1980 and 2015. Wild horse use has been identified as a causal factor in the recent downward trend.

Rawe Peak

Vegetative trend within the portion of the HMA in the Rawe Peak Allotment is downward. Livestock use is not permitted within this allotment and no livestock use has

occurred since prior to 1988. Wild horse use estimated from inventory data was 72 AUMs in 2013-2014. Because current grazing use was five percent utilization on upland vegetation and perennial grass species did not decline at one plot and increased at the other plot between 1980 and 2015, current wild horse grazing has been determined to not be a causal factor in the recent downward trend. The photo record for this site shows an increasing density and size of pinyon and juniper trees between 1976 and 2015. The site is trending toward a treed state. Considering the long-term decrease in the number of perennial grasses and shrubs, a shift toward less desirable grass species and the increase in tree densities, the trend is rated as downward.

Sand Canyon

Vegetative trend within the portion of the HMA in the Sand Canyon Allotment is static to upward. There is no permitted livestock use within the allotment and livestock use has not occurred since prior to 1988. Wild horse use estimated from inventory data ranged from 54 to 108 AUMs from 2006 through 2009 and utilization was less than three percent.

One frequency transect was established in 1982 within the Sand Canyon Allotment. The data comparison from 1982 to 2015 showed no change in the percent frequency of desert needlegrass for key area 1. However, bottlebrush squirreltail has decreased from 41 percent in 1982 to 14 percent in 2015. Sandberg's bluegrass has increased from 26 percent to 37 percent in 2015.

Because current grazing use has been below three percent utilization on upland vegetation and palatable perennial grass species increased and the total number of grasses increased at two of the three monitoring plots, current wild horse grazing has been determined to not be a causal factor in the recent downward trend. The results within Sand Canyon Allotment were mixed for the time period 1980 to 2015, there was a species shift toward less desirable species at two locations but there was also an increase in the number of grasses at two locations, which suggests declining condition early in the monitoring time period and recovery later.

Sunrise

The vegetative trend within the Sunrise Allotment portion of the HMA is static. Livestock use estimated from inventory data was from 106 to 163 AUMs from 2006 until 2014. No livestock use occurred in 2015. The FMUD specifically stated that livestock use would not be authorized until utilization levels by wild horses were below the allowable use levels for grasses and/or bitterbrush. There is no recorded wild horse use in this area for the time period from 2006 through 2014. Current grazing use has been below three percent utilization on upland vegetation, grass seedlings were establishing at one plot and there was no change in the number of perennial grasses between 1980 and 2015 at the other plot. The overall trend in the Sunrise Allotment is static.

3.7 BLM Sensitive Species (Plants)

Table 6 lists the sensitive plant species that occur or their habitat may occur in the Pine Nut Mountains. A brief description of each plant species is provided below.

Table 6. Sensitive Plant Species That Occur or Their Habitat May be Present in the Pine Nut Mountains.

Common Name	Scientific Name
Churchill narrows buckwheat	*Erigonium diatomaceum*
Lavin's eggvetch	*Astragalus oophorus var. lavinii*
Margaret's rushy milkvetch	*A. convallarius var. margaretiae*
Pine Nut Mountains mousetails	*Ivesia pityocharis*
Sand cholla	*Grusonia pulchella*
Tiehm's peppercress	*Stroganowia tiehmiil*
William's combleaf	*Polyctenium williamsiae*

Source: BLM 2014.

Churchill Narrows buckwheat has only been documented in the Churchill Narrows portion of the Pine Nut Mountains. Churchill Narrows buckwheat grows in diatomaceous soil (soft and off-white soil created from fossilized remains of diatoms), at an elevation of 4,300 to 4,600 feet, with neighboring plant species including shadscale saltbush, ephedra, spineless horsebrush, burrobrush (*Hymenoclea salsola*), desert prince's plume (*Stanleya pinnata*), whitestem blazingstar (*M. albicaulis*), volcanic buckwheat (*Eriogonum lemmonii*), flatbrown buckwheat (*Eriogonum deflexum*), and squirreltail (BLM 2014a).

Lavin's milkvetch is a perennial herb that has been found at elevations of 5,700 to 7,467 feet. Lavin's milkvetch grows in soil typically on northeast to southeast facing slopes, badlands, small hills, or slopes that are dry, open, and barren containing gravel with clay originating from volcanic ash or carbonate (BLM 2014a).

Margaret rushy milkvetch is endemic to the Pine Nut Mountains. It typically grows at an elevation of 4,700 to 7,800 feet in rocky soils on slopes and flats in mixed pinyon-juniper and sagebrush landscapes (BLM 2014a).

Pine Nut Mountains mousetails exists on the upper north and east slopes of Mount Siegel in the Pine Nut Mountains at elevations between 6,990 and 8,550 feet. It is wetland-dependent, restricted to periodically wet areas or where the water table and/or bedrock are close to the surface in decomposed granite or sod of meadow margins. This species is associated with features such as springs, riparian corridors, and ephemeral ponds. Accompanying vegetation includes dry rush/forb meadow, adjacent surrounding sagebrush scrub, and occasionally surrounding pinyon/juniper/mountain mahogany woodlands (BLM 2014a).

Sand cholla is a stem-succulent, spiny shrub with magenta flowers. It grows in sand on dunes, well-drained slopes, flats, and borders of dry lakes and washes in desert or sagebrush scrub from 3,950 to 6,300 feet in elevation in western and central Nevada (BLM 2014a).

Tiehm peppercress occurs in the foothill and low mountain regions of the Pine Nut Mountains including Table Mountain in Lyon County. Populations occur in both high and low elevation in

basaltic or sedimentary rocks and at the fringes of rocky scree or talus piles, clay soil, and the base of rock outcrops. It grows in association with shadscale, bitterbrush, sagebrush, and rarely, Utah juniper (BLM 2014a).

Williams combleaf is a small perennial aquatic or aquatic dependent herb in Washoe, Lyon, Douglas, and Mineral counties. It grows in relatively barren sandy to clay or mud margins non-alkaline seasonal lakes perched over volcanic bedrock in sagebrush, pinyon-juniper, and mountain sagebrush zones (BLM 2014a).

3.8 Livestock Grazing

Historically, livestock grazing is known to have occurred in the Pine Nut Mountains since the 1930's under BLM permitting, although sheep and/or cattle grazing are likely to have been occurring in the area since the late 1800s. The Pine Nut Mountains overlaps with 17 livestock grazing allotments, and the HMA overlaps with nine allotments (Figure 8). Areas that are "available" for livestock grazing are determined through a land use plan. Authorization of AUM's, range improvements, season of use, etc. is made through a livestock term grazing permit process that includes analysis under the NEPA and public involvement. Table 7 lists the allotment name, season of use, AUMs, permit status (see also Figure 6), and type of use (cattle or sheep). Table 8 lists the allotments within the HMA, and actual use during the last 10 years.

There has been no grazing for the past ten years on seven of the nine allotments within the HMA. Churchill Canyon and Sunrise were last grazed in 2017 Prior to 2017 these allotments were not grazed year long, however if they were Churchill Canyon would have had the equivalent of 17 cows and Sunrise would have varied between nine and 14 cows.

Table 7. Grazing Allotments in the Pine Nut Mountains HMA.

Name	% in Pine Nut Mountains	In HMA?	% in HMA	Type	AUMs	Permitted Season(s) of Use
Buckeye	98	Yes	12	Cattle	1,471	4/1 to 9/15
Churchill Canyon	72	Yes	18	Cattle	4 1,232	11/1 to 11/30 11/1 to 5/15
Clifton	100	Yes	77	No permitted use	-	-
Eldorado Canyon	100	Yes	79	No permitted use	-	-
Hackett Canyon	100	Yes	88	Cattle/ Sheep	146 39	3/15 to 6/30 3/15 to 6/30
Mill Canyon	100	Yes	43	No permitted use	-	-
Rawe Peak	100	Yes	100	No permitted use	-	-
Sand Canyon	100	Yes	85	No permitted use	-	-
Sunrise	100	Yes	97	Cattle	159	3/15 to 6/15

Table 8. Grazing Allotments in the Pine Nut Mountains HMA and Actual Use (in AUMs) within the HMA.

Year*	Buckeye	Clifton	Churchill Canyon	Eldorado Canyon	Hackett Canyon	Mill Canyon	Rawe Peak	Sand Canyon	Sunrise
2006	0	0	141	0	0	0	0	0	162
2007	0	0	186	0	0	0	0	0	160
2008	0	0	189	0	0	0	0	0	159
2009	0	0	200	0	0	0	0	0	163
2010	0	0	200	0	0	0	0	0	158
2011	0	0	200	0	0	0	0	0	147
2012	0	0	200	0	0	0	0	0	159
2013	0	0	200	0	0	0	0	0	141
2014	0	0	200	0	0	0	0	0	106
2015	0	0	0	0	0	0	0	0	0
2016	0	0	200	0	0	0	0	0	157
2017	0	0	200	0	0	0	0	0	157

*Based on a grazing year of March 1 to February 28.

3.9 Noxious and Invasive Weeds

Invasive species are defined by Executive Order 13112 as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." Alien refers to a species that did not evolve in the environment in which it is found. This includes plants, animals, and microorganisms. Table 9. lists the noxious weeds that may be present in the Pine Nut Mountains. A brief description of each is provided below.

Table 9. Noxious Weeds That May be Present in the Pine Nut Mountains.

Common Name	Scientific Name
Canada thistle	*Cirsium arvense*
Hoary cress	*Cardaria draba*
Perennial pepperweed	*Lepidium latifolium*
Poison hemlock	*Conium maculatum*
Medusahead	*Taeniatherum caput-medusae*
Musk thistle	*Carduus natans*
Scotch thistle	*Onopordum acanthium*
Spotted knapweed	*Centaureau biebersteinii*

Source: BLM 2014a.

Canada thistle is a perennial weed that has a deep, extensive creeping root system. This weed reproduces by both roots and seeds. This weed is often found in patches or colonies due to the spreading root system and grows best in moist areas and is also found in pastures. Hoary cress is a perennial weed that grows best in disturbed, alkaline soils. This weed reproduces through roots and seed. Perennial pepperweed/tall whitetop is a perennial weed that has a creeping root system and can be found in moist areas and pastures. Poison hemlock is a biennial weed that has a thick, deep taproot. It reproduces by seed and is highly toxic to animals and humans when consumed. Medusahead is an annual weed that reproduces by seed and is unpalatable to grazing animals. This weed grows best in clay soils, often in rangelands. Musk thistle is a biennial weed that has a deep, fleshy taproot and reproduces by seed, and often infests roadsides. Scotch thistle is a biennial weed that reproduces by seed and can form dense stands that are difficult to penetrate. This weed has a fleshy taproot and often infests roadsides. Spotted knapweed is a

biennial weed that has a deep, stout taproot, and can be found on dry, well drained soils, and often infests roadsides and rangelands. This weed reproduces by seed and lateral roots (NDA 2013).

Cheatgrass, an invasive weed, is also know to occur in the Pine Nut Mountains. Cheatgrass is an annual grass that displaces native perennial shrub, grasses and forbs because of its ability to germinate quicker and earlier than native species, thus outcompeting natives for water and nutrients. Cheatgrass is also adapted to recurring fires that are perpetuated in part by the fine dead fuels the plant leaves behind.

3.10 Human Health and Safety

Some members of the public are interested in observing wild horse gather operations or may be recreating on public lands during the gather. Members of the public who are present in the vicinity of the wild horse gather 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 themselves, the wild horses and to the BLM employees and contractors conducting the gather and/or handling the wild horses, as well as to the public themselves. Because these wild horses are wild animals, there is always the potential for injury when individuals get too close or inadvertently get in the way of gather activities.

The helicopter work is done at various heights above the ground, from as little as 10 to 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. The same unknown and unexpected obstacles can impact the wild horses being herded by the helicopter in that they may not be able to react and can be potentially harmed or caused to flee, which can lead to injury and additional stress. When the helicopter is working close to the ground, the rotor wash of the helicopter is a safety concern by potentially causing loose vegetation, dirt, and other objects to fly through the air, which can strike or land on any person in close proximity, as well as cause decreased vision. Though rare, helicopter crashes and hard landings can, and have occurred (approximately 10 times over the last 30+ years), while conducting wild horse gathers, which necessitates the need to follow gather operations and visitor protocols at every wild horse gather to assure the safety of all people and animals involved. Flying debris caused by a helicopter crash poses a safety concern to BLM and contractor staff, visitors, and the wild horses.

During the herding process, wild horses would try to flee if they perceive that something or someone suddenly blocks or crosses their path. Fleeing wild horses can go through wire fences, traverse unstable terrain, and go through areas they normally do not use in order to escape the perceived danger, 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 BLM and contractor staff who are trying to sort, move and care for the wild horses and burros by causing them to be kicked, struck, and possibly trampled by the animals trying to flee. Such disturbances also have the potential for similar harm to the public.

The BLM is committed to allowing access by interested members of the public to the fullest possible degree without compromising safety or the success of operations. To minimize risks to the public from helicopter operations, the gather contractor is required to conduct all helicopter operations in a safe manner, and to comply with FAA regulations (FAR) 91.119 and BLM IM No. 2010-164 [6] (Appendix E). Public observations sites would also be established in locations that reduce safety risks to the public (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. The Public Observation Protocols found in Appendix E provide the public with the opportunity to safely observe the gather operations. Every attempt would be made to identify observation site(s) at the gather location that offers good viewing opportunities, although there may be circumstances (flat terrain, limited vegetative cover, private lands, etc.) that require viewing locations to be at greater distances from the gather site to ensure safe gather operations.

3.11 Area of Critical Environmental Concern

An Area of Critical Environmental Concern (ACEC) is defined in the Federal Land Policy and Management Act (FLPMA) (Public Law 94-579, Section 103[a]) as an area on BLM-managed lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, geologic, paleontological, or scenic values, to fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards.

In November 2014, the BLM evaluated six units for ACEC designation, the 6,583 acre Churchill Narrows Buckwheat Botanical, the 137,267 acre Namazii Wunu Cultural ACEC, the 87,302 acre Pine Nut Bi-State Sage-Grouse ACEC, the 330 acre Pine Nut Mountains William Combleaf Botanical ACEC, and the 81,752 acre Tagim Asa Cultural ACEC which partially overlap the Pine Nut Mountains (Figure 14; BLM 2014). A final determination of management actions for each ACEC unit, if designated, would be made as a part of the on-going land use plan revision. A Record of Decision is anticipated in the summer of 2018.

3.12 Lands with Wilderness Characteristics

The authority to inventory BLM-managed lands for wilderness characteristics (LWC) is found in Sections 201 and 202 of FLPMA. Manual 6320, Conducting Wilderness Characteristics Inventory on BLM Lands (BLM 2012b), allows the BLM discretion to manage lands with wilderness characteristics exclusively for protection of those characteristics, or to consider those characteristics in relation to other resource values and demands, or to not manage for wilderness character. An area with wilderness characteristics may also contain other values not necessary for the determination of wilderness character. These supplemental values include the following:

6 At helicopter gathers over the past few years, public observers have ranged in number from only a handful of individuals to a maximum of between 15-25 members of the public. At these numbers, BLM has determined that the current level of public visitation to gather operations falls below the threshold of an “open air assembly” under the FAR regulations. 14 CFR § 91.119.

- *Size*: An area must be a roadless area of 5,000 acres of contiguous BLM-managed lands, or if less than 5,000 acres, must be contiguous with BLM-managed lands that have been formally determined to have wilderness or potential wilderness values.
- *Naturalness*: Lands and resources exhibit a high degree of naturalness when affected primarily by the forces of nature and where the imprint of human activity is substantially unnoticeable.
- *Outstanding Opportunities for Solitude or Primitive and Unconfined Types of Recreation:* Visitors may have outstanding opportunities for solitude or primitive and unconfined types of recreation when the sights, sounds, and evidence of other people are rare or infrequent; where visitors can be isolated, alone, or secluded from others; where the use of an area is by non-motorized, non-mechanical means; and where no or minimal recreation facilities are encountered.
- *Supplemental Values*: The area may contain ecological, geological, or other features of scientific, educational, scenic, or historical values.

In 2014 the BLM inventoried public lands within the project area and identified seven individual units totaling approximately 142,000 acres that meet the criteria for wilderness character. A final determination of management actions for each LWC unit would be made as a part of the on-going land use plan revision. A Record of Decision that would establish management direction and objectives for these units meeting wilderness characteristics is anticipated in the summer of 2018. For more information see the *Report on Lands with Wilderness Characteristics* (BLM 2014b).

3.13 Cultural Resources

Cultural resources include historic and prehistoric evidence of past human activities on the land, including Native American habitation and resource procurement sites, historic mining and ranching sites, and historic architecture. Cultural resources with the potential to provide important information for scientific research or to illustrate significant parts of American history may be listed on, or be eligible for listing on, the National Register of Historic Places (NRHP). The National Historic Preservation Act of 1966, as amended (NHPA) requires federal agencies to consider the effects of federal decision-making on NRHP-listed or eligible cultural resources, which are referred to as "historic properties."

Approximately 13% of the Pine Nut HMA has been subject to cultural resources inventory, resulting in documentation of 400 cultural resources sites, of which about 10% are historic properties. Based on this sample, between 1,000 and 3,000 cultural resources sites are likely present in the HMA, including hundreds of historic properties. Cultural resources in the Pine Nut HMA include evidence of Native American hunting, plant gathering, tool making, and habitation over the past 10,000 years. Cultural resources related to historic mining, ranching, charcoal-making, and settlement over the past 150 years are also present across the HMA. Most cultural resources in this area are archaeological sites (as opposed to architecture) and their eligibility for the NRHP is based on their potential to contribute to our understanding of history and prehistory through scientific research. This scientific value can be adversely impacted by disturbance to soils through hoof action, loss of vegetation cover, and subsequent erosion.

4.0 Environmental Consequences

This chapter describes and compares the environmental consequences predicted to result from implementing the Proposed Action or Alternatives described in Chapter 2.0. The purpose of this chapter is to present the impact analysis of the alternatives and to disclose the impacts of the actions on affected resources by the Proposed Action or Alternatives.

The potential consequences or impacts of each alternative are addressed in the same order of resource topics in Chapter 3.0. This parallel organization allows readers to compare existing resource conditions (Chapter 3.0) with potential impacts (Chapter 4.0).

Types of Effects
This chapter describes the potential direct, indirect, and residual effects to resources that may result from the Proposed Action or Alternatives, as well as identifies the potential monitoring needs associated with the specific resources. In this document, the word "adverse" is used in characterizing minor (non-significant) detrimental effects to a resource, and "negligible" is used in characterizing minor (non-significant) detrimental effects to a resource that are generally undetectable. "Beneficial" effects would have a positive effect on the resource. In this document, the terms "effect" and "impact" are used synonymously. Assessment of effects can be for short-term (generally considered during Project implementation) or the long-term. Effects fall into two categories, direct (caused by the action, same time and place) and indirect (caused by the action, but later in time or further in distance).

4.1 Wild Horse Management Common to Alternatives A, B, and C

Population Modeling
Population Modeling by Alternative. Population modeling was completed to analyze the potential outcome from the Proposed Action and action alternatives on wild horse populations in the HMA. Table 10 compares the Proposed Action to all other alternatives for the HMA.

The WinEquus population model is designed to project how a wild horse population would likely respond to different management alternatives. The program runs 100 simulations for each management alternative, the averages from the 100 simulations are in table 10, see Appendix F for the complete modeling results. The results show the lowest trial and highest trial which represent the lowest and highest number from the 100 simulations. The results also show the median trial which is displayed in table 10. The tables in Appendix F show the 10^{th}, 25^{th}, 75^{th} and 90^{th} percentile. Each percentile indicates the number of simulations that fall below it. As an example if the table showed that 860 horses gathered were in the 10^{th} percentile that would indicate that in 10 percent of the simulations less than 860 horses were gathered. If the table showed 1,059 horses gathered in the 90^{th} percentile that would indicate that in 90 percent of the simulations less than 1,059 horses were gathered.

The population would be expected to increase at a lower rate if contraceptives or spaying were used Table 11. The use of contraceptives or spaying would have several notable benefits, fewer horses would be born which would result in fewer excess horses that would need to be removed and cared for and the gather interval may be increased as it would take longer for the horse population to build back to a level that is detrimental to the resources. Additionally a lower rate

of increase would result in lower use and impacts on resources for a longer period of time, allowing the native vegetation more time to recover in areas that are currently over grazed, decreasing the need to adjust the AML to a lower level in the future.

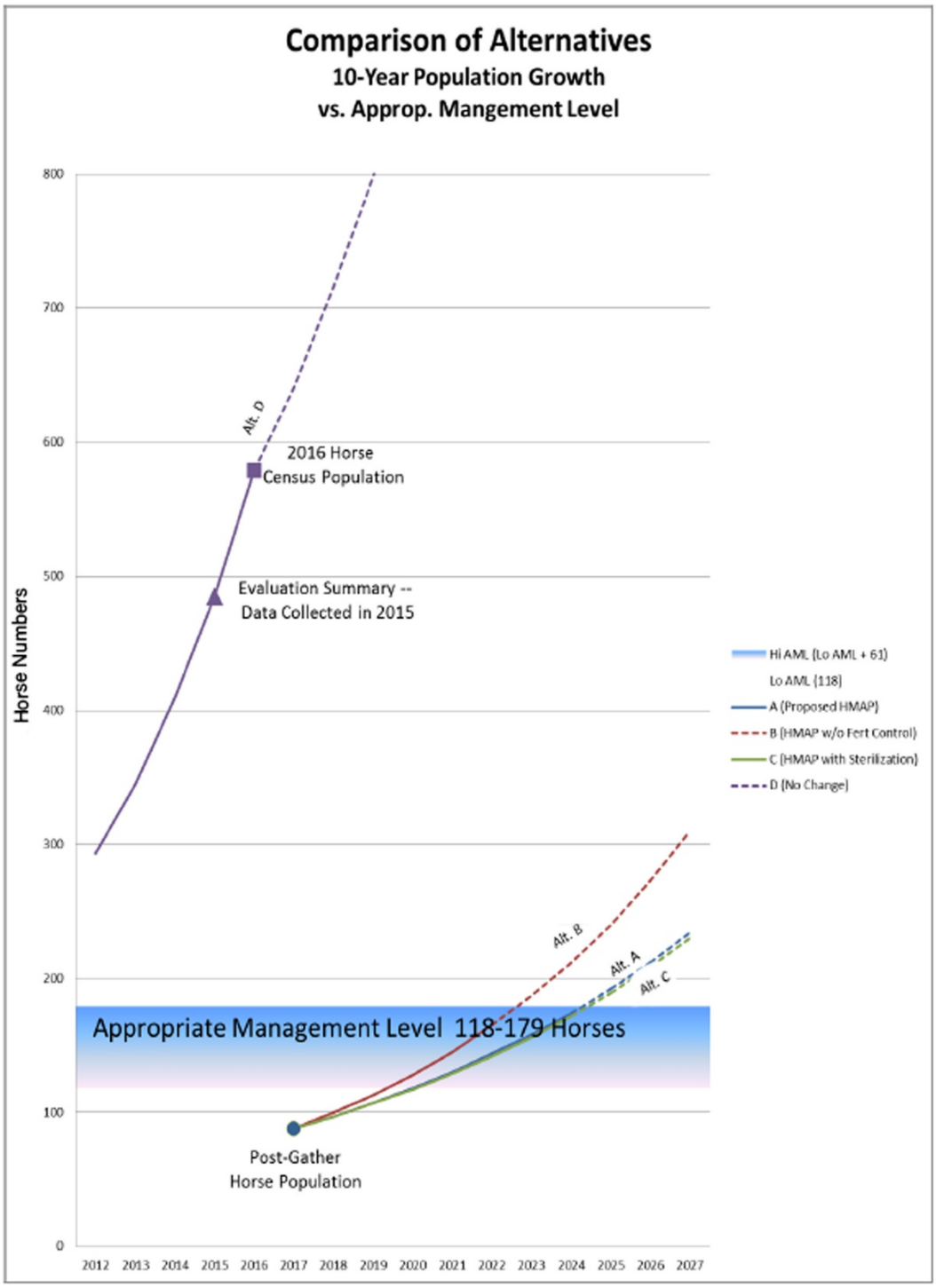
Under these alternative the wild horses would be managed within the AML using a combination of contraceptives (except for alternative B) and removals. Helicopter assisted gather techniques would be the primary method, however, when practical bait and water trapping would supplement larger gathers. Contraceptives would be applied by either utilizing a dart gun or capturing animals using either helicopter or bait trapping techniques

Table 10. WinEquus Population Modeling Results by Alternative.

Alternative	Average Growth Rate Over 10-Years	Population	Number Treated	Number Gathered	Number Removed
A	8.8%	234	50	936	680
B	13.9%	310	N/A	1,004	864
C	8.2%	230	68	944	684
D	20.1%	1,899	N/A	N/A	N/A

Source: WinEquus version 3.2.

Table 11. Horse population growth rate under different alternatives.



Gather methods (helicopter gather; water/bait trapping*)*

Use of Helicopters for Gathering Horses

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 G 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 38,500 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).

When gather objectives require gather efficiencies of 50-80% or more of the animals to be captured from multiple gather sites (traps), the helicopter drive method (with horseback assisted roping) will be the primary gather method used. To the extent possible gather sites (traps) will be located in previously disturbed areas. Post-gather, every effort would be made to return any released animals to the same general area from which they were gathered.

Gathering wild horses using a helicopter is authorized by Section 1338 of the WFRHBA. The use of a helicopter is often the most efficient and humane method for conducting a gather, especially for areas with scattered water sources, variable terrain, and areas that are inaccessible by vehicles. Direct mortality of wild horses associated with helicopter-driven gathers is less than one percent (BLM 2015).

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

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

horses into the trap. Once horses are gathered they are removed from the trap and transported to a temporary holding facility where they are sorted.

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

Use of Bait/Water Trapping

Bait and/or water trapping generally requires long time frames and could be used to supplement the helicopter gather, if gather efficiencies are lower than targeted, or could be used in follow-up gathers to remove smaller numbers of excess horses from targeted areas suitable for this gather method. Bait trapping is very effective for gathering nuisance horses in urban areas and along roadways. Bait/water trapping may also be used to remove horses where resource damage is concentrated such as water sources and riparian areas. To be effective traps need to be constructed in areas frequented by horses during times when water or food is limited. Generally, it takes days or weeks before horses acclimate to the trap and/or decide to access the water/bait. Because of the poor road access to most of the water sources inside and outside of the Pine Nut HMA very limited trapping opportunities exist.

Trapping involves setting up portable panels around an existing water source or in an active wild horse area. The portable panels would be set up to allow wild horses to move freely in and out of the corral until they have adjusted to it. When the wild horses fully acclimate to the corral, it is fitted with a gate system. 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. Often it is necessary to fence off other water sources in the area as horses are more inclined to utilize unfenced water sources.

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

Gathering excess horses utilizing bait/water trapping could occur at any time of the year and extend until the target number of animals is removed in order to achieve management objectives including: attaining AML, implement population control measures, and removing animals residing outside the HMA. Generally, bait/water trapping is most effective and is only appropriate when a specific resource is limited, such as food or water. Because bait and water trapping does not involve horses moving any distance it can occur any time of the year.

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.

If gather efficiencies utilizing helicopter drive-trapping do not achieve the desired goals, or if a follow-up helicopter gather cannot be scheduled to remove the remaining excess wild horses, water/bait trapping may be utilized as a supplement to a helicopter gather. In addition, water/bait trapping would be used to remove sufficient numbers of horses to achieve the management targets, to relieve resource concerns and/or concentrated groups of horses both inside and outside of the HMA if this gather technique is appropriate for a particular portion of the area. For example, in some cases, water/bait trapping could be utilized to gather small numbers of excess wild horses that reside outside of the HMA boundary or where excess horses are concentrated in an accessible area within the HMA. Any water/bait trapping activities would be scheduled during time periods that would be most effective and in those isolated areas that would be most conducive for the use of this technique. The current distribution of wild horses would limit the use of bait trapping, however, if the distribution changes increased use of bait trapping may occur.

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

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. Based on wild horse watering locations in this area, it is estimated that multiple trap sites may be used during trapping activities. Bait or water trapping sites could remain in place for extended periods of time.

An Animal and Plant Inspection Service (APHIS) or other veterinarian may be on-site during bait/ water trapping to examine animals and make recommendations to BLM for care and treatment of wild horses. For bait trapping, veterinarian services would be provided at the holding facilities and available at the trap sites if needed.

Selection of Locations for Trap Sites & Temporary Holding Facilities

Multiple gather sites (traps) may be utilized, depending on the location of wild horses at the time of the gather. Trap sites may be within or outside the HMA on BLM-managed lands or private

lands with land owner permission. To the extent practicable, trap sites would be located in previously disturbed areas and at previously used trap sites (Figure 10). For effective transport purposes and minimizing disturbances to the land, traps sites are typically located on or close to existing roads.

The most humane and efficient gather approach would be chosen when assessing gather areas and actions needed. 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. This 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. 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 G) and to the written approval/authorization of the landowner.

Trap sites and temporary holding facilities will be located in previously used sites or other disturbed areas whenever possible. Undisturbed areas identified as potential trap sites or holding facilities would be inventoried for cultural resources. If cultural resources are encountered, these locations would not be utilized unless they could be modified to avoid impacts to cultural resources.

Temporary gather and holding sites would be no larger than 0.5 acres. Helicopter drive and temporary holding sites could be in place for up to 45 days. 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 G.

No helicopter drive trap sites would be set up on or near sage grouse leks, riparian areas, cultural resource sites, or Congressionally Designated Wilderness Areas. Gather activities (helicopter) would not occur during migratory bird nesting season (April- July). All trap sites and holding facilities on public lands would be recorded with Global Positioning System equipment. In general, gather sites and holding corrals would not be located where sensitive animal and/or plant species are known to occur nor within crucial intact habitat for big game species. If water trapping methods are used traps would be set up at water sources but would be designed to avoid any additional impacts, those impacts that are not present by the current use of these areas by wild horses.

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.

Activities within Bi-State Sage Grouse habitat would be in accordance with the WO IM 2012-043 and adhere to Nevada State Office IM 2015-017 and the Record of Decision and Land Use Plan Amendment for the Nevada and California Greater Sage-Grouse Bi-State Distinct Population segment in the Carson City District and Tonopah Field Office (2016).

Monitoring of Gathered Horses/ Data Collection
Data would be collected on gathered wild horses including: sex, age, condition class (using the Henneke rating system), color and size. The BLM may also collect genetic data to ensure that acceptable genetic diversity is maintained within the remaining herd.

Euthanasia
Any wild horses with chronic or incurable disease, lame horses unable to maintain an acceptable body condition (greater than or equal to a Henneke BCS of 3), or wild horses with serious physical defects (such as severe tooth loss or wear, club foot, and other severe congenital abnormalities) would be humanely euthanized either before gather activities begin or during the gather operations. Decisions to humanely euthanize animals in field situations would be made in conformance with BLM policy (WO IM No. 2015-070 or most current edition).

Activities at Temporary Holding Facilities (Corrals)
Wild horses that are gathered would be transported from the gather sites to a temporary holding corral in goose-neck trailers. While at the temporary holding corrals, the horses would be identified for transport to an off range facility or release due to age, gender and/or other desirable characteristics. At the temporary holding corral wild horses would be sorted into different pens based on sex. Horses would be identified for population growth suppression and administered a shot at the corrals prior to release. Mares and their dependent foals would be kept in pens together.

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

The horses while in the temporary holding corrals are provided good quality hay and water.

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

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 dependent foals would 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), in accordance with BLM IM Washington Office Instruction Memorandum (WO IM 2015-070). 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.

Selective Release and Removal

Horses that display good conformation and health condition would be selected first to be placed back on the HMA. The Proposed Action would permanently remove approximately 600 wild horses, i.e., a sufficient number to achieve low end AML within the HMA and to remove all horses outside the HMA (except for a small population in the Fish Springs area), during an initial gather operation, all weaned foals would be removed. Any dependent foals less than six months of age would be either removed or released with its mare depending on the final disposition of the mare. The gather would occur no earlier than Fiscal Year 2018, and would take between 7 to 10 days to be completed. The BLM would also attempt to gather a sufficient number beyond the excess wild horses to be removed from the public range, to allow for the application of fertility control to mares that would be released back into the HMA.

Excess wild horses would be removed using a selective removal strategy as follows:

a) first priority: age class – 6 years and younger;
b) second priority – age class – 11 to 19 years;
c) third priority – age class – 7 to 10 years; and
d) fourth priority – age class – 20 years and older would not be removed from the HMA unless specific exceptions prevent them from being returned to the range.

Due to the mountainous terrain and vegetative cover (timber), gather efficiency may be less than optimal. Gather efficiencies typically average approximately 80 percent, so it is likely that all wild horses that are accessible and can be located would need to be gathered in order to achieve

the initial phase of the Proposed Action. Wild horse numbers within the HMAs would be reduced to the low range of AML by allotment.

Herd health and characteristics data would be collected as a part of continued monitoring of the wild horse herds. Other data, including sex and age distribution, condition class information (using the Henneke rating system), color, size and other information may also be recorded for all gathered wild horses. Genetic data would be collected to compare with previously collected data and to monitor genetic health of the wild horses.

A veterinarian would assess the condition of all captured wild horses. Removed excess wild horses would be transported from holding corrals to off-range corrals (ORCs) to be prepared for adoption, sale or transportation to off-range pastures (ORPs).

The post removal population would consist of animals from all age classes; however, all weanable foals would be removed.

Wild Horse Response to Handling

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 project, 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 occasionally 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 the majority of the foals would be old enough to travel with the groups 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 by helicopter 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.

Wild Horses Released Back into the HMA

Direct effects to wild horse populations as a result of the gathers include: altered herd population dynamics; altered age structure and/or sex ratio; reduced numbers and in instances where PZP-22 (or other contraceptive technique) is used, lower population growth rates. Reducing the number of animals would improve range health and reduce the possibility that the excess number of wild horses would result in some animals experiencing starvation or terminal dehydration due to insufficient forage and/or water. There would be decreased competition with wildlife and livestock for forage and water. Reducing the wild horse population to within AML would also reduce the likelihood that the animals move outside the HMA onto lands not managed for wild horses. A thriving natural ecological balance would be maintained or restored throughout the gather area. Improved herd conditions would likely result in higher foal survival rates, which may be mitigated by applying contraceptives or other fertility control methods.

Herd dynamics would be expected to normalize within weeks of the animals being returned to the HMA. Wild horse populations would be expected to remain within the AML range for three to five years. If PZP-22 (or other contraceptive) is applied to mares that treatment may further extend the timeframe that the population remains within AML.

Transport, Short-Term Holding, and Adoption Preparation

Wild horses removed from the range would be transported to a short-term holding facility using trucks with stock trailers. Animals would be segregated by sex and age, and loaded into separate compartments. Although transportation time for wild horses is limited to no more than 12 hours, actual transport time from the gather area to a short-term holding facility is expected to be much less. During transport, potential impacts to individual wild horses can include stress, slipping,

falling, being kicked or bitten, or stepped on by another animal. However, these impacts are reduced by insuring the trailer floors are covered with non-skid material, separating horses by sex, age, and smaller or weaker animals.

Upon arrival at the short-term holding facility, the wild horses would be off-loaded and placed into holding pens where they are provided water and hay. A veterinarian would provide care and make any recommendation for an animal that would need to be euthanized.

After some time of adjustment to the short-term holding facility, the animals would be prepared for adoption. Preparation includes freeze-marking with a unique identification number, vaccination for common diseases, castration of studs, and de-worming. Potential impacts during adoption preparation would be similar to those that can occur during transport. A minimum of 700 square feet per animal is provided at the facility. Mortality averages approximately five percent (GAO 2008) including animals euthanized from pre-gather condition, animals unable to transition to feed, and animals which die accidentally during sorting, handling or preparation.

Adoption
Applicants who wish to adopt a wild horse must have at least 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 a minimum of one year, and can conduct inspections. After one year, the applicant may take title to the horse at which point the animal become the property of the applicant. Adoptions are conducted in accordance with 43 CFR 4750.

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

Long-Term Grassland Pastures
Potential impacts to individual wild horses from transportation to long-term pastures are similar to those impacts previously discussed for transportation to short-term pastures. One difference is that when being transported to long-term pastures, animals may be transported for up to 24 hours, at which time they are off-loaded and provided eight hours of on-the-ground rest. During the rest period, each animal is provided water and hay.

Long-term pastures are designed to provide excess wild horses with humane, life-long care in a natural setting. The pastures are large enough in size (privately owned lands ranging in size from 1,100 to 46,000 acres) to allow free-roaming behavior with forage, water and shelter to sustain them in good condition. Mares and castrated stallions are segregated into separate pastures. Foals are born only to those mares recently gathered from the western public lands. When those foals are weaned at about eight to 10 months, they are then shipped to short-term holding facilities to be prepared and made available for adoption. A very small number of animals may be euthanized if their body condition is 3 or lower due to age and other factors.

Although most wild horses residing on long-term pastures live longer than average, natural mortality averages approximately eight percent per year (GAO 2008).

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

Maintain Genetic Diversity
By maintaining genetic diversity, problems associated with inbreeding will be avoided. Hair samples would be collected from horses captured while they are restrained in a portable chute and are being aged. Collecting hair samples would require the animal to be restrained for less than an additional minute. Hair samples are usually collected by wrapping approximately ten hairs around a wood dowel or similar object and pulling them out, which may result in a small annoyance from which the horses quickly recover.

The hair samples would be analyzed by Dr. Gus Cothran, at Texas A&M University and his recommendations would be followed. When analysis indicates low diversity a few young horses from other HMAs or areas outside of the HMA would be released along with animals identified for release back into the HMA. Some stress could occur as these "new" animals assimilate into new bands, however, it would be of relatively short in duration.

Assuring Rangeland Health
Removal of excess wild horses to bring the population back to low end AML will reduce utilization levels to that which will allow the native vegetation to recover and meet sage-grouse objectives. Upland vegetative communities will not only be able to provide quality habitat for wild horses but also for native wildlife. The wild horses would benefit from the restoration and maintenance of healthy rangeland, as would wildlife since their habitat components could be met.

Removal of excess wild horses to bring the population back to low end AML will ensure that riparian areas will not be negatively impacted by soil compaction caused by excessive use and the flow rates may eventually increase as pressures on these areas decrease. Critical riparian habitat will be restored for many species of native wildlife as these areas recover following removal of excess wild horses.

4.2 Wild Hose Management Common to Alternatives A and C

BLMs Use of Contraception in Wild Horse Management

The use of contraceptives would be used under both Alternatives A and C. Wild horse populations generally double every four to five years crating a large number of excess wild horses that if left on the range degrade both upland and riparian habitats. This overuse would eventually lead to the loss of native wildlife species and eventually the loss of wild horses through starvation or dehydration. The number of excess wild horses is far above the adoption demand, through the use of contraceptives the number of excess wild horses could be reduced. The effects of contraceptives is discussed in this section.

Direct Effects of PZP

PZP vaccine is an EPA-approved pesticide (EPA, 2012) that is relatively inexpensive, meets BLM requirements for safety to mares and the environment. Its categorization as a pesticide is consistent with regulatory framework for controlling overpopulations of 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.

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).

Research has demonstrated that contraceptive efficacy of an injected liquid PZP vaccine, such as ZonaStat-H, is approximately 90% or more 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 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 highest efficacy for fertility control has been achieved when applied during the time frame of December through February. Refer to *Appendix A. Standard Operating Procedures for*

Population-level Porcine Zona Pellucida Fertility Control Treatments for more information about fertility control research procedures.

Reversibility and Effects of PZP on Ovaries

In most cases, PZP contraception appears to be temporary and reversible, with most treated mares returning to fertility over time (Kirkpatrick and Turner 2002). 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. 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. (2017a) noted reversible effects on ovaries in mares treated with one primer dose and booster dose. 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 seven 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). 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. 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.

Effects of PZP on Existing Pregnancies, Foals, and Birth Phenology

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 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 the fertility or ovarian function of those 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 foal 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 been 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. However, the paper provided no evidence that such impacts 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. 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 in Nevada do not generally occur in isolated refugia, and they are not a rare species. Moreover, an effect of shifting birth phenology was not observed uniformly: in two of three PZP-treated wild horse populations studied by Ransom et al. (2013), foaling season of treated mares extended three weeks and 3.5 months, respectively, beyond that of untreated mares. In the other population, the treated mares foaled within the same time period as the untreated mares. Moreover, Ransom et al. (2013) found no negative impacts on foal survival even with an extended birthing season. 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.

Effects of Marking and PZP Injection

Standard practices for PZP treatment require that treated animals be readily identifiable, either via brand marks or unique coloration (BLM 2010). BLM has instituted guidelines to reduce the sources of handling stress in captured animals (BLM 2015). Some level of transient stress is likely to result in newly captured mares that do not have freeze 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). Handling may include freeze-marking, for the purpose of identifying that mare and identifying her PZP vaccine treatment history. Under past management practices, captured mares experienced increased stress levels from handling (Ashley and Holcombe 2001). Markings may also be used into the future to determine the approximate fraction of mares in a herd that have been previously treated, and could provide additional insight regarding gather efficiency.

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

Indirect Effects of PZP

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. The observable measure of improved health is 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 mare's 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. 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). 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 eliminate the need to remove WH&Bs from the range or place into short and long-term holding. 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 of fertile mares within the herd would be sustained, as reduced population sizes would 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, wild burros, and wildlife throughout the HMA. With rangeland conditions more closely approaching a thriving natural ecological balance, and a less concentrated distribution of animals across the HMA, there should also be less trailing and concentrated use of water sources, which would have many benefits to the wild horses. 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 between water and desirable foraging areas. Should PZP booster treatment and repeated fertility control treatment continue into the future, the chronic cycle of overpopulation and large gathers and removals would no longer occur, but instead a consistent cycle of balance and stability would ensue, resulting in continued improvement of overall habitat conditions and animal health. While it is conceivable that widespread and continued treatment with PZP could reduce the birth rates of the population to such a point that birth is consistently below mortality, that outcome is not likely unless a very high fraction of the mares present are all treated in almost every year.

Behavioral Effects of PZP

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. This type of behavioral difference 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 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. Nuñez (2009, 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 Nuñez et al. (20090) 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 Wilhelm 1995, Heilmann et al. 1998, Curtis et al. 2002). 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, 2010, 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 (Nuñez 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 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 puts research up to that date by 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)."

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 single HMAs should not be considered as isolated genetic populations. Rather, managed herds of wild horses should be considered 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 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 HMA. 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.

Porcine Zona Pellucida (PZP) Vaccine

PZP vaccines have been used on dozens of horse herds by the National Park Service, US Forest Service, Bureau of Land Management, and Native American tribes and its use is approved for free-ranging wild horse herds. Taking into consideration available literature on the subject, the National Research Council concluded in their 2013 report that PZP was one of the preferable available methods for contraception in wild horses and burros (NRC 2013). PZP use can reduce or eliminate the need for gathers and removals (Turner et al. 1997). PZP vaccines meet most of the criteria that the National Research Council (2013) used to identify promising fertility control methods, in terms of delivery method, availability, efficacy, and side effects. It has been used extensively in wild horses (NRC 2013), and in feral burros on Caribbean islands (Turner et al. 1996, French et al. 2017). PZP is relatively inexpensive, meets BLM requirements for safety to mares and the environment, and is produced as ZonaStat-H, an EPA-registered commercial 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.

Under the Proposed Action, the BLM would return to the project area 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 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.

GonaCon

This literature review is intended to summarize what is known and what is not known about potential effects of treating mares with GonaCon. As noted below, some negative consequences of vaccination are possible. Anti-GnRH vaccines can be administered to either sex, but this analysis is limited to effects on females, except where inferences can be made to females, based on studies that have used the vaccine in males.

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 a 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 Freund's 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' that is associated with slow or sustained release of the antigen, and a resulting 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 luteinizing 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 luteinizing 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, Donovan et al. 2013, Powers et al. 2011). 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 ConaGon-Equine to prepubertal mares will lead to long-lasting infertility, but that has not yet been tested.

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

Other anti-GnRH vaccines also have had reversible effects in mares. Elhay (2007) noted a return to ovary functioning over the course of 34 weeks for 10 of 16 mares treated with Equity. That study ended at 34 weeks, so it is not clear when the other six mares would have returned to fertility. Donovan et al. (2013) found that half of mares treated with an anti-GnRH vaccine intended for dogs had returned to fertility after 40 weeks, at which point the study ended. In a study of mares treated with a primer and booster dose of Improvac, 47 of 51 treated mares had returned to ovarian cyclicity within 2 years; younger mares appeared to have longer-lasting effects than older mares (Schulman et al. 2013). Joonè et al. (2017c) analyzed samples from the Schulman et al. (2013) study, and found no significant decrease in anti-Mullerian hormone (AMH) levels in mares treated with GnRH vaccine. AMH levels are thought to be an indicator of ovarian function, so results from Joonè et al. (2017c) support the general view that the anoestrus resulting from GnRH vaccination is physiologically similar to typical winter anoestrus. 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 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. Similarly, not all animals may be approachable for darting. The uncaptured or undarted portion of the female population would still be expected to have normally high fertility rates in any given year, though those rates could go up slightly if contraception in other mares increases forage and water availability.

GnRH Vaccine Effects on Other Organ Systems

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 hypothalamic or pituitary function.

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

GnRH Vaccine Effects on Fetus and Foal

Although fetuses are not explicitly protected under the WFRHBA of 1971, as amended, it is

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

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

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

There is little empirical information available to evaluate the effects of GnRH vaccination on foaling phenology. It is possible that immunocontracepted mares returning to fertility late in the breeding season could give birth to foals at a time that is out of the normal range (Nuñez et al. 2010, Ransom et al 2013). Curtis et al. (2001) did observe a slightly later fawning date for GonaCon treated deer in the second year after treatment, when some does regained fertility late in the breeding season. In anti-GnRH vaccine trials in free-roaming horses, there were no published differences in mean date of foal production (Goodloe 1991, Gray et al. 2010). Unpublished results from an ongoing study of GonaCon treated free-roaming mares indicate that some degree of aseasonal foaling is possible (D. Baker, Colorado State University, personal communication to Paul Griffin, BLM WH&B Research Coordinator). Because of the concern that contraception could lead to shifts in the timing of parturitions for some treated animals, Ransom et al. (2013) advised that managers should consider carefully before using PZP immunocontraception in small refugia or rare species; 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. (2014b) 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 resources 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 HMA or HMAs. 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. 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 fewer 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 (Nuñez 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 (Nuñez 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 (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."

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 (2013) provides a comprehensive review of the literature on the behavioral effects of contraception that puts 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 would be expected to be comparable to those for PZP, discussed above.

4.3 Wild Horse Management – Alternative A, Proposed Action (proposed Herd Management Area Plan)

This alternative would implement all of the actions identified in the HMAP. Under this alternative the wild horses would be managed within the AML range using a combination of contraceptives and removals. All excess wild horses residing inside and outside the HMA would be gathered and removed (approximately 600 animals). Once a sufficient number of wild horses have been removed from within the HMA to achieve low AML and all wild horses outside of the HMA, this portion of the gather operations would conclude with the expiation of a limited number residing near the Fish Springs area. This small population would be managed on an interim basis to determine if all the habitat components are available in sufficient quantities and conflicts between wild horses and the public including homeowners can be managed. Appendix I discusses how the interim number was determined, vegetation use limits would be the same as identified for the HMA.

Helicopter assisted gather techniques would be the primary method, however, when practical bait and water trapping would supplement larger gathers. Contraceptives would be applied by either utilizing a dart gun or capturing animals using either helicopter or bait trapping techniques.

4.4 Wild Horse Management – Alternative B (HMAP without Fertility Control)

The potential impacts to wild horses and their environment under this alternative is similar to the Proposed Action (proposed HMAP), with the exception that the BLM would not treat any mares with fertility control. All excess wild horses residing inside and outside the HMA would be gathered and removed (approximately 600 animals). Once a sufficient number of wild horses have been removed from within the HMA to achieve low AML, this portion of the gather operations would conclude. The BLM would not apply any fertility controls. Impacts would be similar to Alternative A, except that contraceptives would not be administered, which would result in more excess wild horses and the need for shorter subsequent gather intervals as AMLs would be exceeded more quickly. The vegetation resources may not respond as quickly as in Alternative A, since the wild horse population would increase more quickly. Plants would have less time to recover from over grazing which may necessitate adjusting the AML to a lower level to achieve recovery or rangeland health.

4.5 Wild Horse Management – Alternative C (HMAP with Sterilization)

The potential impacts to wild horses and their environment under this Alternative would be similar to Alternative A except that some mares and/or stallions would be sterilized. The procedures outlined in Appendix B (Standard operating Procedures for Field Castration and Spaying) would be followed.

Because sterilizing offers a permanent form of birth control, fewer horses would be born than with the use of PZP alone. Current formulations of PZP are only effective for a maximum of 22 months unless boostered annually and is effective in only about 90 percent of mares vaccinated. Since fewer horses would be born the need for gathers would decrease which could result in fewer gathers and fewer animals removed from the range. Gelding animals would also allow for fewer reproductive animals on the range as geldings could replace some of the mares while still maintaining AML.

Spaying

Depending upon the particular surgical technique used, direct impacts of spaying to the animal are considered here to be those related to the physical aspect of surgery and indirect impacts are those related to social behaviors and herd dynamics. No long-term effects to the overall health of the mares are expected, other than sterility. While spaying is widely practiced for domesticated pets, spaying female domestic horses is generally only performed to remove tumors, or for behavioral or breeding stock reasons (Scott and Kunze 1977, Hooper et al. 1993, Röcken et al. 2011). Spaying and neutering dogs and cats is generally encouraged to prevent production of unwanted offspring, but it is not without risk. Complications of any surgery can include morbidity or mortality, the distinction being that morbidity reflects survival with some degree of ill health, while mortality implies death. In cats and dogs surgical and post-operative complications were reported to be 3% to 20%, depending on the study (Pollari and Bennett 1996, Kustritz 2007). Long-term complications in spaying dogs and cats can include increased risk for certain cancers, hypothyroidism, urinary incontinence and urinary tract infections and tumors in spayed pets (Hart 1991, Spain et al. 2004), although there is a greatly reduced risk of ovarian or mammary tumors and cysts (Reichler 2009). Any surgery can entail some risk of death, or

morbidity such as intraoperative hypotension, myopathies, and neuropathies, postoperative pain, anorexia, depression, problems around the incision (Loesch et al. 2003), but the choice of surgical method can have a large influence on the risk of post-operative complications.

This literature review of spay impacts focuses on 2 methods: flank laparoscopy, and colpotomy. At the time of the NRC report (2013), no field studies had observed the results of spaying in wild mares, but Collins and Kasbohm (2016) documented that it was used with low rates of mortality and morbidity in a free-roaming horse population. Regardless of the method used for ovariectomy, this procedure can be painful and the use of peri-operative analgesics is important. As with any abdominal surgery, insufficient anti-microbial medication could result in peritonitis, but both of the procedures below take measures to reduce the risk of infection.

Flank laparoscopy has become a favored approach among veterinarians for removal of ovarian tumors; it overcomes drawbacks of several other surgical ovariectomy techniques (Lee and Hendrickson 2008), and is commonly used in domestic horses for application in mares due to its minimal invasiveness and full observation of the operative field. Ovariectomy via flank laparoscopy was seen as the lowest risk method considered by a panel of expert reviewers convened by USGS (Bowen 2015). In a review of unilateral and bilateral laparoscopic ovariectomy on 157 mares, Röcken et al. (2011) found that 10.8% of mares had minor post-surgical complications, and recorded no mortality. Mortality due to surgery or post-surgical complications is not expected, but it is a possibility. In two studies, ovariectomy by laparoscopy or endoscope-assisted colpotomy did not cause mares to lose weight, and there was no need for rescue analgesia following surgery (Pader et al. 2011, Bertin et al. 2013). This surgical approach entails three small incisions on the animal's flank, through which three cannulae (tubes) allow entry of narrow devices to enter the body cavity: these are the insufflator, endoscope, and surgical instrument. The surgical procedure involves the use of narrow instruments introduced into the abdomen via cannulas for the purpose of transecting the ovarian pedicle, but the insufflation should allow the veterinarian to navigate inside the abdomen without damaging other internal organs. The insufflator blows air into the cavity to increase the operating space between organs, and the endoscope provides a video feed to visualize the operation of the surgical instrument. This procedure can require a relatively long duration of surgery, but tends to lead to the lowest post-operative rates of complications. Because the incisions are small, and on the flank, there is low risk of herniation of the bowel. Flank laparoscopy may leave three small (<5 cm) visible scars on one side of the horse's flank, but even in performance horses these scars are considered minimal. It is expected that the tissues and musculature under the skin at the site of the incisions in the flank will heal quickly, leaving no long-lasting effects on horse health. Monitoring for up to two weeks at the facility where surgeries take place will allow for veterinary inspection of wound healing. The ovaries may be dropped into the abdomen, but this is not expected to cause any health problem; it is usually done in ovariectomies in cattle (e.g., the Willis Dropped Ovary Technique) and Shoemaker et al. (2014) found no problems with revascularization or necrosis in a study of young horses using this method.

A different surgical approach, ovariectomy via colpotomy (the vaginal approach), has been used in free-roaming feral horses (Collins and Kasbohm 2017). Advantages of the method include the relatively short time required for the surgery. The mortality rate for this procedure can be relatively low if the surgeon is experienced; major complications that lead to the death or

necessary euthanasia of a mare after ovariectomy via colpotomy are anticipated to be higher than ovariectomy via flank laparoscopy, but still less than 2 percent (Bowen, 2015). This method is associated with greater postoperative morbidity and mortality than other non-emergency surgeries in domestic horses (Loesch and Rodgerson 2003). A morbidity of 4% of 23 mares was found in a study of ovariectomies by colpotomy (Hooper et al. 1993), and 11% of 157 mares in a study of laparoscopic ovariectomies (through the flank) (Röcken et al. 2011). Neither study reported mortality resulting from the procedure, or followed mares over the long-term. Loesch and Rodgerson (2003) list the following potential risks with ovariectomy via colpotomy: pain and discomfort; injuries to the cervix, bladder, or a segment of bowel; delayed vaginal healing; eventration of the bowel; incisional site hematoma; intra-abdominal adhesions to the vagina; and chronic lumbar or bilateral hind limb pain. Most horses, however, tolerate ovariectomy via colpotomy with very few complications, including feral horses (Collins and Kasbohm 2017). The vaginal tissue contracts after the incision, leading to a relatively low risk of herniation of the bowel (Bowen 2015). Two studies examined the short-term (42 days) effect of spaying heifers in field conditions in Australia by colpotomy or by flank incision with a surgeon's hand entering the body (McCosker et al. 2010, Petherick et al. 2011). BLM is not at all considering the use of this type of flank incision surgery for wild horses or burros – the studies here are mentioned here to contrast the outcomes of flank incision with manual entry of the body cavity, versus colpotomy. In those studies, no anesthetic or analgesics were used. Overall conclusions were that spay surgery resulted in compromised health and welfare of some animals for 3-4 days post-surgery, but there were few differences between the surgical methods. Plasma cortisol levels were lower in controls than spayed heifers from both methods, but heifers spayed using the flank method sustained an inflammatory response for longer than colpotomy, suggesting longer-lasting adverse effects (Petherick et al. 2011). In the 6 hours after the surgery there was no difference in morbidity between surgical groups, with both showing signs of acute discomfort (McCosker et al. 2010). During this 6 hour post-surgical period, heifers that had been spayed spent less time feeding than controls, although there was no difference in lying down or drinking. Over the following 42 days, spayed heifers gained less weight than controls (although all groups gained weight), and 5% of flank wounds were still not healed at the end of this period (McCosker et al. 2010, Petherick et al. 2011). Of 400 spayed heifers, 2 died 24-48 hours after surgery from hemorrhage, one died about 5 days after surgery, and 7 died 11-22 days after spaying (McCosker et al. 2010).

Effects of Spaying on Hormones, Pregnancy, and Behavior

There are few peer reviewed studies documenting the effects of ovariectomy on the outcome of pregnancy in a mare. Not all information on the risk associated with conducting ovariectomy on pregnant mares has been documented, but may be surmised from previous work. When wild horses are gathered or trapped for fertility control treatment there would likely be mares in various stages of gestation. The gestation period in horses usually ranges from 335 to 340 days (Evans et al., 1977, p.373). Progesterone is necessary to maintain pregnancy in female mammals; less progesterone is produced when ovaries are removed but production does not cease (Webley and Johnson 1982), allowing late pregnancies to go to term. Evans et al. (1977) wrote that by 200 days, the secretion of progesterone by the corpora lutea is insignificant, given that removal of the ovaries does not result in abortion (p. 376). The NRC committee that reviewed research proposals submitted to the BLM explained, "The mare's ovaries and their production of progesterone are required during the first 70 days of pregnancy to maintain the

pregnancy," and, "…if this procedure were performed in the first 90 days of pregnancy, the fetus would be resorbed or aborted by the mother. If performed after 120 days, the pregnancy should be maintained. The effect of ovary removal on a pregnancy at 90–120 days of gestation is unpredictable because it is during this stage of gestation that the transition from corpus luteum to placental support typically occurs" (NRC 2015). Holtan et al. (1979) evaluated the effects of bilateral ovariectomy at selected times between 25 and 210 days of gestation on 50 mature pony mares. Holtan et al. (1979) found that resorption of the conceptus occurred in all 14 mares ovariectomized before day 50 of gestation, that pregnancy was maintained in 11 of 20 mares after ovariectomy between days 50 and 70, and that pregnancy was not interrupted in any of 12 mares ovariectomized on days 140 or 210.

For those pregnancies that are maintained following an ovariectomy procedure, the development of the foal is not expected to be affected. However, because this procedure is not commonly conducted on pregnant mares the rate of complications to the fetus has not yet been quantified. There is the possibility that entry to the abdominal cavity could cause premature births related to inflammation. However, after five months the placenta should hormonally support the pregnancy after removal of ovaries. In a variety of species, ovariectomies in early stages of pregnancy (25-45 days in horses) led to abortion of the fetus, whereas pregnant animals ovariectomized from mid to late gestation generally went to term (Hartman 1939, Alexander et al. 1955, Estergreen et al. 1967, Holtan et al. 1979, Webley and Johnson 1982) (with the exception of ferrets, which aborted when ovariectomized at any stage of pregnancy (Galil 1975). Ovariectomized cows tended to have calving difficulties and a shorter gestation length than controls (Estergreen et al. 1967), although gestation length was similar between ovariectomized and control mares (Holtan et al. 1979). Progesterone shots led to retention of fetuses in ovariectomized mares, even when embryos were implanted (Bertin et al. 2013). Importantly, ovariectomized mares with implanted embryos produced milk for the growth of healthy foals, and had little postpartum genital discharge (Sertich et al. 1988).

Although the wild mare is expected to remain in a herd, no study has yet documented the behavior of spayed wild mares, so additional consequential behavioral effects of spaying remain speculative. Other studies, below, though, may be informative. Wild horses and burros are instinctually herd-bound and this behavior is expected to continue. However, no study has documented the rate at which spayed mares will continue to remain with the stallion and band from which the mare was most recently attached. Overall the BLM anticipates that some spayed mares may continue to exhibit estrus behavior which could foster band cohesion. Nymphomaniac behavior in domestic mares was not always 'cured' following bilateral ovariectomy (Kobluk et al., 1995). It has been reported that 60 percent of ovariectomized domestic mares will cease estrous behavior following surgery (Vaughn, 1986; Loesch and Rodgerson, 2003). Despite this, the full repertoire of courtship and mating behavior has been displayed by ovariectomized mares and by anestrous mares during the nonbreeding season (Asa et al., 1980; Hooper et al., 1993; NRC 2013, p. 99).

If free-ranging ovariectomized mares also show estrous behavior and occasionally allow copulation, interest of the stallion may be maintained, which could foster band cohesion (NRC 2013, p. 99). Horses are anovulatory during the short days of late fall and early winter, beginning to ovulate as days lengthen and then cycling roughly every 21 days, with about 5 days

of estrus (Asa et al. 1979, Crowell-Davis 2007). Estrus in mares is shown by increased frequency of proceptive behaviors: approaching and following the stallion, urinating, presenting the rear end, clitoral winking, and raising the tail towards the stallion (Asa et al. 1979, Crowell-Davis 2007). In most mammal species outside primates estrus behavior is not shown during the anovulatory period, and reproductive behavior is considered extinguished following spaying (Hart and Eckstein 1997). However, mares may continue to demonstrate estrus behavior during the anovulatory period, and even when ovariectomized (Scott and Kunze 1977, Asa et al. 1980*b*). This is due to non-endocrine support of estrus behavior in horses, specifically steroids from the adrenal cortex, and has the function of maintaining social cohesion within a group even outside the breeding season (Asa et al. 1980*a*, 1984). This may be a unique response of horses (Bertin et al. 2013) as spaying usually greatly reduces female sexual behavior in companion animals (Hart and Eckstein 1997). Application of estrogen and progesterone were necessary for exhibition of estrus behavior in spayed golden hamsters, and estradiol or testosterone for spayed sheep (Ciacco and Lisk 1968, Clarke and Scaramuzzi 1978). Ovariectomy may also affect production of luteinizing hormone: in women there was an increase in luteinizing hormone after ovariectomy, followed by a reduction (Erb and Richter 1970), with levels staying high for 50 days in sheep (Reeves et al. 1972). However in six ponies mean monthly plasma luteinizing hormone levels in ovariectomized mares were similar to intact mares during the anestrous season, and during the breeding season were similar to levels in intact mares at mid-estrus (Garcia and Ginther 1976).

The effect of ovariectomy on hormone production means there is the potential for it to affect behavioral interactions in unforeseen ways (Ransom and Powers 2014). Mares that were ovariectomized due to perceived behavioral problems had an improvement in aggression issues, disagreeable demeanor, excitability, kicking and biting, frequent urination and training problems, but in general spaying mares corrected generalized behavioral problems more successfully than specific issues, and the issue of them having problems with other horses was less affected (Kamm and Hendrickson 2007). It is not known whether or how the social standing of spayed mares may change in a given band. In other species, there has been relatively little clinical or experimental research on the behavioral effects of ovariectomy, but in general there can be wide inter-individual variability in response (Hart and Eckstein 1997, Wirant and McGuire 2004). Social relationships among dominant and subordinate female brushtail possums (*Trichosaurus vulpecula*) did not change 5-12 months after ovariectomy of dominant animals, and there was no effect on relationships between females and males (Jolly and Spurr 2010). The maintenance of the dominance hierarchy could be due to habitual relationships between each pair, or be maintained by adrenal steroids. Spayed ewes and mini pigs did not show any increased aggression or masculine behavior after surgery (Clarke and Scaramuzzi 1978, Tynes et al. 2007), and one study of dogs found no basic personality change after spaying (Hart 1991). Other studies found that some spayed dogs showed increased aggression (O'Farrell and Peachey 1990, Hart and Eckstein 1997, Kustritz 2007). Spayed dogs were more likely to ground scratch after urination or defecation, which could be connected to dominance or territoriality behaviors (Wirant and McGuire 2004). On the other hand, dogs were less interested in the urine of gonadectomised conspecifics, and tended to have fewer social contacts than intact individuals (Lisberg and Snowdon 2009, Sparkes et al. 2014).

Individual-level responses to ovariectomy may be similar to those seen in contracepted populations. At the individual level most studies of contracepted wild horse mares have found no

change in activity budget, with minimal impact on home range size or movements (Gray and Cameron 2010), however group behavioral differences have been observed (Nuñez et al. 2009). Individuals receiving fertility control often have reduced mortality and increased longevity, which has been interpreted as a result of their being released from the costs of reproduction (Kirkpatrick and Turner 2008). The long-term survival rate of treated wild mares appears to be the same as that of untreated mares (Collins and Kasbohm 2016). In other wildlife species a common trend has been higher survival of sterilized females (Twigg et al. 2000, Saunders et al. 2002, Ramsey 2005, Jacob et al. 2008, Seidler and Gese 2012), and in rabbits sterilized females were also heavier and had greater longevity (Twigg et al. 2000). Sterilization affected predation rates in coyotes (Seidler et al. 2014), as their prey preferences changed when they did not need to provision pups (Bromley and Gese 2001).

Other Potential Physiological Effects of Spaying

In domestic animals, spaying is often associated with weight gain and associated increase in body fat (Fettman et al. 1997, Beckett et al. 2002, Jeusette et al. 2006, Belsito et al. 2008, Reichler 2009, Camara et al. 2014). Spayed cats had a decrease in fasting metabolic rate, and spayed dogs had a decreased daily energy requirement, but both had increased appetite (O'Farrell and Peachey 1990, Fettman et al. 1997, Hart and Eckstein 1997, Jeusette et al. 2004). Coit et al. (2009) demonstrated that spayed dogs have elevated levels of LH-receptor and GnRH-receptor mRNA in the bladder tissue, and lower contractile strength of muscles. They noted that urinary incontinence occurs at elevated levels in spayed dogs and in post-menopausal women. Thus, it is reasonable to suppose that some ovariectomized mares could also suffer from elevated levels of urinary incontinence. In horses spaying has the potential to increase risk of equine metabolic syndrome (potentially leading to obesity and laminitis), but both blood glucose and insulin levels were similar in mares before and after ovariectomy over the short-term (Bertin et al. 2013). In wild horses the quality and quantity of forage is unlikely to be sufficient to promote over-eating or obesity. Ovariectomy can lead to depression in mice and humans (Bekku et al. 2006). This was manifested in mice as moving less, but sterilization had no effect on movements and space use of feral cats or brushtail possums (Ramsey 2007, Guttilla and Stapp 2010), or greyhound racing performance (Payne 2013). Spayed possums had a similar core range area after surgery compared to before, and were no more likely to shift their range than intact females (Ramsey 2007).

The BLM knows of no scientific, peer-reviewed literature that documents bone density loss in mares following ovariectomy. A concern has been raised in an opinion article (Nock 2013) that ovary removal in mares could lead to bone density loss. That paper was not peer reviewed, nor was it based on research in wild or domestic horses, so it does not meet the BLM's standard for "best available science" on which to base decisions (Kitchell et al., 2015). Hypotheses that are forwarded in Nock (2013) appear to be based on analogies from modern humans leading sedentary lives. Certainly, premenopausal women who have a hysterectomy with bilateral oophorectomy (both ovaries removed) undergo what could be termed surgical menopause, and those women may experience more sudden changes than women who experience naturally occurring menopause (Women's Health Queensland Wide, Inc., 2011). Menopause is associated with lower levels of estrogen, which can increase the risk of bone density loss in modern humans. Post-menopausal women have a greater chance of osteoporosis (Scholz-Ahrens et al. 1996). This has been linked to reduced circulating estrogen, which led to the concern raised by

Nock (2013) that spayed horses may also be susceptible to loss of bone mass after spaying. No research has been conducted on this in horses, and there have been conflicting results when attempts have been made to explore it in animal models; all experiments have been on laboratory animals, rather than free-ranging animals. While some studies found changes in bone cell activity after ovariectomy leading to decreased bone strength (Jerome et al. 1997, Baldock et al. 1998, Huang et al. 2002, Sigrist et al. 2007), others found that changes were moderate and transient or minimal (Lundon et al. 1994, Scholz-Ahrens et al. 1996, Zhang et al. 2007), and even returned to normal after 4 months (Sigrist et al. 2007). Use of bones, for instance the chewing of hard feed by jaw bones, may limit the negative effects of estrogen deficiency on their micro-architecture (Mavropoulos et al. 2014).

The comparison between sedentary modern humans and wild horses that have been active their entire lives, though, is not at all appropriate, as there are substantial differences in lifestyle between modern humans and wild horses. The effect of exercise on bone strength in animals has been known for many years and has been shown experimentally (Rubin et al., 2001). Dr. Simon Turner, Professor Emeritus of the Small Ruminant Comparative Orthopaedic Laboratory at Colorado State University, conducted extensive bone density studies on ovariectomized sheep, as a model for human osteoporosis. During these studies, he did observe bone density loss on ovariectomized sheep, but those sheep were confined in captive conditions, fed twice a day, had shelter from inclement weather, and had very little distance to travel to get food and water (Simon Turner, Colorado State University Emeritus, written comm., 2015). Dr. Turner indicated that an estrogen deficiency (no ovaries) could potentially affect a horse's bone metabolism, just as it does in sheep and human females when they lead a sedentary lifestyle, but indicated that the constant weight bearing exercise, coupled with high exposure to sunlight ensuring high vitamin D levels, are expected to prevent bone density loss (Simon Turner, Colorado State University Emeritus, written comm., 2015). Home range sizes of wild horses in the wild has been described as 4.2 to 30.2 square miles (Green and Green, 1977) and 28.1 to 117 square miles (Miller, 1983). Green and Green (1977) reported bands travelling up to 7 miles each day to water. A study of distances travelled by feral horses in "outback" Australia shows horses travelling 5 – 17.5 miles per 24 hour period (Hampson et al., 2010a). Horses were recorded up to 34 miles from their watering points (Hampson et al., 2010a). Even when restricted to small paddocks, domestic horses moved approximately 4.5 miles per day (Hampson et al., 2010b); the expected daily movement distance would be far greater in the context of larger pastures typical of BLM long-term holding facilities in off-range pastures. A horse would have to stay on stall rest for years after removal of the ovaries in order to develop osteoporosis (Simon Turner, Colorado State University Emeritus, written comm., 2015) and that condition does not apply to any wild horses turned back to the range or any wild horses that go into off-range pastures.

Spaying effects on Population Growth

Any decrease in the number of breeding females in a population should lead to a direct decrease in the population's growth rate, unless there is compensatory increase in reproduction by non-sterilized females. Horses and burros tend to be limited to one foal per pregnancy, so there is effectively no reproductive physiological mechanism for a compensatory response. Collins and Kasbohm (2017) showed that spaying feral horse mares led to effective population growth suppression on the range. Wild horse population growth rates would be expected to decline

expected as the fraction of sterile females increases (Garrott 1995). Even if wild horse populations continue to grow from year to year, any decrease from the current population growth rates of ~20% per year would be desirable from a management perspective, so that a reduced number of wild horses would need to be removed from the range in any given time period. In long-lived ungulates, one model posited that at least 50% of fertile females would need to be sterilized to actually reduce population size (Hobbs et al. 2000).

It is possible that some demographic compensatory mechanisms could influence local wild horse or burro population growth rate decreases if there is: greater foal survival for those foals that are born; longer average lifespan in adults; or an influx of horses from neighboring areas. These mechanisms may explain why female sterilization is not always an effective strategy for population growth suppression in species that can breed frequently and have large litters. In coyotes (*Canis latrans*) and rabbits (*Oryctolagus cuniculus*), sterilization has led to variable effects on overall population size (Twigg et al. 2000, Seidler et al. 2014). Two studies investigated the effects of sterilizing different proportions of females in populations of possums and rabbits, from 0% to 80% (Twigg et al. 2000, Ramsey 2005). For brushtail possums the rate of breeding was similar among treatments, but there was no downward trend in population abundance due to births and immigration to highly sterilized groups (Ramsey 2005). Similarly, the annual rate of increase was comparable across groups of proportionally sterilized rabbits, also due to immigration and higher survival and recruitment of young in highly sterilized groups, despite lower production (Twigg et al. 2000). Owing to immigration and the high capacity for reproduction, one population of white tailed deer (*Odocoileus virginianus*), a species that can give birth to twins and triplets, was predicted to require high levels of annual sterilization (25-50% of females are sterilized annually) to reduce population sizes (Merrill et al. 2006).

Genetic Effects of Spaying

Effects of having a component of spayed mares in the HMA are expected to be similar to those listed for PZP, except that spayed mares would not reproduce. Roelle and Oyler-McCance (2015) showed that the risk of the loss of genetic heterozygosity is extremely low except in cases 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.

Gelding

Direct impacts to the animal are considered here to be those related to the physical aspect of gelding and indirect impacts are those related to social behaviors and herd dynamics. No long-term effects to the overall health of the males are expected, other than sterility and associated effects such as reduced testosterone levels.

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 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.

Direct Effects of 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. Despite livestock being managed by castrating males for centuries, there has been remarkably little research on castrates (Hart and Jones 1975, Jewell 1997).

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. The behavior of wild horse geldings in the presence of intact male horses has not been studied or well documented. Decreases in testosterone may decrease muscle mass over time, relative to intact stallions.

Though 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. 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).

As was reviewed for spayed mares, it is not expected that gelding would lead to bone frailty in wild horses. Any gelding under this alternative will have developed strong bones from 10-20 years of life in the wild, and continued vigorous exercise is expected to maintain bone strength.

Behavioral Effects of Gelding

Exactly what effect gelding an adult stallion and releasing him back in to a wild horse population would have on his behavior and that of the wider population is unknown. 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, and it is not clear how the behaviors of geldings will change, or how quickly any change will occur after surgery. 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). 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), 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).

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. Geldings continued to have social interactions in the herd (Van Dierendonck et al. 2009). 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 this alternative will potentially interact with 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 will 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 2006). By comparison, bachelor groups tend to be more transient, and can potentially use areas of good forage farther 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.

The BLM does anticipate that gelded individuals may exhibit some behavioral differences, when compared to their own pre-treatment behaviors, or when compared to other intact stallions. There is no evidence that would suggest that a gelded wild horse would become docile or its patterns of movement within the HMA be hindered 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.

A high fraction of stallions in the HMA would not be gelded, and would remain reproductive. Gelding a small subset of stallions would not prevent other stallions and mares from continuing with the typical range of social behaviors for sexually active adults.

Demographic and Genetic Effects of Gelding
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 relatively small subset of stallions will significantly change the social structure or herd demographics (age and sex ratios) of WH&Bs that remain in the HMA.

While geldings are unable to contribute to the genetic diversity of the herd, it does not lead to an expectation that the HMA 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, because stallions selected would be between ages 10-20, stallions that are gelded would be expected to have already had a chance to breed, or have already passed on genetic material to their offspring. The herds within the HMA are not at immediate risk of catastrophic loss of genetic diversity. Ongoing genetic monitoring will allow BLM to confirm that the herds are not at risk of inbreeding into the future. Herds within the HMA would be viable due to the fact that the treated population would still have mares and intact stallions at all times.

It is not expected that genetic health would be impacted, due to the relatively low numbers of geldings in this alternative. The AML range of 118-179 wild horses would provide adequate opportunity for genetic health. Following analysis of samples that would be collected, the Carson City District would work with Dr. Gus Cothran's recommendations to develop plans to maintain and further improve genetic health. If additional genetic diversity should be introduced to the herd, then BLM would bring wild horses from an appropriate source population to augment the number and diversity of breeding animals.

4.6 Wild Horse Management – Alternative D (No Action)

Under the No Action Alternative, the BLM would not conduct any wild horse management actions within or outside the HMA. Under this alternative, the deterioration of the range documented from the current horse overpopulation would continue to expand, potentially leading to the irreversible loss of native vegetation or riparian areas, and the wild horse population would continue to expand and grow in areas not managed for wild horses. Under the No Action Alternative, the BLM would limit its activities to monitoring range health and wild horse populations.

The No Action Alternative would not be in conformance with the CRMP as the AML would not be maintained. The No Action Alternative would also not be in conformance with the WFRHBA and regulations which require the BLM to remove animals immediately upon a determination that excess wild horses are present and need to be removed to achieve a thriving ecological balance. Under the No Action Alternative, the BLM would be unable to manage wild horses in the Pine Nut HMA for a thriving natural ecological balance and would be unable to manage for healthy rangelands within and outside the HMA as a result of the significant overpopulation of wild horses in the area.

4.7 Wetlands/Riparian Zones

Wetlands/Riparian Zones – Alternative A (proposed Herd Management Area Plan)
Wetlands and riparian areas provide essential habitat to many wildlife species, 77 percent of the assessed springs and riparian areas within the HMA are not properly functioning and/or trending downward. Under the Proposed Action (Alternative A), bringing the wild horse population to the lower AML level by allotment through an initial gather and removal of excess wild horses will benefit wetland/riparian areas by reducing the magnitude of impacts from grazing and hoof action enough to allow for recovery of riparian vegetation. Some of the riparian areas may require protective fencing to improve and some riparian areas with bare ground or channelization may require restoration activities to meet proper functioning condition. Removing excess wild horses to the AML by allotment may not – on its own -- result in improvements to the riparian areas as the horses are not distributed evenly throughout the HMA. Removing excess horses to the low end AML could still result in a concentration of horses in the Clifton, Eldorado Canyon, Hackett Canyon, and Mill Canyon allotments in excess of the amount of use that the riparian areas can sustain for recovery from their current degraded situation. Future actions to address this situation could include use of protective fencing or a reduction in AML if monitoring data indicates such actions are needed. Alternative A would allow for a reduced rate of wild horse population increase, thereby providing riparian areas a longer period of reduced use. According to the population modeling, it would take longer for the wild horse population to reach the maximum AML under this Alternative. As population levels increase, targeted removals of wild horses from areas of concentration that are continuing to lead to deterioration of riparian areas or that are preventing recovery of degraded areas would allow for recovery to riparian health. However, if BLM is unable to conduct limited or targeted follow-up gathers over the next 10 years, as prescribed in Alternative A, due to lack of funding or available holding capacity, then riparian areas that are not protected by fence exclosures could return to a more degraded condition or fail to recover to PFC due to wild horse impacts.

Wetlands/Riparian Zones – Alternative B (HMAP without Fertility Control)
Initial impacts would be the same as the Proposed Action, however, the wild horse population would increase more quickly under this alternative, resulting in a faster return to pressures on riparian areas as the population grows. If additional targeted follow-up gathers and removals of excess wild horses over the 10 year period are delayed or do not occur, improvements to riparian functional health resulting from the initial reduction of the wild horse population back to low end AML are expected to decline.

Wetlands/Riparian Zones – Alternative C (HMAP with Sterilization)
Initial impacts would be the same as the Proposed Action. However, the population would increase at a slower rate under this alternative allowing riparian areas more time to recover.

Wetlands/Riparian Zones – Alternative D (No Action)
Under this alternative the degradation resulting from over use of springs and associated riparian areas would continue and expand as the wild horse population continues to increase. Maintenance of existing enclosure fences that protect water sources for functionality and habitat values would become more challenging as more horses place pressures on fencing, threatening their integrity and increasing the possibility that sections of fencing are pushed down as the overpopulation of horses seeks additional sources of water. Currently a majority of the assessed springs are non-

functional or functional at risk with a downward trend. This situation would be expected to continue or worsen as pressure from excess horses continues to increase, and could lead to the permanent loss of some vulnerable riparian areas. The No Action Alternative would not be in conformance with BLM 1737 Manual, RAC Standards and Guidelines, nor the Bi-State Sage-Grouse Plan Amendment.

4.8 General Wildlife

General Wildlife – Alternative A (proposed Herd Management Area Plan)
Key Habitat types and associated Ecological Systems (plant communities) in the HMA that could potentially be affected directly or indirectly by the Proposed Action are displayed in Table 12.

Table 12: Key Habitat types and associated Ecological Systems that may exist and be potentially affected in the HMA. Based on SWReGAP descriptions (USGS 2005).

Key Habitat / Associated Ecological System(s)	Potential Plant Species	Scientific Name
Intermountain Cold Desert Scrub / Intermountain Basins Mixed Salt Desert Scrub	Alkali sacaton	*Sporobolus airoides*
Sagebrush / Great Basin Xeric Mixed Sagebrush Shrubland, Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Semi-Desert Grassland	Thurber's needlegrass Desert needlegrass Indian rice grass	*Achnatherum thurberianum* *Achnatherum speciosum* *Achnatherum hmenoides*
Lower Montane Woodlands / Great Basin Pinyon-Juniper Woodland	Bailey's greasewood	*Sarcobatus vermiculatus* var. *baileyi*
	Big sagebrush	*Artemisia tridentata*
	Black sagebrush	*Artemisia nova*
	Bottlebrush squirreltail	*Elymus elymoides*
	Bud sagebrush	*Picrothamnus desertorum*
	Common spikerush	*Eleocharis palustris*
	Desert needlegrass	*Achnatherum speciosum*
	Fourwing saltbush	*Atriplex canescens*
	Galleta	*Pleuraphis jamesii*
	Indian ricegrass	*Achnatherum hymenoides*
	Low sagebrush	*Artemisia arbuscula*
	Nevada jointfir	*Ephedra nevadensis*
	Needle and thread grass	*Hesperostipa comata*
	Rubber rabbitbrush	*Ericameria nauseosa*
	Saltbush spp	*Atriplex spp*
	Sandberg bluegrass	*Poa secunda*
	Shadscale saltbush	*Atriplex confertifolia*
	Spiny hopsage	*Grayia spinosa*
	Winterfat	*Krascheninnikovia lanata*
	Green rabbitbrush	*Chrysothamnus viscidiflorus*

Direct, short-term, localized impacts could occur to wildlife species during gather operations. Wildlife, including small mammals, rodents, and reptiles, could be displaced, trampled or have burrows destroyed. However, any potential spatial displacement to big game, upland game, and resident birds would likely be temporary.

Horse numbers significantly exceed the upper range of AML for the Pine Nut HMA. Beneficial indirect effects to wildlife resources would be expected from the removal of excess wild horses to bring the population to the established AML for the Pine Nut HMA and continued maintenance of the population within AML over the next 10 years through a combination of targeted removals of excess horses and fertility treatments, because the health of rangeland resources necessary for wildlife habitat would be protected by avoiding the habitat degradation associated with wild horse overpopulation. Managing horses within AML should provide adequate habitat requirements of forage, water, cover, and space for wildlife species.

Overall, if the gather, removal and contraception efforts are successful over the proposed action timeframe, then the lower wild horse utilization levels and reduced competition for forage would benefit species dependent on these key habitats for food, water, and cover. Additionally, species that prey on wildlife that inhabit these plant communities, such as golden eagle, hawk, fox, bobcat, and mountain lion may benefit from an increased prey base over time.

Horse populations that increase over the upper limit of the AML can indirectly have long-term negative impacts to wildlife resources. If AML is exceeded over time and overutilization of vegetation and water sources by wild horses occurs as a result of the overpopulation, this could lead to decreasing plant diversity and irreversibly alter habitat structure (Beever and Brussard 2000). A less diverse plant community can be vulnerable to fire and to the spread of invasive grasses such as cheatgrass. Cheatgrass displaces native perennial shrub, grass, and forb species because of its ability to outcompete native plants for water and nutrients by germinating earlier and quicker. Cheatgrass is also adapted to recurring fires that are perpetuated in part by the fine dead fuels that it leaves behind. In general, most wildlife species have a difficult time thriving in these altered fire regimes because diverse native vegetative communities are required for food, water, and cover. Beever at al. (2008) conducted a study of vegetation response to removal of horses in 1997 and 1998 (part of this study was in the Clan Alpine HMA) and concluded that horse-removed sites exhibited 1.1–1.9 times greater shrub cover, 1.2–1.5 times greater total plant cover, 2–12 species greater plant species richness, 1.9–2.9 times greater native grass cover, and 1.1–2.4 times greater frequency of native grasses than did horse-occupied sites.

The effects of wild horses are not uniform across the landscape. Horses will utilize areas of the HMA that have more grasses because they are primarily grazers. Decreased cover and diversity of grasses and shrubs as well as decreased mammal burrow density have been documented at water sources utilized by wild horses (Beever and Brussard 2000, Ganskopp and Vavra 1986). Since available water is so limited in the Clifton allotment and to a lesser extent in other allotments, individual horses may spend hours at a spring source attempting to obtain adequate water and upon their departure are replaced by other horses, thereby limiting water access for many wildlife species including deer, pronghorn, bears and other species of wildlife. Small mammals are a prey base for many species and as a result of degraded habitat, less prey can

negatively affect raptors and carnivores that may inhabit the area. Mountain lion populations have been shown to predate foals which in turn increased lion numbers (Turner and Morrison 2001). If too many foals are born in these HMAs, mountain lion populations could increase and this in turn could impact deer survival or have ripple effects on the food web in general.

General Wildlife – Alternative B (HMAP without Fertility Control) Initial impacts would be the same as the Proposed Action, however because AML would increase more quickly without the use of fertility controls, if follow-up gathers to remove the excess horses do not occur in a timely manner or are delayed, then improvements to wildlife habitat resulting from the initial removal of excess wild horses could slow or be undone as a result of renewed degradation over time.

General Wildlife – Alternative C (HMAP with Sterilization)
Impacts would be the same as the Proposed Action.

General Wildlife – Alternative D (No Action)
If the wild horse population is left unchecked within the HMAs, the current overpopulation will continue to significantly grow over time. Increased numbers of wild horses in the HMA will result in increased impacts to many wildlife species and their habitats. These impacts will reach beyond the Pine Nut HMA due to horses moving outside the HMA as a result of decreased resources. While no direct, short-term, localized impacts from potential trampling and spatial displacement would occur to wildlife species because no gather operations would occur, the significant overpopulation of wild horses would indirectly have long-term and potentially irreversible negative impacts to wildlife resources. Overutilization of vegetation and water sources by wild horses, as has been documented in areas of the HMA, is a factor in decreasing plant diversity and altering habitat structure (Beever and Brussard 2000). A less diverse plant community can be vulnerable to fire and, in turn, invasive grasses such as cheatgrass. Cheatgrass displaces native perennial shrub, grass, and forb species because of its ability to outcompete native plants for water and nutrients by germinating earlier and quicker. Cheatgrass is also adapted to recurring fires that are perpetuated in part by the fine dead fuels that it leaves behind. In general, most wildlife species have a difficult time thriving in these altered fire regimes because diverse native vegetative communities are required for food, water, and cover. Beever at al. (2008) conducted a study of vegetation response to removal of horses in 1997 and 1998 (part of this study was in the Clan Alpine HMA) and concluded that horse-removed sites exhibited 1.1–1.9 times greater shrub cover, 1.2–1.5 times greater total plant cover, 2–12 species greater plant species richness, 1.9–2.9 times greater native grass cover, and 1.1–2.4 times greater frequency of native grasses than did horse-occupied sites.

Over-utilization of forage has been documented due to current excess wild horse numbers that are already significantly above the AML. The wild horse overpopulation increases trampling effects in riparian areas, limits wildlife species access to water, and results in overgrazing of perennial grasses and meadows. Habitat has become degraded, which decreases forage, water and cover available to wildlife and decreases the prey base for wildlife species that forage in the HMAs. Over time this could decrease the abundance and diversity of wildlife species that inhabit the HMAs and potentially lead to the irreversible loss of some wildlife habitat within the HMA.

The effects of wild horses are not uniform across the landscape. Horses will utilize areas of the HMAs that have more grasses because they are primarily grazers. While impacts to water sources and riparian areas from horses are different than cattle due to behavior (horses tend to not linger at a source and drink in the morning and at night), decreased cover and diversity of grasses and shrubs as well as decreased mammal burrow density have been documented at water sources utilized by wild horses (Beever and Brussard 2000, Ganskopp and Vavra 1986). Horses also tend to prevent other wildlife species from accessing water sources during critical times of the day, especially if multiple bands of horses frequent one source. Small mammals are a prey base for many species and as a result, less prey can negatively affect raptors and carnivores that may inhabit the area. Mountain lion populations have been shown to predate foals which in turn increased lion numbers (Turner and Morrison 2001). If too many foals are born in these HMAs, mountain lion populations could increase and this in turn could impact deer survival or have ripple effects on the food web in general.

4.9 BLM Sensitive Species (Animals)

BLM Sensitive Species (Animals) – Alternative A (proposed Herd Management Area Plan)
Impacts would generally be the same to BLM sensitive species as described in the Environmental Consequences, General Wildlife section (Section 4.3.1). Managing horses within AML should ensure habitat conditions that, over time, would benefit sensitive species by providing a diverse vegetation structure and composition that provides for the life cycle requirements of sensitive species.

Minimizing or reducing levels of competition for water and forage would be beneficial to sensitive species dependent on key habitats for water, food, and cover. Sensitive species such as the golden eagle or ferruginous hawk that forage in the HMAs would benefit from a healthy prey base.

Sage-grouse require specific amounts of grass cover for optimal nesting habitat, an abundance of forbs for brood-rearing habitat, and free water with sufficient vegetation to support insects and to provide cover (Connelly et al. 2000). Bi-state sage grouse habitat can therefore be negatively affected if riparian areas and uplands are over-utilized as a result of an over-population of wild horses. Sage-grouse use sagebrush communities throughout their lifecycle, therefore, a healthy and diverse sagebrush community is essential for survival. Taller sagebrush that reaches above snow levels is an important food source for sage-grouse in winter. Higher canopy cover of sagebrush as well as sufficient perennial grass height in nesting habitat provides protection from predators. Recommended forage utilization standards are less than 45 percent use on herbaceous species within mountain big sagebrush communities and less than 35 percent use on herbaceous species within Wyoming sagebrush, basin big sagebrush and black sagebrush communities (LUPA). Hens and their broods rely on insects and a diversity of perennial forbs within riparian and meadow habitats to survive. Adequate sagebrush cover adjacent to these riparian and meadow habitats is important for cover. Forage utilization standards for riparian and wet meadows are less than 50 percent use of herbaceous species or an average stubble height of at least 4-6 inches (LUPA). To maintain healthy sagebrush habitats and these important habitat characteristics, the current level of overgrazing needs to be eliminated.

BLM Sensitive Species (Animals) – Alternative B (HMAP without Fertility Control)
Initial impacts would be the same as the Proposed Action, however the wild horse population would increase more quickly after the initial gather to low end AML without the use of fertility control. If follow-up gathers to remove the excess horses do not occur in a timely manner or are delayed, then improvements to sensitive species habitat could slow or be undone as a result of renewed degradation over time.

BLM Sensitive Species (Animals) – Alternative C (HMAP with Sterilization)
Impacts would be the same as the Proposed Action.

BLM Sensitive Species (Animals) – Alternative D (No Action)
Over-utilization of forage has been documented due to excess wild horses significantly above AML and would continue to occur and further expand in area. An overpopulation of wild horses increases trampling effects in riparian areas, limits wildlife species' access to water, and results in overgrazing of perennial grasses and meadows. If excess wild horses are not removed, habitat would continue to become degraded, decreasing forage, water, and cover available to wildlife and decreasing the prey base for BLM sensitive species that forage in the HMAs. Over time this could decrease the abundance and diversity of sensitive wildlife species that inhabit the HMAs due to the loss of their habitat.

4.10 Migratory Birds

Migratory Birds – Alternative A (proposed Herd Management Area Plan)
Gather operations would not be expected to directly impact breeding populations of migratory bird species because operations would occur outside the breeding season. Direct, short-term, localized impacts could occur to resident birds during gather operations via potential spatial displacement of individual birds.

For reasons described in the Environmental Consequences, General Wildlife section (Section 4.3.1), managing wild horse populations within AML should maintain habitat conditions that benefit migratory bird species over the long-term by providing a diverse vegetation structure that provides for the applicable components of the life cycle requirements that any given species may need to successfully reproduce.

Migratory Birds – Alternative B (HMAP without Fertility Control)
Initial impacts would be the same as the Proposed Action, however the wild horse population would increase and exceed AML again more quickly without the use of fertility control. If follow-up gathers to remove the excess horses do not occur in a timely manner or are delayed, then improvements to habitat conditions could slow or be undone as a result of renewed degradation over time.

Migratory Birds – Alternative C (HMAP with Sterilization)
Impacts would be the same as the Proposed Action.

Migratory Birds – Alternative D (No Action)
While no direct, short-term, localized impacts from potential spatial displacement would occur to migratory birds because no gather operations would occur, the continued and further increasing over-population of wild horses could indirectly have long-term negative impacts to migratory bird resources, such as riparian areas. Over-utilization of forage by wild horses is occurring and would

continue to increase. Habitat would continue to be degraded and be unable to recover, which would decrease forage plants, prey populations, and cover available to migratory bird species. Over time this could decrease the abundance and diversity of species that inhabit the HMA.

4.11 Vegetation

Vegetation – Alternative A (proposed Herd Management Area Plan)
Alternative A brings the wild horse population back to AML with an initial removal of excess wild horses and would maintain AML through fertility control applications and follow-up removals of excess wild horses over the next 10 years, which promotes vegetative health. Native plant communities can only sustain a certain level of grazing utilization. The maximum AML is the number of wild horses that can be maintained within an HMA and not adversely impact the plant community in combination with other multiple uses such as wildlife and livestock grazing. Maintaining the wild horse population at or below AML, and distributing animals throughout the HMA reduces the utilization of vegetation by wild horses and allows for vegetation to recover from overgrazing. This alternative reduces root crown damage and plant stress from over grazing. The ability of forage species to reproduce and compete with other species in the plant community is also improved without the stress of overgrazing. Under Alternative A, modifications to wild horse grazing intensity and use patterns would improve plant community health in the Clifton, Eldorado, Hackett Canyon and Mill Canyon allotments. Because alternative A reduces the number of wild horses by removing excess horses and redistributes animals within the HMA, vegetative trend is expected to improve. Fertility control treatments as part of the initial gather and in follow-up operations over the Proposed Action timeframe would slow the growth of the wild horse population and delay negative impacts to vegetation from overgrazing. Modeling indicates the wild horse population is expected to not exceed high end AML again until around 2025 under Alternative A.

Vegetation – Alternative B (HMAP without Fertility Control)
Impacts would be similar to those in Alternative A, however the duration of the positive impacts would be shorter under Alternative B without the fertility control treatment. Modeling indicates the wild horse population is expected to exceed AML in 2023 under Alternative B.

Vegetation – Alternative C (HMAP with Sterilization)
Impacts would be similar to those in Alternative A. Modeling indicates that after the initial gather and removal of excess horses to reach low AML, the wild horse population is expected to again exceed AML by around 2025 under Alternative C.

Vegetation – Alternative D (No Action)
Under the no action alternative wild horse populations are currently significantly over AML and would continue to increase. Monitoring shows that the excess number of wild horses present in the and outside of the HMA are overutilizing vegetation. The potential negative effects of this over-utilization of vegetation are root crown damage, plant stress and the reduced ability of forage species to reproduce and compete with other species in the plant community. If wild horse populations continue to grow and remain significantly in excess of AML, the loss of desirable plant species would continue and would eventually be unable to recover and become irretrievably lost from the HMA and surrounding areas.

4.12 BLM Sensitive Species (Plants)

BLM Sensitive Species (Plants) – Alternative A (proposed Herd Management Area Plan)
All BLM sensitive plant species are in areas grazed by both wild horses and livestock. Managing wild horses within the AML would be expected to result in less grazing of sensitive plant species and less trampling and compaction of soils within the habitat.

BLM Sensitive Species (Plants) – Alternative B (HMAP without Fertility Control)
Impacts would be the same as the Proposed Action.

BLM Sensitive Species (Plants) – Alternative C (HMAP with Sterilization)
Impacts would be the same as the Proposed Action.

BLM Sensitive Species (Plants) – Alternative D (No Action)
High densities of wild horses may continue to graze and to graze with increasing intensity on BLM sensitive plant species potentially resulting in the loss of such species over time in areas of wild horse overgrazing and concentration.

4.13 Livestock Grazing

Livestock Grazing – Alternative A (proposed Herd Management Area Plan)
Bringing the wild horse population back to AML with an initial removal of excess horses combined with fertility controls and follow-up management over the next 10 years would promote vegetative health. Reducing wild horse grazing would reduce the amount of grazing use within all allotments. Reducing wild horse use would alleviate the over grazing within the Clifton, Eldorado, Hackett Canyon and Mill Canyon allotments in particular, where overgrazing attributed to excess wild horses has been documented.

Reducing wild horse numbers to AML is beneficial because it contributes to improving range conditions by allowing rangeland resources to recover from overpopulation impacts that have been documented through monitoring. However, livestock grazing in the Clifton, Eldorado, Hackett Canyon, and Mill Canyon allotments would not be permitted until plant communities recover from overutilization by wild horses. Managing horses at AML, would provide adequate forage in the other allotments to support grazing by domestic livestock, in addition to wild horses, which would achieve or move toward meeting multiple use and rangeland health objectives. Modeling indicates that after the initial gather and reduction of the population to low AML, the wild horse population is expected to again exceed AML by around 2025 under Alternative A.

Livestock Grazing – Alternative B (HMAP without Fertility Control) Impacts would be similar to Alternative A, however, the duration of the positive impacts would be shorter under Alternative B without wild horse fertility control if there are delays in follow-up gathers to remove excess wild horses. Modeling indicates that after the initial gather and reduction of the population to low AML, the wild horse population is expected to again exceed AML by around 2023 under Alternative B.

Livestock Grazing – Alternative C (HMAP with Sterilization)
Impacts would be similar to Alternative A. Fertility control is dependent upon multiple treatments to slow the population growth rate whereas sterilization will slow the population growth rate after one treatment. Modeling indicates that after the initial gather and reduction of the population to low AML, the wild horse population is expected to again exceed AML by around 2025 under Alternative C.

Livestock Grazing – Alternative D (No Action)
Declining plant community health negatively impacts all land uses including livestock grazing. Over utilization of vegetation can shift plant community composition by reducing the types of vegetation that are palatable to livestock and wild horses, as well as reduce the amount of forage. If the current overpopulation of wild horses is left unchecked and continues to grow, then there could be insufficient forage of even the small amount of livestock grazing that is currently taking place.

4.14 Noxious and Invasive Weeds

Noxious and Invasive Weeds – Alternative A (proposed Herd Management Area Plan)
Intact healthy native plant communities are more resistant to the establishment and spread of noxious weeds. By managing wild horses at a level compatible with healthy native plant communities and that allows for recovery of degraded range, noxious weeds will be less likely to become established and spread.

Noxious and Invasive Weeds – Alternative B (HMAP without Fertility Control)
Impacts would be the same as the Proposed Action.

Noxious and Invasive Weeds – Alternative C (HMAP with Sterilization)
Impacts would be the same as the Proposed Action.

Noxious and Invasive Weeds – Alternative D (No Change)
Under the no action alternative the current wild horse overpopulation would continue to increase, further adversely impacting the health of the native plant communities and potentially resulting in the loss of those native plant communities as they are increasing replaced by noxious and invasive weeds. Stressed native plant communities facilitate the establishment and spread of noxious and invasive weeds.

4.15 Human Health and Safety

Human Health and Safety – Alternative A (proposed Herd Management Area Plan)
Public safety as well as that of the BLM and contractor staff is always a concern during the gather operations and would be addressed through Observation Protocols that have been used in recent gathers to ensure that the public remains at a safe distance and does not get in the way of gather operations, and by the presence of law enforcement officers 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.

Any person involved with application of fertility control vaccines would be trained to follow the safety guidelines that exist for those vaccines (EPA 2009a, EPA 2012). Following those guidelines will mitigate the risks associated with vaccine handling and application.

Human Health and Safety – Alternative B (HMAP without Fertility Control)
Impacts would be the same as the Proposed Action.

Human Health and Safety – Alternative C (HMAP with Sterilization)
Impacts would be the same as the Proposed Action.

Human Health and Safety – Alternative D (No Action)
There would be no safety concerns to BLM employees, contractors and the general public from the gather operations as no gather activities would occur. However, as the population continues to increase an increasing number of horses would expand out of the HMA increasing the risk of traffic accidents, conflicts with home owners, and aggressive encounters with equestrians, all of which can lead to serious injury and possibly death.

4.16 Areas of Critical Environmental Concern

Areas of Critical Environmental Concern – Alternative A (proposed Herd Management Area Plan)
At present there are no Areas of Critical Environmental Concern though one is proposed in the draft RMP for Churchill Narrows Buckwheat and Williams Combleaf. By managing within the AML by allotment minimal adverse impact would be expected to occur to the Churchill Narrows Buckwheat and Williams Combleaf. Bi-State sage-grouse habitat would improve, though further adjustments maybe needed in the future to meet all of the habitat requirements.

Cultural Areas would be maintained in a more natural state, as native plants, animals, springs and seeps would be less impacted by wild horses.

Areas of Critical Environmental Concern – Alternative B (HMAP without Fertility Control)
Impacts would be the same as the Proposed Action.

Areas of Critical Environmental Concern – Alternative C (HMAP with Sterilization)
Impacts would be the same as the Proposed Action.

Areas of Critical Environmental Concern – Alternative D (No Action)
By not managing the wild horse population within the AML, adverse impacts to Churchill Narrows buckwheat and Williams combleaf as a result of a continuing overpopulation and high densities of horses. Habitat objectives for the Bi-State sage-grouse would not be met as overgrazing would adversely impact the native bunch grasses needed for nest concealment and riparian areas and meadows important for brood rearing would continue to be over grazed.

Cultural Areas would not be maintained in a more natural state, as native plants, animals, springs and seeps would be continue to be over grazed, facilitating establishment of noxious and invasive weeds. Springs and seeps would be denuded and have the appearance of mud holes.

4.17 Lands with Wilderness Characteristics

Lands with Wilderness Characteristics – Alternative A (proposed Herd Management Area Plan)
This alternative would have no effect on wilderness characteristics related to size or outstanding opportunities for solitude or primitive and unconfined recreation. Managing the wild horse population at AML within the HMA will have a positive effect on naturalness within the four units located within or partially within the HMA since the wild horse value is being retained and there would be improved riparian and upland conditions. Managing wild horses within the AML range by allotment would help riparian areas recover.

Lands with Wilderness Characteristics – Alternative B (HMAP without Fertility Control)
Impacts would be the same as the Proposed Action.

Lands with Wilderness Characteristics – Alternative C (HMAP with Sterilization)
Impacts would be the same as the Proposed Action.

Lands with Wilderness Characteristics – Alternative D (No Action)
Current over use of the springs detracts from the area's naturalness. As the current overpopulation of horses increases, the damage to the springs and riparian areas would be expected to increase.

4.18 Cultural Resources

Cultural Resources – Alternative A (proposed Herd Management Area Plan)
Alternative A would have a beneficial effect to NRHP-eligible cultural resources ("historic properties"). Currently, the horse overpopulation causes adverse impacts to historic properties through ground disturbance in areas that are moderately to heavily used by the horses. Impacts to native vegetation, riparian areas, and wildlife habitat are strong indicators of the impacts to historic properties, as impacts to these other resources include ground disturbance and increased potential for erosion. The proposed action would reduce impacts to historic properties by reducing the size and intensity of ground disturbance caused by excess wild horses. The actions proposed in Alternative A to bring the population back to AML, slow population growth and maintain a regular gather schedule would reduce new and ongoing impacts to historic properties from ground disturbance caused by horses.

Cultural Resources – Alternative B (HMAP without Fertility Control)
Alternative B would have a beneficial effect to historic properties, but the benefit to the resource might be less than under Alternative A because of the more rapid increase in the wild horse population following an initial gather. Without fertility control, the horse population would grow more rapidly between gathers, which could cause greater adverse impacts to historic properties as a result of a larger number of horses on the landscape. If there are delays or conditions that preclude adhering to a timely gather schedule to remove excess horses in follow-up gathers, then the population numbers could once again become very high, and horse use and associated adverse impacts from ground disturbance would increase along with the population.

Cultural Resources – Alternative C (HMAP with Sterilization)
Alternative C would have a beneficial effect to historic properties similar to Alternative A, due to similar slowing of population growth and reduced ground disturbance following an initial gather and application of fertility controls.

Cultural Resources – Alternative D (No Action)
Alternative D would have an adverse impact to historic properties by allowing the horse population to continue to increase. Continued growth in the horse population would mean continued increase in impacts from moderate to heavy use by horses, including ground disturbance, loss of vegetation cover, and increased erosion potential.

4.19 Residual Effects

"Residual effects" are those adverse effects that remain after implementation of mitigation measures. No major adverse effects ("significant" per 43 CFR 1508.27) have been identified in this preliminary EA that warrant mitigation. Measures have been incorporated into the elements of the Proposed Action to avoid and minimize adverse effects. No mitigation is necessary; there would be no residual effects.

5.0 Cumulative Effects

A cumulative effect is defined under the NEPA as "the change in the environment which results from the incremental impact of the action, decision, or project when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other action". "Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR Part 1508.7). Past, present, and reasonably foreseeable future actions are analyzed to the extent that they are relevant and useful in analyzing whether the reasonably foreseeable effects of the Proposed Action and/or Alternatives may have an additive and significant relationship to those effects.

Cumulative Effects Geographic Area.
The cumulative effects study area (CESA) for the Project is the Pine Nut Mountains, an area encompassing approximately 397,899 acres (Figure 16). Approximately 73 percent (289,872 acres) of the CESA is managed by the BLM, and 27 percent (108,827 acres) of the CESA is privately-owned or Indian trust lands. The CESA boundary for individual resources may be artificial (administrative) or natural (Table 13). Only those resources directly or indirectly affected by the Proposed Action and/or Alternatives are analyzed for cumulative effects (Tables 7 and 8.

Table 13. CESA by Resource and Summary of Effects.

Resource	Type of Effect	Acres
Wild Horses and Burros	Direct effects during implementation from gather activities that can cause injury and administration of population control treatments; indirect effects are long-term beneficial changes (improvements) to vegetative communities and benefits to wildlife dependent on these communities, through reduced grazing by wild horses.	397,899
Wetlands/Riparian Zones	Direct effects during implementation from disturbances to vegetation by motorized vehicles, people and wild horses that crush or trample plants; indirect effects are long-term beneficial changes (improvements) to riparian vegetative communities through reduced grazing by wild horses.	* 100
General Wildlife, BLM Sensitive* Species (Animals), Migratory Birds	Direct effects during implementation from motorized vehicles, aircraft, people, wild horses that cause displacement; indirect effects are long-term beneficial changes (improvements) to vegetative communities through reduced grazing by wild horses.	100 397,899
Vegetation	Direct effects during implementation from disturbances to vegetation by motorized vehicles, people and wild horses that crush or trample plants; indirect effects are long-term beneficial changes (improvements) to vegetative communities through reduced grazing by wild horses.	10 397,899
BLM Sensitive Species (Plants)	Direct effects during implementation are not expected indirect effects are long-term beneficial changes (improvements) to vegetative communities through reduced grazing by wild horses.	* 10
Livestock Grazing	Direct effects during implementation from displacement; indirect effects are long-term beneficial changes (improvements) to vegetative communities through reduced grazing by wild horses.	100 397,899
Noxious and Invasive Weeds	Direct effects during implementation from motorized vehicles, people and animals that	*

	can transport seed and/or vegetation to other locations. Indirect effects are reductions in conditions conducive to the establishment and expansion of noxious and invasive weeds.	
Health and Human Safety	Direct effects during implementation from motorized vehicles, aircraft, people, wild horses that can cause injury; indirect effects are long-term beneficial reductions in the number of excess horses which would result in fewer horses moving outside of the HMA and into urban areas, were they may cause traffic accidents and interact aggressively with humans.	100

* There would be no adverse direct effects as these areas would be avoided.

Timeframe for Effects Analysis.
Short-term cumulative effects would occur during implementation, anticipated to be from seven to ten days. Long-term cumulative effects would be expected to occur over several years.

5.1 Past, Present, and Reasonably Foreseeable Actions

Past and Present Actions.
Wildfire and Vegetation Treatments. The Pine Nut Mountains were subject to a historic regime of wildfire caused by lightning strikes. Natural-caused fire can burn several acres to several thousand acres during one event. In more modern times, the area is also subject to man-caused wildfire in addition to natural (lightning-caused) fire. The wildfire history for the CESA is included in Table 14. Past and present vegetation treatments (Table 15) have been completed in the CESA to reduce catastrophic wildfire risks and to influence plant community composition and diversity. In response to the Bison Fire which occurred in July 2013, the BLM prepared an Emergency Stabilization and Burned Area Rehabilitation Plan (ESR; BLM 2013). In November 2013, chaining occurred on approximately 1,350 acres, and aerial seeding occurred over 6,482 acres within the 24,140 acre burn area. The Buckskin Valley Vegetation Treatment Project was a multi-year effort to treat up to 7,000 acres on the east side of the CESA. This project was impacted by the 2013 Bison fire and was completed in 2014. In April 2014 the BLM approved the Pine Nut Land Health Project which would treat approximately 24,564 acres over a 10 to 15 year period (BLM 2014). All of these projects will have a positive effect for wild horses and other multiple uses of the land by preventing catastrophic fires, reseeding burned areas with seed mixes that include forage grasses. The Pine Nut Land Health Project would treat pinyon pine and juniper trees creating more habitat for wildlife species that require sagebrush and grasslands. Wild horses would also benefit from the Pine Nut Land Health Project as pinyon pine and juniper trees eventually displace forage grasses which horses require to survive. By treating these areas wild horse habitat can be maintained and potentially expanded.

Table 14. Historic Large Fires.

Fire Name	Fire Year	Fire Cause	Acres

Minnehaha	2015	Human	251
Bison	2013	Natural	24,140
TRE	2012	Human	7,153
Springs	2012	Natural	1,191
Preacher	2012	Natural	1,076
Como	2012	Natural	768
Ray May	2011	Human	3,815
Burbank	2011	Natural	1,113
Laurel	2011	Human	318
Holbrook	2011	Human	133
Como	2008	Human	451
Adrian	2007	Natural	14,004

Fires greater than 100 acres
Source: BLM Wildland Fire Management Information (2015).

Table 15. Past/Present Vegetation Treatments.

Project Name	Treatment Year(s)	Treatment Type(s)	Acres
Pine Nut Land Health (Mill Canyon 2, Illinois, Lyon units)	2014-2015	Lop and scatter, grinding	3,436
Buckskin Valley	2012-2014	Lop and scatter, grinding	2,926
Upper Colony II	2010-2011	Grinding, biomass removal	1,075
Mill Canyon	2007-2010	Lop and scatter, grinding	2,383
Bluebird	2008-2009	Grinding	253
Brunswick Extension	2006	Grinding	30
Upper Colony	2006	Grinding	110
Deer Run/Mexican Dam	2005, 2011, 2014	Grinding, seeding	90

Source: BLM GIS database (2015).

Wild Horse Management.
The HMA is within the CESA. In 1975, the first reliable inventory of wild horses was completed, which identified an estimated 297 animals in the HA. In 1995, the FMUD set the AMLs for wild horses between 118-179 animals. Gather and removal of wild horses has continued periodically since 1978. The most recent action occurred in December 2010with a gather and remove/fertility control treatment effort (BLM 2010a). Approximately 45 mares were gathered, treated with PZP-22, and released back into the HMA. Sixty-five excess wild horses residing outside the HMA were removed.

Recreation.
Dispersed recreation has occurred throughout the CESA. General activities include: rock hounding, hunting, sightseeing, OHV use, and wildlife viewing. Members of area tribes collect pinyon pine nuts. Annually in certain areas, the BLM permits woodcutting/firewood gathering and cutting/removal of younger evergreen trees for the holiday season. The BLM permits non-commercial and commercial recreation events through its Special Recreation Permit (SRP) program. Events include motorcycle enduro races usually lasting one to three days, all-terrain vehicle tours, and horse endurance riding. Table 16 lists the past and current SRP's authorized in the CESA. In March of 2015 construction was completed on a six-mile non-motorized hiking trail adjacent to the Pine Nut Road. An additional six-mile non-motorized hiking trail has been authorized adjacent to Stephanie Way.

Table 16. Special Recreation Permits*.

Name	Permit (Years)	Type	Area
NASTR 30/50/75 (Dayton)	2012-2017	Horse endurance ride	56 miles
High Desert	2013-2018	Horse endurance ride	22 miles
Pine Nut Cracker	2012-2016	Mountain bike race	11 miles
Pine Nut Express	2012-2013	Horse endurance ride	38 miles
Eastern Sierra ATV & UTV Jamboree	2012-2019	Guided OHV tours	238 miles
Valley Off-Road Racing Association	2010-2014	Competitive OHV races	15 miles
Nevada Adventure Company	2012-2017	Guided OHV tours	146 miles

* All SRP activities occur on existing trails and/or roads.

Travel Management.
Most of the CESA is an "open and unlimited use" area for travel management. Although most of the vehicle use occurs on existing two-track trails and dirt roads, OHV use is also permitted. Actual numbers of users per day or per year are not available, but generally speaking the intensity of use is low and dispersed. Most use occurs during spring to fall. The BLM maintains approximately 108 miles of routes within CESA under the Carson City District Office Transportation Plan. According to preliminary route inventory data, there are approximately 1,700 miles of travel routes in the Pine Nut Mountains. These routes range from single track trails to maintained gravel or dirt roads. A final inventory and designation of approved routes would not occur until the BLM completes a Travel Management Plan (date unknown).

Lands and Realty.
Within the CESA there have been a wide range of realty actions. Rights-of-way (ROW) have been issued for overhead transmission lines, roads, communication towers (Pine Nut, Rawe Peak), and wind testing (expired). There are two NV Energy transmission lines in the CESA: the 16-mile Brunswick to Anaconda line, and the four-mile Smith Valley/Topaz line.

Abandoned Mine Lands/Mining Exploration.
In 2012 and 2013 the BLM authorized the closure of 13 abandoned mines in the CESA. Closure of abandoned mines involves either the permanent filling in of a mine shaft, or installation of a bat gate. In December of 2013, the BLM authorized a Plan of Operations for the Hercules Exploration Project. Over a three-year period, exploration drilling would occur on approximately 18 acres of public lands from constructed roads, drill sites and trenching. Upon the conclusion of the exploration activities, the exploration area would be reclaimed (BLM 2014b). Eighteen acres comprises less than 0.0002 percent of the HMA and will be reclaimed after the exploration is complete. The exploration will not impact water sources.

Land Ownership Pattern.
The Pine Nut Mountains is a mix of public, private and Indian trust lands. Approximately 73 percent of the CESA is managed by the BLM, and 27 percent of the CESA is privately-owned. On lands outside of BLM's jurisdiction are activities such as recreation, including OHV use and hunting, residential and energy development. Bentley LLC is the largest non-federal land owner in the Pine Nut Mountains.

Livestock Grazing.
Historically, livestock grazing is known to have occurred in the Pine Nut Mountains since the 1930's under BLM permitting, although sheep and/or cattle grazing are likely to have been occurring in the area since the late 1800s. The Pine Nut Mountains overlaps with 17 livestock grazing allotments, and the HMA overlaps with nine allotments (Figure 8). In addition to authorizing livestock grazing, as a part of grazing management the BLM has authorized the construction and maintenance of allotment boundary fences, pasture fences, corrals, and water developments such as troughs and underground pipelines.

Noxious and Invasive Weeds.
The BLM treats noxious and invasive weeds through an integrated weed management plan using manual, mechanical, biological, chemical methods to eradicate or control weed species. In July 2015 the BLM authorized herbicide treatments on approximately 15 acres of public lands to address Canada thistle infestations.

Climate Change.
Over the last century average temperatures within the Great Basin have increased 0.6 – 1.1 °F. Increased precipitation has been documented in parts of Nevada, along with changes in species distribution and populations. Snowpack has been documented to be on the decline since 1950. The earlier arrival of spring runoff, greater frequencies and intensities of wildland fire and invasion of non-native species such as cheatgrass are attributable to global climate change. Winter temperatures have risen faster than any other season (Dugelby 2011, Chambers 2008).

Reasonably Foreseeable Actions.
On-going activities in the CESA include administration of the grazing program, issuance of SRPs for non-commercial and commercial activities, wild horse management, issuance of Rights of Ways as requests are submitted to the BLM, and authorization of mining exploration plans. A district-wide planning effort is underway to revise the Resource Management Plan (RMP).

Prepared originally in the early 1980's, the new RMP may change the multiple use allocation of resources. A decision on the RMP is not anticipated until summer 2018. Upon the conclusion of the RMP revision, a Travel Management Plan would be prepared, however the date for this is unknown.

Projected warming for the Great Basin ranges from 3.6 to 9 °F over the next century. The loss of snowpack is likely to continue and may accelerate. Higher levels of carbon dioxide (CO_2) may increase plant growth and exacerbate the spread of invasive species such as cheatgrass which has great flammability. The frequency and spread of fire is likely to grow. Pinyon-juniper would likely respond favorably to the increased CO_2 and crown fires may increase. Insect outbreaks could increase during warming episodes (Chambers 2008).

Effects Analysis.
The BLM did not analyze cumulative effects for the following resources because the BLM determined there would not be direct or indirect effects caused by the Proposed Action or Alternatives, or the because the resource is not present. Resources not analyzed for cumulative effects include: environmental justice, farm lands (prime or unique), floodplains, threatened or endangered species, wastes, hazardous or solid, wild and scenic rivers, wilderness/wilderness study area, global climate change, greenhouse gas emissions, land use authorizations, lands with wilderness characteristics, minerals, paleontological, recreation, socioeconomics, soils, and travel management.

Wild Horses and Burros
Cumulative effects of managing within the AML range in balance with the productivity of their habitat could include the loss of some alleles, improved habitat benefiting both wild horses and wildlife and impacts to some horses from the continued use of contraceptives. The loss of alleles can be mitigated by introducing a few wild horses from other HMAs shortly after a gather. Continued use of PZP may result in permanent contraception after multiple applications over time for some treated mares, however, approximately, 20 percent of the wild horses would avoid capture and vaccination (even if the goal is to capture all horses) and fertility control is not 100% effective. While the contraceptive effect of the PZP may become irreversible for some mares if applications are repeated over many years, this would not be the case for all treated mares. If low reproductive rates becomes a problem, vaccinating fewer mares would result in an increased foaling rate.

Wetlands/Riparian Zones
The cumulative effects of removing excess wild horses and managing the population at AML would be increased health of riparian areas, likely reversing the declining trend of many riparian areas and allowing for improvement in functionality, i.e. from non-functioning to functional at risk or even to proper functioning condition.

General Wildlife
The cumulative effects of removing excess wild horses and managing the population at AML would be improved wildlife habitat, which in turn would lead to more abundance and diversity of native species of wildlife.

BLM Sensitive Species (Animals)
The cumulative effects of removing excess wild horses and managing the population at AML would be improved habitat, which in turn would be expected to lead to more abundance and diversity of special status species of wildlife.

Migratory Birds
The cumulative effects of removing excess wild horses and managing the population at AML would be improved migratory bird habitat, which in turn would lead to more abundance and diversity of migratory birds.

Vegetation
The cumulative effects of removing excess wild horses and managing the population at AML would be increased health and vigor of the native plant community, which in turn would be more resilient to fire and less vulnerable to noxious and invasive weeds.

BLM Sensitive Species (Plants)
The cumulative effects of removing excess wild horses and managing the population at AML would be fewer negative impacts to sensitive plant species.

Livestock Grazing
The cumulative effects of removing excess wild horses and managing the population at AML would be increased health and vigor of the native plant community, which would provide forage for domestic livestock grazing.

Noxious and Invasive Weeds
The cumulative effects of removing excess wild horses and managing the population at AML would be increased health and vigor of the native plant community, which in turn would be more resilient to fire and less vulnerable to noxious and invasive weeds.

Human Health and Safety
The effect of conducting a gather would be the possibility of accidents either involving the use of aircraft, motor vehicles, or handling horses and equipment. Effects to the public would be minimized by enforcing public viewing policies that keep the public at a safe distance from aircraft or herded horses. If the population was maintained within the AML range substantially fewer horses would leave the HMA, likely resulting in fewer vehicle accidents and adverse encounters with home owners and equestrians.

6.0 Consultation and Coordination

6.1 Public Review and Comment

The Pine Nut Mountains Wild Horse Gather Plan Preliminary Environmental Assessment (DOI-BLM-NV-C0200-2016-0020EA) was made available to the public, organizations, and other agencies for a 30-day public review and comment period. The comment period closed January 22, 2017. Comments and Responses to Comments are found in Appendix J.

6.2 Individuals, Tribes, Organizations and Agencies Consulted

The following individuals, organizations, and other agencies were notified of this document's availability for commenting:

Individuals
An email notifying individuals on the CCDO wild horse and burro list, and the BLM NV State wild horse and burro list was sent providing the web location of this EA and associated documents. The email also invited comments through the 30 day comment period starting December 22, 2016.

Tribes
Washoe Tribe of Nevada and California
Yerington Paiute Tribe

Organizations & Agencies
A press release, including the web location of this EA and associated documents, inviting comments through the 30 day comment period starting December 22, 2016. The press release was issued to the Reno Media, Northern Nevada and Northern California Media and Southern Nevada Media. This information was also sent to the NV Congressional list, Nevada State Clearing House and the USFWS.

6.3 List of Preparers

BLM staff that contributed to this document:

Name	Resource
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Niki Cutler	Soils and Hydrology
Katrina Leavitt	Livestock Grazing and Vegetation
Dean Tonenna	Special Status Plants and noxious weeds
Arthur Callan	Outdoor Recreation Planner
Rachel Crews	Cultural Resources and Native American Religious Concerns
Katrina Krause	General Wildlife, BLM Sensitive Species, Migratory Birds
Gerrit Buma	Planning and Environmental Coordinator (NEPA)

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8.0 MAPS

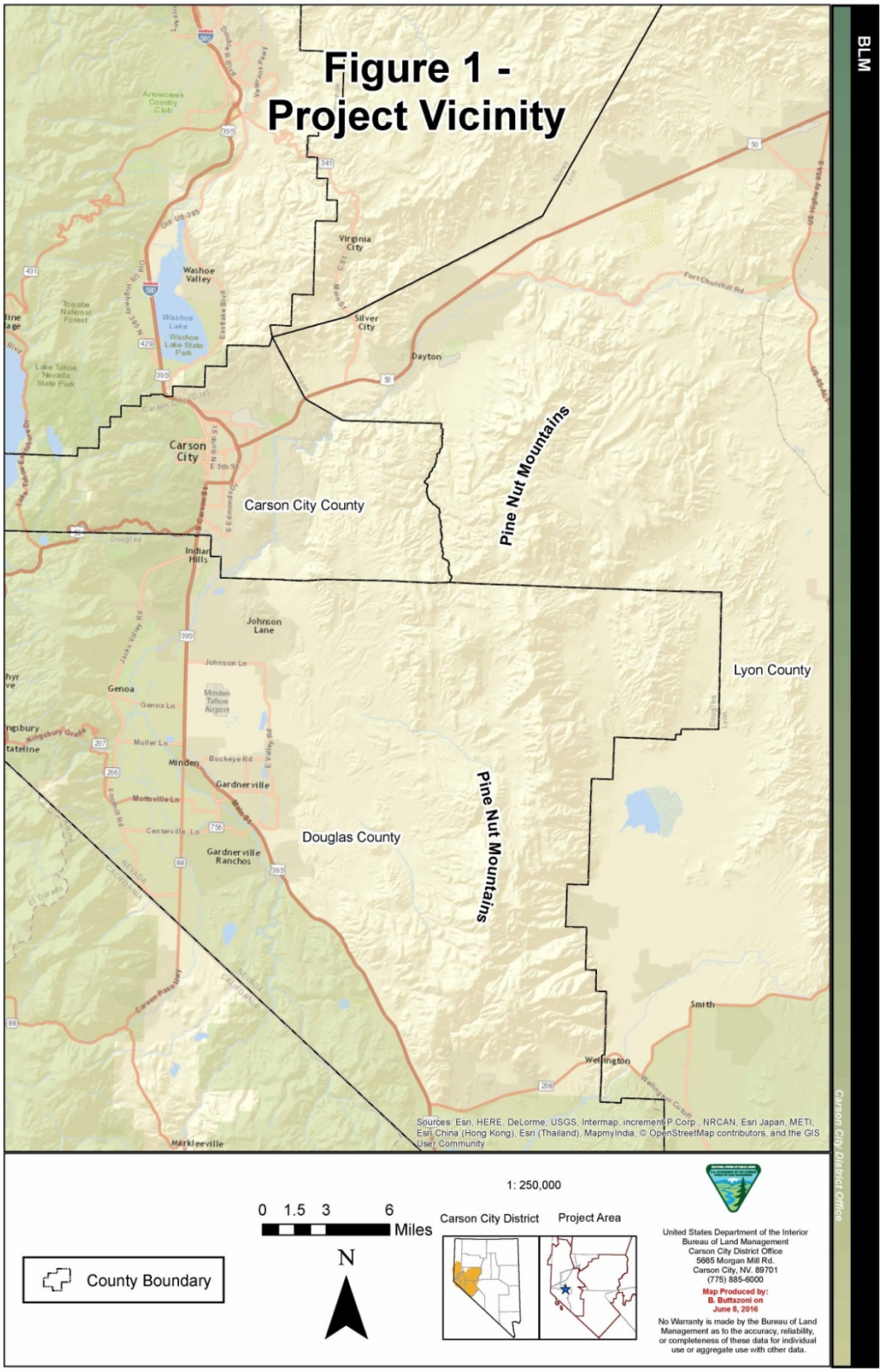


Figure 1, Project Vicinity

Figure 2, Project Area

Figure 2, Pine Nut Mountains Herd Area (HA)

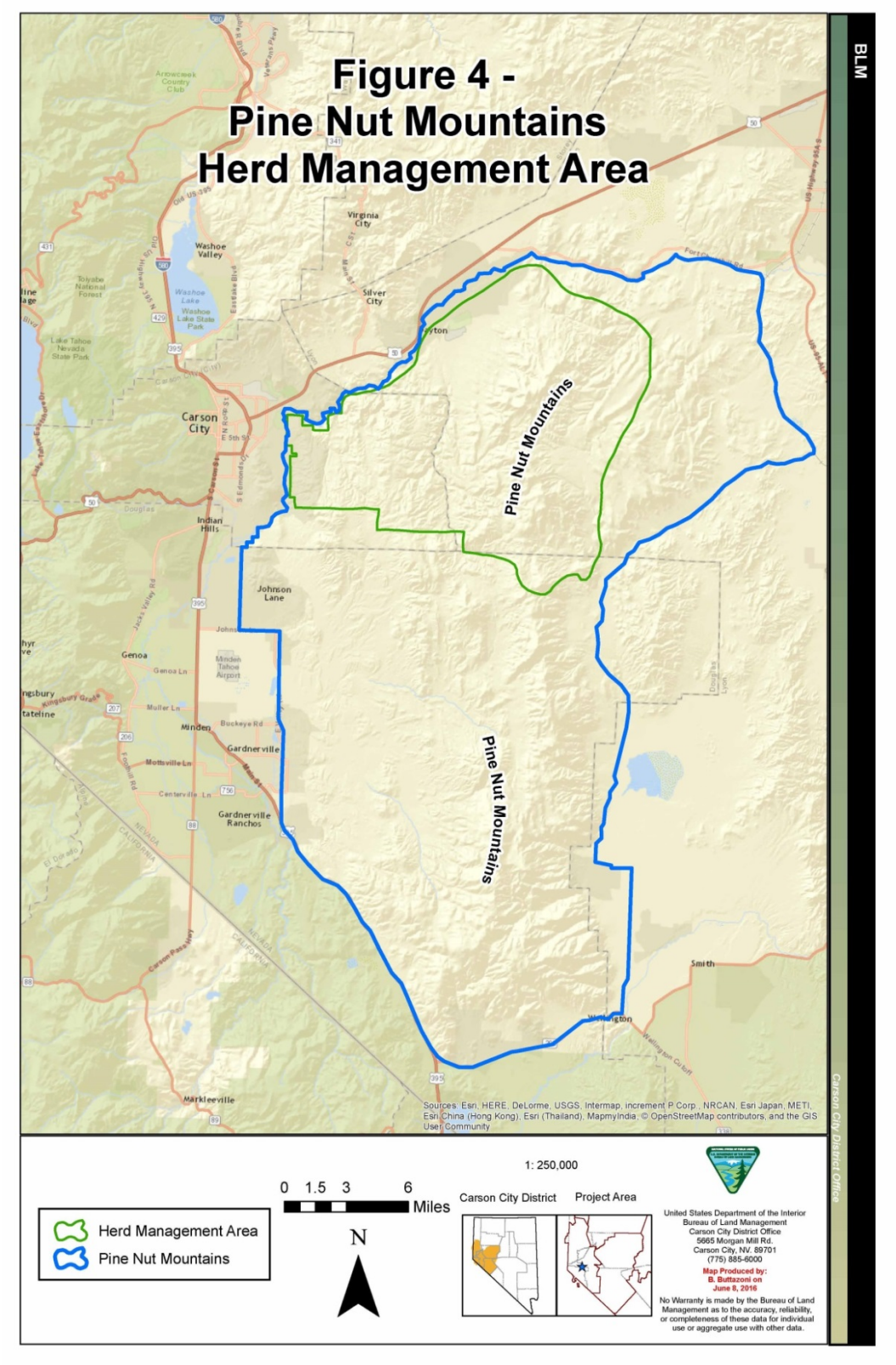


Figure 3, Pine Nut Mountains Herd Management Area (HMA)

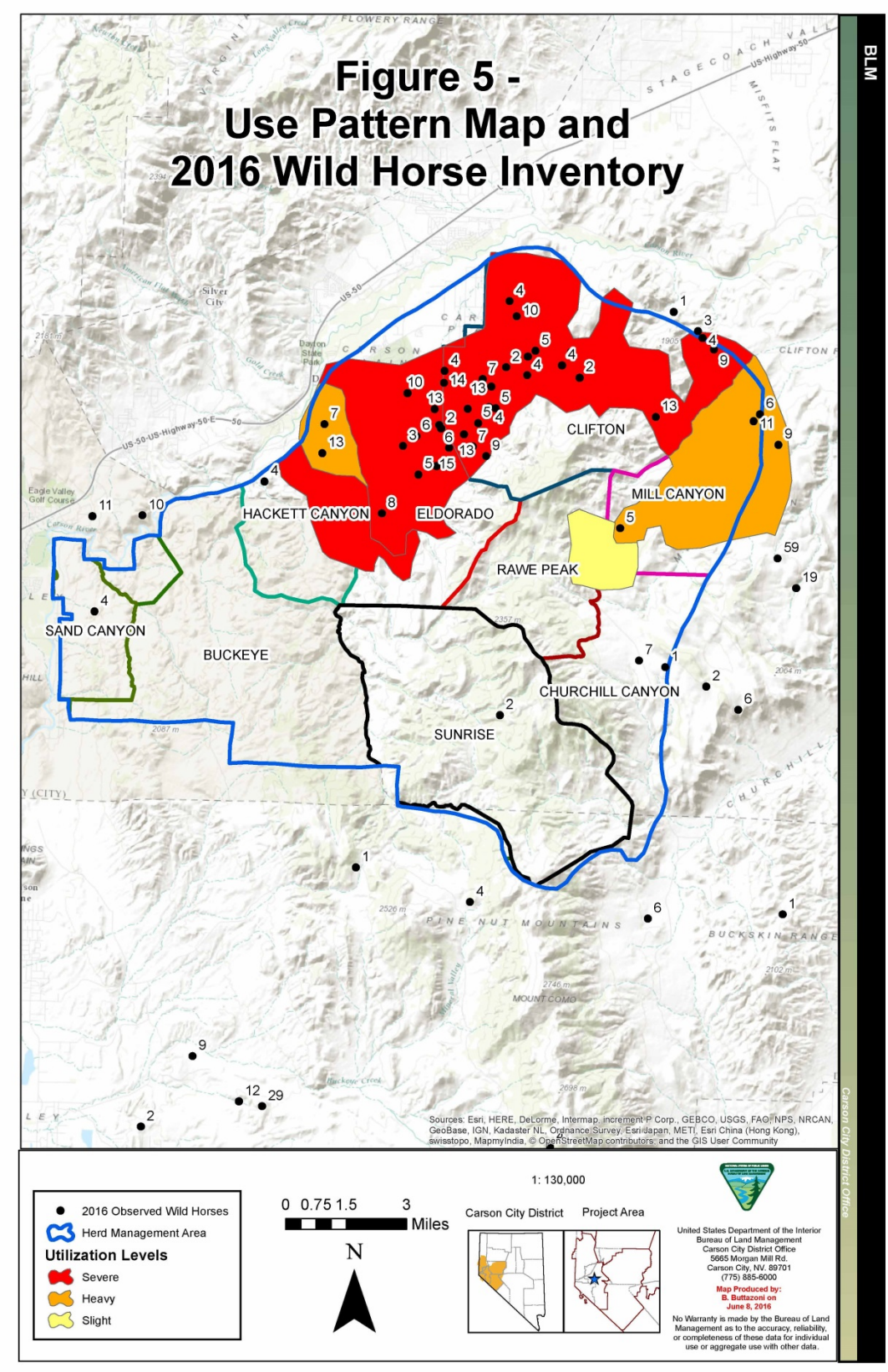


Figure 4, Use Pattern Map and 2016 Wild Horse Inventory

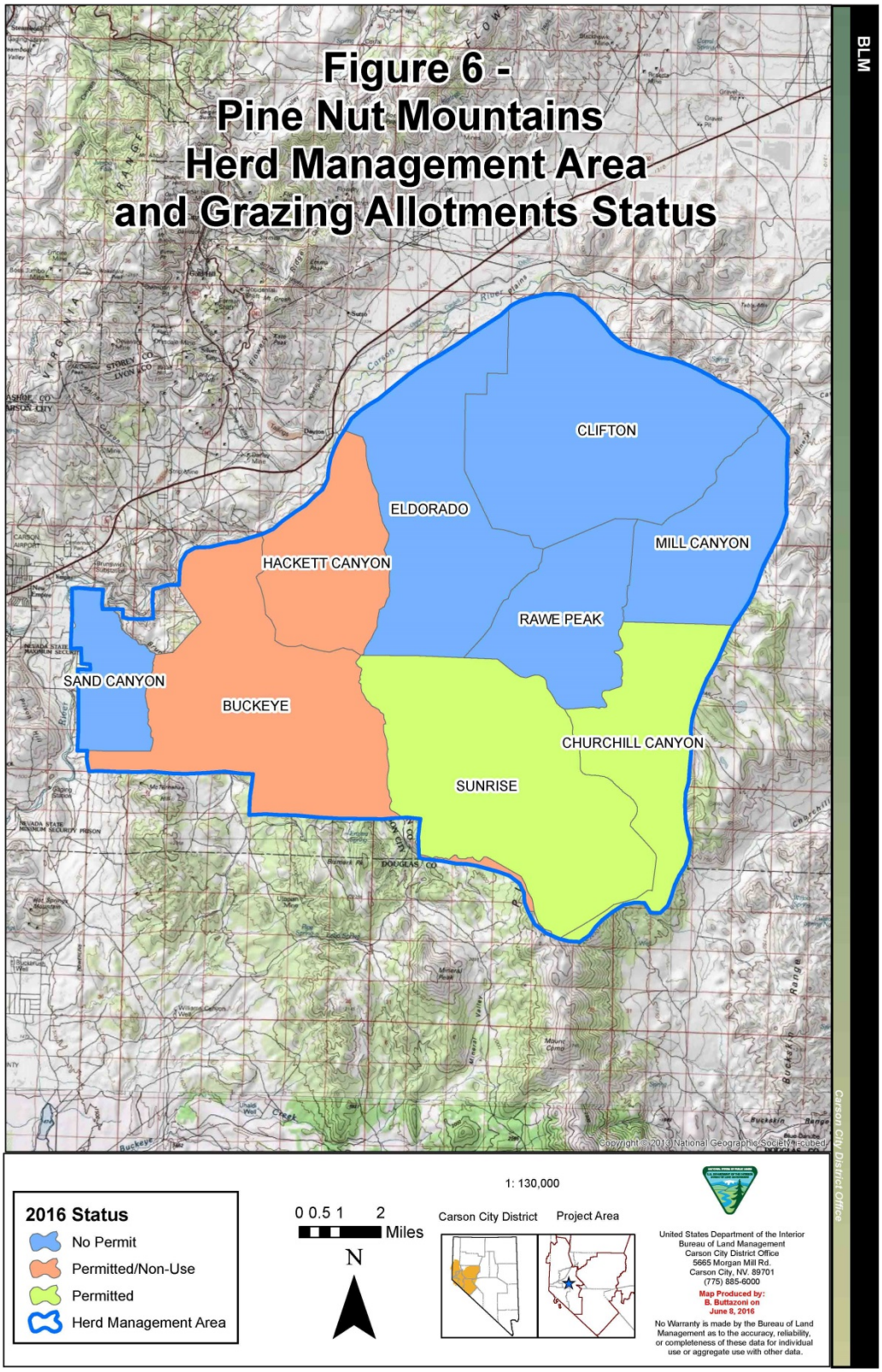


Figure 5, Grazing Allotment Status

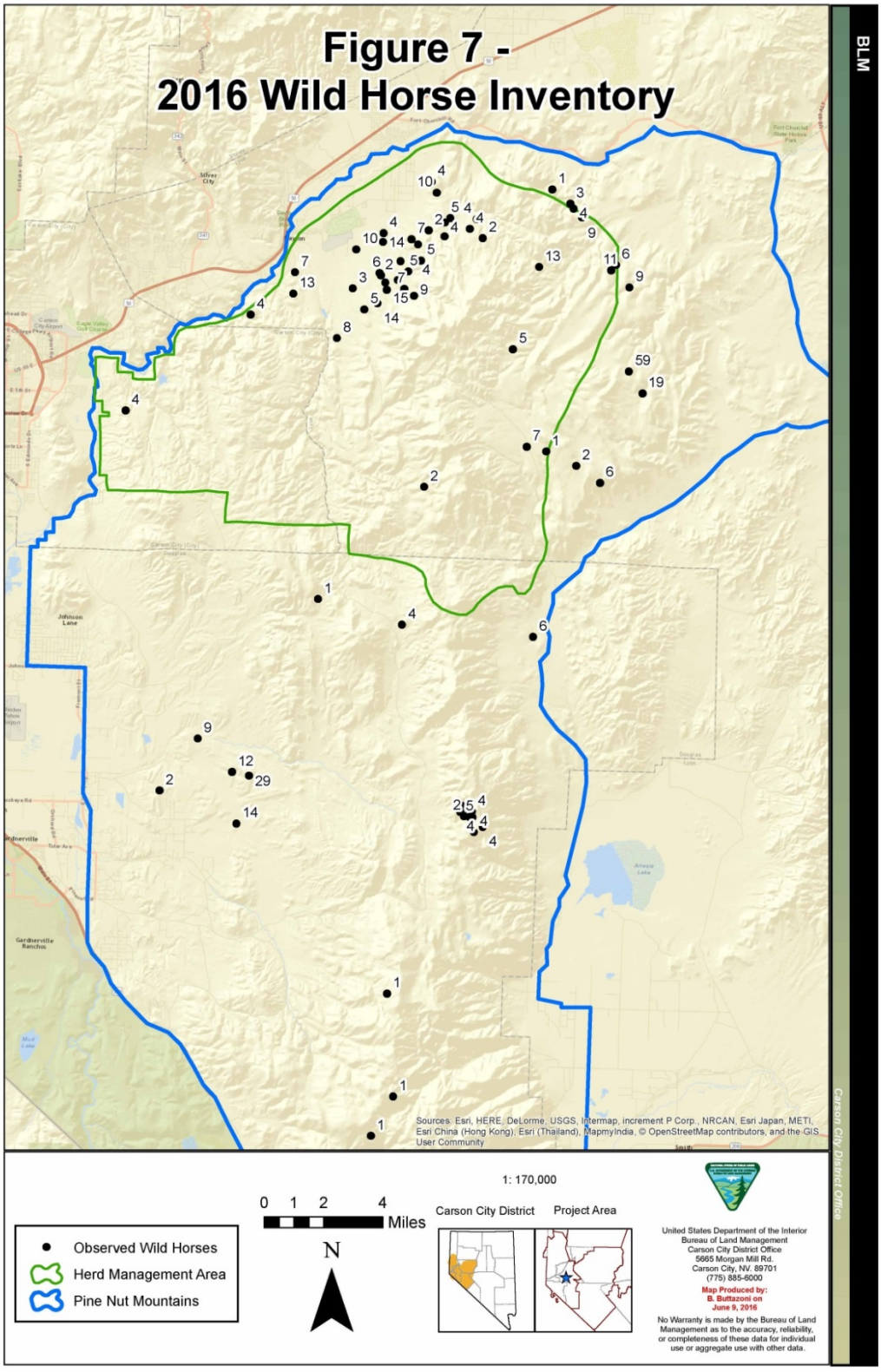


Figure 6, 2016 Wild Horse Inventory

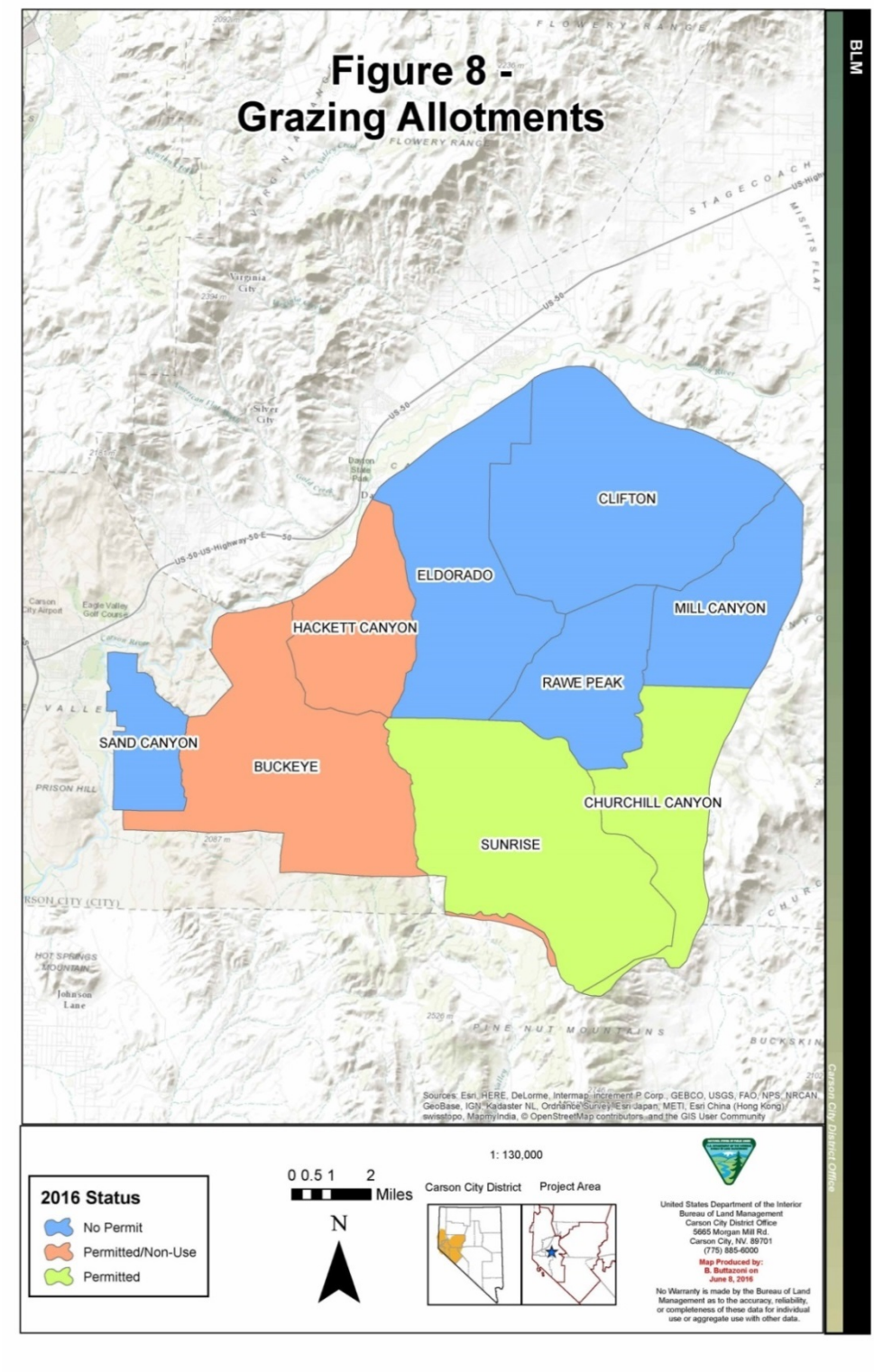


Figure 7, Grazing Allotments

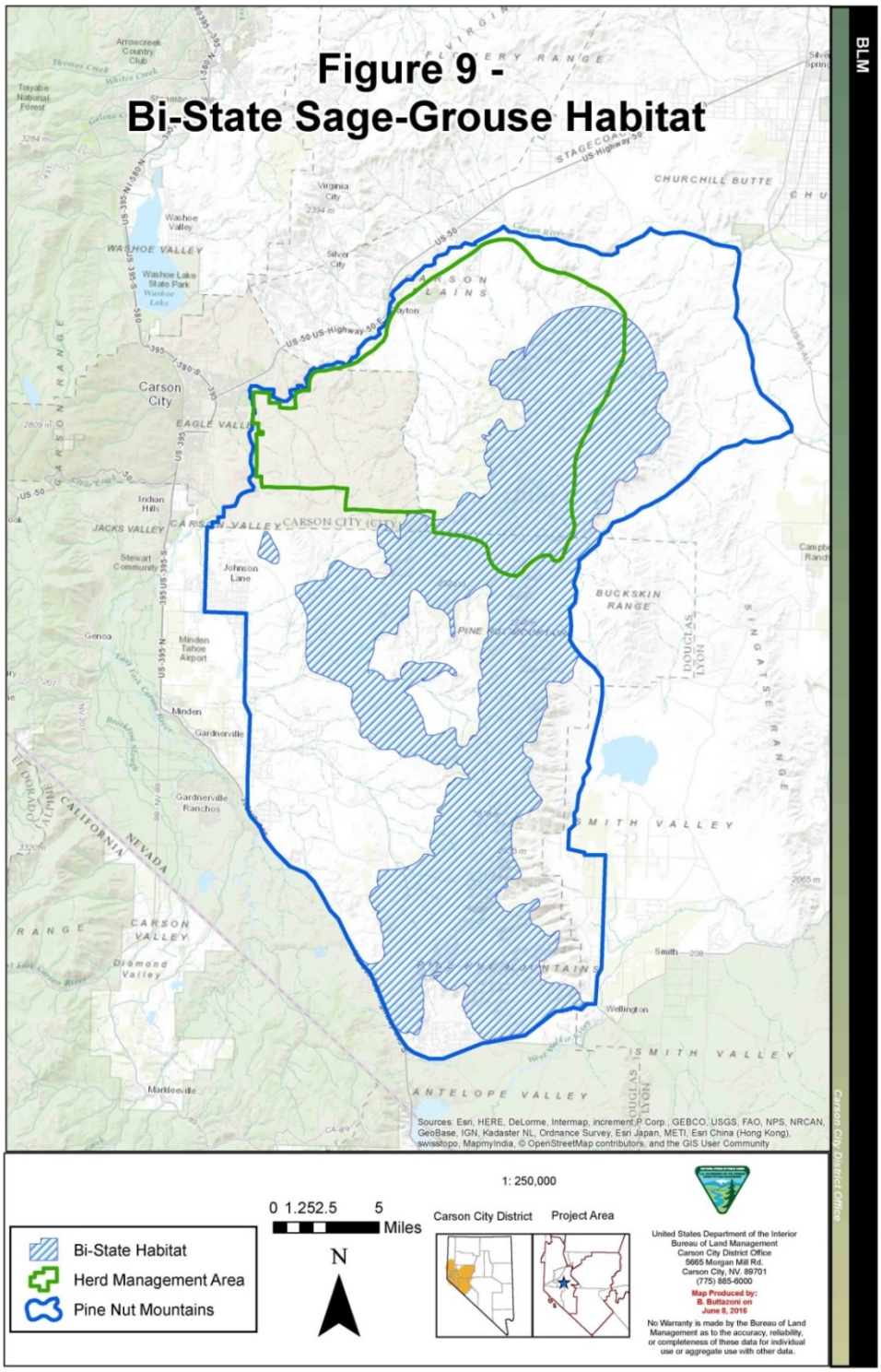


Figure 8, Bi-State Sage-Grouse Habitat

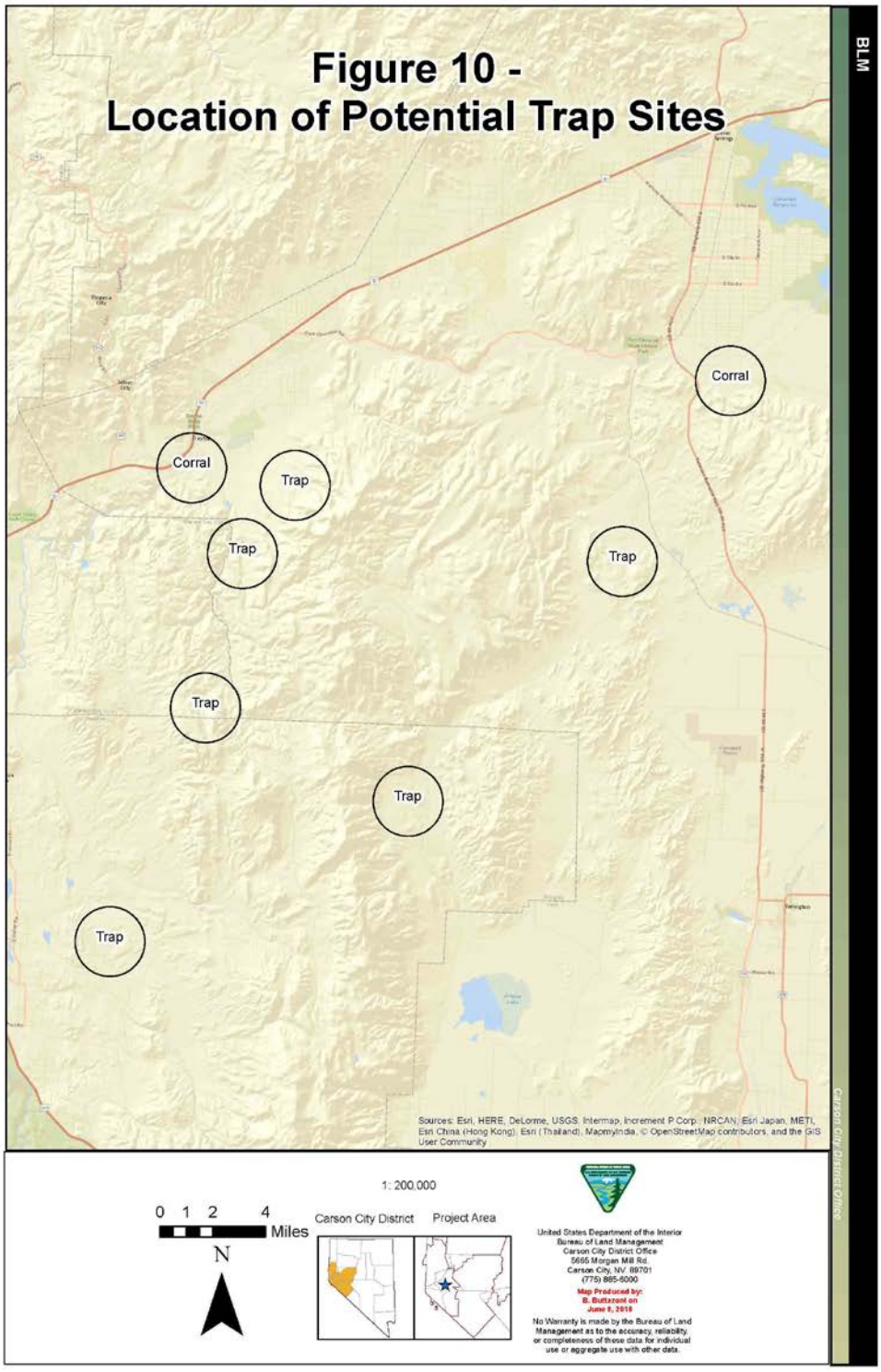


Figure 9, Location of Potential Trap Sites

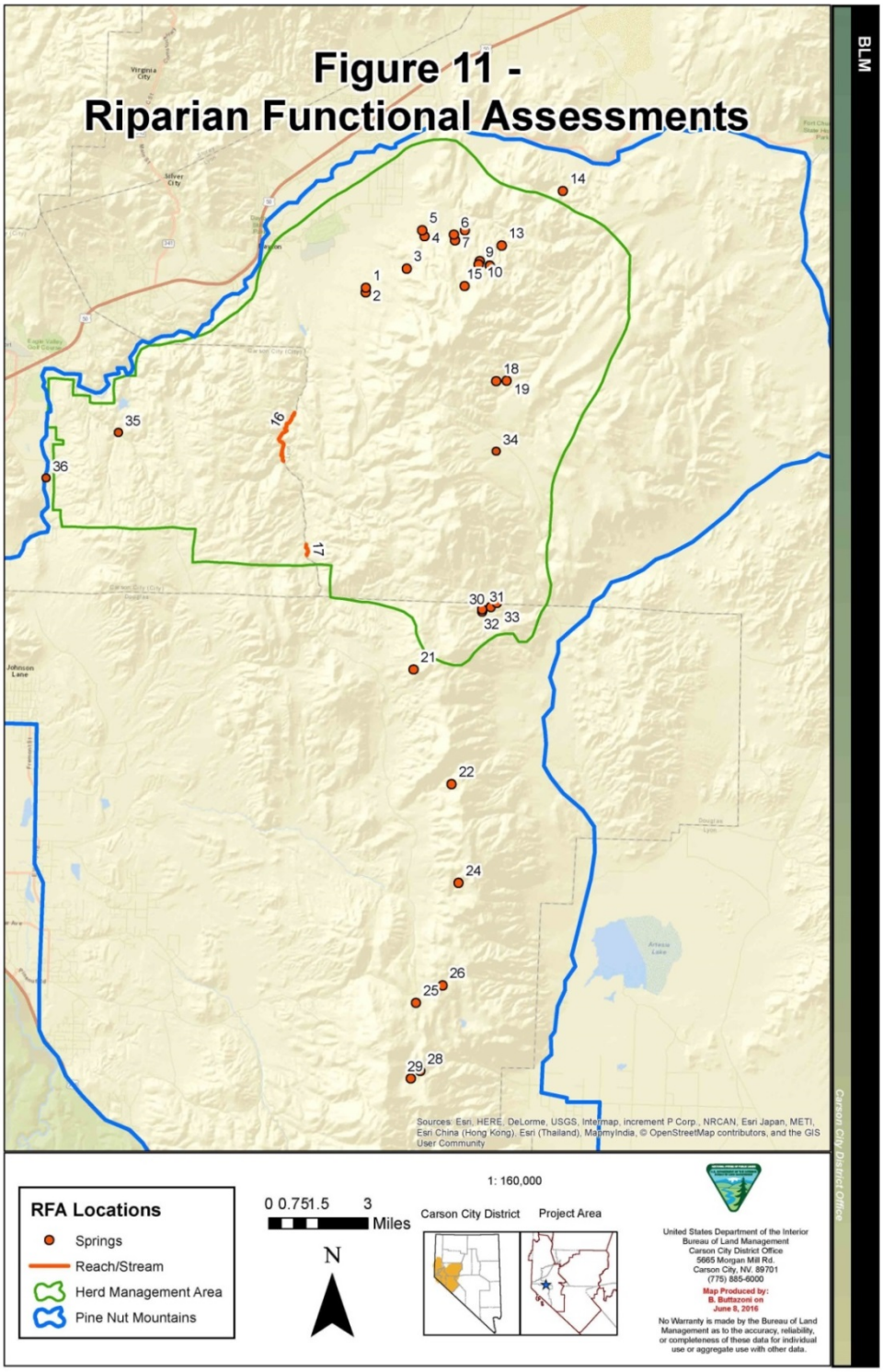


Figure 10, Riparian Functional Assessments

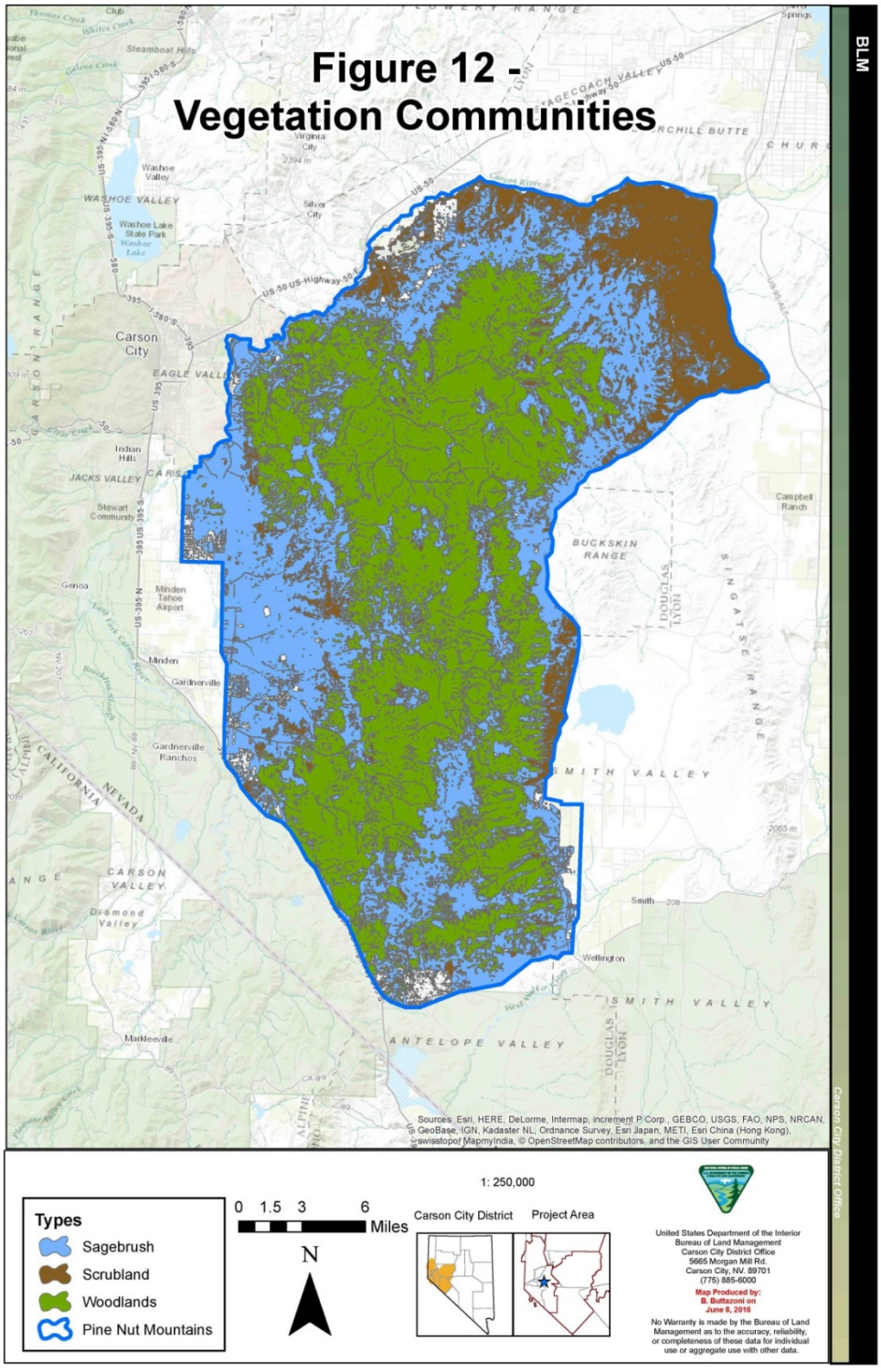


Figure 11, Vegetation Communities

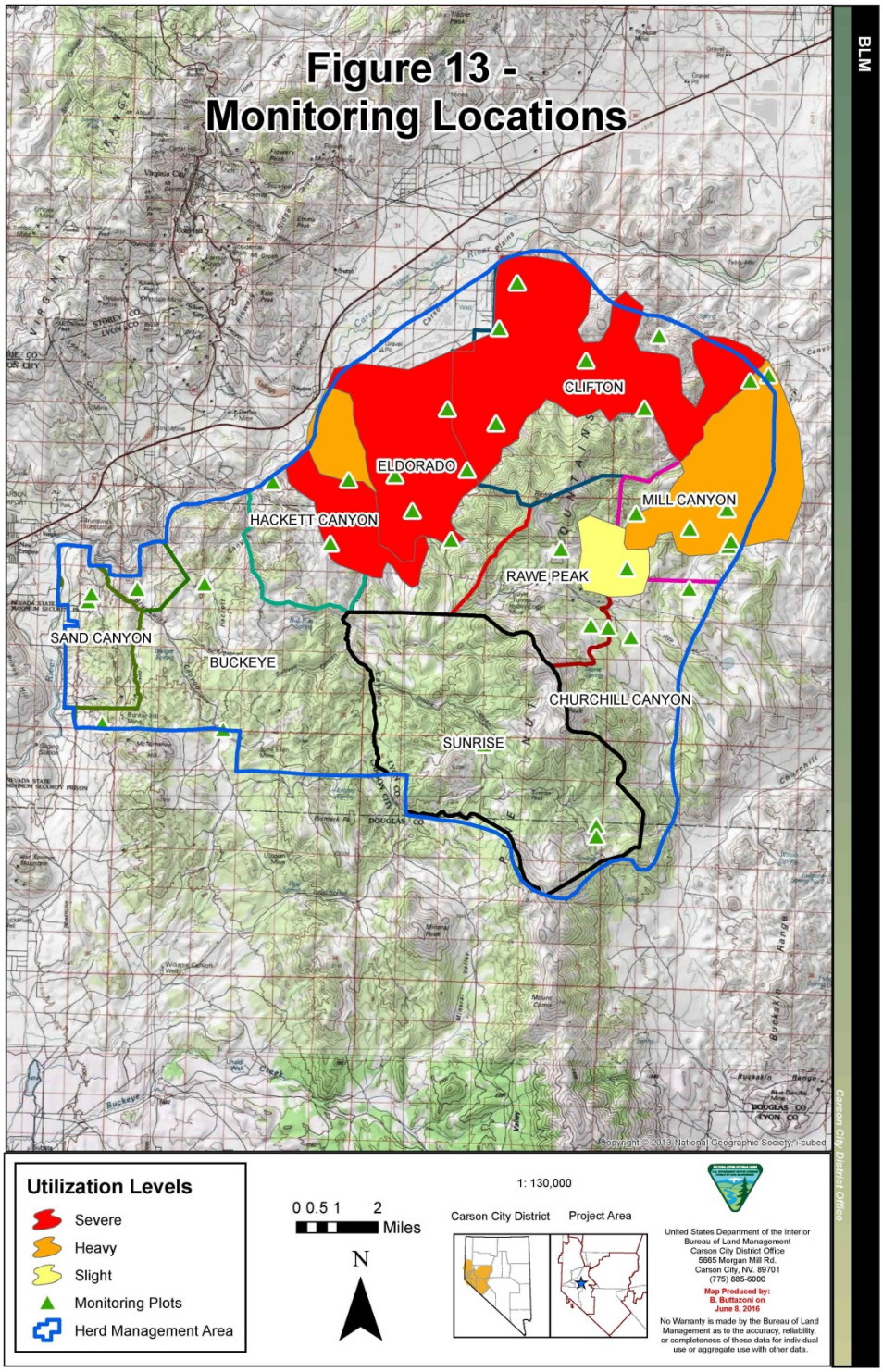


Figure 12, Monitoring Locations

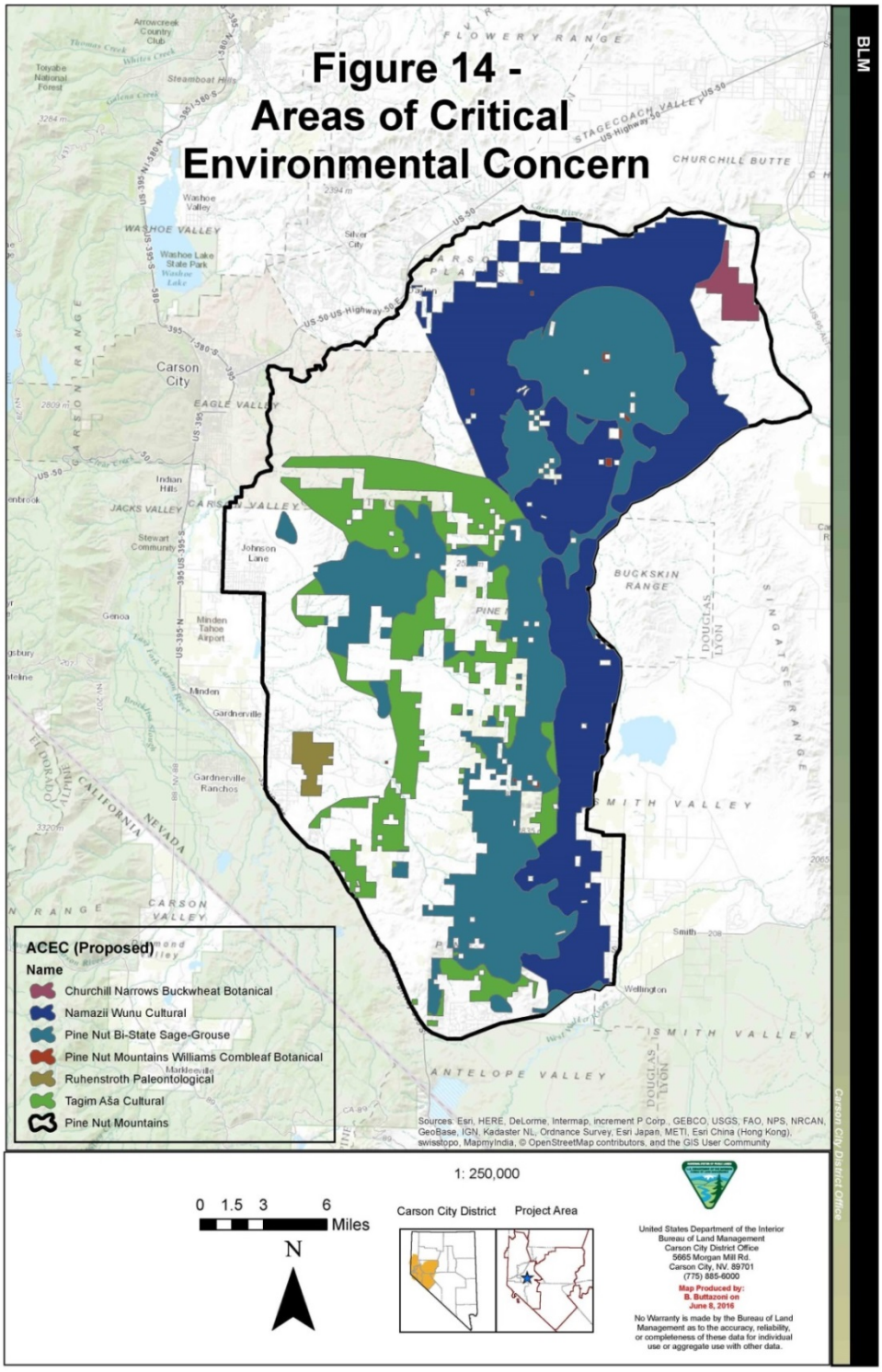


Figure 13, Areas of Critical Environmental Concern

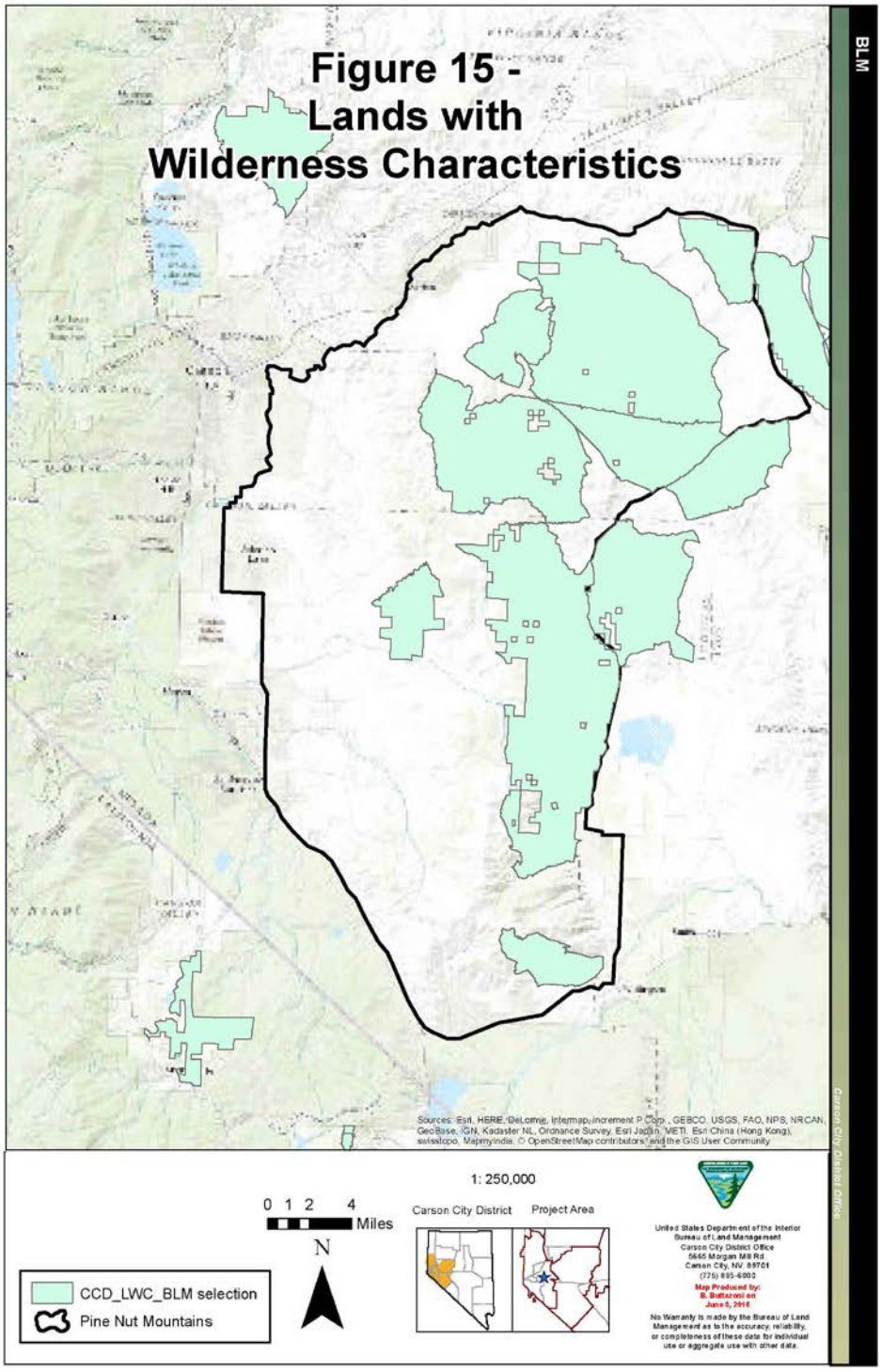


Figure 14, Lands with Wilderness Characteristics

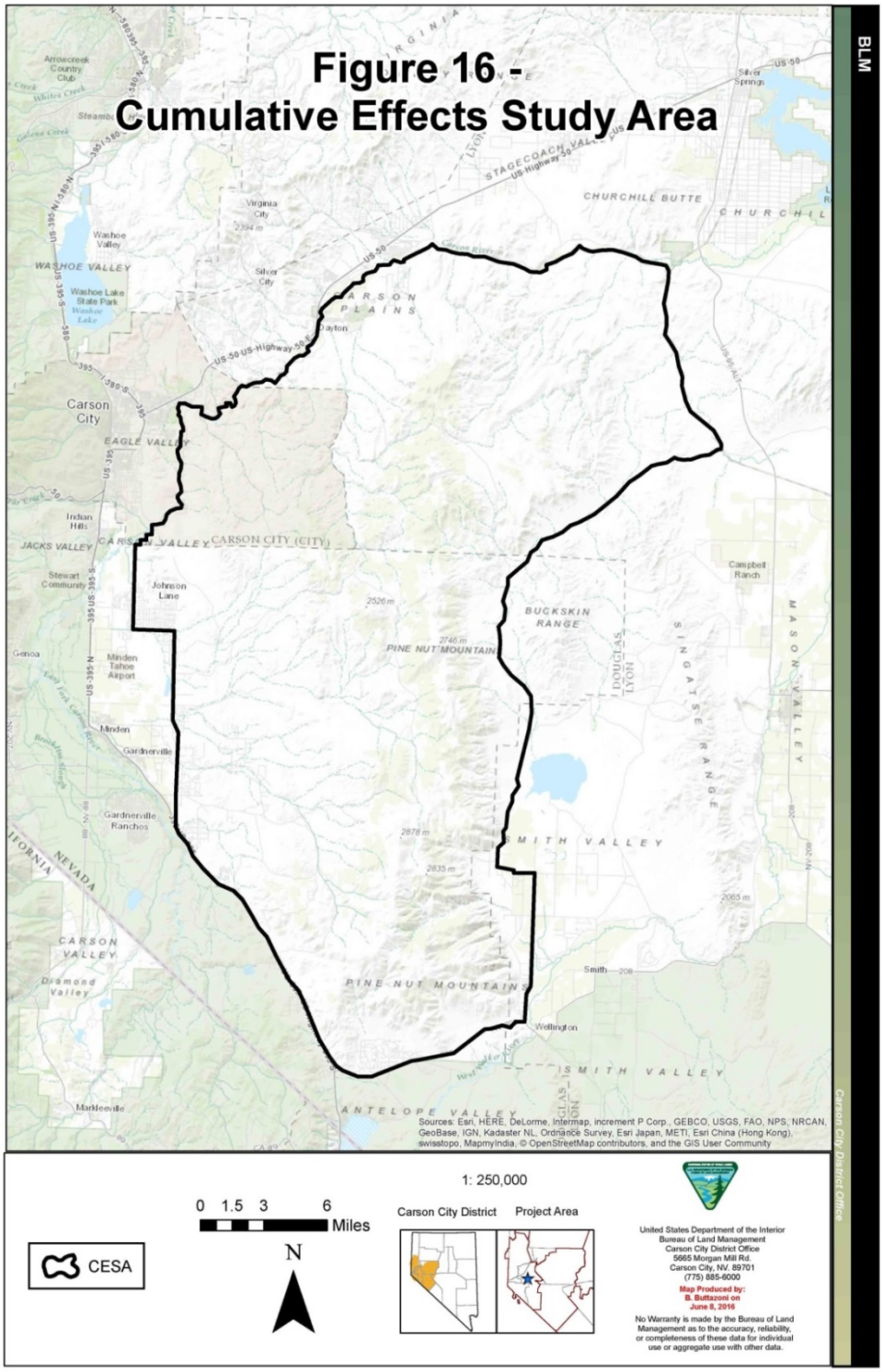


Figure 15, Cumulative Effects Study Area

9.0 Appendices

Appendix A: Standard Operating Procedures for Population-Level Fertility Control Treatments

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

1. PZP, PZP-22, ZonaStat-H, or other PZP vaccines would be administered only by trained BLM personnel, collaborating research partners, or trained volunteers.

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-22 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 jabstick 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 jabstick 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 would be freeze-marked on the hip or neck 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 would 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., to determine the ratio of foals to adults).

2. Population growth rates of herds selected for intensive monitoring would 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., to determine the ratio of foals to 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 would 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 would submit a PZP Application Report and accompanying narrative and data sheets would be forwarded to the NPO (Reno, Nevada). A copy of the form and data sheets and any photos taken would be maintained at the field office.

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

Appendix B: Standard Operating Procedures for Field Castration and Spaying (ovariectomy).

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).

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.

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.
8. Other medications may also be administered at the time of surgery at the professional discretion of the attending veterinarian.
9. All geldings will be allowed to recover from anesthesia within the working pen or the adjacent recovery pen. Once, fully recovered each gelding will be transferred to the gelding holding pen(s). Animals will remain segregated from intact stallions for at least 24 hours following surgery or until their release.
10. Any stallions determined or believed to be a cryptorchid will be allowed to recover from the anesthesia, marked for later recognition, and shipped to a BLM prep facility for appropriate surgery or euthanasia if it is determined that they cannot be fully castrated. At no time will a partial castration be performed. Because cryptorchidism is an inherited condition, cryptorchid stallions should never be released back into an HMA.
11. Gelded animals will be freeze marked on their left hip with an identifying mark to minimize the potential for future recapture and to facilitate post-treatment monitoring. Each State will establish its own marking system in compliance with their State Brand Board. For example, Nevada BLM will utilize the identifying freeze mark on the hip (to be determined) as well as a 2 inch “F” freeze mark on the left side of the neck per agreement with the NV Brand Board.

Post-operative handling, care and monitoring

1. All animals that have fully recovered from anesthesia will have free access to water and hay prior to subsequent release.
2. All geldings will be held at least overnight for observation. Animals will not be left unattended for at least 3 hours following the procedure.
3. The attending veterinarian will observe all animals 12-24 hours after the procedure or again prior to release. Geldings will be released no later than 48 hours following surgery near a water source in their home range when possible.

4. Any gelding observed have complications will be held at the gather site until his condition improves or be shipped to a holding facility until he is able to be returned to the range.
5. Gelded animals would be monitored periodically for complications for approximately 7-10 days post-surgery. This monitoring will be completed either through aerial recon if available or field observations from major roads and trails. It is not anticipated that all the geldings will be observed but the goal is to detect complications if they are occurring and determine if the horses are freely moving about the HMA.
6. Animals found on the range with serious gelding complications will either be recaptured for treatment, if possible or euthanized as an act of mercy if necessary.
7. Observations of the long term outcomes of gelding will be recorded during routine resource monitoring work. Such observations will include but may not limited to band size, social interactions with other geldings and harem bands, distribution within their habitat, forage utilization and activities around key water sources.

Spaying (ovariectomy):

Throughout this EA, the word 'spay' is used to mean ovariectomy; in dogs and cats spaying is actually more invasive. Spaying is a contraception technique that requires an animal to be handled only once, but would result in reducing long-term population growth rates. 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 Science (NAS), American Horse Protection Association (AHPA), the American Association of Equine Practitioners (AAEP), Humane Society of the United States (HSUS), GAO, OIG, and current BLM policy.

The BLM has solicited the USGS to convene a panel of veterinary experts to assess the relative merits of various candidate spay methods for use on wild horses. BLM Wyoming is currently evaluating a research proposal received in 2015 from USGS Fort Collins Science Center and Colorado State University to conduct a study that would assess the behavioral effects of having a portion of spayed mares in a free-roaming population. The USGS proposal includes individual comparisons of spayed versus in-tact mares in terms of behavior, movements, birth and death rates.

The choice of safest method to use for a given mare would be at the discretion of the attending veterinarian, with consideration given to the health and safety of both horse and veterinarian. If it is determined that surgery is not feasible for any reason, no surgery would be conducted.

Mares selected for spaying would have a body condition score of 4 or above. No animals which appear to be distressed, injured, or in failing health, or condition would be selected for spaying. Mares would not be spayed within 36 hours of capture. The surgery would be performed at either a temporary holding facility at the gather location or at a BLM-managed holding center by a licensed veterinarian using appropriate anesthetic agents and surgical techniques. Specific anesthetic agents used would be determined by the on-site veterinarian. The final decision of

which specific animals would be spayed would be based on the professional opinion of the attending veterinarian in consultation with the Authorized Officer.

When spaying procedures are done in the field, mares would be released near a water source, when possible. When the procedures are performed at a BLM-managed facility, selected mares would be shipped to the facility, spayed, held in a separate pen to minimize risk for disease, and returned to the range within 30 days.
For both procedures, feed would be withheld from mares for 24 hours prior to surgery for maximum evacuation of the bowels, allowing adequate room in the abdomen for surgery with minimal interference from the intestines. Holding mares off feed minimizes the negative impact of distended intestines near the surgical region. Water would not be withheld. Surgery would take place with horses standing in a squeeze chute, prepared as aseptically as possible.

After recovering from the procedure these mares would be released back onto the range and would be periodically observed to examine their behavior and band fidelity, demography (birth and survival rates), and spatial ecology following the spaying procedure.

Appendix C: Riparian Functional Assessments (RFA)

Map ID	Name	UTM_X	UTM_Y	Grazing Allotment /Status	Year	Within HMA?	Status/Trend	Comments from Riparian Functional Assessment
1	Nettles Spring Complex (aka Fiddlers Spring, aka Party Spring)	281772	4344484	Clifton/No permitted use	2002	Yes	NF	"Wild horse use of Nettles Spring has denuded the area and trampled the spring."
2	Little Nettles Spring	281762	4344269	Clifton/No permitted use	2002	Yes	FAR	"Wild horse use is heavy with grazing on small willows evident. Impacts to channel from wild horse use are severe in places; channel banks, vegetation and water quality are affected. Downward trend."
3	Dangberg Spring	283755	4345414	Clifton/No permitted use	2015	Yes	NF	"Excessive horse use is degrading and compacti

Map ID	Name	UTM_X	UTM_Y	Grazing Allotment /Status	Year	Within HMA?	Status/Trend	Comments from Riparian Functional Assessment
								ng soils at the site."
4	Rush Spring	284623	4346985	Clifton/No permitted use	1993	Yes	FAR	Horses are compacting soils. Flow may be lost. Downward trend.
5	Egus Spring	284507	4347291	Clifton/No permitted use	<1995	Yes	FAR	No field notes. Photo comparison (1988 and 2014) tells story of downward trend.
6	Populus Spring (aka Hazlett Spring, aka Roadside Spring)	286054	4347065	Clifton/No permitted use	1994, 2013	Yes	FAR (1994), NF (2013)	1994: "Horses are keeping riparian vegetation cleared off with no regeneration occurring. Horses are adversely affecting surrounding watershed. Downward trend." 2013: "Denuded, heavy horse use, hoof action

Map ID	Name	UTM_X	UTM_Y	Grazing Allotment /Status	Year	Within HMA?	Status/Trend	Comments from Riparian Functional Assessment
								may be decreasing flow, compacted soils."
7	Pine Spring	286108	4346803	Clifton/No permitted use	1988, 2015	Yes	FAR, before rating method (1988), NF (2015)	1988 (off Riparian Monitoring Checklist): "Fair condition with little horse use documented." 2015: "Hydric soils are compacted from hoof action. Excessive horse use is degrading site."
8	Rose Spring	286592	4347291	Clifton/No permitted use	2014	Yes	NF	"Excessive horse use is impacting functionality."
9	West Barton Spring	287250	4345625	Clifton/No permitted use	<1995, 2002, 2013, 2015	Yes	PFC (<1995), FAR (2002), FAR (2013), FAR (2015)	A enclosure fence was built after the 2002 assessment to reduce wild horse impacts to the site. The riparian

Map ID	Name	UTM_X	UTM_Y	Grazing Allotment /Status	Year	Within HMA?	Status/Trend	Comments from Riparian Functional Assessment
								area was in recovery in 2013 (25 identified species of riparian vegetation), but with the fence down in 2013-2015 the riparian vegetation has been impacted and the current rating reflects a downward trend due to heavy/excessive horse use.
10	East Barton Spring	287307	4345781	Clifton/No permitted use	<1995, 2013	Yes	PFC (<1995), NF (2013)	The confining layer allowing surface water expression was anthropogenically punctured. East Barton Spring no longer exists.
11	Hercules Meadow	287805	4345551	Clifton/No	<1995, 2013	Yes	FAR (<1995),	"A lot of wild horse

Map ID	Name	UTM_X	UTM_Y	Grazing Allotment /Status	Year	Within HMA?	Status/Trend	Comments from Riparian Functional Assessment
	(Mine) Spring			permitted use			PFC (2013)	trails and sign around enclosure." The enclosure is protecting the area.
12	Hercules Spring	287800	4345561	Clifton/No permitted use	2014	Yes	NF	"Excessive horse use is impacting riparian functionality."
13	Lower Hercules Spring	288376	4346541	Clifton/No permitted use	2014	Yes	NF	"Excessive horse use is preventing recruitment of cottonwood and other riparian vegetation and causing negative impacts on soils and their hydric characteristics."
14	Urrutia Spring	291367	4349199	Clifton/No permitted use	1988	No	NF, before rating method	1988 (off Riparian Monitoring Checklist): "Trampling of small meadow by cattle.

Map ID	Name	UTM_X	UTM_Y	Grazing Allotment /Status	Year	Within HMA?	Status/Trend	Comments from Riparian Functional Assessment
								Meadow dried up due to water development. No JDR."
15	Rawe Peak N. Spring	286582	4344557	Rawe Peak/No permitted use	<1995	Yes	PFC, NF (2014)	No supporting documentation of PFC rating was found. Rating was gleaned from Rawe Peak Allotment Evaluation (1995). Spring was dry in 1980 Water Source Inventory. Spring is dry, has been for some time.
16	Middle Eldorado Canyon	n/a	n/a	Eldorado Canyon / Hackett Canyon	2002	Yes	PFC	RFA covered a stream reach in T.15 N., R. 22 E., Sections 30 & 31.
17	Upper Eldorado Canyon	n/a	n/a	Sunrise/ Buckeye Allotments	2002	Yes	FAR	RFA covered a stream reach in T.14 N.,

Map ID	Name	UTM_X	UTM_Y	Grazing Allotment /Status	Year	Within HMA?	Status/Trend	Comments from Riparian Functional Assessment
								R. 22 E., Section 6. Rating due to erosion and road management issues.
18	Greg's Cabin Meadow Spring	288113	4339926	Mill Canyon/No permitted use	<1995, 2002, 2013	Yes	FAR (<1995), NF (2002), NF (2013)	<1995: No field notes. 2002: "Lack of water flow and heavy grazing are the two major impacts to resource. The meadow was grazed in an extreme manor by both wild horses and cattle. There was no authorized use in the allotment. " 2013: "Riparian vegetation is dead or dying. Riparian area is severely degraded

Map ID	Name	UTM_X	UTM_Y	Grazing Allotment /Status	Year	Within HMA?	Status/Trend	Comments from Riparian Functional Assessment
								due to lack of water. Horse evidence. "
19	Pony Meadow Artesian Well	288627	4339954	Mill Canyon/No permitted use	2012	Yes	FAR	2012: Artesian well acting as spring head and supporting riparian area below dried out meadow. "Rating due to knickpoint, expanding Canada and Bull Thistle (noxious weeds), and wild horse hoof action causing disturbance of surface and subsurface flow patterns."
20	Poor Geometry Spring	284088	4325880	Pine Nut	2004	No	FAR	"Rating due to horse impacts."
21	D019	n/a	n/a	Pine Nut	2013	No	NF	"Dry meadow, no surface

Map ID	Name	UTM_X	UTM_Y	Grazing Allotment /Status	Year	Within HMA?	Status/Trend	Comments from Riparian Functional Assessment
								water left. Old headcuts. No noxious weeds present. Long term drying trend." Wild horse presence was not documented.
22*	PN-T-D018 high elevation seep	285940	4320310	Pine Nut	2013	No	PFC	"Wild horses present outside HMA. This water source supports a healthy aspen stand."
23*	PN-T-D018 lower seep in drainage	285940	4320310	Pine Nut	2013	No	NF	"Denuded area, multiple trails in and out. Sedges, juncus and yarrow are being over grazed. Roots exposed with excessive erosion. Hoof action is compacti

Map ID	Name	UTM_X	UTM_Y	Grazing Allotment /Status	Year	Within HMA?	Status/Trend	Comments from Riparian Functional Assessment
								ng soils. Horse sign present. Wild horses present outside HMA."
24	Sheep Trough Spring	286283	4315495	Pine Nut	2014	No	NF	"Excessive horse use and lack of riparian vegetation. Horses outside of HMA."
25	Sage Hen Enclosure	284211	4309648	Pine Nut	2013	No	FAR	"Lack of water causing meadow characteristics to shrink, thistle present. Fence in need of maintenance. Historic disturbance. Downward trend." Horse presence not documented.
26	South Dry Meadow Complex	285503	4310506	Pine Nut	2013	No	Not Riparian	"Topographically low areas where seasonal water collects."

Map ID	Name	UTM_X	UTM_Y	Grazing Allotment/Status	Year	Within HMA?	Status/Trend	Comments from Riparian Functional Assessment
27	Top of Pipeline Canyon-Upper Meadow	284415	4306326	Pine Nut	2012	No	FAR	"Evidence of year round grazing by wild horses. Old skeletons. Fence down. Hoof shearing is altering surface and subsurface flow. Knickpoint present. Downward trend."
28	Top of Pipeline Canyon-Lower Meadow	284415	4306326	Pine Nut	2012	No	FAR	"Wild horse use, willow utilization, annilation and degradation. No noxious weeds documented. No apparent trend. Lower meadow would respond quickly if horse pressure was removed."
29	Winters Mine Spring	283947	4305958	Pine Nut	2012	No	FAR	"Unstable system due to historic mining, road system and active head cutting. Wild horses are perpetually browsing and trailing. Outside of HMA. No noxious weeds. Mousetail in general vicinity. Downward trend."
30	Unnamed Spring	287430	4328703	Sunrise	2015	Yes	NF	"Lack of water due to pinyon-juniper encroachment"
31	Chaining Spring	287609	4328822	Sunrise	2015	Yes	FAR	"Lower fence line was placed too high in riparian area causing instability of

								system, high risk of downward trend from any grazing pressure along fence line. Unstable system is reason for downward trend."
32	East Chaining Spring	287857	4328929	Sunrise	2015	Yes	PFC	"Past hoof action from cattle grazing has caused surface and subsurface flow disturbance. Large (24-30") pedestals. Removal of grazing pressure is allowing site to begin recovery."
33	Unnamed Stream	288146	4329123	Sunrise	2015	Yes	PFC	"Lotic area, stream reach below willows is stable and could dissipate high energy storm events. No horse sign observed."
34	Mud Spring	288113	4336509	Churchill Canyon	2007	Yes	NF	"Excessive erosion due to headcutting."
35	Tapemeck Spring	269709	4337432	Sand Canyon	2000	Yes	PFC	"Riparian area popped up with effluent pond coming on-line. No wild horse or livestock sign."
36	Carson River reach	266192	4335208	Sand Canyon	2000	Yes	PFC	"Reach stream type C3 or C4 with a moving stream course." Site location estimated.

Rating key: PFC-NC = Proper Functioning Condition, Not Rated Trend
FAR-NA = Functional-At-Risk, Not Apparent Trend
FAR-UP = Functional-At-Risk, Upward Trend
FAR-DOWN – Functional-At-Risk, Downward Trend
NF = Non-Functional

*Same location on Figure 10.

Appendix D: BLM Sensitive Animals and Migratory Birds That May be Present or Their Habitat May be Present in the Pine Nut Mountains

Common Name	Scientific Name	BLM Sensitive Species	BLM Migratory Bird
Big brown bat	*Eptesicus fuscus*	Y	-
Brazilian free-tailed bat	*Tadarida braziliensis*	Y	-
Brewer's sparrow	*Spizella breweri*	Y	Y
Burrowing owl	*Athene cunicularia*	Y	N
California myotis	*Myotis californicus*	Y	-
Dark kangaroo mouse	*Microdipodops megacephalus*	Y	-
Ferruginous hawk	*Buteo regalis*	Y	Y
Fringed myotis	*Myotis thysanodes*	Y	-
Golden eagle	*Aquila chrysaetos*	Y	Y
Greater sage-grouse (Bi-State DPS)	*Centrocercus urophasianus*	Y	N
Green-tailed towhee	*Pipilo chlorurus*	N	Y
Little brown bat	*Myotis lucifugus*	Y	-
Loggerhead shrike	*Lanius ludovicianus*	Y	Y
Long-eared myotis	*Myotis evotis*	Y	-
Long-legged myotis	*Myotis volans*	Y	-
Mourning dove	*Zenaida macroura*	N	Y
Northern goshawk	*Accipiter gentilis*	Y	N
Pale kangaroo mouse	*Microdipodops pallidus*	Y	-
Pallid bat	*Antrozous pallidus*	Y	-
Pinyon jay	*Gymnorhinus cyanocephalus*	Y	Y
Sage sparrow	*Amphispiza belli*	N	Y
Sage thrasher	*Oreoscoptes montanus*	Y	Y
Swainson's hawk	*Buteo swainsoni*	Y	N
Townsend's big-eared bat	*Corynorhinus townsendii*	Y	-
Virginia's warbler	*Vermivora virginiae*	N	Y
Western pipistrelle bat	*Pipistrellus hesperus*	Y	-
Western small-footed myotis	*Myotis ciliolabrum*	Y	-
Yuma myotis	*Myotis yumanensis*	Y	-

Appendix E: Public Observation of Wild Horse and Burro Gathers

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240
http://www.blm.gov

July 22, 2010

In Reply Refer To:
4710 (260) P

EMS TRANSMISSION 07/23/2010
Instruction Memorandum No. 2010-164
Expires: 09/30/2011

To: All Field Officials (except Alaska)

From: Assistant Director, Renewable Resources and Planning

Subject: Public Observation of Wild Horse and Burro Gathers

Program Area: Wild Horse and Burro Program

Purpose: The purpose of this Instruction Memorandum (IM) is to establish policy for public observation of wild horse and burro (WH&B) gathers.

Policy/Action: The Bureau of Land Management's (BLM's) policy is to accommodate public requests to observe a gather primarily through advance appointment, on days and at times scheduled by the authorized officer. Planning for one public observation day per week is suggested.

Specific viewing opportunities will be based on the availability of staff with the necessary expertise to safely and effectively host visitors, as well as other gather-specific considerations (e.g., weather, terrain, road access, landownership). The public should be advised that observation days are tentative and may change due to unforeseen circumstances (e.g., weather, wildfire, trap relocation, equipment repair, etc.). To ensure safety, the number of people allowed per observation day will be determined by the District Manager (DM) and/or Field Office Manager (FM) in consultation with the Contracting Officer's Representative/WH&B Specialist (COR) for the gather.

The DM/FM has the primary responsibility for effectively planning and managing public observation of the gather operation. Advance planning will:

- Ensure that the public have opportunities to safely observe wild horse gathers;
- Minimize the potential for disruption of the gather's execution;

- Maximize the safety of the animals, visitors, and the BLM and contractor personnel;
- Provide for successful management of visitors; and
- Ensure preparedness in the event of unanticipated situations.

The authorized officer will consider the following when planning for public observation of WH&B gather operations. Also see Appendix F (Best Practices When Planning for Public Observation at Gathers).

A. Safety Requirements

During WH&B gathers, the safety of the animals, the BLM and contractor personnel, and the public is of paramount importance. Because of the inherent risk involved in working with WH&B, the public will not be allowed inside corrals or pens or be in direct contact with the animals. Viewing opportunities during the gather operation must always be maintained at a safe distance (e.g., when animals are being herded into or worked at the trap or temporary holding facility, including sorting, loading) to assure the safety of the animals, the BLM and contractor personnel, and the public.

Unless an emergency situation exists, the BLM's policy prohibits the transportation of members of the public in Government or Contractor-owned or leased vehicles or equipment. Therefore, observers are responsible for providing their own transportation to and from the gather site and assume all liability for such transportation.

The helicopter/aircraft is the private property of the gather contractor. Due to liability and safety concerns, Bureau policy prohibits observers from riding in or mounting cameras onto the aircraft. Should observers create unsafe flying and gathering conditions, for example, by hiring an aircraft to film or view a gather, the COR, in consultation with the gather contractor, will immediately cease gather operations.

The COR has the authority to stop the gather operation when the public engage in behavior that has the potential to result in harm or injury to the animals, employees, or other members of the public.

B. Planning for Public Observation at WH&B Gathers

During advance planning for public observation at WH&B gathers, the authorized officer should consult with the State External Affairs Chief or appropriate Public Affairs office. An internal communications plan will be developed for every gather (Appendix F).

C. Law Enforcement Plan

A separate Law Enforcement Plan should be developed if the need for law enforcement support is anticipated. The Law Enforcement Plan must be approved in advance by the Special Agent-In-Charge (SAC) or the State Staff Ranger of the State in which the gather is occurring.

D. Temporary Closure to Public Access

Under the authority of section 303(a) of the Federal Land Management and Policy Act (43 U.S.C. 1733(a)), 43 CFR 8360.0-7, and 43 CFR 8364.1, the authorized officer may temporarily close public lands within all or a portion of the proposed gather area to public access when necessary to protect the health and safety of the animals, the public, contractors and employees. Completion of a site-specific environmental analysis of the environmental impacts associated with the proposed closure and publication of a Federal Register Notice is required.

E. Gather Contract Pre-Work Conference

- Talk to the contractor about how many members of the public are expected and when. Discuss, and reach mutual agreement, about where best to position the public at the individual trap-sites to allow the gather to be observed, while accomplishing the gather objectives and assuring the humane treatment of the animals and the safety of the BLM and contractor personnel, and public.
- No deviation from the selected viewing location(s) should be made, unless the gather operation is being adversely impacted. The COR will consult with the gather contractor prior to making any changes in the selected viewing locations.
- The BLM's policy prohibits it from ferrying observers in the helicopter or any other mode of conveyance unless an emergency situation exists. Review this policy with the contractor during the pre-work conference.

F. Radio Communication

- Assure there is effective radio communication between law enforcement personnel, gather COR or project inspectors (PIs), and other BLM staff.
- Identify the radio frequencies to be used.
- Communication with the gather contractor is through the BLM COR or PI, and from the gather contractor to the helicopter pilot. Direct communication between BLM personnel (other than the COR) and the helicopter pilot is not permitted, unless agreed upon by the BLM authorized officer and the contractor in advance, or the pilot is requesting information from the COR.

G. Pre- and Post-Action Gather Briefings

- Pre-briefings conducted by knowledgeable and experienced BLM staff can be helpful to the public.
- The pre-gather briefing is an opportunity to explain what individuals will see, why the BLM is conducting the gather, how the animals will be handled, etc.
- Post-action briefings may also be helpful in interpreting and explaining what individuals saw, what happened, why certain actions were taken, etc.

H. Summary of Individual Roles and Responsibilities

1. District and/or Field Office Managers

DMs and/or FMs are responsible for keeping the State Director and State WH&B Lead fully informed about the gather operation. Included is working with State/local public affairs staff to prepare early alerts if needed. An additional responsibility is determining if a law enforcement presence is needed.

2. Public Affairs Staff
The local district/field office public affairs staff is responsible for working with the COR, DM/FM, other appropriate staff, the State WH&B Program Lead, and the State Office of Communications to implement the communications strategy regarding the gather.

3. Law Enforcement
Develop and execute the law enforcement plan in consultation with District/Field Office Managers, the COR/PI, and the State's Special Agent-In-Charge or State Staff Ranger.

4. Contracting Officer's Representative (COR)/Project Inspectors (PIs)
The COR and the PI's primary responsibility is to administer the contract and manage the gather. A key element of this responsibility is to assure the safe and humane handling of WH&B. The COR is also responsible for working closely with the DM/FM and Public Affairs Staff to develop the communication plan, and for maintaining a line of communication with State, District, and Field Office managers, staff and specialists on the progress of, and any issues related to, the gather operation.

Timeframe: This instruction memorandum is effective immediately.

Budget Impact: Higher labor costs will be incurred while accommodating increased interest from the public to attend gather events. The budget impacts of unanticipated situations which can occur during WH&B gathers include substantial unplanned overtime and per diem expense. Through advance planning, necessary support staff can be identified (e.g., law enforcement, public affairs, or other BLM staff) and the cost-effectiveness of various options for providing staff support can be evaluated. In situations where public interest in a gather operation is greater than anticipated, the affected state should coordinate with the national program office and headquarters for assistance with personnel and funding.

Background: Heightened interest from the public to observe WH&B gathers has occurred. Advance planning for public observation of gather operations can minimize the potential for unanticipated situations to occur during WH&B gathers and assure the safety of the animals, the BLM and contractor personnel, and the public.

Manual/Handbook Sections Affected: No change or affect to the BLM manuals or handbooks is required.

Coordination: This IM was coordinated among WO-200 and WO-260 staff, State WH&B Program Leads, field WH&B Specialists, public affairs, and law enforcement staff in the field.

Contact: Questions concerning this policy should be directed to the Washington Office at (202) 912-7262.

Signed by:
Bud C. Cribley
Acting, Assistant Director
Renewable Resources and Planning

Authenticated by:
Robert M. Williams
Division of IRM Governance, WO-560

PINE NUT MOUNTAINS HMA-SPECIFIC ACTIONS & PROCEDURES

Daily Visitation Protocol and Ground Rules for Pine Nut Mountains Wild Horse Gathers

BLM recognizes and respects the right of interested members of the public and the press to observe the Pine Nut Mountains wild horse gather. 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, 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 and burros.

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.

General Daily Protocol

- A wild horse gather info 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. However, the contractor and their 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 adverse 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 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 and burros 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 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 a helicopter or other heavy equipment in close proximity to a designated observation area, is in use, 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 horses in, visitors must sit down in areas specified by BLM representatives and must not move or talk as the 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, 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-Specific Protocol

- A public outreach and education day provides a more structured mechanism for interested members of the public to see the wild horse gather activities at a given site. On this day,

BLM attempts to allow the public to get an overall sense of the gather process and has available staff who can answer questions that the public may have. The public rendezvous at a designated place and are escorted by BLM representatives to and from the gather site.

Appendix F: Results from WinEquus Population Modeling by Alternative

Proposed Action, Alternative A. Gather to Low AML by Allotment and Treat Mares with PZP:

Alt. A: Totals in 11 Years*			
	Gathered	**Removed**	**Treated**
Lowest Trial	803	497	26
10th Percentile	860	565	39
25th Percentile	900	639	44
Median Trial	936	680	50
75th Percentile	1006	728	58
90th Percentile	1059	782	82
Highest Trial	1301	993	106

* 0 to 20+ year-old horses

Alt. A: Average Growth Rate in 10 Years	
Trial	Percent Growth Rate
Lowest Trial	3.6
10th Percentile	6.5
25th Percentile	7.3
Median Trial	8.8
75th Percentile	10.1
90th Percentile	11.3
Highest Trial	15.3

Alt. A: Population Sizes in 11 Years*			
	Minimum	Average	Maximum
Lowest Trial	71	193	583
10th Percentile	91	210	592
25th Percentile	98	221	609
Median Trial	110	234	633
75th Percentile	121	245	668
90th Percentile	130	262	718
Highest Trial	159	327	901

* 0 to 20+ year-old horses

Alternative B. Gather to Low AML by Allotment, Treat Mares with PZP and Adjust Sex Ratios, Some Horses would be spayed or gelded:

Alt. B: Totals in 11 Years*			
Trial	Gathered	Removed	Treated
Lowest Trial	751	509	39
10th Percentile	858	548	55
25th Percentile	903	634	60
Median Trial	944	684	68
75th Percentile	986	718	78
90th Percentile	1053	776	98
Highest Trial	1210	887	128

* 0 to 20+ year-old horses

Alt. B: Average Growth Rate in 10 Years	
Trial	Percent Growth Rate
Lowest Trial	1.7
10th Percentile	5.4
25th Percentile	6.4
Median Trial	8.2
75th Percentile	9.9
90th Percentile	11.3
Highest Trial	14.1

Alt. B: Population Sizes in 11 Years*			
Trial	Minimum	Average	Maximum
Lowest Trial	73	178	581
10th Percentile	89	208	598
25th Percentile	94	221	610
Median Trial	104	230	640
75th Percentile	120	240	671
90th Percentile	130	253	738
Highest Trial	159	293	810

* 0 to 20+ year-old horses

Alternative C. Gather to Low AML no Fertility Control:

Alt. C: Totals in 11 Years*		
Trial	Gathered	Removed
Lowest Trial	678	595
10th Percentile	890	764
25th Percentile	957	810
Median Trial	1004	864
75th Percentile	1086	934
90th Percentile	1170	1002
Highest Trial	1299	1110

* 0 to 20+ year-old horses

Alt. C: Average Growth Rate in 10 Years	
Trial	Percent Growth Rate
Lowest Trial	8.7
10th Percentile	10.2
25th Percentile	12.0
Median Trial	13.9
75th Percentile	15.0
90th Percentile	16.8
Highest Trial	18.9

Alt. C: Population Sizes in 11 Years*			
Trial	Minimum	Average	Maximum
Lowest Trial	104	233	584
10th Percentile	134	270	598
25th Percentile	148	285	606
Median Trial	160	310	628
75th Percentile	193	336	662
90th Percentile	210	366	685
Highest Trial	268	409	817

* 0 to 20+ year-old horses

Alternative D. No Action, no Contraception and no Removals:

Alt. D: Average Growth Rate in 10 Years	
Trial	Percent Growth Rate
Lowest Trial	16.1
10th Percentile	17.7
25th Percentile	18.9
Median Trial	20.1
75th Percentile	21.2
90th Percentile	22.7
Highest Trial	24.2

Alt. D: Population Sizes in 11 Years*			
	Minimum	Average	Maximum
Lowest Trial	571	1307	2691
10th Percentile	592	1621	3200
25th Percentile	611	1733	3652
Median Trial	630	1899	4052
75th Percentile	673	2074	4516
90th Percentile	720	2228	4894
Highest Trial	786	2416	5754

* 0 to 20+ year-old horses

Appendix G: Standard Operating Procedures for Wild Horse Gathers

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

Prior to any gathering operation, the BLM would provide for a pre-gather evaluation of existing conditions in the gather area(s). The evaluation would include animal conditions, prevailing temperatures, drought conditions, soil conditions, road conditions, and a topographic map with WSA boundaries, the location of fences, other physical barriers, and acceptable gather locations in relation to animal distribution. The evaluation would determine whether the proposed activities would 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 would be apprised of all conditions and would be given instructions regarding the gather and handling of animals to ensure their health and welfare is protected.

Gather sites and temporary holding sites would 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 Gathering. This gather method involves utilizing a helicopter to herd wild horses into a temporary gather site.

2. Helicopter Assisted Roping. This gather method involves utilizing a helicopter to herd wild horses to ropers.

3. Bait Trapping. This gather method involves utilizing bait (e.g., water or feed) to lure wild horses into a temporary gather site.

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

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

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

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

3. All gather sites, 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. Gather sites 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 high for burros, and the bottom rail of which shall not be more than 12 inches from ground level. All gather sites and holding facilities shall be oval or round in design.

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

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

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

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

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

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

6. Alternate pens, within the holding facility shall be furnished by the Contractor to separate mares or jennies with small foals, sick and injured animals, estrays or other animals the COR determines need to be housed in a separate pen from the other animals. Animals shall be sorted as to age, number, size, temperament, sex, and condition when in the holding facility so as to minimize, to the extent possible, injury due to fighting and trampling. Under normal conditions, the government would require that animals be restrained for the purpose of determining an animal's age, sex, or other necessary procedures. In these instances, a portable restraining chute may be necessary and would be provided by the government. Alternate pens

shall be furnished by the Contractor to hold animals if the specific gathering requires that animals be released back into the gather area(s). In areas requiring one or more satellite gather site, 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 would be at the discretion of the COR.

7. The Contractor shall provide animals held in the gather sites and/or holding facilities with a continuous supply of fresh clean water at a minimum rate of 10 gallons per animal per day. Animals held for 10 hours or more in the gather site or holding facilities shall be provided good quality hay at the rate of not less than two pounds of hay per 100 pounds of estimated body weight per day. The contractor would supply certified weed free hay if required by State, County, and Federal regulation.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

C. Use of Motorized Equipment

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

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

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

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.

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

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

11 square feet per adult horse (1.4 linear foot in an 8 foot wide trailer);

8 square feet per adult burro (1.0 linear foot in an 8 foot wide trailer);

6 square feet per horse foal (0.75 linear feet in an 8 foot wide trailer);

4 square feet per burro foal (0.5 linear feet in an 8 foot wide trailer).

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

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

D. Safety and Communications

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

The proper operation, service and maintenance of all contractor furnished property is the responsibility of the Contractor. The BLM reserves the right to remove from service any contractor personnel or contractor furnished equipment which, in the opinion of the contracting officer or COR/PI violate contract rules, are unsafe or otherwise unsatisfactory. In this event, the Contractor would 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.

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

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

Should the contractor choose to utilize a helicopter the following would apply:

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

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

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

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

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

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

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

H. Responsibility and Lines of Communication
Contracting Officer's Representative/Project Inspector: TBD

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

All publicity, formal public contact and inquiries would be handled through the Field Manager and District Public Affairs Officer. These individuals would be the primary contact and would coordinate with the COR/PI on any inquiries.

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

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

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

Appendix H: Comprehensive Animal Welfare Policy

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240-0036
http://www.blm.gov

September 25, 2015

In Reply Refer To:
4720 (260) P

EMS TRANSMISSION 09/29/2015
Instruction Memorandum No. 2015-151
Expires: 09/30/2018

To: All Field Office Officials (except Alaska)

From: Assistant Director, Resources and Planning

Subject: Comprehensive Animal Welfare Program for Wild Horse and Burro Gathers

Program Area: Wild Horse and Burro (WH&B) Program

Purpose: The purpose of this Instruction Memorandum (IM) is to establish policy for the Wild Horse and Burro (WH&B) Gather component of the Comprehensive Animal Welfare Program (CAWP). It defines standards, training and monitoring for conducting safe, efficient and successful WH&B gather operations while ensuring humane care and handling of animals gathered.

Policy / Action: The Bureau of Land Management (BLM) is committed to the well-being and responsible care of WH&B we manage. At all times, the care and treatment provided by the BLM and its contractors will be characterized by *compassion and concern* for WH&B well-being and welfare needs.

All State, District and Field Offices are required to comply with the CAWP policy for all gathers within their jurisdiction. The CAWP for WH&B gathers includes three components:

1. Comprehensive Animal Welfare Program Standards for Wild Horse and Burro Gathers (Attachment 1): These standards include requirements for trap and temporary holding facility design; capture and handling; transportation; and appropriate care after capture. The standards have been incorporated into helicopter gather contracts as specifications for performance.

2. Training: All Incident Commanders (IC), Contracting Officer Representatives (COR), Project Inspectors (PI) and contractors must complete a mandatory training course. The training is available online via DOI Learn: Course Title: BLM's Comprehensive Animal Welfare Program (CAWP) – gathers; Course Number: 4700-13.

3. CAWP Gather Assessment Tool (Attachment 2): The Gather Assessment Tool will be used during FY2016 for evaluating the effectiveness of mandatory training and adequacy of the Standards for CAWP for WH&B Gathers. The WO-260 Division is responsible for overseeing implementation of assessments as well as providing the necessary access to the assessment tool for those gathers selected for internal assessment during FY2016.

4. Starting in FY2017, the Assessment Tool will be used to evaluate compliance by the BLM and its contractors with the Standards for CAWP for WH&B Gathers. The WO-260 Division will oversee the completion of all assessments as well as providing the necessary access to the assessment tool for those gathers identified for both internal and external assessment by internal and external personnel during FY2017.

This IM supersedes Interim IM No. 2013-059, Wild Horse and Burro Gathers: Comprehensive Animal Welfare Policy which was issued as part of a package of IMs covering various aspects of the management of WH&B gathers, including:

- IM No. 2013-058, Wild Horse and Burro Gathers: Public and Media Management.
- IM No. 2013-060, Wild Horse and Burro Gathers: Management by Incident Command System
- IM No. 2013-061, Wild Horse and Burro Gathers: Internal and External Communicating and Reporting

The goal of this IM is to ensure that the responsibility for humane care and treatment of WH&Bs remains a high priority for the BLM and its contractors at all times. The Bureau's objective is to use the best available science, husbandry and handling practices applicable for WH&Bs and to make improvements whenever possible, while also meeting our overall gather goals and objectives in accordance with current BLM policy, standard operating procedures and contract requirements. The CAWP and its associated components will be reviewed regularly and modified as necessary to enhance its transparency and effectiveness in assuring the humane care and treatment of the WH&Bs.

The Lead COR is the primary party responsible for promptly addressing any actions that are inconsistent with the Standards set forth in the CAWP. The Lead COR may delegate responsibility to an alternate COR. The Lead COR will promptly notify the contractor if any improper or unsafe actions are observed and will ensure that they are promptly rectified. If issues are left unresolved or immediate action is required, the Lead COR has the authority to suspend gather operations. Through coordination with the Contracting Officer, the Lead COR shall, if necessary, ensure that corrective measures have been taken to prevent such actions from reoccurring and all follow-up and corrective measures shall be reported as a component of the Lead COR's daily reports.

Timeframe: All portions of this policy are effective as of October 1st, 2015.

Budget Impact: This IM is implementing new policy and guidance with additional training and reporting requirements for personnel and contractors. The cost for the required training is about $250 per person. CAWP program implementation, oversight, data compilation and reporting requirements will require an additional 12 to 15 work months per year.

Background: The authority for a Comprehensive Animal Welfare Program for WH&B Gathers is provided by Public Law 92-195, Wild Free-Roaming Horses and Burros Act of 1971 (as amended) and 43 CFR 4700.0-2.

The Comprehensive Animal Welfare Program for WH&B gathers consolidates and highlights the BLM's policies, procedures and ongoing commitment to protect animal welfare; provide training for employees and contractors on animal care and handling; and implement a gather assessment tool which will be used to evaluate the agency's and contractor's adherence to standards for the handling and care of animals during gather operations.

Manual/Handbook Sections Affected: None

Coordination: This IM was coordinated among WO-100, WO-200, WO-260, WO-600, WH&B State Leads and WH&B Specialists.

Contact: Bryan Fuell, On-Range Branch Chief, Wild Horse and Burro Program, at 775-861-6611.

Signed by:
Michael H. Tupper
Acting, Assistant Director
Resources and Planning

Authenticated by:
Robert M. Williams
Division of IRM Governance, WO-860

2 Attachments
1 - Comprehensive Animal Welfare Program Standards for Wild Horse and Burro Gathers (20 pp)
2 - CAWP Gather Assessment Tool screen shots (26 pp)

Appendix I: Fish Springs Area Interim Horse Management

Some of the horses that have established home ranges outside of the HMA are found in the Fish Springs area, Gardnerville Nevada, which is approximately eight miles south of the HMA. This area is within the original HA and was removed from the HMA in 1983, as a result of complaints from private land owners and the Bureau of Indian Affairs on behalf of allotment owners. The land ownership pattern in this area is mixed between public and private land with urban interface along the western edge creating management challenges as the horses move freely between these lands and roadways. Wild horses in this area have been involved in traffic accidents, acted aggressively toward the public, domestic horses and damaged landscaping.

Some residents in this area would like the HMA expanded to include the Fish Springs area. Under the Proposed Action wild horses in this area would be managed at levels as outlined in the HMAP forage utilization limits and the area evaluated for suitability and possible designation as a HMA. In the interim, volunteers would apply a contraceptive such as ZonaStat-H to prevent pregnancies. If it is determined that all the habitat requirements are present for wild horses an RMP amendment would be initiated to expand the HMA in this area Nuisance wild horses would continue to be removed when complaints are received.

Determination of Interim Management Level

During the 2016 inventory a total of 57 wild horses were seen in the general area of Fish Springs

Horse utilization data was collected on native perennial grasses for the 2016 /17 grazing period. The area most impacted was 1,828 acres centered around a water trough which sustained heavy use with an average use of 75%. If Indian trust land was included the total acres in heavy use would be greater.

Portions of this area had previously burned however, all transects were completed in un-burned areas. Along some transects key species were not found, the lack of these species likely resulted from many years of over use by wild horses. In these areas utilization data on squirrel tail was collected. On some transects squirrel tail received more use than the key species which are generally more palatable, this could have resulted from grazing during periods when squirrel tail was green and the key species were dry.

It is generally recommended that utilization be limited to less than 35% on non-key species such as squirrel tail to allow for the recovery of key species. The eastern edge of the mapped heavy use is within identified bi-state sage-grouse habitat. The guidelines for bi-state sage-grouse habitat limit utilization on grasses to less than 35% in low and Wyoming sage habitats.

Because most of the area within the mapped heavy use category was dominated by squirrel tail proper range management would limit use to 35% until the range recovers, which could take decades.

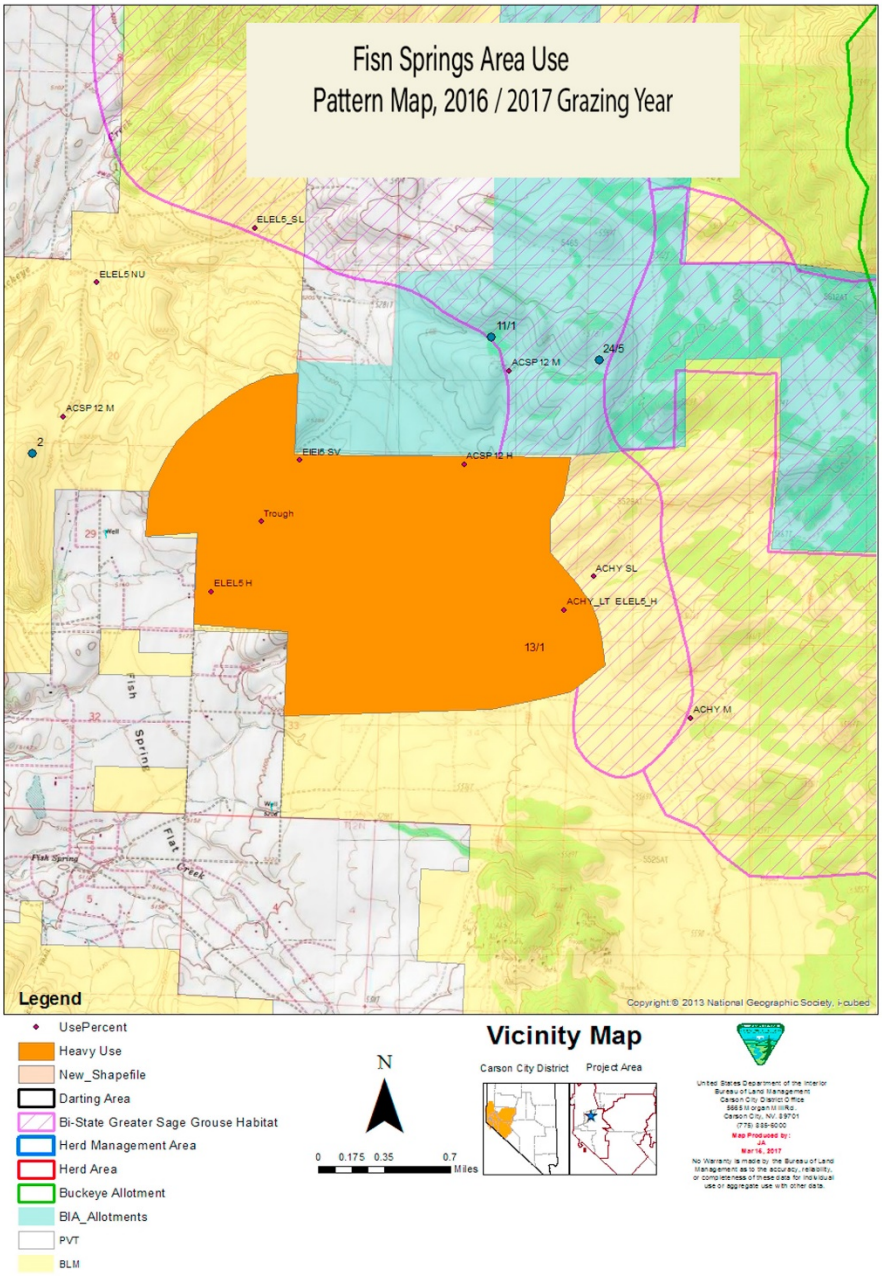
During the 2016 inventory 50 adult horses and 7 foals were identified within the Fish Springs area. The desired use is 35%, the average observed use was 75%. If foals were not included in the calculation the maximum number of horses would be 23.3.

$$\frac{35\% \text{ use}}{75\% \text{ use}} = \frac{X}{57 \text{ horses}} = 26.6 \text{ horses maximum}$$

Therefore the maximum number of horses that can graze this area year long and meet habitat objectives is 26.6. Since removal of horses annually is not feasible the number of horses is generally reduced to a level that would be anticipated to take five years to reach the maximum number of animals that the area can support. In this case the lower number is 10.7 horses. Since this is not an HMA the term AML would not be appropriate but the maximum and minimum number of horses would be analogous to the maximum and minimum AML if all the available forage were allocated to wild horses and the decision was made to graze at the maximum sustainable level.

The volunteer group in the Fish Springs area would like to deliver contraceptives through darting, if successful then the lower number of animals could be increased, ZonaState-H is approximately 90% effective. However, if we assume 100% efficacy and 50% of the remaining animals are mares and that 50% of the mares would wean a foal following treatment, ZonaState-H does not affect pregnancy, so pregnant mares that are treated would deliver a foal normally, though they would not conceive during the breading season following parturition. A remaining population of 11 males and 10 females would be exacted to wean five foals bring the total population to 26 the following year. If the mares are vaccinated yearly with ZonaState-H then the population would not be expected to grow, and might even stabilize or decrease, if the area is included into the HMA in the future and the population is decreasing fewer mares would be treated in order to maintain the target population.

Wild horse use in the Fish Springs area, for the 2016/2017 grazing year.



Appendix J: Summary of Public Comments and Responses

The Pine Nut Mountains Wild Horse Gather Plan Preliminary Environmental Assessment (DOI-BLM-NV-C0200-2016-0020EA) was made available to the public, organizations, and other agencies for a 30-day public review and comment period. The comment period closed on January 22, 2017.

Based on our request for public comments on the Preliminary Environmental Assessment (EA), we received seven letters from groups and individuals which provided an array of comments. We also received several hundred form letters, some of them personalized, originating from the websites of special interest groups. Based on our review of all of the public comments, we have either clarified or enhanced the analysis in the final EA, or responded to the comments below.

The comments are organized according to the content of the EA. We received 4,662 form emails, 374 unique emails though in some cases the same individuals sent in multiple emails, six faxes and three letters several of which were from the same individuals which also submitted emails. Comments received ranged from removing all excess wild horses to not removing any. Most respondents were in favor of using PZP. We received some comments from recreationalists visiting the Pine Nuts concerned with the resource damage that the excess wild horses are causing, especially at springs.

Certain types of comments do not warrant analysis in the EA because they do not provide information that is helpful or relevant to make a reasoned choice among alternatives. Comments that are not helpful or relevant include personal opinion with no supporting reason(s), statements of disagreement with BLM or proclamation policies, and/or simple statements of agreement or opposition to the project.

Issues beyond the scope of the EA include all items not related to decisions that would occur as a result of this planning process. In short, they include decisions that are not under the jurisdiction of the BLM or the scope of the EA. Examples of issues outside the scope of this EA would include increasing the size of the HMA, eliminating livestock grazing from the Pine Nuts, eliminating wild horses from the Pine Nuts and management of wildlife as the Nevada Department of Wildlife has jurisdiction over the management of wildlife.

The following comment table 17, lists the relevant comments received and the BLM response:

Table 17, Comments

Comment:	**BLM Response:**
Wildlife	
The Nevada Department of Wildlife (NDOW: supports the plan and is concerned that the status quo is negatively impacting wildlife and their habitat by forcing wildlife into lower quality habitat leading to stress. Encourage AML adjustments based on rangeland conditions considering water source	BLM will continue to evaluate range conditions in relationship to AML. BLM has determined that it is necessary to reduce the wild horse population to low end AML to prevent continuing impacts to rangeland resources and to allow for their recovery.

and forage availability and conditions of riparian areas. NDOW is optimistic that managing wild horse numbers within AML will lead to improved habitat conditions and consequently reduced stress on wildlife and wild horses	
Allow predators to return.	Hunting is regulated by the Nevada Department of Wildlife and outside the jurisdiction of the BLM. Mountain lions are hunted in Nevada and inhabit the Pine Nut Mountains. In some situations mountain lions can kill foals but have not been shown to control wild horse populations.
Work with the Department of Wildlife to minimize the loss of predators.	In some areas mountain lions kill a few wild horses, usually young animals, however, despite an extensive study utilizing radio and GPS collared mountain lions no predation of mountain lions on wild horses has been documented within the Pine Nut Mountains. Coyotes can also kill very young foals. The Nevada Department of Wildlife issues mountain lion tags to hunters but very few are taken from the Pine Nut Mountains.
Water Issues	
NV Division of Water Resources: All Nevada water laws must receive full compliance.	The BLM will not authorize any water hauling unless the proper permits are obtained.
Do not discontinue allowing the group to water wild horses.	In order to legally haul water for wild horses a permit is required from the Nevada State Water Engineer. Based on previous rulings they will only issue permits to water wild horses within HMAs. See Attachments 4 – 6 of the Final HMAP.
Remove fencing and enhancing water sources would mitigate or reduce the need to remove horses and more evenly distribute wild horses across the HMA alleviating possible over use in certain areas.	We received multiple comments suggesting that there is extensive fencing within the HMA, these comments may be the result of inaccurate information being posted on web sites. There is very little fencing that exists within the HMA. For the most part the little fencing that exists within the HMA is to protect riparian areas and study plots. Horse movement is not impeded by the fencing. Water distribution, available forage and tree cover are likely the factors most influencing horse distribution.

	Flow rates on many of the springs have diminished so much that improvements would not be expected to increase flows to useful levels. Digging in an attempt to improve flows could also result in complete loss of the spring, which has occurred at one source in this HMA. There is one spring within the HMA where we have initiated the process of acquiring water rights so that we can improve and pipe some of the water to a trough which would be placed nearby for wild horses.
Allow access to Carson River, N and NW.	The Carson River along the northwest boundary of the HMA is unfenced though the land is a mix of private and city owned, there is no public land along the river in this area. There is fencing along the northern boundary of the HMA, between the HMA and the Carson River. The fencing is along private land and is infrequently maintained by the BLM. However if it was not fenced, horses would enter residential areas and likely require removal as they would become a nuisance and public safety hazard.
Increase AML or HMA	
Removing horses to low AML in certain allotments is not in conformance with existing law.	The AML's were set by grazing allotment. Because the horses are not distributed evenly throughout the HMA and the wild horses are only adversely impacting four of the nine allotments, BLM has determined that it is only necessary to remove excess horses from these four allotments. The alternative would be to lower the AML for the entire HMA, which is unnecessary as the rest of the HMA is not being adversely impacted. For long term persistence of horses within the HMA it is critical to manage these four allotments in a way that will maintain and improve the remaining palatable grass plants as these allotments are most important to the horse population.

Designate the Fish Springs area as an area of study for humane wild horse management on the range. The advocates have proven they will do what it takes to keep our horses safe with logical solutions and hard work.	This designation does not exists
Do not remove any Fish Springs horses which have been involved in the pilot program using PZP resume	We would like to continue working with groups to vaccinate mares, and are working to find ways consistent with laws, regulations, and policy to continue the pilot program.
Expand the HMA to re-incorporate portions of the Herd Area was not considered.	Expansion of the HMA would be an RMP level decision and is therefore outside the scope of this document. As a result of complaints from private landowners, the Bureau of Indian Affairs on behalf of allotment owners and the Washoe Tribe in 1982, the HMA boundary was adjusted to avoid the areas of mixed ownership. Managing horses was in those areas was infeasible given the land ownership patterns. Since that time large areas of bi-state sage-grouse habitat have been identified in the HA. Urban development to the west of the HA has continued since the boundary was changed in 1982 creating new conflicts with increased traffic and home owners.
Re-evaluate AMLs to accommodate the present wild horse population without removals making forage adjustments, if necessary.	The range cannot support the current wild horse population, and severe resource damage is occurring to the range, riparian areas and water sources with the current overpopulation of wild horses.
Increase the AML to avoid possible inbreeding.	The limiting factor within the HMA is forage and water availability. By allowing the horse population to increase above the existing AML resource degradation and damage will continue and worsen, further lowering the carrying capacity (the number of horses the area can support) of the HMA. To avoid deleterious effects of inbreeding the BLM would continue to sample for genetic diversity, and release unrelated wild horses from other HMAs if needed. Increasing the

	AML is not an option as it would allow the continued overuse of range resources, lowering the capacity of the area to support horses and native wildlife species.
Need to be at least 150 adult horses for genetic viability.	The HMA cannot produce enough forage for 150 wild horses over the long term. The alternatives would be to either remove all wild horses or manage for what the HMA can support. As stated in the EA, genetic data would be collected and if genetic diversity drops below the established threshold then a few horses from other areas would be introduced to maintain and increase genetic diversity.
Reevaluate AML's to increase the population.	Due the prolonged excessive over use within areas of the HMA and the current level of over use there is not sufficient forage for an increase in AML. Adjusting the population to the low AML by allotment should allow the grasses to start to recover. If grasses do not respond positively to this lower level of grazing under the Proposed Action, adjusting the AML downward may be necessary in the future in order to provide forage to wild horses over the long term.
Fertility Control	
The majority of comments supported the use of PZP to suppress the rate of population increase. Some respondents advocated forgoing removals and managing the population on the range utilizing PZP fertility control at levels sufficient to control population growth.	We fully embrace the use of PZP, and realize its potential in slowing population growth, however, the current population, estimated at 579 wild horses far exceeds the carrying capacity of the range. Severe resource damage has been documented to be occurring to the range, riparian areas and water sources. Sole use of PZP as a management method to control population would mean that several decades might pass before the horse population is in balance with the available resources. Once the wild horse population is at the appropriate management level (AML), PZP could be a valuable tool in slowing the rate of increase and reducing the number of excess animals that would need to be removed in the future. The challenge with PZP is that the mares need to be vaccinated approximately every 12 months with the current formulation to maintain

	contraception, and not all mares can be reached to be vaccinated. Additionally, PZP is only 90 percent effective for mares which are vaccinated, meaning ten percent of vaccinated mares are expected to become pregnant.
Oppose removals in favor of birth control.	The ideal situation would be managing the population within the AML range solely by using contraceptives or other methods of birth control. This may be possible in the future after the population has been brought back to AML, however, for the short term the population is so far above what the resources can support that a combination of removals and fertility control will be needed to achieve a thriving natural ecological balance. Please also see the response above.
Opposes the use of PZP as a contraceptive.	PZP has a long history of safety and efficacy. PZP can be an important tool in reducing the rate of population growth and thereby decreasing the number of excess wild horses present on the range and that have to be removed from the range. The EA included alternatives that use and do not use PZP.
PZP is a pesticide.	PZP is registered with the EPA as a pesticide as there are few categories available to register products of this type. As described in greater detail in the EA, PZP is a protein derived from pig ovaries. PZP has been used safely on wild horses for over 20 years and on 75 HMAs. The greatest impact to treated mares is that their life expectancy increases, as pregnancy and lactation are very stressful to mares in many HMAs. In many HMAs forage and water are not always found in sufficient quantities needed by pregnant and lactating mares. PZP is also used by many zoos as a reversible contraceptive.
Horses are at manageable levels through darting.	The proposed action in the EA would allow for the use of PZP by either hand injection or darting. In areas where darting can be effective. Currently an overpopulation of wild horses exists and is causing a deterioration of the rangeland. Some areas of the HMA can now only support about half as many animals as

	in 1995, due to excessive grazing by wild horses. In the Fish Springs area outside of the HMA some over grazing is also occurring. The challenge with relying solely on PZP is that even if all mares could be vaccinated (whether by hand injection or darting) it is only about 90 percent effective (so approximately 10% of treated mares would continue to reproduce) and the mares must be re-vaccinated every year.
Capturing wild horses is 100's of times more expensive than PZP.	While capturing and caring for excess wild horses is more expensive than treating the mares with PZP, the area analyzed in the EA cannot sustain the excessive over grazing that is occurring at the current wild horse population numbers. To properly manage rangelands in a manner that can sustainably support wild horses and native wildlife the excess wild horses need to be removed from the HMA so that the population returns to a level which is sustainable and would allow for the plant communities to recover from over grazing. The application of fertility control will help to decrease the rate of population growth and the number of excess animals that need to be removed in the future, which will allow for recovery of the plant communities.
Work with the public to vaccinate the mares with PZP.	The BLM has worked with volunteers to vaccinate mares and would like to continue to do so by expanding the vaccination program where possible.
Oppose gelding, spaying, adjusting sex ratios	These are options recommended by the National Academy of Sciences, spaying would not be implemented until this method is further evaluated in studies.
Geld the males.	Gelding was analyzed in one of the alternatives.
Opposes sterilization, i.e. neutering and spaying.	Neutering and spaying techniques are currently being evaluated bureau wide as methods to decrease the number of excess wild horses. In some situations they may be an appropriate cost effective method to maintain wild horses within the AML.
Gregg wants her Wild Horse Population Growth report included in the EA	Outside the scope of analysis for this EA

Growth Rates	
Some commenters indicated that they did not feel horse populations could increase at 20% a year and doubted the accuracy of the inventories.	During the 2014 inventory it was felt that many horses were missed, they most likely moved into the trees prior to being detected. The 2016 inventory detected 536 horses which yielded an estimate of 579. BLM followed NAS recommendations regarding inventories and contracted with the USGS., to develop more accurate inventory methods. The 2016 inventory followed the protocol developed by the USGS In response to NAS concerns that BLM inventories fail to detect 20-30 percent of the horses, resulting in underestimates of the population. As stated in the EA we felt that many horses were missed in the 2014 inventory, however between 2012 and 2016 the data shows a 17 percent annual rate of increase which is a little less than the 20 percent annual rate of increase for most herds.
Past Projects	
Hercules Exploration Project 2014-0033 EA, was not adequately analyzed in the HMAP EA.	The Hercules Exploration would disturb a total of 18 acres which comprises less than 0.0002 percent of the HMA. After the exploration is complete the disturbed area would be reclaimed. This action will not affect water and will have minimal impact on available forage.
Pine Nut Land Health Project 2013-0017 –EA, was not adequately analyzed in the HMAP EA.	This project would treat approximately 24,564 acres over a 10 to 15 year period. Wild horses would benefit from this project as pinyon pine and juniper trees eventually displace forage grasses which horses require to survive. By treating these areas, wild horse habitat can be maintained and potentially expanded.
Gathers	
Round ups are violent and dangerous with horses sent to slaughter.	The Carson City BLM has not sent any horses to slaughter; they have either been adopted by qualified adopters or eventually placed in grassland pastures in the mid-west. The gathers are closely monitored. Serious wild horse injuries and deaths are rare, the mortality rate is less than one percent.

Utilize bait and water trapping techniques in lieu of helicopter gather techniques.	The EA analyzed these alternative gather methods, which would be used to supplement or replace helicopter gathers as appropriate. However, given the number of horses currently on the range, their distribution and lack of accessibility, this precludes the use of bait and water trapping as a means to bring the wild horses back to low end AML in an initial gather.
Grazing Issues	
Horses benefit the range by dispersing grass seeds.	The establishment of the most palatable native grasses is substantially increased by intact soil crusts, but these soil crusts are quickly broken down by hoof action, thereby impeding such establishment. We have seen not seen any evidence indicating that horses facilitate seed dispersal or establishment. Grazing young grass plants can decrease growth and establishment rates.
Horses prevent fires.	In order for grazing by wild horses to affect fire spread the number of horses required to remove the amount of vegetation necessary to stop fires would be so high that so much over grazing would occur during the growing season leading to the likely irreversible loss of important forage grasses, which in turn would reduce available habitat for horses within the HMA.
Reconsider existing grazing permits.	A decision to modify grazing permits is subject to regulatory requirements at 43 CFR Park 4100. A reallocation of multiple uses for public lands within the HMA, including the potential closure of grazing allotments to grazing is an RMP level decision that falls outside the scope of this EA.
Privately owned livestock outnumber horses 80:1 in this particular HMA.	As stated in the EA most of the allotments within the HMA have not been grazed by livestock in over 20 years including the areas that are sustaining some of the worst resource damage.
Other Topics	
Install speed limit and horse crossing signs.	Areas where horse vehicle collisions occur currently have posted speed limit signs. The horses do not have any well used crossing points but rather seemingly randomly enter the roadways which span many miles.

The BLM is removing horses to sell for slaughter.	Congress has prohibited the expenditure of appropriated funds for the destruction of healthy unadoptable animals and the BLM therefore does not sell any horses for slaughter. Horses that are not adopted by qualified adopters are currently placed and maintained in grassland pastures. Only chronically lame horses are euthanized. The reality is that the BLM expends a large part of the wild horse and burro budget caring for excess animals on private grassland pastures. This comment erroneously implies that the BLM is removing excess wild horses to generate revenue. BLM's management of wild horses is governed by law and regulation, including the need to ensure a thriving natural ecological balance and multiple use.
Let the animals self-regulate.	Wild horses are not native and predation has not been effective at limiting the HMA population. Without management, the wild horse population would continue to increase until forage and water were insufficient to maintain them. At this point the range would be degraded to a point where wildlife habitat (including native vegetative communities and riparian resources) may become irretrievably lost. The horses would then self-regulate through starvation or succumb to dehydration, resulting in the suffering and death of individual animals.
Relocate horses that are outside of the HMA back into the HMA.	The population of wild horses within the HMA far exceeds the capacity of the HMA to support the current overpopulation. Adding to the overpopulation as suggested would only exacerbate the current damage to the range resources.
Eliminate wild horses from the Pine Nut Mountains and the western ranges as they are not native.	Eliminating wild horses from the Pine Nuts HMA would be an RMP level decision and is therefore outside the scope of this EA.