BLM

Rawlins and Lander Field Offices, Wyoming

Environmental Assessment

Red Desert Complex Herd Management Area Gather
DOI-BLM-WY-030-EA15-63

August 2015

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The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

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1.0 INTRODUCTION

This Environmental Assessment (EA) has been prepared to analyze the Bureau of Land Management's (BLM) High Desert District, Rawlins Field Office (RFO), and Wind River/Bighorn Basin District, Lander Field Office (LFO), proposal to conduct a wild horse gather in the Lost Creek, Stewart Creek, Green Mountain, Crooks Mountain and Antelope Hills Herd Management Areas (HMAs) – collectively called Red Desert Complex (See Map 1). The BLM has determined that excess wild horses are present in the Red Desert Complex. The proposed gather would include gathering wild horses from inside and outside the Red Desert Complex (Complex); treating all females to be released with Porcine Zona Pellucida (PZP 22); and releasing treated females and untreated male horses back into the HMA. Depending on the alternative selected, horses that are outside the HMA may be removed to achieve the low appropriate management level (AML) for each HMA, previously determined in the approved Rawlins and Lander Resource Management Plans (RMPs).

The EA contains a site-specific analysis of potential impacts that could result from implementation of any one of the three alternatives. The EA assists the BLM in project planning and ensuring compliance with the National Environmental Policy Act (NEPA), and in making a determination as to whether any "significant" impacts to the human environment could result from the analyzed actions. "Significance" is defined by NEPA and is found in regulation 40 CFR 1508.27. An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a statement of "Finding of No Significant Impact" (FONSI). If the decision maker determines that this project has "significant" impacts following the analysis in the EA, then an EIS would be prepared for the project. If the decision maker determines that this project does not have "significant" impacts following the analysis, then an FONSI would be prepared for the project. A Decision Record would then be signed for the EA approving one or a mixture of the alternatives presented in the EA.

The RFO and LFO areas of jurisdiction are located in south central and central Wyoming, covering the eastern third of Sweetwater County, all of Carbon, Albany, Laramie, and Fremont County and portions of Hot Springs and Natrona Counties. The Complex is located in the Sweetwater, Carbon, Fremont and Natrona Counties west and south of Wyoming Highway 789/287 (See Map 1). The Complex encompasses about 753,000 acres of land. About 49,500 acres (about 6 percent) is privately or state owned. The Complex is characterized by gently rolling hills to steep mountainous terrain around Green Mountain and Crooks Mountain, to greasewood flats and sand dunes in the lower portions of Lost Creek and Stewart Creek. Annual precipitation ranges from 5 to 7 inches per year at the lower elevations and 15-20 inches for the upper elevations on Green Mountain and Crooks Mountain, most of which is received in the form of winter snows. This general discussion tiers to the affected environment that is discussed in the Great Divide Resource Area Wild Horse Herd Management Area Evaluation / Capture Plan and the associated Environmental Analyses: WY-037-EA4-122 and WY037-EA4-121, and the Lander Herd Management Area Evaluation / Capture plan and the associated EAs: WY-036-EA3-010 and WY-036-EA3-013.

The Wild Free-Roaming Horses and Burros Act of 1971 (WFRHBA) established the framework for managing wild horse and burro (WH&B) populations on public lands. The WFRHBA

provides in part, that the Department of Interior "manage wild free-roaming horses and burros in a manner that is designed to achieve and maintain a thriving natural ecological balance on the public lands." P.L. 92-195 Section 1333 (as amended). BLM's management of wild free-roaming horses must comply with law and policy on public lands. The policy of the BLM addresses a range of topics including establishment and maintenance of appropriate management levels in a humane, safe, efficient, and environmentally sound manner.

Wild horse population numbers have the potential to double every four years (NAS, 2013). With fertility control vaccine treatment (PZP-22), reproduction rates can be reduced in the short term since treatments are effective for at least 22 months, after which they become less effective (Turner et al. (2007). Because mares in the Complex were treated in the fall of 2011 during the last gather and removal, reproduction in the HMAs was reduced, but horse numbers currently exceed the high end of the AML. The definition of AML (BLM 2010b) is the population range within which WH&B can be managed for the long term. The AML upper limit is established as the maximum number of WH&B which results in a thriving natural ecological (TNEB) and avoids a deterioration of the range.

The Great Divide Resource Area Wild Horse Herd Management Area Evaluation / Capture Plan and the associated Environmental Analyses WY-037-EA4-122 and WY037-EA4-121, the Lander Herd Management Area Evaluation / Capture Plan and the associated Environmental Analyses WY-036-EA3-010 and WY-036-EA3-013 states that wild horses; "will be managed in a range from 480 to 724 wild horses". The AMLs were also analyzed in the Rawlins (BLM 2008a) and Lander (BLM 2014) Field Office Resource Management Plans (RMPs). Table 1 lists the AML for wild horses in the Red Desert HMA Complex by HMA and grazing allotment.

Table 1. AML by Allotment/HMA and Decision Record Date

Allotment	HMA	AML (low)-(high)	Decision Record Date
Stewart Creek (#10102)	Stewart Creek	125-175	May 1994
Cyclone Rim (#10103)	Lost Creek	60-82	May 1994
Antelope Hills (#17055), Cyclone Rim (#10103)	Antelope Hills	60-82	May1994
Arapahoe Creek (#17056), Alkali Creek Sheep (#17056)	Crooks Mountain	65-85	May 1994
Mountain (#32030), Arapahoe Creek (#17056), Whiskey Peak Common (#12003)	Green Mountain	170-300	February 1993
Complex Total		480-724	

The boundaries of the HMAs are delineated by fencing and topography which is generally effective in limiting wild horse distribution to the HMAs; however, wild horses have been observed outside of HMA boundaries.

1.1 Purpose and Need

Purpose: The proposed capture and fertility treatment of wild horse mares is necessary to slow the population growth of the herds and the proposed removal of excess animals is necessary in order to achieve a thriving natural ecological balance among wild horse populations, wildlife, livestock and vegetation. It also prevents the deterioration of vegetation resources associated with overpopulation of wild horses as authorized under Section 3(b) (2) of the 1971 Free-Roaming Wild Horses and Burros Act (1971 Act) and section 302(b) of the Federal Land Policy and Management Act of 1976.

Need: The need for the Proposed Action is established by the BLM's authority under the WFRHBA and the Federal Land Policy and Management Act of 1976. The WFRHBA provides in part, that the Department of Interior "manage wild free-roaming horses and burros in a manner that is designed to achieve and maintain a thriving natural ecological balance on the public lands." P.L. 92-195 Section 1333 (as amended). BLM's management of wild, free roaming horses must comply with law and policy pertaining to wild, free roaming horses on public lands.

In order to meet local and national wild horse program goals, the objectives would be to:

- Slow population growth to maximize the time between gathers;
- Reduce the number of wild horses being placed
    - for adoption/sale; or
    - in short-term holding or long-term pastures;
- Maintain wild horse populations within AMLs;
- Remove wild horses outside the HMAs; and

By achieving and maintaining AML in the Complex, the BLM would also meet its objectives within the individual HMAs. These objectives include:

- Manage the HMA to achieve and maintain a thriving natural ecological balance, and multiple-use relationship.
- Manage the HMA population to preserve and enhance the historic physical and biological characteristics of the herd, including noted Spanish characteristics.
- Maintain sex ratios and age structures, which would allow for the continued physical, reproductive, and genetic health of horses.
- Preserve and maintain a healthy and viable wild horse population that will survive and be successful during poor years when elements of the habitat are limiting due to severe winter conditions, drought, or other uncontrollable and unforeseeable environmental influences to the herd. Manage the HMA herd as a self-sustaining population of healthy animals in balance with other uses and the productive capacity of their habitat.

1.2 Decision to be made

Based on the analysis presented in the EA, the authorized officer will select an alternative that meets the Purpose and Need for the proposed action, which is to meet management objectives for the Red Desert Complex of HMAs to maintain and preserve a thriving natural ecological

balance. The BLM's authorized officer will decide whether or not to gather, remove, treat and release wild horses in the Red Desert Complex.

The decision to be made would not set or adjust AMLs, which were set through previous planning-level decisions. Future decisions regarding long-term management within the HMAs would continue to be accomplished through a land use planning process. Additionally, the decision would not adjust livestock use, which has been established through prior planning-level decisions which have complied with NEPA requirements and provided opportunity for public review and input.

1.3 Scoping

Internal scoping by an interdisciplinary team identified issues of concern to be analyzed. Public comments on the various components of wild horse management on public lands in the Complex have been received throughout the last several years. On April 20th, 2015 the BLM issued a scoping letter for this proposed wild horse gather. In excess of 6,000 comment letters/emails were received from individuals, organizations, and agencies following the issuance of the Red Desert Complex Wild Horse Gather Plan Scoping Letter addressing the proposed action. These comments represented a wide range of views. The vast majority of 6,000 letters or emails were submitted as a form letter. All substantive comments were considered in the preparation of this EA.

Resources considered, but not present or affected in such a manner as requiring site-specific analysis in this EA are identified in the Table below.

Table 2. Resources considered and RMP references

Resource/Resource Use	Approved Rawlins RMP FEIS Reference	Approved Lander RMP FEIS Reference
Air Quality/Greenhouse Gas Emissions	3-3 to 3-9	3.1.1
Environmental Justice	3-77	3.8.4
Fire and Fuels Management	3-18 to 3-20	3.3
Forest Management	3-21 to 3-23	3.4.1
Hazardous Materials	Appendix 32	3.8.3
Health and Safety		3.8.3
Lands and Realty	3-24 to 3-26	3.6-3.6.3
Lands with Wilderness Characteristics	RMP ROD 1-3	3.1.6
Minerals	3-34 to 3-44	3.2
Noise		3.4.9
Off-Highway Vehicles	3-45 to 3-47	3.6.4
Paleontology		3.5.2
Reclamation	3-44; Appendix 36	3.1.3
Socioeconomics	3-59 to 3-76; Appendix 35	3.8.1, 3.8.2

Resource/Resource Use	Approved Rawlins RMP FEIS Reference	Approved Lander RMP FEIS Reference
Special Designations and Management Areas	3-86 to 3-98	3.7.1-3.7.3
Transportation	3-100; Appendix 21	
Visual Resource Management	3-120 to 3-122	3.5.3
Water Resources/Quality (drinking/surface/ground)	3-123 to 3-135; Appendix 11	3.1.4

2.0 ALTERNATIVES CONSIDERED AND ANALYZED IN DETAIL

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

- Alternative 1: Remove all wild horses outside of HMA boundaries and utilize fertility control on mares to be released back to the HMA
- Alternative 2: Proposed Action: Remove excess animals inside and outside of the HMA boundaries, remove to low AML, and utilize fertility control
- Alternative 3: No action--No gather or removal and no fertility control

Alternative 1 and Alternative 2 were developed to meet the BLM's purpose and need. Alternative 3 does not comply with the WFRHBA and FLPMA, nor does it meet the purpose and need for the action; it is included as a basis for comparison with the action alternatives.

2.1 Actions Common to Alternative 1 and Alternative 2: Proposed Action

- All capture and handling activities would be conducted in accordance with the Standard Operating Procedures (SOPs) described in Appendix 1 (SOPs). Multiple capture sites (traps) would be used to capture wild horses within the Complex. Whenever possible, capture sites would be located in previously disturbed areas. Capture techniques would include the helicopter-drive trapping method and/or helicopter-roping from horseback. Bait trapping may also be utilized on a limited basis, as needed.
- An Animal and Plant Inspection Service (APHIS) veterinarian would be on-site, as needed, to examine animals and make recommendations to the BLM for care and treatment of wild horses in accordance with Instruction Memorandum No. 2015-070, *Animal Health, Maintenance, Evaluation and Response* (BLM 2015). On-site inspection by an APHIS veterinarian is required for any animals to be transported across State borders without testing for Equine Infectious Anemia (EIA) prior to transport. The IM can be found at: http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2015/IM_2015-070.html)
- Selection of animals for removal and/or release would also be guided by Instruction Memorandum No. 2010-135, *Gather Policy, Selective Removal Criteria, and Management Considerations for Reducing Population Growth Rates* (BLM 2010a). The IM can be found at:

http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2010/IM_2010-135.html

- Policy and procedures for safe and transparent visitation by the public and media at wild horse gather operations would be in accordance with Instruction Memorandum No. 2013-058 *Wild Horse and Burro Gathers: Public and Media Management* (BLM 2013a). This IM can be found at: http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2013/IM_2013-058.html
- The BLM is committed to the humane treatment and care of wild horses and burros through all phases of its program. The gathering of wild horses would be in accordance with Instruction Memorandum No. 2013-059, *Wild Horse and Burro Gathers: Comprehensive Animal Welfare Policy* (BLM 2013b). This IM can be found at: http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2013/IM_2013-059.html
- Advance planning for observation of gather operations can minimize the potential for unanticipated situations to occur and ensure the safety of the animals, staff, and Contractor personnel, as well as the public/media. In response to this, an Incident Command System would be followed during the gather operations as guided by Instruction Memorandum No. 2013-060, *Wild Horse and Burro Gathers: Management of Incident Command System* (BLM 2013c). This IM can be found at: http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2013/IM_2013-060.html
- All wild horses outside of the HMA boundaries, between HMA's or on the checkerboard south of the Complex, would be removed.
- A helicopter inventory would be completed during the gather and prior to releasing any horses back into the Complex.
- Certified weed free hay would be used to feed the horses while in trap sites and holding locations throughout the gather time period. Prior to the establishment of the trap sites and holding areas a weed inventory would be performed by the weeds specialist. Mobile equipment being transported from an offsite location to the trap site areas, would be cleaned prior to arrival using water, steam, or air pressurized cleaning methods to remove any invasive or noxious weed seed and plant parts.
- Multiple gather sites (corral traps) would be used, and to the extent possible, would be located in previously disturbed areas. Gather sites would be analyzed as they are identified and would include clearances from archeology, weed, botanical and wildlife specialists prior to use. If new trap sites are needed, they would be surveyed for cultural, botanical, and wildlife resources prior to use. If sensitive resources are encountered (riparian areas, tall sagebrush, sensitive species habitat, etc.), these locations would not be utilized unless they could be modified to avoid any impacts.
- Livestock operators within the gather area would be notified prior to the gather, enabling them to take precautions and avoid conflict with gather operations.
- Public access to the gather sites/traps may be restricted during gather operations to ensure public and horse safety and minimize disruption to the gather process. Any areas closed would be reopened upon completion of the gather operations. Public viewing of the gather would be permissible, but it would be managed through the gather incident commander and public affairs officer assigned to the gather.

- Monitoring and data collection would be continued to assess whether healthy and self-sustaining wild horse herds are being maintained on the HMAs over the long term. Monitoring of the project area would continue for wild horses as well as vegetation and water resources.
- Mares older than one year that would be returned back into the Complex and would be treated with PZP-22. Horses that are a year old or younger would not be treated with PZP-22. Data on the captured horses would be collected, including sex and age distribution, and color.
- Approximately 26 hair samples (13 mares, 13 studs) per HMA would be collected to assess the genetic diversity of the herd for DNA analysis in accordance with IM No. 2009-062. This IM can be found at: http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2009/IM_2009-062.html
- Horses that are removed would be shipped to BLM holding facilities where they would be prepared for adoption and/or sale to qualified individuals and/or long-term holding. Implementation of fertility control treatment on captured mares would be conducted in accordance with the approved standard operating and post-treatment monitoring procedures (Appendix 4).

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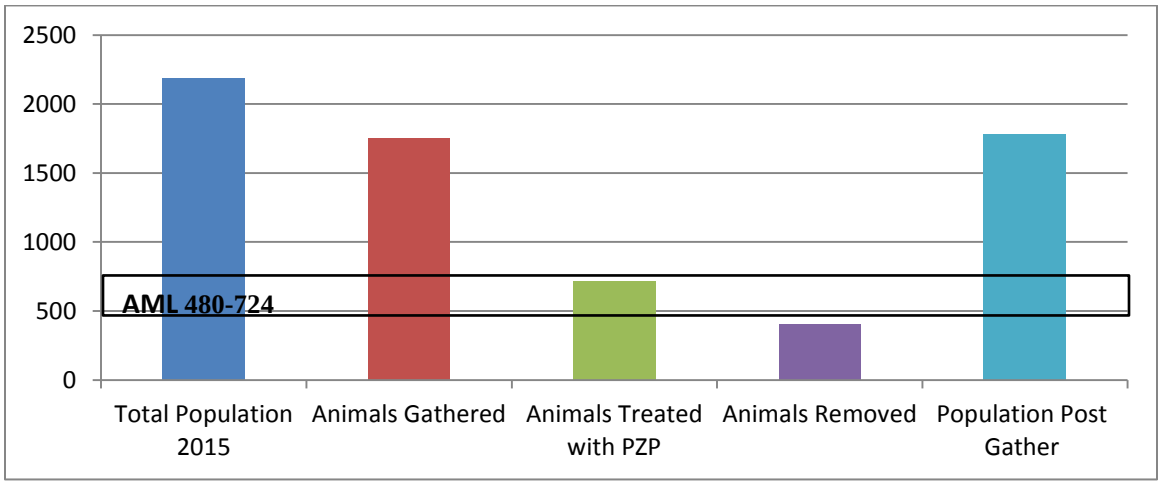
2.2 Alternative 1: Remove all wild horses outside of HMA boundaries and utilize fertility control on mares to be released back to the HMA

Approximately 80% of an estimated population of 2,185 wild horses in the Complex would be gathered (approximately 1,748 wild horses) and approximately 402 wild horses would gathered and removed from outside of the HMA boundaries. Approximately 713 mares would be treated with PZP-22, and approximately 1,320 wild horses would be released back into the HMAs. Every effort would be made to return the released horses to the same HMA from which they were gathered. The estimated 482 horses residing outside of HMA boundaries at the time of gather was determined from the 2015 aerial survey that included certain discrete areas outside of the HMA boundaries of interest to the BLM. The post gather population remaining in the HMAs would be approximately 1,800 horses.

The primary objective of this alternative is to slow the population growth within the Complex until another gather can be completed.

Figure 1 illustrates how Alternative 1 would reduce the wild horse population within the Red Desert Complex:

Figure 1: Projection of Wild Horse Population under Alternative 1



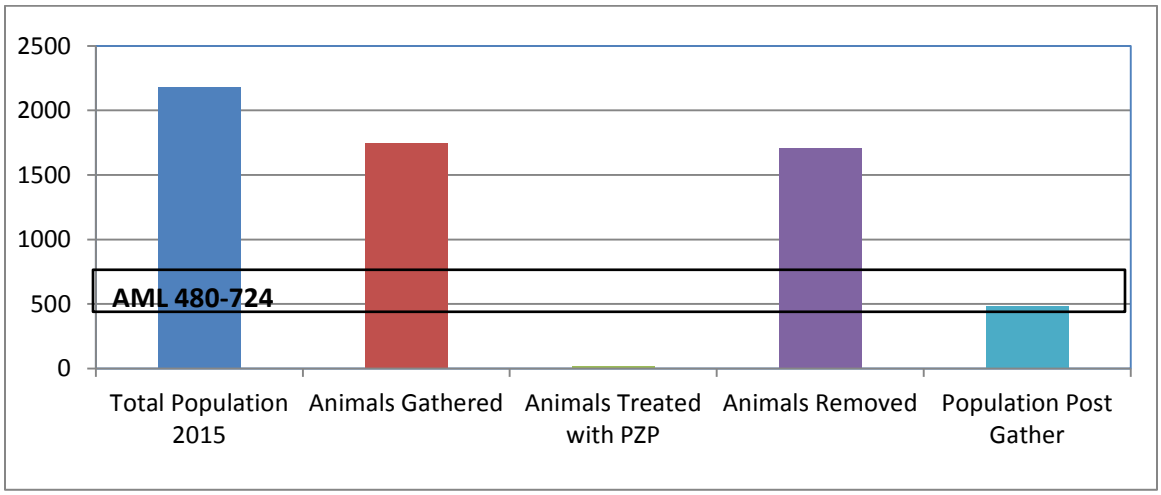
2.3 Alternative 2: Proposed Action—Remove to low AML and utilize fertility control

Approximately 80% of an estimated population of 2,185 wild horses of the Complex would be gathered (approximately 1,748 wild horses) and approximately 1,705 wild horses would be removed. In contrast to Alternative 1, only 22 studs and 21 mares (numbers are approximate) would be returned to the Complex and the mares older than 1 year would be treated with PZP-22 before being released back into the HMA(s). This would bring the population to low AML and would ensure long term health of the horses and ensure an ecological balance with other uses of the landscape

The primary objective of this alternative is to reduce the population to the lower AML and slow the population growth within the Complex to increase the time interval before another gather would need to be completed.

Figure 2 illustrates how the Proposed Action would reduce the wild horse population within the Red Desert Complex:

Figure 2: Projection of Wild Horse Population under the Proposed Action

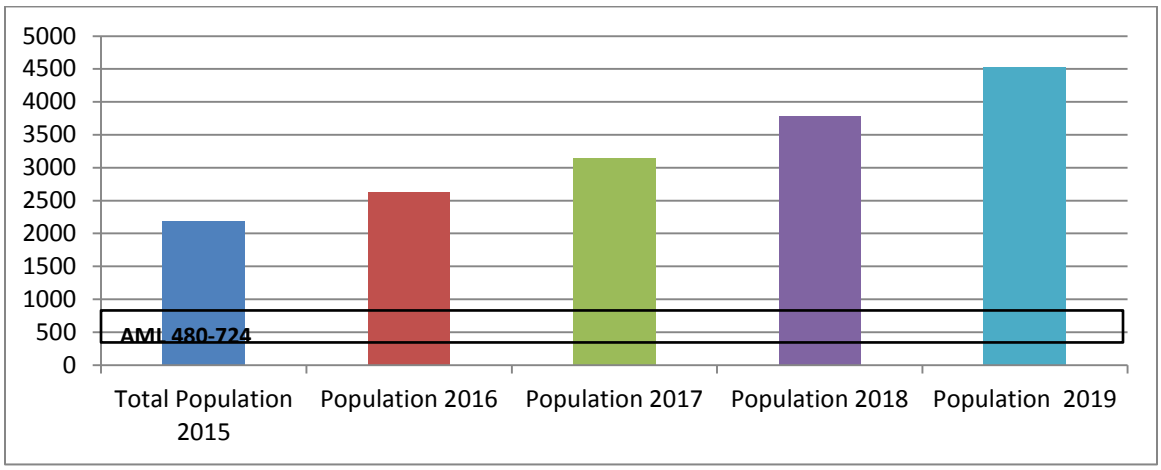


2.4 Alternative 3: No Action--No Gather or Removal and no fertility control

A wild horse gather would not be conducted within the Red Desert HMA Complex. Wild horse populations would not be actively managed at this time and excess wild horses would not be removed. The population growth suppression program would not be continued within the Complex. The current estimated population of 2,185 wild horses would continue to increase at an estimated rate of approximately 20% annually and the established AML range of 480-724 within the Complex would continue to be exceeded. This Alternative would not achieve the Purpose and Need identified in Section 1.1. However, it is analyzed to provide a basis for comparison with the action alternatives, and to assess the effects of not gathering. The No Action Alternative would not be consistent with the requirement under the WFRHBA to remove excess wild horses and burros from public lands and is also not in conformance with regulatory provisions for management of wild horses and burros as set forth at 43 CFR § 4700-1.

Figure 3 illustrates how the No Action Alternative would affect the wild horse population within the Red Desert Complex. The population from 2015 to 2019 is shown to illustrate what would happen if no gather occurred in the Complex over the next 4 years. This estimate used a 20% reproduction rate. The estimated population at the end of 2019 would be approximately 4,530 horses.

Figure 3 Projection of Wild Horse Population under Alternative 3



2.5 Alternatives Considered But Eliminated From Further Analysis

These alternatives were eliminated from further analysis because they either do not accomplish the management objectives, are not consistent with the RMPs, existing regulations, policy, or pose a health and safety issue for horses and personnel.

2.5.1 Use of Bait and/or Water Trapping

The use of bait and water trapping, though effective in specific areas and circumstances, would not be timely, cost-effective or practical as the primary or sole gather method for this Complex

of HMAs. This alternative was dismissed from detailed study as a primary or sole gather method for the following reasons:

- The project area is too large to effectively use this gather method as the primary or sole method;
- The number of water sources on both private and public lands within and outside the Complex would make it difficult to restrict wild horse access to selected water trap sites.
- Road access for vehicles to potential trapping locations necessary to get equipment in/out as well as safely transport gathered wild horses is limited;
- The large numbers of horses proposed to be gathered would make water or bait trapping impossible within a reasonable time frame.

2.5.2 Other Alternative Capture Techniques

Capture methods other than helicopters to gather excess wild horses, were suggested through public comment. As no specific methods were suggested, the BLM identified chemical immobilization, net gunning, and wrangler/horseback (drive trapping) as potential methods for gathering wild horses. Chemical immobilization is a very specialized technique and strictly regulated. Currently, the BLM does not have sufficient expertise to implement this method and it would be impractical to use given the size of the HMAs, access limitations, the number of horses involved, and the approachability of the wild horses. Net gunning techniques normally used to capture big game also rely on helicopters and are therefore not under consideration as an alternative to the helicopter-capture method. Use of wranglers on horseback (drive-trapping) to remove excess wild horses can be fairly effective on a small scale; however, due to the number of excess wild horses to be removed, the large geographic extent of the HMA, and the approachability of the wild horses; this technique would be ineffective and impractical to meet the purpose and need. Horseback drive-trapping is also very labor intensive and can be dangerous for the domestic horses and wranglers. For these reasons, the alternative capture method alternatives were eliminated from further consideration and are not analyzed in detail.

2.5.3 Remove or Reduce Livestock within the HMAs

Livestock grazing may be reduced or eliminated under 43 CFR 4100 and must be consistent with multiple use allocations set forth in the land-use plan. Such changes to livestock grazing cannot be made through a wild horse gather decision, and are only possible if the BLM first revises the land-use plans to re-allocate livestock forage to wild horses and to eliminate or reduce livestock grazing.

Furthermore, re-allocation of livestock AUMs to increase the wild horse AMLs would not achieve a thriving natural ecological balance due to differences in how wild horses and livestock graze. Livestock can be managed through seasons of use, numbers, and different pastures and allotments to minimize impacts to vegetation during the critical growing season or to riparian zones during the summer months. However wild horses are present year-round and their use of rangeland resources cannot be controlled through establishment of a grazing system, such as for

livestock. Thus, vegetation use from wild horses can only be addressed by limiting their numbers to a level that does not degrade rangeland resources and other multiple uses.

While the BLM is authorized to remove livestock from HMAs "if necessary to provide habitat for wild horses or burros, to implement herd management actions, or to protect wild horses or burros from disease, harassment or injury" (43 CFR 4710.5), this authority is applied in cases of emergency and not for general management of wild horses, livestock removal cannot be applied in a manner that would be inconsistent with the existing land-use plans. (43 CFR 4710.1).

For the reasons stated above, this alternative was dropped from detailed analysis. For modifications in long-term multiple use management, changes in forage allocations between livestock and wild horses would have to be re-evaluated and implemented through the appropriate public decision-making processes

2.5.4 Change the Current Established AMLs

Changing the established AMLs within the HMAs was not brought forward for detailed analysis. The population range for the Stewart and Lost Creek HMA's is established in the approved Rawlins RMP. To adjust the AML in these HMA's would require an amendment to the RMP. The population range for the Crooks Mountain, Green Mountain and Antelope Hills are established in the approved Lander RMP. To adjust the AML in these HMA's would require an amendment to the Herd Management Area Plan (HMAP), RMP, or both. Current information indicates that the AML ranges for the Red Desert Complex maintain a TNEB. For these reasons, this gather document is not the appropriate mechanism for adjusting the AML of an HMA.

2.5.5 Incremental Approach for Wild Horse Removals

Using an incremental approach (conducting smaller, more frequent gathers rather than larger removals every two to three years) of removing excess wild horses over a period of time was considered. Due to the number of excess wild horses needing to be gathered, combined with the large geographic area of the HMAs, would render this approach ineffective and impractical to meet the purpose and need identified in this document. Additionally, the repeated human contact and pressure with the horses could affect their wild and free roaming nature.

2.5.6 Control of Wild Horse Numbers by Natural Means

The use of natural control means, such as natural predation, forage availability, and weather, to control the wild horse population was eliminated from further consideration because it would be contrary to the WFRHBA. The Act requires the BLM to protect the range resources from deterioration associated with an overpopulation of wild horses. Wild horse populations are not substantially regulated by predators. In addition, wild horses are a long-lived species with documented foal survival rates exceeding approximately 95% and are not a self-regulating species. An exponential increase in the wild horse population would occur (see Figure 3 above). The result would be a continued exceedance of the carrying capacity of the range and would cause increasing damage to the vegetation until severe range degradation or natural conditions like blizzards or extreme drought, cause a catastrophic mortality of wild horses. Horses would

also continue to expand in numbers outside of the HMAs increasing rangeland degradation across the landscape.

2.6 Conformance with Existing Land Use Plans (LUPs)

The Proposed Action is in conformance with the land use plans' terms and conditions as required by 43 CFR 1610.5-3(a). Any action in the Rawlins and Lander Field Offices is subject to requirements established by the Rawlins and Lander Resource Management Plans, approved December 24, 2008 and June 26, 2014 respectively. The Red Desert HMA Complex has been designated as suitable for long term, sustained wild horse use in the Rawlins and Lander RMPs. The proposed capture, treatment and removal conform to the land use decisions and resource management goals and objectives of the Resource Management Plans.

The Rawlins RMP can be accessed at:
http://www.blm.gov/wy/st/en/programs/Planning/rmps/rawlins.html

The Lander RMP can be accessed at:
http://www.blm.gov/wy/st/en/programs/Planning/rmps/lander.html

The RMPs are currently undergoing amendment as part of the Wyoming Greater Sage-Grouse Land Use Plan Amendment (Amendment). The Proposed Amendment and Final Environmental Impact Statement (EIS) were released on May 28, 2015.

The Proposed Action was screened against the Proposed Amendment to ensure that the Proposed Action would not preclude BLM's ability to select any alternative in a ROD. The Proposed Action was also determined to not be inconsistent with the direction outlined in the Amendment's Preferred Alternative.

2.7 Relationship to Statutes, Regulations, or Other Plans

Conformance with Rangeland Health Standards and Guidelines: The action alternatives are in conformance with the BLM Wyoming "Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management" (BLM 1997). The action alternatives would assist in maintaining the health of the public lands within each HMA and within the Complex. A copy of the BLM Wyoming "Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management" is available upon request from the BLM.

Relationship to Statutes, Regulations, or Other Plans: Public lands are managed under the Federal Land Policy and Management Act of 1976 (FLPMA), which provides that the public lands are to be managed in accordance with land use plans and under principles of multiple use and sustained yield to protect the quality of scenic, ecological, environmental, and archeological values; to preserve and protect public lands in their natural condition; to provide feed and habitat for wildlife and livestock; and to provide for outdoor recreation (43 U.S.C. 1701(a)(8).1732(a)). FLPMA also stresses harmonious and coordinated management of the resources without permanent impairment of the environment (43 U.S.C. 1701(c)).

Alternative 2: Proposed Action would be in conformance with the WFRHBA, while Alternatives 1 and 3 would not be in conformance with the WFRHBA, 16 U.S.C. 1333(b)(2) and 1334, and its implementing regulations found at 43 CFR 4700:

- 43 CFR 4700.0-6 (a): Wild horses shall be managed as self-sustaining populations of healthy animals and in balance with other uses and the productive capacity of their habitat.
- 43 CFR 4700.0-6 (e): Healthy excess wild horses for which an adoption demand by qualified individuals exists shall be made available at adoption centers for private maintenance and care.
- 43 CFR 4710.4: Management of wild horses shall be at the minimum level necessary to attain the objectives identified in approved land use 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 exist, the authorized officer shall remove the animals immediately.
- 43 CFR 4720.2-2: If the authorized officer determines that proper management requires the removal of wild horses and burros from areas that include private lands, the authorized officer shall obtain the written consent of the private owner before entering such lands. Flying aircraft over lands does not constitute entry.

Wild horse gather EAs have been completed during past years which analyzed the impacts of various gather methods on wild horses, and other critical elements of the human environment, to achieve AML. For a list of these documents, see Appendix 2. These documents are available for public review at the Rawlins and Lander Field Offices.

No federal, state, or local law, or requirement imposed for the protection of the environment would be threatened or violated under the either of the action alternatives described in detail in this EA.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Introduction

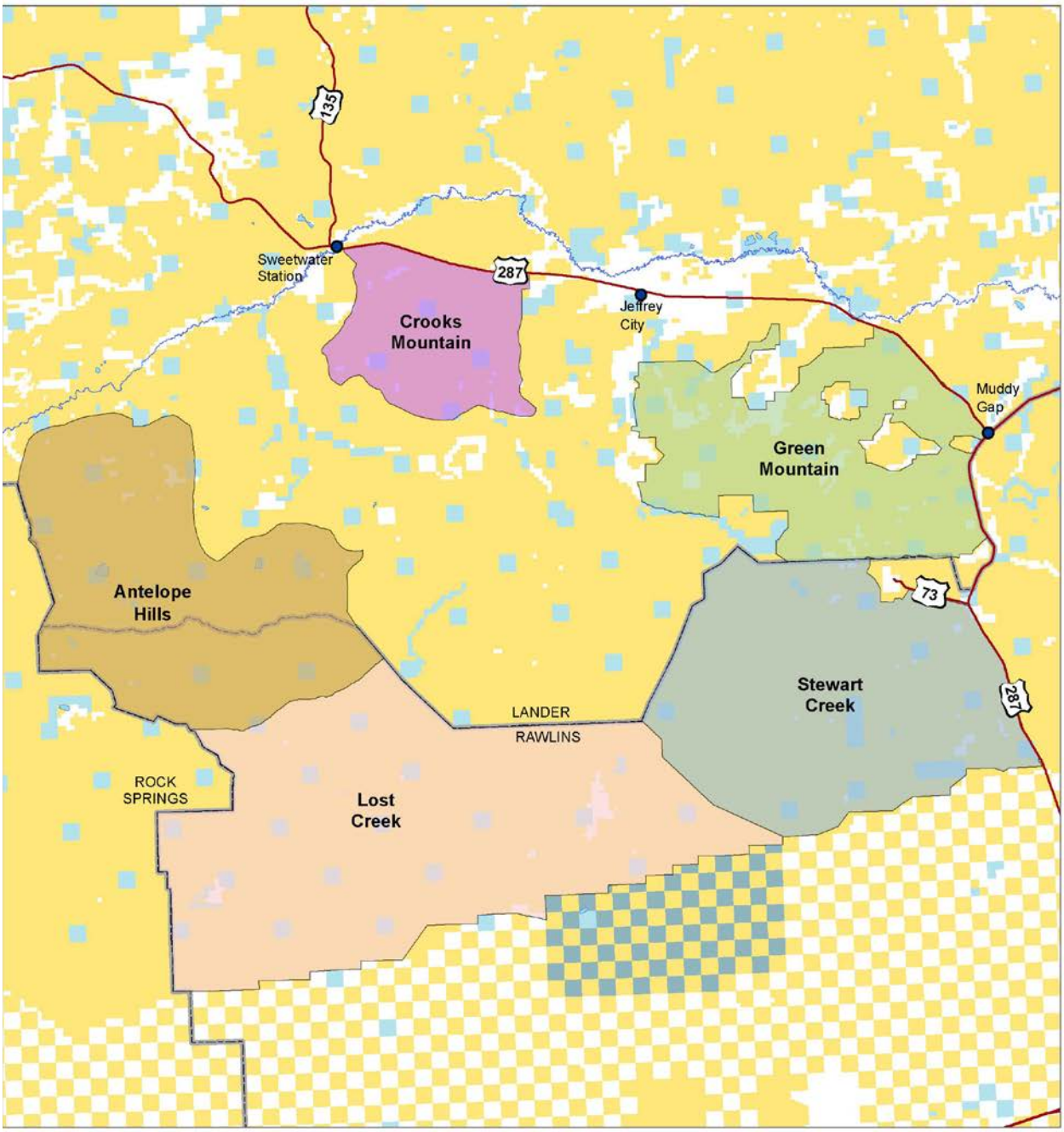
This section of the environmental assessment briefly discusses the relevant components of the human and natural environment which would be either affected or potentially affected by the alternatives. Direct impacts are those that result from management actions while indirect impacts are those that exist once the management action has occurred. By contrast, cumulative impacts result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such action. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Analysis related to maintaining the AMLs for the Red Desert Complex, specifically Stewart Creek, Lost Creek, Antelope Hills, Crooks Mountain, and Green Mountain HMAs, is tiered to the Final EISs for the Rawlins RMP (BLM 2008a, pp. 139-142) and Lander RMP (BLM 2014, pp. 69-70), respectively.

3.1 Wild Horses

3.1.1 Affected Environment

The Complex (Lost Creek, Stewart Creek, Antelope Hills, Crooks Mountain and Green Mountain HMAs) is located in the Sweetwater, Carbon, Fremont and Natrona Counties west and south of Wyoming Highway 789/287 (See Map 1).

Map 1. Red Desert HMA Complex



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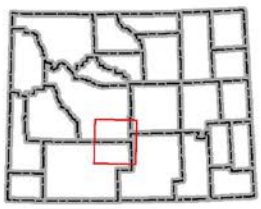
Miles

No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by BLM.

Red Desert Complex
Wild Horse Management Areas

- Highways
- BLM field office boundaries
- Bureau of Land Management
- Private
- State
- Wyoming Game & Fish Dept.
- Water



Date: 7/29/2015

Gather History and Population Estimates

Gathers have been conducted in the Red Desert HMA Complex numerous times since 1980; most recently in 2011. For gathers conducted within this timeframe and the number of horses gathered, refer to the Tables in Appendix 2.

Table 3 shows the population estimates for the five HMAs and the Complex from 2013-2015. The 2013 and 2014 wild horse estimates were determined using the double observer method in the RFO, and direct count with a correction factor in the LFO. This estimate assumes a 20% reproduction rate for the adjusted estimate (see Appendix 6). In April of 2015, the BLM conducted simultaneous double-count aerial surveys. The current Complex population is estimated at 1,821 adult animals.

Table 3. Horse Population by HMA and Year

HMA	2013	2014	2015*
Stewart Creek	302	362	509
Lost Creek	100	120	234
Antelope Hills	94	112	231
Green Mountain	388	465	982
Crooks Mountain	140	168	229
Complex Total	1,024	1,227	2,185

*The 2015 population estimate uses the population estimate from Table 4 below plus a 20% foal crop to account for foal production in 2015.

Table 4 shows the census data collected in April, 2015, by HMA within the Red Desert Complex, and their correlating AMLs.

Table 4. Red Desert HMA Complex Horse Population Inventory

HMA	Population Estimate April 2015	Population Estimate with 90% Confidence	AML Range
Stewart Creek	424	405-447	125-175
Lost Creek	194	150-241	60-82
Antelope Hills	193	162-233	60-82
Crooks Mountain	191	167-222	65-85
Green Mountain	819	774-892	170-300
Complex TOTALS	**1821**	**1658-2035**	**480-724**

The number of horses in the Complex was estimated using the simultaneous double-observer method, in a mark recapture analysis framework. The data were collected using this method and then an analysis was completed to give the point estimate of abundance for the number of horses within each HMA and the Complex, and also the 90% confidence intervals around those point estimates for each HMA and for the Complex as a whole. The 90% confidence interval is a

statistical measure which represents the expected range of possible point estimates, if the survey was conducted again under the same conditions. In practical terms, the 90% confidence interval represents a plausible range of horse abundance values that might actually have been present at the time of the survey, but the point estimates represent the single most likely value of population sizes, given the data that were observed. For the purposes of this EA, the point estimates of abundance were used, plus an additional number of animals to represent a 20% reproduction rate, to estimate the numbers for each alternative (Appendix 6). The population estimates for 2015 show a marked increase greater than the expected 20% reproduction rate in 3 of the 5 HMA's. The factors that may have caused this are: a new census method, effectiveness of PZP has faded in treated mares (last treated in 2011), mild winters, movement of horses among HMA's, and high foal survival.

Genetic testing based upon hair samples would be collected during the proposed gather. This would help ensure genetic variation within the wild horse herds. Based on genetic testing from previous gathers, the Red Desert HMA Complex demonstrates adequate genetic fitness. Due to the proximity and generally unfenced boundaries between HMAs adequate drift of individual animals between HMAs has maintained genetic variability. Wild horse movements among the five herd areas in the Red Desert HMA Complex are apparent through trails and seasonal variation in distribution. It is recognized that individually, the AML for wild horses in three of the herd areas (Lost Creek, Antelope Hills, and Crooks Mountain) may not provide for a genetically diverse population. However, as indicated, these horses interact with each other among herd areas. The interaction and exchange should ensure genetic viability. For further information on genetic diversity and variability in the Red Desert Complex refer to Appendix 3.

3.1.2 Environmental Consequences

BLM ran the WinEquus model for the three alternatives by the Complex to analyze possible differences in the wild horse populations between alternatives. Model results are displayed in detail in Appendix 5 (Population Model Overview).The modeling may not necessarily reflect actual on-the-ground results. One objective of the modeling exercise was to identify if any of the alternatives "crash" the population or cause extremely low population numbers or growth rates. Minimum population levels and growth rates determined from modeling were found to be sufficient to maintain population viability.

When comparing the differences between the three alternatives, the No Action alternative would result in the greatest population number with an average population of approximately 2,430 in the Complex: 590 in Stewart Creek, 240 in Lost Creek, 1,110 in Green Mountain, 240 in Crooks Mountain, and 280 in Antelope Hills. According to the population modeling, the Proposed Action results in the lowest average population of approximately 620 in the Complex: 140 in Stewart Creek, 65 in Lost Creek, 230 in Green Mountain, 50 in Crooks Mountain, and 70 in Antelope Hills.

Effects Common to Action Alternative 1 and Alternative 2: Proposed Action

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

The BLM has conducted wild horse gathers since the mid-1970s. During this time, methods and procedures have been identified and refined to minimize stress and adverse effects to wild horses during gather implementation. The Standard Operating Procedures in Appendix 1 would be implemented to ensure a safe and humane gather occurs and would minimize potential stress and injury to wild horses.

Wild horse gather-related mortality averages about one percent (1.0%) nationwide. About one half of the horses included in all gather related mortality could be humanely euthanized due to pre-existing conditions in accordance with BLM policy (BLM 2015). These data confirm that the use of helicopters and motorized vehicles are a safe, humane, effective, and practical means for the gather and removal of excess wild horses (and burros) from the public lands. It is BLM policy to restrict the use of helicopters as a tool to gather wild horses from February 28 through July 1, to minimize impacts to foals. The peak of foaling generally occurs during a four-week period from mid-April to mid-May for most wild horse herds.

Individual, direct effects to wild horses include handling stress incurred during capture, sorting, handling, and transportation of the animals. The intensity of these effects varies by individual horse and is manifested by behaviors ranging from nervous agitation to obvious physical distress.

A variety of injuries may occur after a wild horse has been captured and is either within the trap site corral, the temporary holding corral, during transport between facilities, or during sorting and handling. Occasionally, wild horses may sustain a spinal injury or a fractured limb but based on prior gather statistics, serious injuries requiring humane euthanasia occur in less than 1 horse per every 100 captured. Similar injuries could be sustained if wild horses were captured through bait and/or water trapping, as the animals still need to be sorted, aged, transported, and otherwise handled following their capture. Injuries resulting from kicks and bites or from collisions with corral panels or gates can occur. Injuries sustained by wild horses while being herded to trap site corrals by helicopter may include bruises, scrapes, or cuts to feet, legs, face, or body from rocks, brush or tree limbs. Wild horses may encounter barbed wire fences and receive wire cuts during gather activities but this type of injury is rarely fatal and can be treated on-site in consultation with a veterinarian.

To minimize the potential for injuries from fighting in the corral, the horses are transported from the trap site to the temporary (or short-term) holding facility where studs are separated as quickly and safely as possible, then moved into large holding pens where they are provided with hay and water. On many gathers, no wild horses get injured from fighting.

Indirect individual effects are those which occur to wild horses after all handling and processing is completed. These may include miscarriages, increased social displacement, and conflict among studs. These effects are known to occur intermittently during wild horse gather

operations. An example of an indirect individual impact would be a brief 1-2 minute skirmish between two studs opting for dominance and ending when one retreats. Injuries can also occur from these skirmishes and typically involve a bite or bruise from a kick. Like direct individual effects, the frequency of these effects varies with the population and the individual. Observations following capture indicate the rate of miscarriage varies, but can occur in about 1 to 5% of the captured mares, particularly if the mares are in poor body condition and/or health.

Foals may be orphaned during a gather if the mare rejects the foal, the foal becomes separated from its mother and cannot be matched up following sorting, the mare dies or must be humanely euthanized during the gather, the foal is ill or weak and needs immediate care that requires removal from the mother, or the mother does not produce enough milk to support the foal. On occasion, foals are gathered that were previously orphaned on the range (prior to the gather) because the mother rejected it or died. These foals are usually in poor health. Every effort is made to provide appropriate care to orphan foals. Veterinarians may be called to administer electrolyte solutions or orphan foals may be fed milk replacer as needed to support their nutritional needs. Orphan foals may be placed in a foster home in order to receive additional care. Despite these efforts, some orphan foals may die or be humanely euthanized as an act of mercy if the prognosis for survival is very poor.

Through the capture and sorting process, wild horses are examined for health, injury and any defects using the humane care and treatment methods as described in BLM Instruction Memorandum 2015-070 (BLM 2015). Decisions to humanely euthanize animals in field situations would be made in conformance with BLM policy. The policy described in Instruction Memorandum 2015-070 is used as a guide to determine if animals meet the criteria and should be euthanized (Appendix 1, SOPs). Animals that are euthanized for non-gather related reasons include those with old injuries (broken or deformed limbs) that cause lameness or prevent the animal from being able to maintain an acceptable body condition (greater than or equal to Body Condition Score (BCS) 3); old animals that have serious dental abnormalities or severely worn teeth and are not expected to maintain an acceptable body condition, and wild horses that have serious physical defects such as club feet, severe limb deformities, or sway back. Some of these conditions have a causal genetic component and the animals should not be returned to the range to avoid amplifying the incidence of the problem in the population.

Mares that receive the fertility control treatment would experience increased levels of stress from additional handling while they are being inoculated and freeze marked. There would be potential additional indirect impacts to animals at the isolated injection site following the administration of the fertility control vaccine. Injection site injury associated with fertility control treatments are extremely rare in treated mares, and may be related to experience of the person administering the vaccine. For monitoring purposes, wild horses treated with the PZP-22 vaccine would be identified by the freeze mark. All treated mares would receive an “HB” brand on the left hip. In addition to the hip marking, another smaller number would be applied to the left side of the neck to identify what HMA that horse came from, following past branding practices. Horses from Antelope Hills were marked with a 6, Crooks Mountain received a 5, Green Mountain received a 4, Lost Creek received a 2, and Stewart Creek were marked with a 1.

Recent research (Ransom 2013) suggests mares treated with PZP may experience longer lasting contraceptive effects, and those effects may have a longer effect if the mare has had been previously inoculated. Studies have shown that parturition dates varied between treated and untreated mares. Parturition for untreated females ranged from January 15- September 7, while the range for parturition of treated females was February 20- December 22. There was some evidence that the timing of fertilization and parturition could shift back to the natural range after PZP treatment effects have worn off. Treatment of mares had slight to no influence on foal survival, depending on study location. The effect of PZP varies widely between individual horses. Administration of PZP has occurred for several years in this Complex. PZP is most effective one to two years post treatment, and conception rates have returned to natural levels in 3-5 years post treatment.

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

Transport, Short-Term Holding, and Adoption (or Sale) Preparation

Approximately 1,748 horses would be gathered and transported to temporary holding corrals. Under Alternative 1, only horses outside of the HMA boundaries would be removed. Under the Proposed Action, approximately 1,705 excess horses would be removed from inside and outside the HMAs. Animals would be transported from the capture/temporary holding corrals to the designated BLM off-range corral facility(s) in accordance with BLM Instruction Memorandum 2013-059 (BLM 2013b). From there, they would be made available for adoption or sale to qualified individuals or placed in long-term pastures.

Wild horses selected for removal from the range are transported to the receiving short-term holding facility in straight deck semi-trailers or goose-neck stock trailers. Vehicles would be inspected by the BLM Contracting Officer's representative (COR) or Project Inspector (PI) prior to use to ensure wild horses can be safely transported and that the interior of the trailer is in a sanitary condition. Wild horses would be segregated by age and sex and loaded into separate compartments. A small number of mares may be shipped with foals. Transportation of recently captured wild horses would be limited to a maximum of 8 hours. During transport, potential effects to individual horses can include stress, as well as slipping, falling, kicking, biting, or being stepped on by another animal. Unless wild horses are in extremely poor condition, it is rare for an animal to be seriously injured or die during transport.

Upon arrival at the short-term holding facility, recently captured wild horses would be off-loaded by compartment and placed in holding pens where they would be fed good quality hay and water. Most wild horses begin to eat and drink immediately and adjust rapidly to their new situation. Lactating mares and young foals are put in a separate pen to encourage pairing. At the short-term holding facility, a veterinarian would examine each load of horses and provide 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 would

be sorted and placed in hospital pens, fed separately and/or treated for their injuries as indicated. Recently captured wild horses, generally mares, in very thin condition may have difficulty transitioning to feed. Some mares may lose their pregnancies. Every effort is taken to help the mare make a quiet, low stress transition to captivity and domestic feed to minimize the risk of miscarriage or death.

Euthanasia and Sale without Limitation

While humane euthanasia and sale without limitation of healthy horses for which there is no adoption demand is authorized under the WFRHBA, Congress prohibited the use of appropriated funds between 1987 and 2004 and again starting in 2010 through the appropriations language each fiscal year through 2015 for this purpose. Sales of wild horses are conducted in accordance with Instruction Memorandum No. 2014, *Guidance for the Sale of Wild Horse and Burros.* (BLM 2014a)

Impacts of Alternative 1: Remove all wild horses outside of HMA boundaries and utilize fertility control

Approximately 1,748 wild horses would be gathered from the Red Desert Complex. Approximately 402 horses gathered from outside HMA boundaries would be permanently removed. Horses that are gathered within the HMA boundaries would be returned to the HMAs. Approximately 713 mares one year or older would be treated with PZP-22 before being released back to the HMAs. Treated mares that are pregnant, would be expected to foal during the 2016 foaling season, but would not be expected to foal the following 1 or 2 years. The PZP treatment would be expected to slow population growth starting in 2017 and be effective for 1-3 years following treatment. This alternative would slow population growth, but it would not reduce the number of wild horses within the Complex low AML.

Considering approximately 400 horses could be removed permanently and the released mares being treated with PZP-22, Alternative 1 would make only a small difference in the current social structure of the wild horse population within the Complex.

Impacts of Alternative 2: Proposed Action--Remove to low AML and utilize fertility control

The post-gather population of wild horses for the Red Desert Complex would be the low range of AML (approximately 480). The post-gather numbers represent the combined lower limit of the AML range. The BLM would ensure wild horse numbers within each HMA would not go below the respective low range of AML. Approximately 22 studs and 21 mares would be returned to the Complex and the mares older than 1 year would be treated with PZP-22 before being released back into the HMA(s). The current social structure of the wild horse population within the Complex would likely be altered from the removal of approximately 1,705 horses.

Impacts of Alternative 3: No Action--No gather or removal and no fertility control

No wild horses would be gathered and no fertility control treatment would be implemented. As a result, wild horses would not be subject to any individual direct or indirect impacts described in Alternative 1 or 2. Projected population increases would result in minimal potential for inbreeding over the long term, but would be expected to result in deterioration of the range, and eventually lead to long-term impacts to both the health of the rangeland and the wild horse population with in the Complex. Competition for available forage and water resources would increase as the numbers of wild horses increase. See section 3.3.2 for more information on impacts to vegetation, special status plants, soils, and watershed.

Lactating mares, foals, and older animals are most susceptible to stress; they would be affected most than other horses in the population. Social stress among animals would likely increase as a shortage of resources resulted in competition to protect their resources. An overall decline in the health of the population would result in lower reproductive rates.

The body condition of horses would be expected to deteriorate as a result of declining quality and quantity of forage and from the need to travel further from water to find forage. As competition for forage between livestock, wildlife, and wild horse increases, livestock operators may choose to take nonuse as range condition deteriorates. If livestock operators take nonuse, the maintenance of livestock water sources would no longer take place, reducing the availability and reliability of many water sources currently used by wild horses. Mares with foals would be most susceptible to forage and water depletion. The potential risk of injury or death would increase as horses search for forage and water in other areas. The search for water and forage would also increase the chances of horses to stray outside of HMAs.

PZP would not be administered and there would be no associated impacts to wild horses.

3.2 Wildlife, Threatened and Endangered Species, Special Status Species, and Migratory Birds

3.2.1 Affected Environment

The mosaic of plant communities and topographic features that are found throughout the Red Desert Complex supports a wide variety of wildlife species that use the various habitats for resting, courtship, foraging, travel, supplies of food and water, thermal protection, escape cover and reproduction.

A variety of wildlife species occur or have the potential to occur in the project area including mule deer, pronghorn antelope, elk, moose, coyote, red fox, bobcat, desert cottontail, Wyoming ground-squirrel, horned lark, raven, magpie, and common nighthawk. Mule deer, elk and antelope utilize the project area year-round and approximately 20% of the project area is identified as crucial winter range for mule deer and antelope and winter or crucial winter range for elk. For a complete description of species and habitats found within BLM jurisdiction in the Red Desert Complex, see the Rawlins RMP (2008a, FEIS p. 3-143 to 150) and the Lander Field

Office RMP (2013, FEIS p. 392-421). A summary of the wildlife resources identified as being potentially impacted by the Proposed Action is provided below.

Threatened, Endangered, Proposed and Candidate Species:

Black-footed Ferret (Endangered): Potential ferret habitat (white-tailed prairie dog towns) exists in the project area. Past surveys conducted in relation to other development activities in the Complex have not recorded the presence of black-footed ferrets. Horse trap sites and staging areas associated with gathers are never placed in prairie dog towns due to the possibility of horses breaking their legs in the burrows or degrading prairie dog habitat. This action would have no impacts to black-footed ferrets and this species will not be addressed further in the document.

Greater Sage-Grouse (Candidate): A status review by the US Fish and Wildlife Service was recently completed in 2010 for the Greater Sage-Grouse to determine if it warrants listing under the Endangered Species Act (ESA). The status review determined that the Greater Sage-Grouse (sage-grouse) warrants protection under the ESA but was precluded from listing in favor of species that are more imperiled. It is currently listed as a candidate species as well as a BLM Sensitive Species.

BLM records indicate that there are approximately 30 Greater Sage-Grouse leks and associated nesting habitat within or immediately adjacent to the Stewart Creek and Lost Creek HMAs in the RFO, and approximately 20 Greater Sage-Grouse leks and associated nesting habitat within or adjacent to the Antelope Hills, Crooks Mountain and Green Mountain HMAs in the LFO. The proposed action has been analyzed for consistency with the LFO and RFO RMPs and RODs, with WY-IM-2012-019 "Greater Sage-Grouse Habitat Management Policy on Wyoming BLM Administered Public Lands", WO-IM-2012-043 "Greater Sage-Grouse Interim Management Policies and Procedures", and WO-IM-2012-044 "BLM National Greater Sage-Grouse Land Use Planning Strategy". In accordance with BLM policies and guidance outlined in the RMPs and WY-IM-2012-019, the following timing stipulations and surface disturbance restrictions would be used to determine the location of the trap sites during the gather:

- No surface disturbing activities or surface occupancy within a 0.6-mile radius of the perimeter of occupied or undetermined sage-grouse leks inside Core areas.
- No surface disturbing activities within 0.25-mile radius of the perimeter of occupied or undetermined sage-grouse leks outside Core areas.
- No surface disturbing and/or disruptive activities or surface occupancy would occur within sage-grouse nesting habitat from March 15 through July 15.
- No surface disturbing and/or disruptive activities in mapped or modeled sage-grouse winter habitats/concentration areas that support Core area populations November 15-March 14. Currently, there are no mapped or modeled sage-grouse winter concentration areas within the Complex.

Of the 753,028 acres making up the Complex, 512,446 acres (68%) is within Greater Sage-Grouse Core Area. The BLM is required to consult with the Wyoming Game and Fish Department (WGFD) on any project in Core Area as well as to comply with seasonal timing

limitations, distance from leks for surface disturbance and disruptive activities, and other protective measures. Nesting and early brood-rearing habitats are considered to be the most important in chick survival which ultimately leads to population growth. With 2 years of adequate or surplus precipitation during the growing season, residual vegetative cover during the spring has helped to conceal nests from predators and provided hiding cover and adequate food for chicks. The result has been an upward trend in number of sage grouse observed on leks in 2014 and 2015.

Important seasonal habitats within the Complex include breeding, nesting, and early and late brood rearing habitats. All of these important sage-grouse habitats require healthy upland and riparian rangeland conditions. Healthy riparian vegetation is important for concealing and providing forage for Greater Sage Grouse (and other sensitive species) which depend on these areas during mid-late summer and early fall. Sage grouse utilize riparian areas extensively during late brood rearing phase of their life cycle and healthy riparian areas are critical component in maintaining population size.

Sensitive Species

A number of animal species potentially present in the project area have been accorded “sensitive species” status. Sensitive mammal species that have the potential to occur, or that may have habitat located within the project area include the Wyoming pocket gopher, pygmy rabbit, swift fox, spotted bat, long-eared myotis, fringed myotis, Townsend’s big-eared bat, and white-tailed prairie dog.

Sensitive bird species that have the potential to occur in the area, or may have habitat located within the area include the Ferruginous hawk, mountain plover, Greater Sage-Grouse (see Candidate Species above), long-billed curlew, burrowing owl, sage thrasher, loggerhead shrike, Brewer’s sparrow, sage sparrow, and bald eagle. Numerous other migratory birds, including sagebrush obligate species, occur in the Complex.

Mountain plover have been recorded in the project area, and potential mountain plover breeding/nesting habitat exists throughout the Complex.

Other sensitive species that have the potential to occur in the area, or may have habitat located within the area include the Great Basin spadefoot toad and the Northern leopard frog.

No water depletions are associated with the proposed action; therefore, there would be no effect to any federal listed aquatic species present in the project area or downstream of the project area.

3.2.2 Environmental Consequences

Impacts of Alternative 1

BLM wildlife biologists would recommend trap site locations to avoid adverse impacts to wildlife, including occupied sage-grouse leks and winter concentration areas, and big game crucial winter ranges. Although no unusual or excessive negative effects on big game, sage-

grouse, riparian species, or other priority species are expected, the BLM would coordinate with WGFD if traps are located within big game crucial winter habitats. The gather would not occur during winter months, however, minimizing the trampling of sagebrush and other shrubs that provide browse for big game would be minimized. Tall brush which provides habitat for pygmy rabbits would also be avoided when selecting trap sites.

Since the gather would occur in late summer or early fall, impacts to ground nesting birds would be minimal since the chicks of all species would have fledged. No impact to the Wyoming pocket gopher would be expected since this species spends the vast majority of time underground.

Wildlife adjacent to trap sites would be temporarily displaced during capture operations by increased activity during trap setup, from helicopter noise, and vehicle traffic, but in most cases displacement should only last 2-3 days in each trap area. Reduction of wild horse numbers outside of HMAs would result in reduced competition for forage and water resources between wild horses and wildlife. The short-term stress and displacement to wildlife during the gather operations would be offset due to reduced horse numbers and lower reproductive rates and would result in long-term benefits to wildlife habitat conditions. Disturbance associated with wild horses along stream bank riparian habitat and adjacent upland habitat would be reduced outside the HMAs. The effect of reducing disturbance to riparian resources benefits all aquatic species by reducing sedimentation and maintaining quality habitats.

Impacts of Alternative 2

Impacts would be more beneficial and widespread compared to Alternative 1. Approximately the same number of horses would be rounded up, but the number of wild horses removed would be far greater, thereby reducing disturbance to soils, riparian resources, and vegetation post-gather. The effects of reducing wild horse numbers to the low AML would help to maintain the population within AML for a longer duration, reducing competition for forage and habitat with wildlife species. More vegetation (hiding cover) and forage would be available for Greater Sage-Grouse during critical nesting and brood-rearing times. Future gathers would not be needed as soon to maintain horse numbers at AML which would reduce future disturbance to wildlife within the Complex. Riparian resources would not be used as heavily, leaving more vegetation for forage.

Impacts of Alternative 3

Wildlife would not be temporarily displaced or disturbed as a result of gather operations. However, there would be continued and increased competition with wild horses for limited water and forage resources. This competition would increase as wild horse numbers continued to increase annually. Although diet overlap is highest between wild horses and elk, fecal analysis data shows higher wild horse use of shrubs during the winter, which would also overlap with the diets of antelope and mule deer. Wild horses are aggressive around water sources and some wildlife species may not be able to compete successfully. The continued competition for limited resources would lead to increased stress or displacement of native wildlife species. Although wildlife may move to locations outside of the Complex, these areas are likely already occupied,

which may result in long-term reductions in wildlife populations over an area much larger than the Complex. Additionally, increased competition between wild horses and wildlife species for forage resources, particularly in the spring when plants make and store carbohydrates, would impede long-term vegetation recovery, and encourage non-native or invasive plants to become established, displacing more desirable species used by wildlife.

Residual nesting cover needed by Greater Sage-Grouse and other nesting songbirds might not be adequate to hide and protect nests from predation. The long-term decline in vigor and cover or even the loss of native vegetation would reduce wildlife populations and diversity, and lower the likelihood of providing suitable habitat in order to support the Wyoming Game and Fish Department population objectives for big game and other sensitive species in this area.

No direct impact to sensitive fish species would occur from gathering horses. The effect of increasing impacts to water and riparian resources due to expanding horse herds negatively affects all aquatic species by increasing sedimentation and reducing or eliminating aquatic or riparian habitats.

3.3 Vegetation, Special Status Plants, Soils, and Watershed

3.3.1 Affected Environment

There are a variety of vegetation types in the Red Desert Complex. Vegetation types include: sagebrush, sagebrush/grass, saltbush, greasewood, desert shrub, juniper woodland, grass, meadow, broadleaf trees, conifer forest, mountain shrub, and badlands. The high-elevation, cold-desert predominant vegetation type is sagebrush/grass.

Plant communities are very diverse in this large area, reflecting the diversity in soils, topography, and geology found there. Needle-and-thread, Indian ricegrass, bluebunch wheatgrass, western wheatgrass, Junegrass, basin wildrye, sandhill muhly, Canby and little bluegrass, and threadleaf sedge are the predominant grasses and grass-like species. Wyoming big sagebrush, black sagebrush, bud sage, birdsfoot sage, Gardner's saltbush, spiny hopsage, four-wing saltbush, greasewood, bitterbrush, winterfat, horsebrush, Douglas and rubber rabbitbrush, and true mountain mahogany are important shrub species for wildlife. Forbs are common and variable depending on the ecological site and precipitation zone.

Wild horses generally prefer perennial grass species as forage when available. Shrubs are more important during the fall and winter, and in drought years. The species of grasses preferred depends on the season of the year. Needle-and-thread and Indian ricegrass are most important during the winter and spring and wheatgrasses during the summer and fall.

The soils in the Red Desert Complex are highly variable in depth and texture as would be expected with the great variability in geology and topography that characterizes the area. Generally, the western third is a mix of sandy soils with high wind erosion potential and clayey soils with high water erosion potential, low bearing strength and varying amounts of salts. The eastern third has more loamy inclusions in the form of undulating uplands and alluvial complexes, with moderate erosion potential, while the middle third is a mixture of both. Virtually any soil condition that may be encountered in the region can be found somewhere

within the Red Desert Complex. More specific soils information can be found in the draft soil surveys located in the BLM files in the RFO and LFO.

The western portion of the Red Desert Complex extends into the Continental Divide closed basin. The eastern portion of the Complex is part of the North Platte River drainage. Additional land management guidance is provided by various, agencies, compacts and agreements that are focused primarily but not exclusively upon the North Platte River Drainage. There are few riparian areas in the Complex; however, riparian areas are often considered the most productive sites in the region. There are numerous developed water sources such as stock tanks, wells and reservoirs in the area.

Wild horses are uneven grazers, meaning that they do not always graze an area in its entirety before moving on to another. Areas where they do graze have been noted to have a lower abundance of cover grasses, lower shrub cover, lower total vegetative cover, lower species richness, and less continuous shrub canopy (Beever and Herrick 2006).

When wild horse numbers have been maintained within AML, the vegetation data collected for the Stewart Creek HMA has generally shown an upward trend in vegetative cover and increased species composition. There has also been a noted reduction in undesirable plant species such as halogeton and prickly pear. The riparian areas have shown a similar pattern while wild horse numbers have not exceeded the established AML. In the 1990's and early 2000's, wild horse numbers were above AML in both the Lost Creek and Stewart Creek HMAs. At that time, utilization studies indicated moderate to high use in riparian habitat and light to moderate use in sites adjacent to riparian habitats. Additionally, data collected from rain gauges within the Lost Creek and Stewart Creek HMAs has reflected a 10 year average (2005-2014) of about 91% of normal precipitation. Wild horse numbers exceeding the high AML were identified as a contributing factor to riparian area degradation within the Lost Creek, Stewart Creek, and the portion of the Antelope Hills HMA within the Cyclone Rim Allotment to not passing the standards for rangeland health in 2002. However, areas that were not meeting the standards for healthy rangelands in 2002 have since had projects completed or to proposed for completion to aid in improvement. The Stewart Creek and Cyclone Rim Allotments were recently re-assessed in 2011 (BLM 2013). These allotments were found to be meeting upland and riparian standards with a static to upward trend in soils/watershed and vegetation health.

The three HMAs encompassing the Northern portion of the Complex have received normal or above normal precipitation five out of 14 years from 2000 through 2014 (BLM Rain Gauge Data). The Lander Field Office portion of the Complex has seen several drought years since the year 2000; 2002, 2012, and 2013 were particularly dry years, resulting in low forage production and plant vigor. As the wild horse population increases, horses must increase their range in search of available forage and water. Some livestock permittees and the BLM often try to manage the rangelands within the HMAs to maintain a balance between use and available forage during drought or poor forage production years by adjusting the amount of livestock use.

Special Status Plant Species

Special status plants are those species that are federally listed as threatened or endangered, proposed for listing, or candidates for listing under the ESA. They also include species designated by each BLM State Director as sensitive and those listed or proposed for listing by a

state in a category implying potential endangerment or extinction. The BLM is mandated to protect and manage threatened, endangered, candidate, proposed, and sensitive species and their habitats. The federally listed Ute ladies'-tresses has habitat in the area but surveys throughout the area have not found any populations. It occurs in riparian areas below 7,000 feet. The Wyoming special status plant species that grow, or have potential habitat in the project area are listed in Table 5. The Colorado butterfly plant and blowout penstemon plant are not located within, or habitat is not found, in the project area.

Threatened, Endangered, Proposed and Candidate Species
One federally designated threatened, endangered, proposed, or candidate plant species has the potential to be present within the project area.

Ute ladies'-tresses (Threatened)
Potential habitat may exist in the project area; however project activities would not take place in suitable riparian habitat for this species. Therefore this action would result in no impacts to Ute ladies' tresses and this species will not be addressed further in the document.

Sensitive Plant Species
Sensitive plants that have the potential to occur within the project area include the Cedar Rim thistle, Ownbey's thistle, and Gibben's penstemon (Table 5). Prior to placement of horse gather holding facilities, desktop analyses would be conducted to identify new areas with known special status plant species (SSPS) or potential habitat. Analyses would be based on occurrence records and potential occurrence modeling data from the Wyoming Natural Diversity Database (WYNDD), as well as BLM internal records. Results would guide holding facility placement to avoid SSPS and potential habitat. Therefore, there should not be any impacts to SSPS as a result of implementing the Proposed Action beyond what occurs normally by wild horse movements through the area.

Table 5. Wyoming Special Status Plant Species

Common Name	Scientific Name	Habitat
Cedar Rim thistle	*Cirsium aridum*	Barren, chalky hills, gravelly slopes, & fine textured, sandy-shaley draws at 6,700-7,200'
Ownbey's thistle	*Cirsium ownbeyi*	Sparsely vegetated shaley slopes in sage & juniper communities at 6,440-8,400'
Gibbens' penstemon	*Penstemon gibbensii*	Sparsely vegetated shale or sandy-clay slopes at 5,500-7,700'

Invasive and Noxious Weeds
Federal agencies are directed by Executive Order 13112, Invasive Species, to expand and coordinate efforts to prevent the introduction and spread of invasive plant species and to minimize the economic, ecological, and human health impacts that invasive species cause. Weed populations are generally found along dirt roads and two-tracks, in areas of animal (livestock, wild horses and wildlife) concentration, in areas of oil and gas development, and in areas of intense recreational use. Motorized vehicles transporting seeds can be a major source of new

infestations of weed species. Within the Lander BLM Field Office portion of the Complex, the Fremont County Weed and Pest (FCWP) inventoried for the presence of noxious or invasive species in 2007 and are scheduled to re-inventory in 2018. From the inventory in 2007, Early Detection Rapid Response Areas (EDRR) were established where noxious weeds were found and have been visited for treatment at least one time every year. From the 2007 inventory, the FCWP determined that the LFO portion of the Complex was relatively weed-free. The RFO portion of the Complex has not been completely inventoried, but areas inventoried so far are relatively weed-free also.

Noxious and invasive species known to occur in the Complex include: Russian knapweed, spotted knapweed, houndstongue, Canada thistle, saltcedar, Russian olive, leafy spurge, whitetop (hoary cress), perennial pepperweed, Swainson pea, black henbane, halogeton, cheatgrass, and Russian thistle. Most of these infestations are small and few and have thus far been kept in control using the Integrated Pest Management (IPM) approach.

Post–gather weed monitoring of trap sites would be performed for 1-3 years after the project. If noxious weeds are found, the site would gain EDRR status and would be treated every year as needed.

In Alternative 3, there is a potential for the over-utilization of range resources and subsequent reduction in vegetative ground cover that would promote the establishment and spread of invasive species. The removal of excess wild horses in the Proposed Action would aid in the curtailment of the introduction and spread of noxious weed species. In alternative 1 the curtailment of noxious and invasive species would last for only the first few years until populations return to current levels.

3.3.2 Environmental Consequences

Impacts of Alternative 1

Impacts from the gather operations would be temporary and include trampling of vegetation and soil compaction, particularly at the trap sites and holding locations. The number of traps sites used during a gather can fluctuate depending on horse distribution, location, and seasonal limitations on horse movement (i.e. hot, cold, snow, dry, etc). Each trap site and holding facility varies in size, but generally less than 2 acres. If a particular trap site is used, wild horses would be kept there until they can be loaded onto semi-truck trailers. The amount of time they stay in these sites is generally less than one day.

The implementation of fertility control and removal of excess wild horses from non-HMA areas would slow over-utilization of forage and the reduction of vegetative ground cover on upland and riparian systems. Where horses are removed, vegetation removal from wild horses could be reduced and provide a beneficial effect to the soil and vegetation. Vegetation composition, cover, and vigor could improve or be maintained near water sources where wild horses tend to congregate. Some riparian systems may experience reduced wild horse use after removal for a few years, giving the systems some added rest to help maintain or improve their condition. An improvement in forage condition could lead to improved livestock distribution, which would

prevent over-utilization. Vegetative diversity and health should improve in areas where excess wild horses are removed.

Short-term effects to vegetation and soils would occur at trap sites when gathers are being conducted. Upland vegetation would be disturbed by trap site construction, and short-term trails and soil compaction may develop near and in the trap site. Any vegetation removed would be minimal and localized. These sites are used infrequently, providing the soil and vegetation time to recover on its own. Holding facilities are generally located on private land, and are existing pens or corrals. Trap sites and holding locations would not be located within or directly adjacent to riparian areas; thus these areas would not be disturbed.

Wild horses captured outside the HMA boundaries would be removed. Based on the most recent wild horse census, it is estimated that approximately 400 horses would be removed, which is approximately 20% of the total number of wild horses within the Complex. The overall net reduction in wild horses would have a beneficial effect on soils and vegetation, but not as much when compared to the Proposed Action. Wild horse population growth would be lower when compared to Alternative 3, but not as much as the Proposed Action. As a result, there would be a potential for short term positive impacts on riparian health, water quality, and rangeland health outside of the HMAs, but would be less noticeable than the Proposed Action in the long term as AML could continue to be exceeded within the Complex and horse populations would continue to increase.

Continued monitoring and data collection would be needed to assess whether healthy and self-sustaining wild horse herds are being maintained on the HMAs over the long term. Monitoring of the project area would continue for wild horses as well as vegetation and water resources.

Impacts of Alternative 2

The impacts associated with capture and removal operations are expected to be similar to the Alternative 1. However, the implementation of this alternative would result in the lowest population of wild horses within the Complex over the long term as a result of removing wild horses inside and outside the HMAs and the implementation of fertility control measures. The removal of approximately 1,700 wild horses would bring the numbers to the low end of AML. This would have the greatest beneficial effect on soil and vegetation within the Complex. Riparian health and water quality would also improve due to overall reduction of wild horses and the use of fertility control.

Impacts of Alternative 3

Wild horse population control measures would not be implemented and no gather operations impacts would occur. This would allow wild horse populations to continue to increase within and outside of the HMAs. Perennial upland vegetation and riparian systems would continue to receive increasing year-long grazing pressure as wild horse numbers continue to increase, which is not conducive to optimum plant health and vigor. Soil erosion and plant health would continue to be greatly affected around water locations, and to a lesser extent away from water sources. Several range research projects have shown that even with rest or deferment from

grazing for a year following a season of repeated grazing through the growing season does not provide sufficient time for full plant recovery. Continued year-long grazing with horse numbers above the determined AML becomes a cumulative nutrient draw to the desired plants. Plants draw nutrients from reserves in their roots to initiate plant growth in the spring, which must be replenished during the growing season to maintain or expand the root system. If these nutrients are not replaced, the plant's root system and plant growth above ground is reduced, and if continued long-term may lead to plant mortality. The subtle depletion of root reserves, and plant health, are not measurable until the plants begin to die out. Therefore, the current high wild horse numbers would lead to a decline in desired bunchgrass vigor, composition, and forage production in the long-term, resulting in decreased plant cover and incorporation of organic matter into the soil, and decreased soil moisture retention and shortened plant growth period that would not be realized until becoming measureable and then it may be too late to get those plants back into the community naturally. Habitat may be altered for sensitive plant species resulting in reduced conditions for continued survival.

As native plant health deteriorates and plant cover, vigor, and litter are reduced, soil erosion would increase and long-term loss of productivity would occur. More desirable upland bunchgrass species, such as Indian ricegrass, needle-and-thread, basin wildrye, bottlebrush squirreltail, and riparian species would be reduced or lost from the native plant communities. Plant species that are less desirable or more grazing resistant, such as sandhill muhly, western wheatgrass, little bluegrass, threadleaf sedge and weeds, would be increased in terms of their composition within the affected plant communities. However, in some cases there would be an increase in the amount of bare ground, especially around water sources. Similar results would occur in the riparian systems within the Red Desert Complex, with sedges and grasses being replaced with Baltic rush, mat muhly, and weedy species. These vegetation shifts would also start occurring outside the HMAs as horses travel further in search of better forage or reliable water sources. Vegetation shifts and soil exposure would slowly continue over time and would affect areas beyond the HMAs. Eventually, rangeland health would measurably deteriorate. In the absence of healthy rangelands, animal health would eventually be reduced, leading to increased numbers of wild horses in poor body condition.

As vegetation cover and litter decrease and bare ground increases, soil erosion would increase in proportion to herd size and vegetation disturbance. The shallow desert topsoils cannot tolerate much loss without an associated loss in productivity and thus the ability to support the existing native plant community. Invasive, non-native species would increase following increased soil disturbance and reduced native plant vigor and abundance. The greater vegetation loss would be around water locations. Watershed health throughout the area would continue to decrease, resulting in increased sediment and salinity delivery downstream. These impacts would continue to slowly increase over time as horse numbers increase. If wild horses are left unmanaged, damage to riparian areas would increase due to destruction of vegetation and trampling along stream banks.

Invasive, non-native plant species would continue to increase and invade new areas following increased soil disturbance and reduced native plant vigor and abundance. This would lead to both a shift in plant composition towards weedy species and a loss of productivity from loss of native species and the erosion of soils. There would also be similar vegetation impacts outside

the HMAs as horses travel further in search of better forage. Impacts would continue over time and would affect areas beyond the HMAs.

Reclamation efforts would be less likely to succeed as wild horse populations increase within and outside the Complex. Many oil and gas well pads would require fencing for initial recovery of vegetation; however, once fences were removed, grazing by wild horses would result in loss of vegetation and destabilization of soils similar to adjacent rangelands. Linear features would not likely be fenced due to both the cost and restrictions they would place on movement of wildlife, wild horses, and livestock. These sites would likely receive grazing use that would reduce or eliminate desirable species and promote weeds, less palatable plant species and bare ground which would, in turn, lead to increased soil erosion and water runoff into drainages and adjacent rangelands.

3.4 Recreation

3.4.1 Affected Environment

The public enjoys seeing wild horses roaming free in the Rawlins and Lander Field Office areas. Although demand is not high, some people (residents and nonresidents) make special trips to see wild and free-roaming horses in their natural environment.

Other recreation in the project area is quite dispersed with the greatest amount occurring during the hunting seasons for the various game animals and birds. Primary recreational activities other than hunting include camping, hiking, rock hounding, photography, wildlife and wild horse viewing, off highway vehicle (OHV) use, and sightseeing.

While varied recreation activities and values occur in the project area, the one most likely to be affected is hunting.

Several of the gathers are proposed in elk and antelope hunt units currently under Wyoming Game and Fish special management criteria. This means that the Wyoming Game and Fish reduces the amount of special draw licenses to ensure a higher male:female ratio and therefore a higher chance for a hunter to harvest a trophy class animal. In addition, because tag numbers in these areas remain fairly low, hunters expect to be able to find solitude and high numbers of huntable animals.

3.4.2 Environmental Consequences

Impacts of Alternative 1

The implementation of Alternative 1 would improve rangeland health only slightly when compared to the Proposed Action. The aesthetic quality of recreational opportunities, such as hiking, wildlife viewing, and hunting are not expected to be as beneficial as the Proposed Action. Opportunities to view wild horses in the Complex would continue, however, there would be slightly fewer animals available for viewing than at present. Gather activities may interrupt or interfere with viewing opportunities and make animals harder to find. Fertility control treatment

would be expected to slow population growth; opportunities to view mares with foals during the next 2-3 years would be slightly reduced over the present situation.

The gather operation could occur during fall hunting seasons. If gathering occurs during hunting season, the hunting experience could be diminished in areas within hearing distance of the helicopter, paths of horses being gathered, and a resultant increased awareness of game animals to activity. Affected hunters would likely relocate in areas of the hunt unit not affected by the gather activities. This relocation can reduce visitor satisfaction with the hunting opportunities and or increase hunter densities in those areas not disturbed by the project.

Impacts of Alternative 2

Impacts associated with capture and removal operations are expected to be similar to the Alternative 1. Fewer wild horses would be available for viewing following the gather because excess horses within and outside the HMA's would be removed to the low AML. As a result, habitat conditions are likely to improve at a much higher rate than under Alternative 1, resulting in indirect benefits to wildlife and recreationists (higher reproduction rates, greater hiding cover, less competition for forage/better body condition, etc.). In years 2-3 following the gather, viewing opportunities of mares with foals would be reduced as a result of removing excess wild horses and applying fertility control. The viewing public would see wild horses in better condition and improved big game habitat in the long term.

Impacts of Alternative 3

Impacts from gather operations discussed under Alternative 1 and the Proposed Action would not occur. However, Alternative 3 could result in indirect impacts occurring from uncontrolled horse population numbers.

Viewing opportunities associated with the presence of wild horses would increase, but they may be less palatable due to the increasing occurrence of malnourished horses. Thus, although the increased population of wild horses might make them easier to find, the experience might not be as desirable due to the poor condition of the horses. The likelihood of wild horses expanding their range in search of water and feed would be much higher than Alternative 1 and the Proposed Action. As a result, more human/recreationist conflicts are expected to occur.

The quality of recreational opportunities associated with the quality of the habitat, such as viewing or hunting wildlife, could decline as the wild horse population increased beyond the carrying capacity of the habitat.

3.5 Livestock Grazing

3.5.1 Affected Environment

Two Rawlins Field Office grazing allotments (Map 2), Cyclone Rim and Stewart Creek are within the Stewart and Lost Creek HMAs. Between 2002 and 2005, actual use levels averaged 14% of permitted livestock levels in the HMAs, with 26% actual use made between 2005 and 2009 and 34% actual use by livestock from 2010 through 2012. All nonuse was made

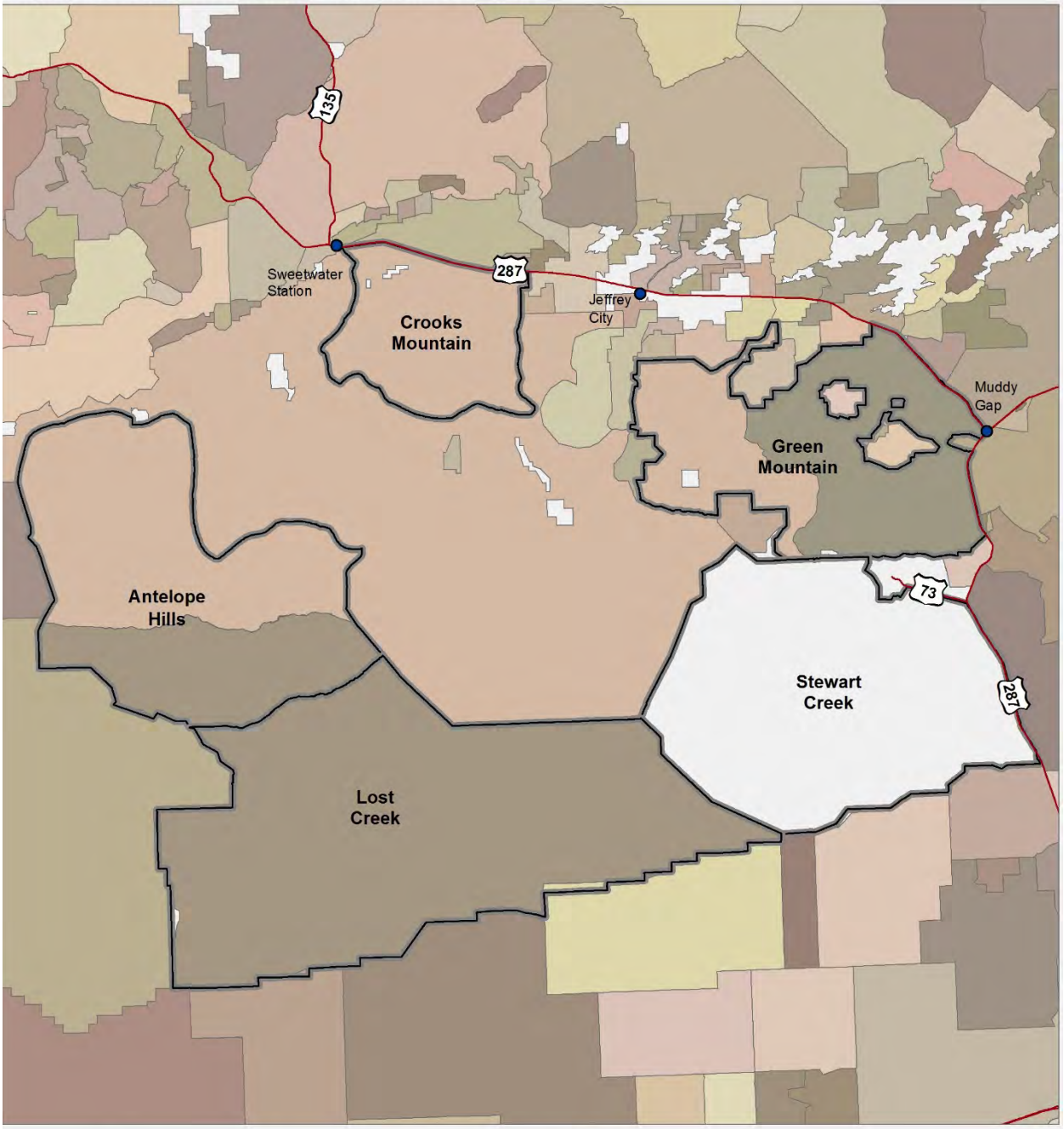
voluntarily by the grazing permittees due to drought conditions (2002, 2006 and 2012) and high horse numbers (until after the 2011 gather). Livestock operations with greater flexibility have made little to no use in this area, while those with limited flexibility to go elsewhere have reduced their livestock numbers. Permitted livestock still make up the majority of actual use within these HMAs.

The Stewart Creek and Cyclone Rim Allotments were recently assessed (BLM 2013). These allotments are currently meeting upland and riparian standards with a static to upward trend in soils/watershed and vegetation health. Recent drought years (2002, 2006, and 2012) have resulted in plant mortality throughout multiple areas within the watershed, even in observation areas that were receiving moderate to no forage use. High numbers of wild horses have for some years left little residual forage, and combined with water shortages, they have moved to other allotments. Over the last decade, livestock permittees have taken voluntary nonuse and have used on average 34% of their permitted AUM use and as low as 10% in some years due to a lack of available forage.

Five grazing allotments in the Lander Field Office occur within the Antelope Hills, Crooks Mountain, and Green Mountain HMAs (Map 2). In 2011, the Green Mountain Common Allotment was divided into four smaller allotments (Antelope Hills, Arapahoe Creek, Alkali Creek Sheep, and Mountain). Historically (1980-2010), the Green Mountain Common Allotment averaged 48% of total permitted use. In the last three years (Antelope Hills, Alkali Creek Sheep, Arapahoe Creek) actual use levels have averaged less than 50% as well. Like the Rawlins Field Office, this nonuse has been voluntarily taken by permittees due to drought and drought recovery conditions. In addition, livestock grazing permittees in the Antelope Hills, Arapahoe Creek, and Alkali, Creek Sheep Allotments are required to meet stubble height, willow browse, and bank alteration standards. If stubble height requirements are reached or exceeded, they are required to remove the livestock from either the selected regions or eventually from the allotment. There is no way to tell whether the use is from livestock or wild horses, but when the standard is met, the livestock are moved.

Rangeland Health Standards were assessed in 2002 for all these allotments under one assessment. Prior to the 2011 Final Decision, these allotments were part of the Green Mountain Common Allotment--one larger common use allotment. The 2011 analysis showed approximately 47% of the upland acres were meeting rangeland health standards and the remaining 48-50% of acres were undetermined. The majority of riparian habitats, however were not meeting rangeland health standard #2 (riparian and wetland vegetation). The final decision resulted in the GMCA being divided into 4 separate allotments, implementing a 44% reduction in permitted numbers and implementing separate grazing rotation systems.

Map 2. Allotments within the Red Desert HMA Complex



Allotments within the Red Desert Complex

Highways
Wild Horse HMA boundary
Allotments are shown below HMAs in varying colors

N

0 8
Miles

No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by BLM.

Date: 7/31/2015

Table 6. Red Desert Complex Allotments

Allotment Name and Number	HMA	Number and Kind of Livestock	Authorized Use Period	BLM AUMs	Exchange Of Use AUMs	Number of Permits within the Allotment
Alkali Creek Sheep #17057	Crooks Mountain	2,686 S	04/01-04/30, 10/02-10/31	1,060	0	1
Antelope Hills #17055	Antelope Hills	1,581 C 2,868 S	05/20-09/20, 05/20-10/01	8,365	1,225	10
Arapahoe Creek #17056	Crooks Mountain, Green Mountain	2,756 C 2,422 S	05/01-10/01, 11/01-03/31	15,077	0	12
Mountain #32030	Green Mountain	371 C	05/01-11/16	1,976	305	2
Whiskey Peak Incommon #12003	Green Mountain	1010 C 2,528 S	06/01-12/31, 07/16-11/30	7,739	0	2
Stewart Creek #10102	Stewart Creek	89 C 760 C 505 C 48 C	11/1-4/30 5/16-12/30 5/1-11/16 5/28-8/30	8,380	0	4
Cyclone Rim #10103	Lost Creek, Antelope Hills	600 C 2043 C 5930 S 3580 S 811 S 170 S	5/1-12/15 11/1-4/30 10/1-4/15 11/1-3/31 5/25-12/9 5/1-7/15	27,292	0	4

The rangelands in the HMAs provide seasonal grazing for cattle and sheep. Range improvements (e.g., stock ponds, water wells, reservoirs fences, etc.) authorized by the BLM are primarily maintained under cooperative agreements with the livestock permittees. These water developments are important sources of water for wild horses and wildlife as well as livestock. Fencing is primarily used to keep livestock in specific allotments during specified seasons of use thereby improving range management. There is limited amount of fencing found within the HMAs when compared to surrounding grazing allotments.

3.5.2 Environmental Consequences

Impacts of Alternative 1

The proposed gather could directly interfere with livestock operations within or adjacent to the HMAs. Gather operations may temporarily cause some disturbance to livestock, especially during the fall when the livestock are being removed from their respective allotments. Livestock operators within the gather area would be notified prior to the gather, enabling them to take

precautions and avoid conflict with gather operations. If gather operations are conducted after the authorized grazing period, the interference to livestock operations would be eliminated.

Over the short term (1-2 years), an expected improvement in the quality and quantity of forage availability is expected in areas outside the HMA where wild horses would be removed. This would provide opportunity for improved range conditions within the areas outside of the HMA boundaries. Over the mid to long-term, competition for forage resources would remain high because wild horse numbers would continue to exceed AML levels. Wild horses gathered within HMAs would be fertility treated and placed back into their respective HMAs. Since the wild horse numbers exceed the AML levels, there would be no improvement in range conditions over the short and mid-term periods because there would be no net reduction in wild horse numbers. Over the long-term (3+ years), the wild horse numbers would increase because of the fertility control treatments would no longer be effective. As a result, there would be greater competition with permitted livestock for forage and water. Range conditions would decline at a faster rate than the Proposed Action, but less than Alternative 3.

A complete analysis of livestock grazing and grazing impacts within a portion of the Red Desert Complex can be found in the Green Mountain Common Grazing Allotment EA found at:

http://www.blm.gov/wy/st/en/info/NEPA/documents/lfo/greenmtn_common.html.

Grazing in this area is also addressed in the Record of Decision and Approved Rawlins Resource Management Plan (BLM 2008b, p. 18-19; BLM 2008a, p. 4-69 to 4-82), Great Divide Basin/Ferris Mountain and Seminoe Mountain Watersheds Standards and Guidelines Assessment (BLM 2013), and the Lander RMP (FEIS) (p. 479-487).

Impacts of Alternative 2

Impacts associated with capture and removal operations are expected to be similar to Alternative 1. There would be fewer horses remaining inside and outside of the HMAs. This would allow for the return of greater flexibility for livestock management and improved likelihood of utilizing the forage allocated to livestock. Improvement of forage quality, quantity, and vigor over the mid and long term (3-5 years) would likely result from implementation of this alternative when compared to Alternatives 1 and 3 Livestock/wild horse conflicts would be fewer when compared to Alternatives 1 and 3 because there would be far fewer wild horses within the project area. Similarly, the condition of riparian areas is likely to improve at a much faster rate. Wild horse numbers would be brought to the lower end of AML (approximately 480 wild horses), resulting in greater probability that wild horse gathers within the Complex would be more infrequent.

Impacts of Alternative 3

A wild horse gather would not take place and population control methods would not be implemented. This would allow wild horse populations to continue to increase and likely continue expanding outside of established HMA areas. Forage conditions would be expected to continue to deteriorate, affecting other animals that depend on the same resource. Winter sheep operations would likely be the least impacted initially, but as wild horse diets become more dominated by shrubs and grass availability is low during the winter months, the winter use by

sheep would also be displaced by wild horses as demand for space, forage, and water increased. Displacement of livestock would be slow and indirect at first. However, as time progresses, livestock and wild horse conflicts would increase exponentially as the wild horse population increases. The need for maintenance on all range improvements would increase due to increased numbers of wild horses and their potential to damage range improvements. Range conditions throughout the area would deteriorate, and even if wild horses are rounded up in the future or a population crash occurs during a bad winter, long-term vegetation recovery may require continued nonuse by livestock operators.

3.6 Cultural Resources

3.6.1 Affected Environment

Prehistoric sites known to exist within the HMAs include open camps and lithic scatters. Historic sites known to exist include trash dumps, trails, roads, and structures associated with early settlement and commerce, or with the local ranching industry. Additionally, stone circle sites, rock alignments, rock art and other sites potentially sensitive to Native American Tribes may occur in the area. Cultural Resource program support for the wild horse capture would consist of file search (Class I) and/or intensive field (Class III) inventories, and, if necessary, mitigation of impacts or relocation of the proposed temporary horse holding sites. Support includes consultation with the Wyoming State Historic Preservation Office according to the Wyoming State Protocol agreement of the BLM National Cultural Resources Programmatic Agreement, which states inventory may not be required for "Animal traps and corrals in use for three days or less" (SHPO Protocol Appendix B-21).

3.6.2 Environmental Consequences

Impacts of Alternative 1 and Alternative 2

Direct or indirect impacts to cultural resources are not anticipated to occur from implementation of Alternative 1 or 2. All gather sites and temporary holding facilities would be analyzed for impacts to historic properties prior to construction. The RFO and LFO archeologists would review all proposed temporary holding facility locations to determine if known historic properties are present and if a Class III inventory is necessary. If cultural resources are encountered at proposed gather sites or temporary holding facilities, those locations would not be utilized unless they could be modified to avoid or mitigate adverse impacts to significant cultural resource site(s).

Within the HMAs, impacts to historic properties are limited to trampling. Fewer horses would result in reduced potential disturbance to historic properties. Any increased trampling during gather operations would be minimal.

Impacts of Alternative 3

At the present time and for the short term future, taking no action to remove excess wild horses is not expected to adversely affect historic properties. However, a substantial increase in the

number of wild horses over time may adversely affect historic properties from trampling, rubbing or otherwise changing the character of a site.

4.0 CUMULATIVE IMPACTS

NEPA regulations define cumulative impacts as impacts on the environment that result from the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions (40 CFR 1508.7). Reasonably foreseeable future actions are those for which there are existing decisions, funding, formal proposals, or which are highly probable, based on known opportunities or trends. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Past, Present, and Reasonably Foreseeable Actions

The Past, Present, and Reasonably Foreseeable Future Actions applicable to the assessment area are identified in Table 7. Assessment areas are determined by what is practical and reasonable for each resource.

Table 7. Past, Present, and Reasonably Foreseeable Future Actions

Project – Name or Description	Status (x)		
	Past	Present	Future
Livestock grazing	x	x	x
Wild horse gathers	x	x	x
Mineral exploration/Oil and gas exploration/Abandoned mine land reclamation	x	x	x
Recreation	x	x	x
Water and spring development	x	x	x
Fence construction (including protective fencing)	x	x	x
Invasive weed inventory/treatments	x	x	x
Wildlife/Big game studies		x	x
Wild horse issues, AML adjustments and planning	x	x	x

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

Beginning in the fall of 2015, the grazing permittees will start constructing the Granite Creek Rocks Fence in the Antelope Hills Allotment to improve riparian habitat. The southern boundary of this fence was designed to reduce interference to wild horses migrating through the area, while protecting wetland habitat from livestock grazing use (portions of the fence will be removable fence, removed when livestock are not present). For more information on the 2011 Final Decision and fence construction, please refer to:

http://www.blm.gov/wy/st/en/info/NEPA/documents/lfo/greenmtn_common.html

Effect of Past, Present, and Reasonably Foreseeable Future Actions
All resource values described for the Affected Environment have been evaluated for cumulative impacts. If there are no direct or indirect impacts to said resources, there are likewise no expected cumulative impacts. The resources evaluated in this section for cumulative effects include: Wild Horses, Wildlife, Vegetation, Soils, Watershed, Recreation, Livestock Grazing, and Heritage Resources (Cultural Resources and Native American Concerns).

4.1 Wild Horses

Numerous gathers of wild horses have occurred throughout the Red Desert Complex in the past. The most recent gather of wild horses was in November of 2011; these gathers were necessary to bring the wild horse population in line with population management goals. Fertility control has been implemented in the past. Genetic testing has been completed in the Red Desert Complex; the results indicate that the existing wild horse population has variability levels high enough that no action to increase diversity is needed at this point. Depending upon the population size the herd may need some monitoring but there should be few or no problems for at least ten years.

Past activities which may have affected wild horses within the Red Desert Complex include recreational uses, livestock grazing and management, and energy development. These activities can reduce the quantity and quality of vegetation, as well as water quality and quantity, and result in increased human presence. Repeated horse gathers in the same areas or conducted too frequently can affect wild horse behavior making them harder to capture.

All other foreseeable activities would likely result in negligible impacts to wild horses in the long term. This is because the areas of disturbance would be small compared to the overall size of the Red Desert Complex and are usually short term.

Under the No Action Alternative, there would be no long-term cumulative benefits to wild horses. Future generations of wild horses would experience range deterioration. At the current rate of annual population growth, the projected wild horse population could exceed 4,000 animals within 4 years. Left unchecked, irreparable damage to the habitat could result.

4.2 Wildlife, Threatened and Endangered Species, Special Status Species, and Migratory Birds

Historic use by livestock, wild horse grazing, recreation, mineral exploration, mining and vegetation harvesting have likely impacted wildlife, special status species, and migratory bird habitat within the Red Desert Complex, especially near water locations. These activities result in loss of habitat and disruption of movement patterns. The current overpopulation of wild horses is also impacting wildlife by increasing the competition for available forage, water and thermal protection. Cumulative impacts associated with range management, such as construction of other water projects and invasive weed treatments, are beneficial for wildlife and wildlife habitat. These projects/activities are implemented to enhance rangeland condition which benefit wildlife species and associated habitat.

The cumulative impacts associated with implementation of Alternative 1 or 2 would lead to overall improvement of rangeland resources and wildlife habitat, though under the Proposed Action the improvements occur quicker and would last longer. Under the Proposed Action, wild horse populations would be managed within the AML range over the next 3-4 year period. As a result, fewer wild horses would be present and the quality and quantity of these resources would be expected to improve. When combined with past, present, and reasonably foreseeable future actions, and the identified mitigation measures, the potential for significant adverse cumulative impacts to wildlife habitat from implementation of Alternatives 1 or 2 would be negligible.

No long-term cumulative benefits to any rangeland user would be expected with implementation of the No Action Alternative. The No Action Alternative would be expected to result in range deterioration, and lead to long-term reduction of range and riparian health. Once range and riparian health is reduced, any reasonably foreseeable projects or other management actions are unlikely to significantly improve habitat for wildlife, sensitive species, or other values

4.3 Livestock Grazing, Vegetation, and Soils

The vegetation within the Red Desert Complex has been utilized by wild horses since the project area was first settled. Domestic livestock have grazed all portions of the Red Desert Complex in the past and are expected to continue in the future. Water is a limiting resource in some areas within the Red Desert Complex. As a result, existing water sources tend to be heavily utilized in some areas by livestock, wildlife, and wild horses which cause soil compaction around the immediate vicinity of water and competition with other animals.

Implementation of Alternative 1 or 2 would contribute to isolated areas of vegetation disturbance through the gather activities. Under Alternative 1 and Alternative 3, AML would still be exceeded. When combined with other foreseeable future actions such as recreation, mineral exploration and reclamation, livestock grazing, and invasive weed treatment, would result in greater risk to the resources. Under the Proposed Action, however, the achievement of AML in conjunction with proper grazing management and other foreseeable future actions such as recreation, mineral exploration and reclamation, and invasive weed treatment, would contribute to improved vegetative resources.

Under Alternative 1, vegetation improvements are mostly likely to occur outside of the HMA. Under the Proposed Action, ecological condition improvements would be expected to occur throughout the Complex. Excessive use by wild horses would not occur at water sources outside the Red Desert Complex, and utilization and competition between animals would be reduced. Key forage and browse species would improve in health, abundance and robustness, and would be more likely to set seed and reproduce, which in turn would contribute to improvements in rangeland health. The proposed population control and other foreseeable actions would begin to offset past negative trends in habitat modification by allowing for attainment of rangeland health standards and site-specific management objectives.

Implementation of the No Action Alternative would result in continued expansion in area and severity of degradation of vegetation by wild horses due to increasing population pressures. In the long term, this would cause more palatable native vegetation to be replaced by more

opportunistic native and/or nonnative species. These species tend to both expand in disturbed soil areas and be less palatable. Past degradation would not be offset and downward trends would continue to occur. When combined with past, present, and reasonably foreseeable future actions the potential for significant cumulative impacts to livestock grazing, vegetation, and soils is expected to be higher than Alternatives1 or 2 due to increased wild horse populations.

4.4 Recreation

Implementation of Alternative 1 or 2 would allow for continued viewing of wild horses. The aesthetic values provided in association with a variety of recreational opportunities would also be enhanced as the quantity and quality of vegetation within the area improves.

Implementation of the No Action Alternative would allow for recreational opportunities as they currently exist. Viewing opportunities of wild horses would be greater under this alternative; however, heavy utilization of vegetation would occur, impacting the aesthetic values associated with various recreational opportunities. As animal health declines or animals leave the HMAs in search of food and water, some recreational opportunities would be less enjoyable. When combined with past, present, and reasonably foreseeable future actions the potential for significant cumulative impacts to recreation is expected to be higher than Alternative 1 or 2 due to less aesthetic values.

5.0 MITIGATION MEASURES AND SUGGESTED MONITORING

The BLM Contracting Officer Representative and Project Inspectors assigned to the gather would be responsible for ensuring contract personnel abide by contract specifications and SOPs. Ongoing rangeland, riparian, and wild horse monitoring would continue, including periodic aerial population counts.

Under the Alternative 1 and the Proposed Action, fertility control monitoring of treated mares would be conducted in accordance with the SOPs outlined in Appendix 4. Standard Operating Procedures for Population-level Porcine Zona Pellucida Fertility Control Treatments and routine monitoring of the herd health would continue.

The Red Desert Complex would continue to be monitored post-gather. Data would be collected which would assist the BLM in determining whether existing AMLs are appropriate or need future adjustment (either increase or decrease). Data collected would include observations of animal health and condition, climate (precipitation), utilization, distribution, population census, range condition and trend, riparian health, among other items.

Mitigation and monitoring are incorporated into the proposed action through standard operating procedures and policies, which have been developed over time. These SOPs (Appendices 1 and 4), along with BLM IMs 2010-135 (BLM 2010a), 2013-059 (BLM 2013b), 2015-070 (BLM 2015) represent the "best methods" for reducing impacts associated with gathering, handling, transporting, collecting herd data and applying fertility control.

Based on the analysis of impacts above and consideration of all design features, wild horse gather best management practices, standard operating procedures presented as part of the proposed action and alternatives, no additional mitigation measures are proposed or required.

6.0 RESIDUAL IMPACTS

There are no known residual impacts associated with the implementation of the action alternatives.

7.0 TRIBES, INDIVIDUALS, ORGANIZATIONS, OR AGENCIES CONSULTED

Tribes, individuals, organizations, and agencies were included in the scoping process (Appendix 7). The letter soliciting scoping comments for the proposed gather in the Red Desert Complex was mailed February 20, 2015. In addition, public hearings are held annually on a state-wide basis regarding the use of motorized vehicles, including helicopters and fixed-wing aircraft, in the management of wild horses. During these meetings, the public is given the opportunity to present new information and to voice any concerns regarding the use of the motorized vehicles. The High Desert District Office hosted the state-wide meeting on May 5, 2015; the current gather operation SOPs were reviewed in response to the concerns expressed and no changes to the SOPs were identified.

List of Preparers

This section contains the list of preparers and reviewers for this Environmental Assessment.

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APPENDIX 1 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* (BLM 2009b).

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 and IM 2013-059.

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 with plywood or metal without holes.

    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 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, strays, 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 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 willows, etc., that may be injurious to animals.

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

    c. 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.

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

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

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

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

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

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

D. Safety and Communications

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

2. 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.

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

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

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

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

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

E. Site Clearances

1. 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.

2. Prior to setting up a gather site or temporary holding facility, the 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.

3. 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

- Rawlins Field Office – Contracting Officer's Representative/Project Inspector: Benjamin Smith
  Alternate – Contracting Officer's Representative/Project Inspector: Jeremie Arterie
- Wyoming State Office – Contracting Officer's Representative/Project Inspector: N/A

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 Rawlins and Rock Springs Assistant Field Managers for Renewable Resources and the Rawlins and Rock Springs Field Managers will 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 Assistant Field Manager for Renewable Resources 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 2 Historical Gather Environmental Analyses and Tables

1. Lander Resource Area Wild Horse Herd Management Plan, Lander Herd Management Area Evaluation / Capture Plan and the associated Environmental Analyses WY-036-EA3-010 and WY-036-EA3-013, 1993.

2. The Great Divide Resource Area Wild Horse Herd Management Area Evaluation / Capture Plan and the associated Environmental Analyses WY-037-EA4-122 and WY037-EA4-121, 1994.

3. Wild Horse Gathering Inside and Outside of the Muskrat Basin, Rock Creek Mountain, Dishpan Butte and Conant Creek Wild Horse Herd Management Areas, EA No. WY-050-EA1-039, 2001.

4. Wild Horse Gathering Inside of the Green Mountain Wild Horse Herd Management Area EA No. WY-050-EA2-031, 2002

5. Wild Horse Gathering Inside and Outside of the Crooks Mountain Wild Horse Herd Management Area, EA No. WY-050-EA2-032, 2002.

6. Antelope Hills/Cyclone Rim Horse Management Area Capture/Removal and Fertility Control Lander Field Office, EA No. WY-050-EA4-060, 2004.

7. North Lander HMA Complex (Conant Creek, Rock Creek Mountain, Dishpan Butte and Muskrat Basin) Capture/Removal and Fertility Control Lander Field Office EA No. WY-050-EA4-061, 2004.

8. Green Mountain Horse Management Area Capture/Removal and Fertility Control Lander Field Office, EA No. WY-050-EA5-133, 2005.

9. Crooks Mountain Horse Management Area Capture/Removal and Fertility Control Lander Field Office, EA No. WY-050-EA06-129, 2006.

10. Removing Excess Wild Horses From the Adobe Town and Salt Wells Creek HMAs of the Rawlins and Rock Springs Field Offices EA No. WY030-05-EA-158, 2006.

11. Removing Excess and Stray Wild Horses From the Area North of Interstate 80 and West of US HWY 287 in the Rawlins Field Office, EA No. WY030-06-EA-165, 2006.

12. Adobe Town – Salt Wells Creek Herd Management Complex – Management Action and Environmental Assessment EA No. WY040-07-EA-37, 2007.

13. Wild Horse Gathering for the North Lander Complex Wild Horse Herd Management Areas (Conant Creek, Dishpan Butte, Rock Creek Mountain and Muskrat Basin)

Capture/Removal and Fertility Control, Lander Field Office, EA No. EA WY-050-EA08-95, 2008.

14. Wild Horse Gathering for the Red Desert Complex Wild Horse Herd Management Areas (Lost Creek, Stewart Creek, Green Mountain, Crooks Mountain, Antelope Hills), EA No. WY-030-2009-0258-EA, 2009.

15. Adobe Town – Salt Wells Creek Herd Management Area Complex Wild Horse Gather, EA No. WY-040-EA10-109, 2010.

16. Wild Horse Gathering for the North Lander Complex (Conant Creek, Dishpan Butte, Rock Creek Mountain and Muskrat Basin HMAs), EA No. WY-050-EA12-33, 2012.

Historic Gather Numbers: Lost Creek and Stewart Creek HMA's

Year	**HMA Name**	**Number Gathered**	**Number Removed**
1986	Lost Creek, Stewart Creek & Antelope Hills/Cyclone Rim (Previously Seven Lakes HMA)	88*	88*
1987	Lost Creek, Stewart Creek & Antelope Hills/Cyclone Rim (Previously Seven Lakes HMA)	184*	184*
1988	Lost Creek, Stewart Creek & Antelope Hills/Cyclone Rim (Previously Seven Lakes HMA)	63*	63*
1989	Lost Creek, Stewart Creek & Antelope Hills/Cyclone Rim (Previously Seven Lakes HMA)	154*	154*
1995	Lost Creek & Stewart Creek (Gathered and documented as one)	121	121
1997	Lost Creek & Stewart Creek (Gathered and documented as one)	190	143
1998	Lost Creek & Stewart Creek (Gathered and documented as one)	81	50
2001	Lost Creek HMA	302	302
2001	Stewart Creek HMA	105	105
2002	Lost Creek HMA	21	21
2002	Stewart Creek HMA	283	283
2003	Stewart Creek HMA	94	94
2006	Lost Creek HMA	285	231
2006	Stewart Creek HMA	267	212
2009	Stewart Creek HMA	305	212
2009	Lost Creek HMA	287	224
2011	Lost Creek HMA	114	73
2011	Stewart Creek HMA	205	106
	TOTALS:	**3,149**	**2,666**

Historic Gather Numbers: Antelope Hills/Cyclone Rim HMA

Year	HMA Name	Number Gathered	Number Removed
1986	Antelope Hills/Cyclone Rim	88*	88*
1987	Antelope Hills/Cyclone Rim	184*	184*
1988	Antelope Hills/Cyclone Rim	63*	63*
1989	Antelope Hills/Cyclone Rim	154*	154*
2000	Antelope Hills/Cyclone Rim	59	59
2001	Antelope Hills/Cyclone Rim	50	50
2004	Antelope Hills/Cyclone Rim	258	208
2009	Antelope Hills/Cyclone Rim	144	77
2011	Antelope Hills/Cyclone Rim	156	80
	Totals	**1,156**	**963**

Historic Gather Numbers: Crooks Mountain HMA

Year	HMA Name	Number Gathered	Number Removed
1985	Crooks Mountain	708	708
1996	Crooks Mountain	380	319
1998	Crooks Mountain	295	220
2002	Crooks Mountain	103	103
2006	Crooks Mountain	74	74
2009	Crooks Mountain	26	0
2011	Crooks Mountain	72	17
	Totals	**1,658**	**1,441**

Historic Gather Numbers: Green Mountain HMA

Year	HMA Name	Number Gathered	Number Removed
1980	Green Mountain	255	255
1984	Green Mountain	199	199
1993	Green Mountain	413	318
1995	Green Mountain	107	88
1996	Green Mountain	105	105
1997	Green Mountain	220	145
2002	Green Mountain	155	155
2003	Green Mountain	75	75
2005	Green Mountain	574	490
2006	Green Mountain	89	89
2009	Green Mountain	472	330
2011	Green Mountain	352	240
	Totals	**3,016**	**2,489**

APPENDIX 3 Genetic Diversity and Variability

Genetic Diversity and Viability

Blood samples were collected from horses removed during the 2001 and 2006 gathers to develop genetic baseline data (e.g. genetic diversity, historical origins of the herd, unique markers). Genetic samples (hair samples) were taken in 2009 and these samples were also analyzed by Dr. E. Gus Cothran, Equine Genetics Laboratory, Texas A&M University (Cothran). His conclusions and recommendations regarding genetic diversity in the Red Desert Complex of HMA's herd are summarized as follows:

Summary of the Lost Creek HMA-2009

"Genetic variability of this herd is fairly high. The values related to allelic diversity and heterozygosity are high. Genetic similarity results suggest a herd with mixed ancestry that primarily is North American. There is a possibility of some, although limited, Iberian ancestry."

Recommendations for the Lost Creek HMA - 2009

"Current variability levels are high enough that no action is needed at this point. The herd should be monitored to make sure population size remains stable or increase to make sure no dramatic reductions in variability take place."

Summary of the Stewart Creek HMA - 2009

"Genetic variability of this herd is generally high. The values related to allelic diversity are near above average while heterozygosity is high. The herd appears to be in genetic equilibrium despite a high percentage of alleles at risk of loss. Genetic similarity results suggest a herd with mixed ancestry that primarily is North American."

Recommendations for the Stewart Creek HMA - 2009

"Current variability levels are high enough that no action is needed at this point. The herd should continue to be monitored to make sure that population size does not fall to low levels (less than 100)."

Summary of the Antelope Hills/Cyclone Rim HMA - 2006

Genetic variability within the Antelope Hills/Cyclone Rim herd is near and slightly above the average for wild herds. The Herd has genetic markers that would reflect a similarity for the New World Spanish horse breeds. The genetic similarity to this group is relatively high for a mustang herd. In conclusion, the data support a strong Spanish heritage for this herd but there likely is some other type of blood within the group. The Antelope Hills portion of the herd shows a number of markers that are suggestive of Spanish blood, however, the overall similarity is greatest with the North American breeds and Spanish breed similarity is relatively moderate. Although one cannot rule out Spanish heritage, it does not look like that is the main component of this herd.

Recommendations for the Antelope Hills/ Cyclone Rime HMA -2006
This herd has reasonably high genetic variability so that no action need be taken at this time. However, the AML for this herd is fairly low so that future monitoring will be needed.

Summary of the Green Mountain and Crooks Mountain HMA's - 2006
Blood samples were collected from Crooks Mountain and Green Mountain wild horses in previous gathers to develop genetic baseline data (e.g. genetic diversity, historical origins of the herd, unique markers). The samples were analyzed by a geneticist to determine the degree of heterozygosity for the herd. The results showed enough genetic diversity to prevent inbreeding and negative genetic mutation. This genetic data would be incorporated into the Herd Management Area Plan in the future. There is known movement between the HMA's (Green Mountain, Antelope Hills/Cyclone Rim, Stewart Creek and Lost Creek) and this helps to diversify these gene pools and contribute to herd heterozygosity.

The following summarizes current knowledge of genetic diversity as it pertains to wild horses.

- Smaller, isolated populations (<200 total census size) are particularly vulnerable when the number of animals participating in breeding drops below a minimum needed level (Coates-Markle, 2000).
- It is possible that small populations will be unable to maintain self-sustaining reproductive ability over the long term, unless there is a natural or management-induced influx of genetic information from neighboring herds. An exchange of only 1-2 breeding age animals per generation would maintain the genetic resources in small populations of about 100 animals, thus obviating the need for larger populations in all cases (Singer, 2003).
- There is little imminent risk of inbreeding since most wild horse herds sampled to date, have large amounts of genetic heterozygosity, genetic resources are lost slowly over periods of many generations, wild horses are long-lived with long generation intervals, and there is little imminent risk of in breeding or population extinction (Singer, 2003).
- Genetic effective population size (Ne) is a difficult number to calculate for wild horses, since the calculation is complicated by many factors inherent in wild horse herds. No single universally acceptable formula exists to deal with these complexities, and no standard goal for Ne or loss of genetic resources currently exists for wild horse herds. A goal of Ne=50 is currently being applied as an estimate for Ne in wild horse herds (Singer, 2000).
- Current efforts with wild horses suggest management should allow for a 90% probability of maintaining at least 90% of the existing population diversity over the next 200 years (Coates-Markle, 2000).

The following summarizes what is known about the Red Desert HMA Complex as it pertains to genetic diversity:

- The current estimated population for the Red Desert HMA Complex is 1,024 horses (pre 2015 foaling and not including horses outside the HMAs).

- Ne (genetic effective population size) for Red Desert HMA Complex has not been established.

Current knowledge is limiting for application of these concepts to wild horse herds managed by the BLM. As more research is completed, and knowledge becomes available, it will be applied to the HMAs managed by the RFO and LFO.

APPENDIX 4 Standard Operating Procedures for Application of Fertility Control

The following management and monitoring requirements are part of the Alternatives analyzed.

- The 22-month pelleted PZP vaccine would be administered by trained BLM personnel.

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

- Delivery of the vaccine would be as an intramuscular injection while the mares are restrained in a working chute. 0.5 cubic centimeters (cc) of the PZP vaccine would be emulsified with 0.5 cc of adjuvant (a compound that stimulates antibody production) and loaded into the delivery system. The pellets would be loaded into the jabstick for the second injection. With each injection, the liquid and pellets would be propelled into the left hind quarters of the mare, just below the imaginary line that connects the point of the hip and the point of the buttocks.

- All treated mares will be freeze-marked with two 3.5-inch letters on the left hip, and a smaller number on the left side of the neck to track what HMA that mare came from, for treatment tracking purposes. This step is to enable researchers to positively identify the animals during the research project as part of the data collection phase.

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

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

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

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

APPENDIX 5 Population Model Overview

WinEquus is a program used to simulate the population dynamics and management of wild horses created by Stephen H. Jenkins of the Department of Biology, University of Nevada at Reno. For further information about this model, you may contact Stephen H. Jenkins at the Department of Biology/314, University of Nevada, Reno, NV 89557.

Detailed information is provided within the WinEquus program available at http://unr.edu/homepage/jenkins, including background about the use of the model, the management options that may be used, and the types of output that may be generated.

The population model for wild horses was designed to help the BLM evaluate various management strategies that might be considered for a particular area. The model uses data on average survival probabilities and foaling rates of horses to project population growth for up to 20 years. The model accounts for year-to-year variation in these demographic parameters by using a randomization process to select survival probabilities and foaling rates for each age class from a distribution of values based on these averages. This aspect of population dynamics is called environmental stochasticity, and reflects the fact that future environmental conditions that may affect wild horse population's demographics can't be established in advance. Therefore each trial with the model will give a different pattern of population growth. Some trials may include mostly "good" years, when the population grows rapidly; other trials may include a series of several "bad" years in succession. The stochastic approach to population modeling uses repeated trials to project a range of possible population trajectories over a period of years, which is more realistic than predicting a single specific trajectory.

The model incorporates both selective removal and fertility treatment as management strategies. A simulation may include no management, selective removal, fertility treatment, or both removal and fertility treatment. Wild horse and burro specialists can specify many different options for these management strategies such as the schedule of gathers for removal or fertility treatment, the threshold population size which triggers a gather, the target population size following a removal, the ages and sexes of horses to be removed, and the effectiveness of fertility treatment.

To run the program, one must supply an initial age distribution (or have the program calculate one), annual survival probabilities for each age-sex class of horses, foaling rates for each age class of females, and the sex ratio at birth. Sample data are available for all of these parameters. Basic management options must also be specified.

Population Modeling – Red Desert Creek Complex

To complete the population modeling for the Red Desert Complex, version 1.40 of the WinEquus program, created April 2, 2002, was utilized.

Objectives of Population Modeling

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

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

Population Data, Criteria, and Parameters utilized for Population Modeling

Initial age structure for the 2015 herds were developed from age structure data collected during the 2011 Red Desert Complex gather. The following table shows the proposed age structure that was utilized in the population model for the Proposed Action and Alternatives:

Initial Age Structure Red Desert Complex

Age Class	Females	Males
Foal	264	224
1	184	189
2	140	176
3	107	86
4	72	61
5	62	38
6	37	40
7	34	39
8	17	20
9	34	37
10-14	99	83
15-19	40	48
20+	25	29
Total	**1115**	**1070**

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

Sex ratio at Birth: 47% Females; 53% Males

The following percent effectiveness of fertility control was utilized in the population modeling for Alternative 1:

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

The following table displays the removal parameters utilized in the population model for the Proposed Action and all Alternatives:

Removal Criteria

Age	***Percentages for Removals***	
	Females	**Males**
Foal	100%	100%
1	100%	100%
2	100%	100%
3	100%	100%
4	100%	100%
5	0%	0%
6	0%	0%
7	0%	0%
8	0%	0%
9	0%	0%
10-14	0%	0%
15-19	0%	0%
20+	0%	0%

The following table displays the contraception parameters utilized in the population model for Alternative 1:

Contraception Criteria (Alternative 1)

Age	**Percentages for Fertility Treatment**
Foal	0%
1	100%
2	100%
3	100%
4	100%
5	100%
6	100%
7	100%
8	100%
9	100%
10-14	100%
15-19	100%
20+	100%

Population Modeling Criteria

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

- Starting Year: 2015
- Initial gather year: 2015
- Gather interval: regular interval of three years
- Gather for fertility treatment regardless of population size: No
- Continue to gather after reduction to treat females: Yes
- Sex ratio at birth: 53% males
- Percent of the population that can be gathered: 80%
- Minimum age for long-term holding facility horses: Not Applicable
- Foals are not included in the AML
- Simulations were run for 10 years with 100 trials each

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

Population Modeling Parameters

Modeling Parameter	Alternative 1 Fertility Control Only (Treat & Release)	Alternative 2 (Remove to Low Limit of Management Range & Fertility Control)	Alternative 3 (No Removal & No Fertility Control)
Management by removal and fertility control	Yes	Yes	N/A
Management by removal only	No	No	N/A
Threshold Population Size for Gathers in the HMAs	1,703 for the Complex. This is the number of wild horses projected to be inside of the Complex with 482 outside of the HMA boundaries.	125 Stewart Creek 60 Lost Creek 170 Green Mountain 65 Crooks Mountain 60 Antelope Hills	N/A
Target Population Size Following Gathers	1,703 for the Complex. This is the number of wild horses projected to be inside of the Complex with 482 outside of the HMA boundaries.	125 Stewart Creek 60 Lost Creek 170 Green Mountain 65 Crooks Mountain 60 Antelope Hills	N/A
Gather for fertility control regardless of population size	Yes	Yes	N/A
Gathers continue after removals to treat additional females	Yes	Yes	N/A
Effectiveness of Fertility Control: year 1	94%	94%	N/A
Effectiveness of Fertility Control: year 2	82%	82%	N/A
Effectiveness of Fertility Control: year 3	68%	68%	N/A

Results of WinEquus Population Modeling

Population modeling was completed for the proposed action and the alternatives. One hundred trials were run, simulating population growth and herd demographics to determine the projected herd structure for the next four years, or prior to the next gather. The computer program used simulates the population dynamics of wild horses. It was written by Dr. Stephen H. Jenkins, Department of Biology, University of Nevada, Reno, under a contract from the National Wild Horse and Burro Program of the Bureau of Land Management and is designed for use in comparing various management strategies for wild horses.

Data from the January 2000 Clan Alpine study, in Nevada, determined the fertility rates for the 2-year PZP vaccine with the treatment of 96 mares. The test resulted in fertility rates in treated mares of 6% year one and 18% year two.

Interpretation of the Model

The estimated populations for the population modeling consist of: 2,185 wild horses in the Red Desert Complex based on the April 2015 census plus a 20% foal crop. Year one is the baseline starting point for the model, and reflects wild horse numbers immediately prior to the gather action and also reflects a slightly skewed sex ratio which favors males. A sex ratio of 53:47 was entered into the model for the post gather action population. In this population modeling, year one would be 2015. Year two would be exactly one year in time from the original action, and so forth for years three, four, and five, etc. Consequently, at year eleven in the model, exactly ten years in time would have passed. In this model, year eleven is 2025. This is reflected in the Population Size Modeling Table by "Population sizes in ten years" and in the Growth Rate Modeling Table by "Average growth rate in 10 years." Growth rate is averaged over ten years in time, while the population is predicted out the same ten years to the end point of year eleven. The Full Modeling Summaries contain tables and graphs directly from the modeling program.

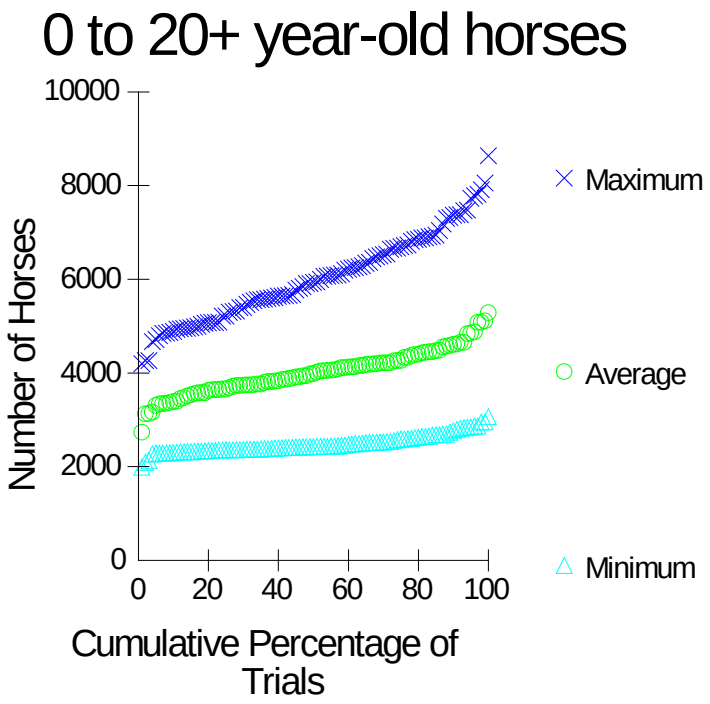
The initial herd size, sex ratio and age distribution for 2015 was structured by the WinEquus Population Model using data from the horses gathered and removed during the 2011 gather. This initial population data was then entered into the model and the model was used to predict various outcomes of the different alternatives, including the No Action Alternative for comparison purposes.

The parameters for the population modeling were:

1. Gather when population exceeds 1,703 wild horses in the Red Desert Complex for Alternative 1 and 724 wild horses in the Red Desert Complex for Alternative 2.
2. Foals are not included in AML
3. Percent to gather: 80%
4. Three years between gathers
5. Number of trials: 100
6. Number of years: 10
7. Initial calendar year: 2015
8. Initial population size: 2,185 wild horses in the Red Desert Complex.
9. Population size after gather would be: 480 wild horses in the Red Desert Complex.
10. Implement selective removal criteria
11. Fertility control Yes for Alternative 1 and Yes for Alternative 2, the Proposed Action

Alternative 1-

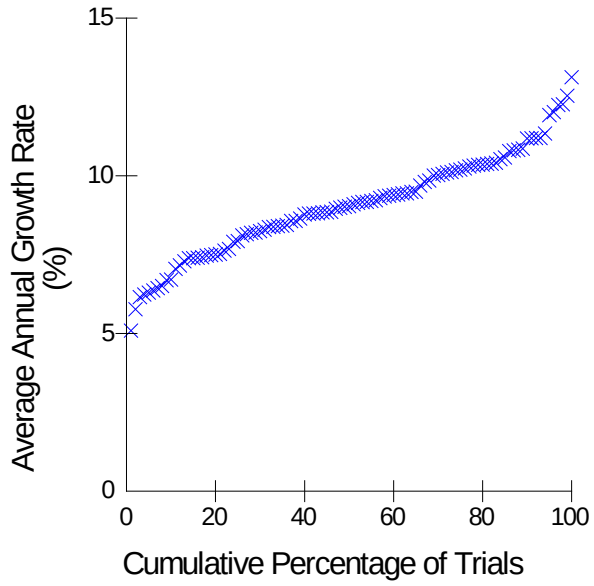
Population Size and Modeling Graph and Table (Fertility Control Only (Treat & Release))



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	**AVERAGE**	**MAXIMUM**
Lowest Trial	1992	2733	4149
10th Percentile	2301	3391	4910
25th Percentile	2358	3670	5256
Median Trial	2426	4002	5940
75th Percentile	2587	4298	6708
90th Percentile	2778	4611	7372
Highest Trial	3065	5285	8638

* 0 to 20+ year-old horses

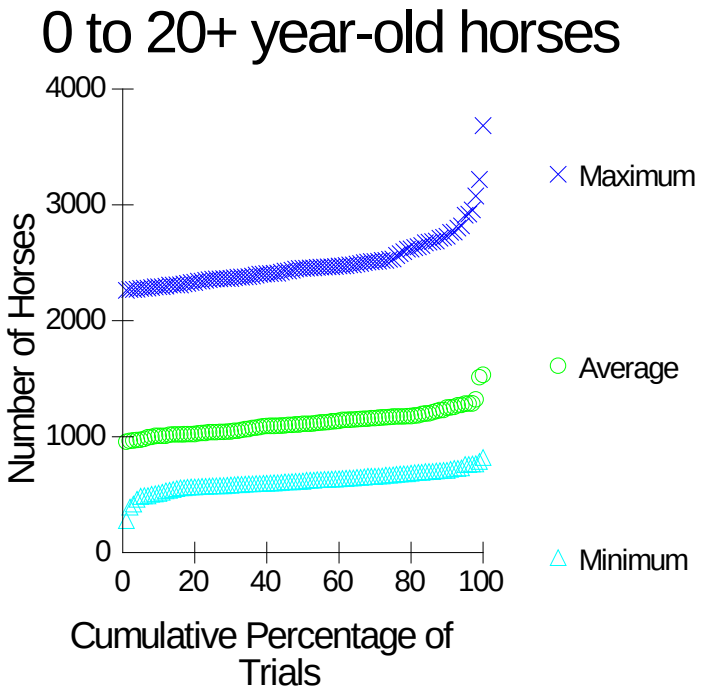
Growth Rate Modeling Graph and Table



AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	5.1%
10th Percentile	6.9%
25th Percentile	8.0%
Median Trial	9.1%
75th Percentile	10.2%
90th Percentile	11.2%
Highest Trial	13.1%

Alternative 2: Proposed Action:

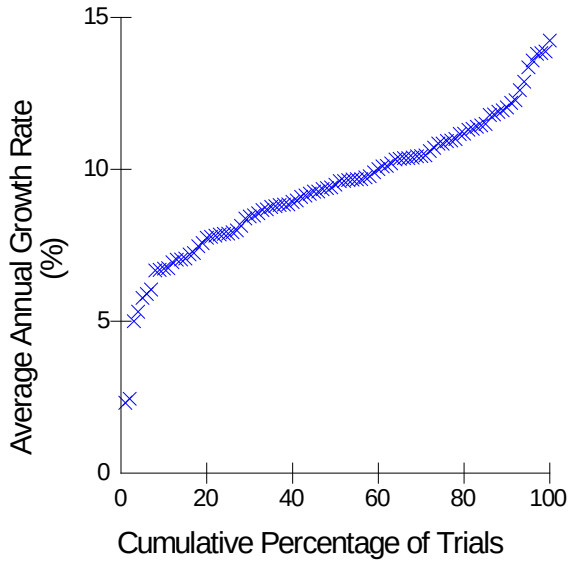
Population Size and Modeling Graph and Table (Remove to Low Limit of Management Range & Fertility Control)



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	**AVERAGE**	**MAXIMUM**
Lowest Trial	275	956	2262
10th Percentile	516	1006	2293
25th Percentile	576	1038	2360
Median Trial	620	1110	2452
75th Percentile	672	1172	2548
90th Percentile	714	1251	2746
Highest Trial	820	1532	3683

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table



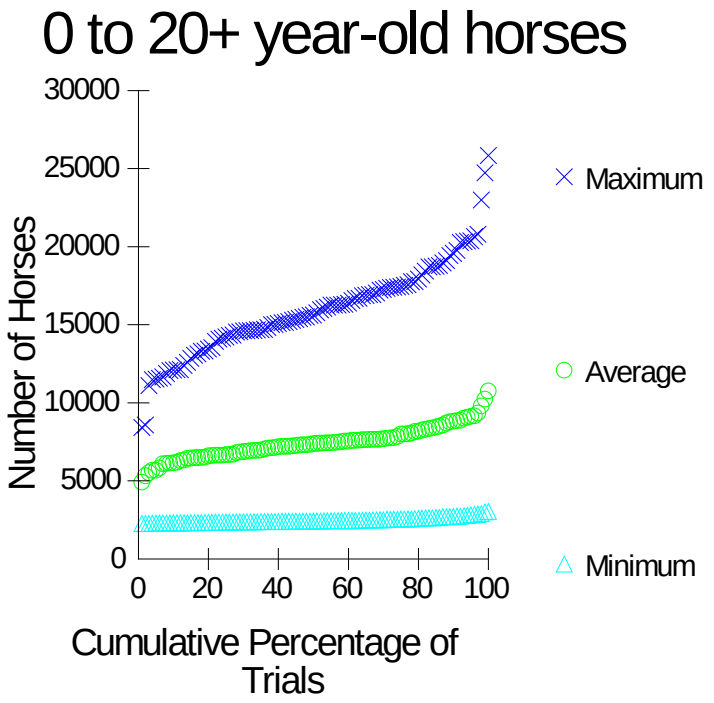
AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	2.3%
10th Percentile	6.7%
25th Percentile	7.9%
Median Trial	9.6%
75th Percentile	10.9%
90th Percentile	12.1%
Highest Trial	14.2%

<u>Alternative 3</u> – No Action

The changed parameters for the population modeling were:

Do not gather in 2015
Foals are not included in AML
Percent to gather: 0

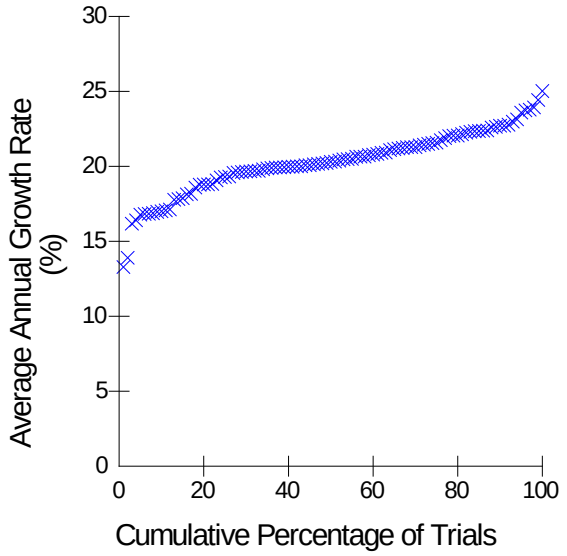
Population Size Modeling Graph and Table (No Removal & No Fertility Control)



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	**AVERAGE**	**MAXIMUM**
Lowest Trial	2267	4914	8423
10th Percentile	2314	6175	12110
25th Percentile	2358	6684	14265
Median Trial	2426	7387	15697
75th Percentile	2552	8005	17486
90th Percentile	2724	8839	19663
Highest Trial	3051	10761	25839

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table



AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	13.3%
10th Percentile	17.0%
25th Percentile	19.3%
Median Trial	20.3%
75th Percentile	21.7%
90th Percentile	22.7%
Highest Trial	25.0%

APPENDIX 6 Population Estimate and Methods

MEMORANDUM

To: Paul Griffin (BLM)
CC: Dennis Carpenter, Scott Fluer, Bryan Fuell, Ben Smith, Trent Staheli, Rubel Vigil, Tim Vosburgh, June Wendlandt, Bea Wade (BLM).
From: Bruce Lubow, IIF Data Solutions
Date: 17 July 2015
RE: Statistical analysis for 2015 survey of the Red Desert Complex horse population.

I. Summary Table

Survey areas and Dates:	April 6, 2015	Antelope Hills HMA and 'the middle'.
	April 7, 2015	Crooks Mountain HMA, Green Mountain HMA, Stewart Creek HMA and 'the middle'.
	April 9, 2015	Green Mountain HMA, Stewart Creek HMA.
	April 10, 2015	Stewart Creek HMA, Lost Creek HMA.
Type of Survey	Simultaneous Double-observer	
Aviation Company	Tony Herbie, pilot, Sky Aviation (Worland, WY)	
Agency Personnel	Ben Smith, Trent Staheli, Tim Vosburgh, Eric Collier (BLM), Paul Griffin (USGS)	

Table 1. Estimated population sizes (Estimate) are for the numbers of horses in the surveyed areas at the time of survey. For HMAs and for the complex as a whole, 90% confidence intervals are shown in terms of the lower limit (LCL) and upper limit (UCL). The coefficient of variation (CV) is a measure of precision; it is the standard error as a percentage of the estimated population. Number of horses seen (No. Seen) leads to the estimated percentage of horses that were present in the surveyed area, but that were not recorded by any observer (% Missed). The estimated number of horses associated with each HMA but located outside the HMA's boundaries is already included in the total estimate for that HMA. I also present the estimated numbers of horses in certain discrete areas outside of the HMA boundaries of interest to managers; these horses are already reflected in the HMA totals and complex total estimates, but are provided here for reference.

Area	Age Class	Estimate (No. Horses)	LCL [a]	UCL	Std Err	CV	No. Horses Seen	% Missed	Estimated # of Groups	Estimated Group Size	Foals per 100 Adults [b]	Est. No. Horses Outside HMA
Antelope	Total	208	171	253	23.8	11.5%	193	7.0%	16	12.9	7.6	112
Hills	Foals	15	9	22	3.8	25.9%						
HMA [c]	Adults	193	162	233	20.3	10.5%						
Crooks	Total	202	175	235	20.2	10.0%	187	7.6%	35	5.8	5.7	127
Mountain	Foals	11	8	14	1.7	15.9%						
HMA	Adults	191	167	222	18.7	9.7%						
Green	Total	854	803	931	44.9	5.3%	795	6.9%	99	8.6	4.2	137
Mountain	Foals	35	30	42	4.5	12.9%						
HMA	Adults	819	774	892	41.3	5.0%						
Stewart	Total	431	412	454	14.3	3.3%	421	2.4%	55	7.8	1.7	6
Creek	Foals	7	6	9	0.5	7.1%						
HMA	Adults	424	405	447	14.1	3.3%						
Lost	Total	208	163	258	28.7	13.8%	188	9.5%	18	11.4	6.9	20
Creek	Foals	13	9	18	2.3	17.0%						
HMA [c]	Adults	194	150	241	26.7	13.8%						
Complex	Total	1903	1817	2014	59.9	3.1%	1784	6.3%	224	8.5	4.4	402
Total	Foals	81	70	94	6.2	7.7%						
	Adults	1822	1739	1921	54.9	3.0%						

Table1 (continued)

Estimated numbers of horses in sub-areas; these horses are already included in the totals for the HMAs and complex, above.

"The Middle"	Total	300	277	331	16.0	5.3%	287	4.3%	33	9.0	6.3	270
	Foals	18	15	21	1.3	7.6%						
	Adults	282	260	311	14.9	5.3%						
Crooks North	Total	31	26	38	3.9	12.8%	29	5.8%	8	4.0	3.4	28
	Foals	1	1	2	0.1	11.8%						
		30	25	37	3.9	13.1%						
Green Mountain North	Total	38	23	55	7.9	20.7%	36	6.3%	3	12.1	3.0	19
	Foals	1	0	3	0.6	49.5%						
	Adults	37	23	53	7.4	19.9%						
Green Mountain South	Total	40	24	54	8.6	21.3%	36	10.6%	6	6.9	3.0	32
	Foals	1	0	3	0.4	37.5%						
	Adults	39	23	53	8.4	21.4%						

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

[b] The estimated ratio of foals to adults reflects what was observed during these April surveys and likely does not represent the full cohort of foals for this year.

[c] Initial counts of raw numbers of horses seen, circulated within BLM Wyoming, had 11 more animals seen in Antelope Hills HMA and 11 less animals seen in Lost Hills HMA; this discrepancy was because a group of 9 adults and 2 foals in 'the middle' were initially associated as being closer to Antelope HMA. For this analysis, though, that group of 9 adults and 2 foals was associated with Lost Creek HMA.

II. Narrative

In April of 2015, Bureau of Land Management (BLM) personnel conducted simultaneous double-count aerial surveys (Lubow and Ransom 2007) of the wild horse populations in the Red Desert complex of Wyoming. This complex includes all of the Antelope Hills HMA, Crooks Mountain HMA, Green Mountain HMA, Stewart Creek HMA, and Lost Creek HMA, as well as the lands adjacent to and nearly surrounded by (in the middle of) these five HMAs (Figure 1). In keeping with recommendations of the National Academies of Science recommendations (NAS 2013) and BLM policy (BLM 2010), these areas were surveyed together at one time, using a survey method that allows for estimating the number of horses that were present, but not seen by any observer.

I analyzed these data to estimate sighting probabilities, which I then used to correct the raw counts for systematic biases (undercounts) that are known to occur in aerial wildlife surveys, and to provide confidence intervals (which are measures of uncertainty) associated with the estimated population sizes for the HMAs and surrounding areas that were surveyed.

Population Results

The estimated total horse populations (Table 1) within these areas provided a relatively large sample size of observations (184 horse groups, Table 1, Figure 1), on which to base statistical estimates of sighting probability. Estimated sighting probabilities were high, resulting in a statistically estimated 93.7% of horses present in the surveyed areas being observed, on average, although the percentage missed was as high as 9.5% at Lost Creek HMA. The high sighting probability resulted in reasonable confidence intervals and coefficients of variation that are adequate for management purposes. Biases in the estimates could still exist due to heterogeneity of sighting probabilities that were not fully accounted for in this dataset, particularly due to the fairly large number of back seat observers used in this survey, as I discuss below.

The simultaneous double count method has not been used to estimate this population prior to the current survey, so the estimates presented here may not be comparable to those made by other methods in the past, which differed both in field technique and correction methods for missed horses. However, the correction for missed horses estimated here is similar to the assumed percentage missed in prior surveys (10%). Nevertheless, there have been very large increases in the estimated population between surveys in 2011 and 2013 and again between 2013 and 2015. In discussions with district personnel, I have identified several possible explanations for the surprisingly large increases between 2013 and 2015; however I have no information to address the changes between 2011 and 2013.

1. The prior method may have undercounted by more than the 10% assumed. This is particularly likely because only 2 observers were used in addition to the pilot, so one side was surveyed by a single individual. Comparing flight paths from earlier surveys to the current one, there were a few areas with significant vegetation that were not covered as well (wider transects) although the coverage was similar in most areas. Also, photographs of large groups were not used in the past. The observers and pilot used on earlier surveys were different and I have no information on their sighting acuity. All of these differences in methodology could have led to larger numbers of horses being missed in the past than the 10% that was assumed.
2. Foaling rates after the 2013 survey (i.e., in 2014) may have been exceptionally high. This population was treated with PZP in 2011, so it is likely that mares were especially well nourished and in good health after not foaling for the prior 2 years and could have had high pregnancy rates and produced healthy foals with unusually high survival rates.

3. Two problems may have occurred with the 2015 survey that could have inflated the estimates. First, some groups may have been observed and counted multiple times. This is a particular concern given the interruption of the survey due to weather. Observers made every effort to identify larger groups using photos and eliminate any duplicate observations from the dataset, but this effort may not have been 100% successful, especially for smaller groups for which photographs were not available. Second, it is also possible that horses not present during the prior survey found a way to immigrate into the survey area before the 2015 survey, causing an increase in the actual population present. These issues and suggested improvements are discussed further, below.

Sighting Probability Results

The front observers saw 87.9% of the groups (90.5% of the horses) seen by any observer, whereas the back seat observers saw 78.7% of all groups (82.4% of horses) seen (Table 2). These results demonstrate that simple raw counts do not fully reflect the true population without statistical corrections for missed groups, made possible by the double observer method and reported here. There were undoubtedly additional groups not seen by any observer; I address this issue in the analysis that follows.

The analysis method used for the surveyed areas was based on simultaneous double-observer data collected during these surveys. Informed by preliminary analyses and *a priori* reasoning, all models used in the double-observer analysis contained an estimated parameter for an intercept common to all observations. Ten groups were recorded on the centerline, so I also included a parameter in all models to account for the inability of back-seat observers to see this type of group. A total of 14 groups were recorded as seen spread across both sides of the flight path and visible from both sides of the helicopter. Front seat sighting probability for these groups was much higher, given their availability to all both front-seat observers, so an additional parameter was included to account for this added visibility.

I did not consider effects on detection probability of vegetation type, vegetation cover, or lighting conditions due to insufficient variation in the values of these covariates–nearly all observations were in open vegetation, 0% cover, and high contrast lighting. Only 10 observations (5 tree cover, 5 broken cover; all at Green Mountain) had any concealing vegetation recorded and all but 1 of these had ≤30%, the remaining 1 had 50% cover. These data provided an insufficient sample size to estimate the effect of vegetation. I did not attempt to estimate effects for any site (HMA) individually. Other than covariates that were recorded, sighting conditions and the range of overall topography and vegetation was similar at the sites. Furthermore, 3 of the 5 sites had ≤12 observed groups; too few to reliably estimate a unique site effect.

In preliminary analyses, I determined that there was overwhelming support for differences between the 2 front-seat observers and among the 5 back-seat observers, so I included separate additive parameters for each unique individual in all models.

In addition to the parameters included in all models, described above, I tested 6 possible effects on sighting probability by fitting models for all possible combinations of these effects, resulting in 64 alternative models. The 6 effects were: (1) an additive effect for groups located on the pilot's side of the flight path on the front-seat observers combined sighting probability due to the pilot's focus on flying and the obstructed view from the opposite side; (2) group size; (3) horse activity (moving); (4) snow and snow squared (both included if either was); (5) rugged terrain; and (6) distance of the horse group from the observers.

The effects of distance (99.5% of model weight) and snow (92.0% of model weight) were very strongly supported. Effects of group size (63.8%) and rugged terrain (47.5%) received modest support. The effects of horse movement (28.9%) and pilot-side effect (25.3%) received minimal support, so were unimportant predictors of sighting probability in this dataset.

All groups visible on both sides of the aircraft were seen by the front observers, making sighting probability 100% for these groups (Table 3). Visibility in the front for groups on the pilot's side was essentially the same as for the primary observer's side, which seems to indicate that the pilot had a good ability at spotting groups. Groups that were larger, moving, in smooth terrain, or closer to the observers were more visible, as expected. Sighting probability was lower for the average back seat observer than for either front-seat observer. Sighting probability in the front was higher for observer BS than for TS. Sighting probability varied dramatically among back-seat observers.

The estimated sighting probabilities for the combined observers ranged across horse groups from 42.5-100%. For front-seat observers, independent sighting probability ranged from 29.4-100% and for back-seat observers it was from 13.7-98.7% (excluding groups on the centerline, which were unavailable to back seat observers). Comparing actual horses seen to the estimated population size computed from the estimated sighting probabilities, I estimate that 6.3% of the horses in these combined surveys were never seen by any of the observers, with as much as 9.5% missed in Lost Creek HMA (Table 1). The high overall sighting probabilities resulted in good confidence intervals and coefficients of variation, averaging 3.1% for the complex and ranging from 2.4% to 9.5% across the individual HMAs. Even in this survey area with excellent sighting conditions characterized in most places by very open and relatively smooth terrain, adjustment to raw counts for those groups not seen by any observer are needed. This underscores the importance of using a statistical method for correcting raw counts.

Assumptions and Caveats

The results obtained from these surveys are estimates of the horses present in the areas surveyed at the time of the survey and should not be used to make inferences beyond this context.

The reliability of results from any population survey that is based on the simultaneous double-observer method rests on several important assumptions.

1. First, the method assumes that all groups of animals are flown over once during a survey period, and thus have exactly one chance to be counted by the front and back seat observers, or that groups flown over more than once are identified and considered only once in the analysis. Groups counted more than once would constitute 'double counting,' which would lead to estimates that are biased higher than the true number of groups present. Photography and the identification of 'marker' horses (e.g., horses with unusual coloration) in each group, and variation in group sizes, helped to reduce the risk of double counting during aerial surveys. This was probably not a large problem in this data set because staff from the Lander Field Office and Rawlins Field Office were meticulous about searching for and removing possible double-count observations from the data, with reference to detailed notes about horse color, photographs, and way point locations of observations (P. Griffin, pers. comm.).

   Additionally, groups that are never available to be seen (for example, due to temporary emigration from the study area, due to moving, undetected, from an unsurveyed area to one already surveyed, or due to being in such dense tree cover that they were effectively invisible to any observer) can lead to estimates that are negatively biased compared to the true population size. Although attempts were made to minimize the potential for horse movement among survey days by making use of fences, rivers, and topographic barriers, inter-day horse

movements during a multi-day survey could potentially bias results if those movements result in unintentional double counting or unavailability of groups.

Unfortunately, there was a one day break in the survey, due to a winter storm; the survey through the first 2 days had covered Antelope Hills, Crooks Mountain, and most of the areas in 'the middle' of the complex. Fences separated most of the areas surveyed up to the end of the second day from the unsurveyed areas, with the exception of within Stewart Creek. The survey staff was hopeful that the rim dividing Stewart Creek would limit movement from areas surveyed before the storm to areas surveyed after the storm.

The results presented here are based on a survey design and methods that assume that any unobserved movements were random, so combined effects of double counting and unavailable groups, if there were any, would cancel each other out.

2. Second, this method assumes that all horse groups with identical sighting covariate values have equal sighting probability. If there is additional variability in sighting probability not accounted for in the sighting models, such heterogeneity could lead to a negative bias (underestimate) of the population. However, given the relatively good sighting conditions that led to high sighting probabilities during this survey, this issue is unlikely to be important. It is possible that there could have been horse groups in heavily forested areas, for example in Green Mountain HMA, with substantially different detection probabilities that were not well represented in the observation data. If this was the case, then the estimated abundance for such areas (Table 1) would be lower than the true value. However, this potential problem is mitigated by the fact that transects over the heavily vegetated areas were generally spaced <0.5 miles apart, thereby compensating for the reduction in visibility caused by the vegetation.
3. A third assumption is that the number of horses in each group is counted accurately. In very large groups it may be common to miss a few horses unless photographs are taken and scrutinized after the flight. Relying on raw counts made from the airplane could lead to biased low estimates of population size. Using photography is in the drafted standard operating procedures for BLM double-observer aerial surveys for horses, when group size is ≥20. Group sizes ranged from 1 to 100 horses in this survey with 53 groups (15%) containing >10 horses (14 groups of those groups had >20 horses), so inaccurate counting would have been a substantial risk for some groups. Observers circled over large groups to get as accurate a count as possible and did use photography consistently to record group size of most large groups.

Given the several potential sources of bias, listed above, it is more likely that the estimates are somewhat lower, rather than higher, than the true population, unless the problem of potential double counting was not adequately avoided. However, given the high sighting probabilities and precision estimated for these surveys, the population estimates I present here provide a sound and reliable basis for management decisions.

Recommendations for Future Surveys

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

1. There is a substantial benefit to maximizing the sighting probabilities and minimizing the number of different factors that cause variation in sighting probability. By far the most potent means to accomplish both objectives is to reduce the number of observers used in future surveys. In this survey, 2 individuals observed from the front seat and 5 from the back. One of these (EC) observed only 9 groups–less than an ideal sample size for estimating individual

acuity. There is no need to rotate observers in the front seat–a single observer should be used for the entire set of surveys, if possible, and no more than 2. It is preferable to have one observer consistently in the front seat, rather than having observers rotate from front to back seats. In a data set such as this, though, where there are a substantial number of observations from two districts, it is understandable if the district specialist sits in the front during the portion of the survey over their district. Using a single pilot is also preferred, as was done in this case. Back seat observers must be rotated, as they were, but they should be limited to as few as possible–ideally only 2 but no more than 3 or 4 unique individuals. All observers should be present long enough to accumulate >30 observations. Most important, observers should be carefully selected based on their past performance and ability to spot horses. The wide variation in acuity of the observers used in this survey suggests an opportunity to both reduce the total number of observers while retaining only those with high sighting probabilities (Table 3). It is especially important to use highly qualified observers in the front seat. These changes could improve the precision and reduce the risk of undetected biases in future results.

2. The presence of heavy vegetation cover in the Green Mountain HMA poses a challenge. It would be good to have sufficient data to estimate the effect of this vegetation cover given the tight transect spacing over it. The current dataset did not an adequate sample size. A future survey might be done when the population is larger, thereby providing a larger sample size. Or, a future survey could be pooled with the current one to obtain a larger sample size. To make this effective, it is important that future surveys be done under as similar conditions to the current one as possible. It is especially important for the observers used in the future to be primarily ones who already flew this survey.
3. I emphasize the continued importance of using photography for large horse groups (>10 is preferable, >20 is extremely important) so that group sizes recorded in flight can be validated with reference to photographs after the flight to ensure that such groups are counted accurately. Given that this population may have a tendency to form large groups, it is all the more important to have accurate counts of group size for each large group. A reliable, high-resolution camera with an adequate telephoto or zoom lens for the distance between observer and horses should continue to be used for this purpose.
4. The pilot followed predetermined transect lines (Figure 1) that were loaded into the pilot's GPS unit during most of the fight that were the same pattern of planned flight lines as was used for these surveys in 2014. The flight lines were generally spaced between 0.5-2.0 miles apart, depending on topography and vegetation. Tighter transects were flown over the mountains in the Green Mountain HMA and extending to the west beyond the boundary of that HMA (Figure 1). Slightly tighter transects over the eastern portion of the mountains in Green Mountain HMA might be desirable. Nevertheless, the high overall sighting probabilities estimated for this survey indicate that the transect layout generally provides good coverage.
5. Temporary emigration into or out of the surveyed areas was unlikely to have been a significant problem. The survey area (including the area outside of HMAs referred to as "the middle") is bounded by highways and fences along most of the north, west, and east sides. There are gaps that would permit horses to cross the study area southern boundary of Lost Creek HMA; however, this is an area of relatively low horse density. There are certainly opportunities for horses to move among some of the HMAs within the overall complex, particularly between Antelope Hills and Lost Creek. Extending future surveys outside of the

HMA boundaries in this area should be considered in areas where there may be wild horse activity.

6. The survey design and execution was adequate to minimize the possibility of horse movements within the survey area that could result in undercounting or no opportunity to observe some groups more than once, except for the unexpected interruption of the survey due to weather. If a storm is forecast that will disrupt a survey and the aircraft will continue to be available, it is better to wait to begin the survey of a given HMA or complex until the storm has passed. To the extent possible, future inventories should continue to include all the HMAs in this complex together on consecutive days.

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Table 2. Tally of raw counts of horses and horse groups by observer (front and back) and survey year for combined HMAs. This table is based on raw counts (not statistical estimates) and, therefore does not address groups not seen by any observer.

Observer	Groups Seen (Raw Count)	Horses Seen (Raw Count)	Actual Sighting Rate[a] (Groups)	Actual Sighting Rate[a] (Horses)
Front	182	1,614	87.9%	90.5%
Back	163	1,470	78.7%	82.4%
Both	138	1,300	66.7%	72.9%
Combined (either)	207	1,784		

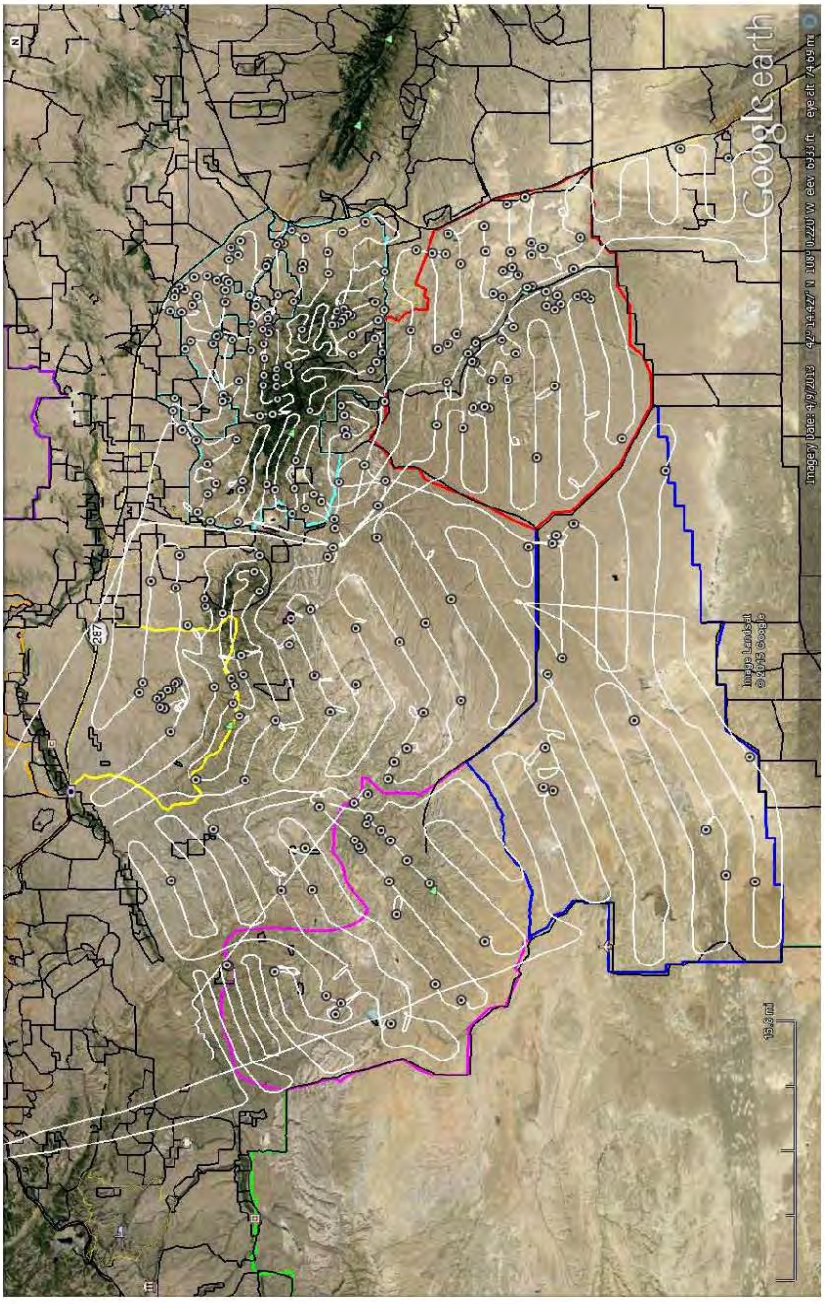
[a] Percentage of all groups/horses seen that were seen by each observer.

Table 3. Illustration of the effects of observers and sighting condition covariates on estimated sighting probability of horse groups for both front and rear observers. Baseline case (**bold**) is for observers in the indicated seat (except for horses on the pilot's side observed in the front). The baseline is for front observer TS, the average back-seat observer, a group size of 6 horse (the median value observed), horses not moving, smooth terrain, no snow cover, and the most common distance category (¼-½ mile). Other cases vary a covariate, one effect at a time, as indicated. Sighting probabilities for each row should be compared to the baseline (first row) to see the effect of the change in observer or condition. Baseline values are shown in bold wherever they occur. Sighting probabilities are calculated from weighted averaged model parameters across all 64 models.

	Sighting Probability, Front Observer	Sighting Probability, Back Observer
Baseline	**86.3%**	**78.3%**
Effect of horses on centerline	**86.3%**	0.0%
Effect of horses on both sides	100.0%	**78.3%**
Effect of Pilot's side[a]	86.9%	**78.3%**
Effect of group size (N=1)	84.5%	75.7%
Effect of group size (N=10)	87.7%	80.3%
Effect of horse movement	87.2%	79.6%
Effect of rugged terrain	79.7%	69.3%
Effect of snow cover (50%)	72.1%	59.6%
Effect of snow cover (100%)	73.5%	61.4%
Effect of distance (0-1/4 mile)	91.4%	85.9%
Effect of distance (1/2-1 mile)	74.4%	62.5%
Effect of observer BS in front	91.5%	**78.3%**
Effect of observer PG in back	**86.3%**	53.2%
Effect of observer TV in back	**86.3%**	87.0%
Effect of observer BS in back	**86.3%**	77.8%
Effect of observer TS in back	**86.3%**	95.7%
Effect of observer EC in back	**86.3%**	50.8%

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

Figure 1 (following page). Map of surveyed areas in the Red Desert complex, including Antelope Hills HMA (pink), Crooks Mountain HMA (yellow), Green Mountain HMA (light blue), Stewart Creek HMA (Stewart Creek), and Lost Creek HMA (dark blue). White lines indicate the actual path of the helicopter taken during surveys. Circles are GPS waypoints at the locations where observers saw groups of animals. Black lines depict fencing. Adjacent and nearby management areas not included in this survey are shown for reference: Divide Basin HMA (green), Dishpan Butte HMA (orange), and Muskrat Basin HMA (purple).



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APPENDIX 7 Individuals, organizations, Tribes or Agencies consulted

- Wyoming Governor's Office
- Andrea Lococo, Animal Welfare Institute
- Government and Legal Affairs, Animal Welfare Institute
- c/o Ernie Evans, Bureau of Indian Affairs
- Carbon County Commissioners
- Carl L Huhnke, Central Bank & Trust
- Congresswoman Cynthia M Lummis
- Deniz Bolbol
- Liz Clancy Lyons, Doris Day Animal League
- Double D Ranch, Dwayne and Denise Oldham; Ed Womack
- Office of the Governor, Environmental Policy Division
- Doug R Anesi, First Interstate Bank
- Douglas L Thompson; Chairman, Fremont County Commission
- Gail O'Neal
- Gerald Nelson
- Hooved Animal Humane Society
- Jack Corbett
- Wyoming Advocates for Animals, Jeannie R. Stallings
- Fremont County Cattlemen, Jim Hellyer
- Kathy Gregg
- Kevin Edinger, NRCS
- Marybeth Devlin
- Mathew Dillon
- Mike Henn, Wyoming State Land & Farm Loan Office
- Jeri Trebelcock, Popo Agie Conservation District
- Animal Protection Institute of America, Public Land Wildlife Division
- REP. Larry Meuli, MD
- REP. William "Jeb" Steward
- Rock Springs Grazing Association
- Ron Cunningham
- Scott Harnsberger
- State Planning Coordinator
- Steve Poitras, NRCS
- Tim and Heather O'Neal
- Tom Morrison
- Tyrel Nicholas
- U.S. Senator John A. Barrasso
- U.S. Senator Mike Enzi
- Lander Fish and Wildlife Conservation Office
- US Fish and Wildlife Service
- US Rep. Cynthia Lummis: ATTN: Pat Aullman
- US Rep. Cynthia Lummis; ATTN: Bonnie Cannon

- US Rep. Cynthia Lummis-Cheyenne FO
- US Senator Mike Enzi: ATTN: Reagon Green
- US Senator Mike Enzi: ATTN: Robin Bailey
- US Senator Mike Enzi: Casper Field Office
- US Senator Mike Enzi: Cheyenne Field Office
- Travis Bruner, Executive Director, Western Watersheds Project
- Jonathan B. Ratner, Director, Western Watersheds Project
- Tribal Historic Preservation Office, Wilfred Ferris
- Linda Serdiuk, Wind River Backcountry Horsemen Assoc.
- Wyoma D. Burris
- Jason Fearneyhough, Director, Wyoming Department of Agriculture
- Natural Resource & Policy Section, Wyoming Department of Agriculture
- Office of the Director (5), Wyoming Game & Fish Department
- Wyoming Game & Fish Department, Amy Anderson
- Wyoming Livestock Board
- Jennifer Womack
- Wyoming Livestock Roundup
- Field Director, Wyoming Outdoor Council
- Dick Loper, Wyoming State Grazing Board
- Patricia M. Fazio, Ph. D. Statewide Coordinator, Wyoming Wild Horse Coalition
- Executive Director, Wyoming Wildlife Federation
- Harold Schultz, Wyoming Wildlife Federation
- Wyoming State Historic Preservation Office (SHPO)
- Wyoming State Lands & Investments
- Wyoming Travel & Tourism
- Wyoming Planning Office
- Shoshone Business Council
- Shoshone Rose Casino
- Wyoming Business Council
- Wind River Visitors Council, c/o Paula McCormick
- Lander Chamber of Commerce
- City of Lander, c/o Mayor Mick Wolfe
- Arapahoe Business Council
- Abernathy Ranches, LLC
- David, Lyle and Colleen
- Armstrong Ranch, Inc.
- Armstrong , John D. & or William L. Bregar
- Jolley Livestock Grazing Association, LLC
- Poor Farm DTA, LP
- Anderson, Christopher and Susan
- Walking S Grazing Association, LLC
- Stewart Creek LLC
- Schiff of Wyoming, LLC. Split Rock Ranch
- Faris, Allen Guy

- Chris Anderson, ET AL.
- Quarter Circle Block, LLC
- Joshua Anderson Ranch Management, LLC
- Whitlock, Robert or Judy
- Alkali Creek Grazing Association