5-04

FOX-HOG WILD HORSE HERD MANAGEMENT AREA
CAPTURE PLAN
ENVIRONMENTAL ASSESSMENT

CA-370-03-26

May 2004

SURPRISE FIELD OFFICE

1.0 Need for the Proposed Action

1.1 Purpose and Need for Action

The purpose of this environmental assessment is to analyze the impacts of the potential methods that may be used to meet the established wild horse appropriate management level on the resources within the Fox-Hog Wild Horse Herd Management Area (HMA). An Appropriate Management Level (AML) of a maximum of 226 wild horses in the Fox-Hog Wild Horse Herd Management Area was established through the Bare Allotment and Fox-Hog Wild Horse Herd Management Area decision of April, 1999, as assessed in environmental assessment #CA-370-99-08. The chief goal of managing wild horses within Appropriate Management Levels is to achieve a thriving natural ecological balance of resources, while maintaining a healthy and viable population of wild horses. No additional information has been found that would indicate a need to adjust the established appropriate management level for the Fox-Hog HMA.

The Fox Hog HMA encompasses approximately 97,000 acres of land within Washoe County, Nevada, about 23 miles northwest of Gerlach. Elevations range from 5000 feet in Little High Rock Canyon to 8100 feet at the top of Fox Mountain. The High Rock and Calico Mountain Herd Management Areas are located to the north and east of the Fox-Hog HMA. Little High Rock Canyon separates the Fox-Hog HMA from the High Rock HMA. The Bare Allotment fence separates the Fox-Hog HMA from the Calico Mountain HMA. The key limiting factors for wild horses within the Fox-Hog HMA are: 1) the increasingly heavy use of public and private riparian areas by wild horses, 2) the limited amount of public water available for wild horse use, and 3) the egress of wild horses from the Fox-Hog HMA into areas not identified in the land use plan as areas where wild horses are to be managed. An aerial census of the Fox-Hog Wild Horse Herd Management Area was conducted in May of 2001. It was determined that there were 411 wild horses (344 adults and 67 foals) present, of which 177 wild horses (151 adults and 26 foals) were outside of the Fox-Hog HMA. Due to extreme drought and lack of water sources in summer of 2001, 87 horses were removed from the HMA, leaving 324 horses (275 adults and 49 foals). Based on the Wild Horse Population modeling program, it is estimated that, as of May 2004 there are 451 adult horses and 96 foals in the Fox Hog HMA.

The BLM has determined that there are excess wild horses present in the Fox-Hog HMA and the Proposed Action is needed to remove about 411 horses and to restore wild horse herd numbers to levels consistent with the Appropriate Management Level (AML) for the HMA. The proposed capture and removal is needed at this time in order to achieve a thriving natural ecological balance between wild horse populations, wildlife, livestock, and vegetation, and to protect the range from the deterioration associated with overpopulation of wild horses as authorized under Section 3(b)(2) of the 1971 Free-Roaming Wild Horses and Burros Act and Section 302(b) of the Federal Land Policy and Management Act of 1976. In addition, applying fertility control measures as part of the Proposed Action would slow the reproduction rate of mares returned to the HMA following the gather. This would reduce disturbance to the herd by decreasing the gather frequency and it would provide for a more stable wild horse social structure.

Additional objectives include: collecting information on herd characteristics, determining herd health, and conducting fertility control research. All activities would be conducted according to a specified set of Standardized Operating Procedures (SOP's) (Appendix B).

1.2 Conformance with Existing Land Use Plans

The Tuledad/Home Camp Management Framework Plan (MFP)/Final Grazing Environmental Impact Statement (EIS) and Record of Decision direct the management of the project area. The MFP requires the BLM to protect and maintain no less than 50 horses for the Fox-Hog Herd Management Area, and to ensure that this population is viable and self-sustaining.

The Proposed Action is in conformance with these plans and consistent with federal, state, and local laws, regulations, and plans to the maximum extent possible.

1.3 Conformance with Rangeland Health Standards

The Fox-Hog HMA was assessed for conformance with Rangeland Health Standards in 1998. Excessive levels of wild horse use during the hot season was identified as a contributing factor to the area not meeting the Stream Health, Riparian/Wetland, and Riparian Biodiversity Standards. Partly in response to these findings, a Multiple Use Decision was issued in 1999 that addressed livestock grazing systems, and livestock and wild horse use authorizations/AML's.

1.4 Relationship to Statutes, Regulations, Policies, Plans, or Other Environmental Analysis

The Fox-Hog Herd Management Area Plan (HMAP) was signed in 1989. This document, the Bare Allotment and Fox-Hog Wild Horse Herd Management Area decision of April 1999, and the Tuledad/Home Camp Management Framework Plan guide the management of the Fox-Hog HMA. The Management Framework Plan provides general management direction, the 1999 decision established the AML, and the HMAP provides specific management parameters on age structure.

The Surprise Field Office is supporting research aimed at controlling the reproduction rate of wild horses through a collaborative effort to develop an immuno-contraceptive vaccine. The vaccine is a safe, humane and inexpensive tool, when used with management prescriptions, and may reduce the frequency of gathering excess wild horses. Studies have been conducted on a varied group of HMA's in Nevada and these studies will be utilized to develop management strategies implementing fertility control treatment. The analysis of the use of this vaccine on wild horses in the Fox-Hog HMA is part of Alternative 1.

The Tuledad/Home MFP, the Bare Allotment and Fox-Hog Wild Horse Herd Management Area decision of April, 1999, environmental assessment #CA-370-99-08, and the Fox-Hog Herd Management Area Plan are available in the Surprise Field Office for public review.

2.0 Alternatives, Including the Proposed Action

2.1 Actions Common to All Alternatives

Common to all alternatives, except the No Action Alternative, is the collection of genetic information from animals captured. This data would be used to determine if actions are necessary to increase genetic variability in the herd. Actions may include the periodic introduction of new animals into the population to expand the genetic base of the herd.

Complete removal of wild horses was considered; however, this would not be in conformance with the Tuledad/Home Camp Land Use Plan or the 1971 Free-Roaming Wild Horses and Burros Act (PL 92-195, as amended).

The Wild Horse Population Model Version 3.2, developed by Dr. Steven Jenkins, Associate Professor, University of Nevada, Reno was used to predict populations under each alternative considered in this document.

2.2 Alternatives to be Considered in Detail

2.2.1 Alternative 1 (Proposed Action)

The Proposed Action is based on the BLM's 2001 Wild Horse Strategy, which is to implement population management for each HMA where wild horses will be managed to stay within the Appropriate Management Levels (AML). For the Fox-Hog Herd, it is planned to implement a three to four year gather cycle, so that the herd does not have to be gathered annually. This herd reproduces at a rate of 15% to 20% each year. Therefore, the Proposed Action is to reduce the herd to 40% below AML. This would ensure that wild horse numbers do not exceed the AML between gathers.

Part of the Proposed Action for the Fox-Hog HMA would be to capture approximately 90% of the Fox-Hog HMA wild horses (this figure is approximately 492 of the estimated 547 wild horses from the Fox-Hog HMA). All 492 animals would be examined to determine sex, age, and color; acquire blood samples for genetic analysis; and assess herd health (pregnancy, parasite loading, physical condition, etc.). Of the 492 animals that are captured, 411 would be permanently removed from the HMA and 81 animals would be selected to be returned to the HMA. The age, sex, temperament, and physical condition of the 81 returned animals would be recorded to track future population trends. Determination of which horses would be returned to the range would be based on an analysis of existing population characteristics and post gather data for age, sex ratio, and colors. A balanced representation of age classes would be returned to the range. The 411 excess wild horses would be prepared for adoption.

The following Table 1 shows the current population projection obtained by helicopter census on May 23, 2001, adjusted for estimated foal crops during 2002, 2003, and 2004. This data was used to determine the estimated number of wild horses to be removed from the HMA.

Table 1 – Fox-Hog HMA

Estimated 2004 Population	Estimated Number to Remove	Appropriate Management Level	Estimated Number to Remain
547	**411**	**226**	**136**

Multiple capture sites (traps) may be used to capture wild horses from this HMA. Whenever possible, capture sites would be located in previously disturbed areas. All capture and handling activities would be conducted in accordance with the Standard Operating Procedures (SOP's) described in Appendix B. Selection of capture techniques would be based on several factors such as the season of removal, condition of animals, herd health, and environmental considerations.

In addition, the BLM would conduct immuno-contraceptive research and monitor results as appropriate. Of the 81 animals that would be selected for return to the HMA, approximately 15 (20%) would be foals, 33 would be studs, and 33 would be mares. The Proposed Action would include the treatment of all 33 of the released mares with a revised immuno-contraceptive vaccine, Porcine Zona Pellucida (PZP). It is anticipated that this vaccine would inhibit reproduction of captured, treated, and released mares for two to three breeding seasons. All treated mares would be freeze marked on the right hip with two letters assigned by NPO for tracking purposes to enable researchers to positively identify animals in the research project during the data collection phase. Monitoring would include, as a minimum, helicopter flights to be conducted in years 2 through 4 to locate treated mares and determine efficacy. The flight to be scheduled in year 4 has an objective of determining the percentage of mares that have returned to fertility. In addition, field monitoring would be routinely conducted as part of other regular monitoring activities.

The Surprise Field Office will assure that treated mares (as identified by the hip freeze marking) do not enter the adoption market for a minimum of three years following treatment. A field data sheet will be forwarded to the field from the National Program Office (NPO) prior to treatment. This form will be used to record all pertinent data relating to identification of each mare (including a photograph when possible), date of treatment, type of treatment (1yr, 2yr- and Adjuvant used) Herd Management Area (HMA), etc. The form and any photos will be maintained at the field office and a copy of the completed form will be sent to the NPO.

A tracking system will be maintained by NPO detailing the quantity of PZP issued, the quantity used, the disposition of any unused PZP, and the number of treated mares by HMA, FO and State along with the freeze-mark applied, by HMA. In the vast majority of cases, the released mares will never be gathered sooner than the mandatory three-year holding period. In those rare instances when, due to unforeseen circumstances, treated mare(s) are removed from an HMA they will be maintained either in a BLM facility or a contracted Long Term Holding Facility until the expiration of the three-year holding period. In the event that it is necessary to remove treated mares, their removal and disposition will be coordinated through NPO. After expiration of the three-year holding period, treated animals may be placed in the adoption system.

As there is a limited amount of mixing between the Fox-Hog herd and High Rock and Calico herd to the north and east, it is not anticipated that there would be a need to augment the genetic pool by the introduction of animals from other herds. However, under the Proposed Action and the Alternatives, data from blood drawn for genetic analysis would be used to determine actions necessary to keep the populations viable and self-sustaining. Any animals introduced into the herd would meet the general characteristics (color, size, type, etc.) as the existing population.

It is anticipated that the Proposed Action would be implemented in late summer or early fall of 2004.

2.2.2 Alternative 2 (Proposed Action without the use of Immuno-contraceptives)

This alternative would be the same as the Proposed Action; however, BLM would not conduct immuno-contraceptive research. None of the captured and released mares would be treated to inhibit reproduction. This alternative reflects current management of the Fox-Hog HMA.

2.2.3 Alternative 3 (No Action)

This alternative consists of no direct management of wild horse numbers. Wild horses would be allowed to regulate their numbers naturally through predation, disease, and forage, water, and space availability. It is estimated, based on population modeling, that wild horse numbers would increase to 956 by 2008, and may be as high as 3,626 by 2018 under this alternative.

This alternative is not in compliance with the Tuledad/Home Camp Land Use Plan and the requirements of the 1971 Free-Roaming Wild Horses and Burros Act which mandates the Bureau to protect the range from the deterioration associated with overpopulation, and to preserve and maintain a thriving natural ecological balance and multiple-use relationship in that area. However, for comparative purposes, the No Action Alternative will be included in this analysis.

3.0 Environmental Consequences (Proposed Action & Alternatives)

Critical Elements	Affected	Critical Elements	Affected
Air Quality	No	Soil	No
Areas of Critical Environmental Concern (ACEC)	No	Waste, Hazardous or Solid	No
Cultural Resources	Yes	Water Quality, Surface and Ground	No
Environmental Justice	No	Wetlands/Riparian Zones	No
Farmlands, Prime or Unique	No	Wild and Scenic Rivers	No
Flood plains	No	Wilderness/WSA	Yes
Noxious Weeds and Invasive, Non-native Spp	No	Wildlife	Yes
Native American Concerns	No	Wild Horses and Burros	Yes
Recreation	Yes	Vegetation	Yes
Social and Economic	Yes	Threatened and Endangered Species	Yes

3.1 Air Quality

Affected Environment

The area designation for northern Washoe County National Ambient Air Quality Standards has been classified as attainment or not classified. Federal actions are not subject to conformity determinations under 40 CFR 93. Air quality is normally very good. Travel on the roads, especially along the relatively high-speed Lost Creek gravel road, causes dust seasonally (May through November). In addition, smoke from wild fires is occasionally present, generally in August and September.

Environmental Consequences

Direct impacts associated with the Alternatives #1 and #2, would consist of an increase in dust as wild horses are herded to temporary gather site(s) and transported by stock trailer(s) to a temporary holding facility. Dust caused by a concentration of animals at the temporary gather site(s) and at the temporary holding facility would be controlled by watering the areas as needed, to keep dust to a minimum. In addition, there would be an increase in vehicle traffic as excess wild horses are transported from the temporary holding site to a BLM adoption preparation/holding facility. These impacts would be temporary, with a short duration, and should not result in a significant cumulative impact or change the air quality classification for the project area. No direct or indirect impacts would occur with Alternative #3.

3.2 Cultural Resources

Affected Environment

There are numerous cultural resource sites throughout the Fox-Hog HMA. These range from prehistoric temporary and permanent loci to historic ranching, homesteading and trail sites.

Environmental Consequences

Direct impacts to cultural resources are not anticipated to occur due to implementation of any of the Action Alternatives because gather sites and temporary holding facilities would be inventoried for cultural resources prior to construction. The Surprise Field Office archeologist would review all proposed and previously used gather sites and temporary holding facility locations to determine if these have had a cultural resources inventory and/or if a new inventory is required. If cultural resources were encountered at proposed gather sites or temporary holding facilities, these locations would not be utilized unless they could be modified to avoid impacts. No direct impacts are associated with Alternative #3.

Indirect impacts to cultural resources occur from increased erosion and from trampling damage in areas where there are concentrations of animals. Adverse impacts to cultural resource sites from overgrazing and trampling include modification and displacement of artifacts and features as well as erosion of organic middens containing valuable information. Areas in the vicinity of permanent and intermittent water sources (i.e., riparian areas) have the highest potential for cultural resource sites. Since wild horses concentrate in these areas, these areas are most likely to be impacted by trampling and erosion. Indirect impacts associated with each of the Alternatives would be related to wild horse population size. Impacts would be the least with implementation of Alternative #1, the Proposed Action. Impacts are anticipated to increase with Alternative #2. The No Action Alternative #3 is likely to have the most negative impacts.

3.3 Noxious Weeds and Invasive, Non-native Species

Affected Environment

Noxious weed and invasive non-native species introduction and proliferation is a growing concern among local and regional interests. Noxious weed surveys, including invasive and non-native species, are ongoing in the HMA. To date, few noxious weeds have been found within the HMA; however, the HMA contains two heavily traveled routes (Nevada highway 34 and the Lost Creek Road). Numerous populations of Russian knapweed and perennial pepperweed can be found on highway 34 southeast of the HMA traveling down Leadville Canyon. Vehicles and heavy equipment traveling on these routes, and crossing the associated drainages along these routes, is increasing the likelihood that Russian knapweed and several other species of noxious weeds, including perennial pepperweed, bull thistle, and scotch thistle, will become established in the HMA in the near future. All the known populations of noxious weeds along roads and on public lands, and most known populations on private lands, are being actively treated and monitored.

Environmental Consequences

Direct, short-term impacts associated with the Alternatives #1 and #2 include the potential to import or transport non-native species (noxious weeds) and/or spread existing noxious weed seeds and plant parts to new areas in the HMA. These impacts would potentially occur if contractor vehicles are carrying noxious weed seeds and plant parts when they arrive on site, or if they drive through existing infestations and spread seed into previously weed free areas, or if they feed contract horses contaminated hay before arriving on site and the seeds pass through the horses' digestive system. Feeding contaminated hay to wild horses, which are released back into the HMA before the seeds pass through their digestive systems, could also spread noxious weeds. There are no direct impacts associated with the No Action Alternative #3.

Indirect, long-term impacts are related to the wild horse population sizes and growth rates associated with each of the Alternatives. As wild horse numbers increase, utilization of vegetation and trampling/compaction of soils increases. When vegetation is used continuously, heavily, and annually, and soils are trampled and compacted, plant vigor, production, and diversity are reduced and overall ecological site conditions are reduced. Disturbed areas and areas in poor ecological condition are much more susceptible to having noxious weeds and invasive non-native species populations establish and expand in size.

Implementation of Alternative #1, the Proposed Action, would result in the slowest wild horse population growth rates, and the greatest period of time when wild horse numbers are at or below maximum AML's. As a result, Alternative #1 would be the least likely to result in increased populations of noxious weeds and invasive non-native species. Implementation of Alternative #3, the No Action Alternative, would result in the most rapid increase in wild horse numbers. Population modeling shows there would likely be an increase to over 1900 horses in the HMA within 10 years (see Appendix A). As a result, Alternative #3 would have the greatest negative impact on soils and vegetation, and would be the most likely to result in increased populations of noxious weeds and invasive non-native species. Implementation of Action Alternative #2 would have a slightly higher negative impact on soils and vegetation, and a slightly higher risk of increased populations of noxious weeds and invasive non-native species, than implementation of the Proposed Action Alternative #1.

3.4 Recreation

Affected Environment

This HMA is a popular destination for pronghorn antelope, mule deer, and upland game bird (chukar, quail, dove, and sage-grouse) hunters from Nevada.

The HMA is also popular for off-highway driving, camping, and wildlife/wild horse viewing. The three main roads that cross the HMA (NV Highway 34, Lost Creek, and Old Camp/Fox Mtn) are well maintained and accessible to two-wheel drive vehicles and camp trailers. These roads reach the some of the higher elevation areas and, as a result, they afford recreational users the opportunity to view mule deer, pronghorn antelope, wild horses, and upland game birds in their summer use areas.

Environmental Consequences

Direct, short-term impacts to recreation with implementation of the Alternatives #1 and #2 would consist primarily of disturbance of hunting activities by the low-flying helicopter. These impacts would be temporary, with short duration, and minimal. No direct impacts are associated with the No Action Alternative.

Indirect, long-term impacts are related to the wild horse population sizes and growth rates associated with each of the Alternatives. As wild horse numbers increase, utilization of cover, space, forage, and water increases. As the amount and quality of habitat is reduced, wildlife populations are also reduced, and opportunities for hunting and wildlife viewing are reduced. Conversely, as wild horse numbers increase, the likelihood of recreational users seeing wild horses from the main roads and trails increases.

Implementation of Alternative #1, the Proposed Action, would result in the slowest wild horse population growth rates, and the greatest period of time when wild horse numbers are at or below maximum AML's. As a result, Alternative #1 would have the least negative impact on recreation involving hunting, camping, and wildlife viewing. However, wild horse viewing opportunities would be decreased. Implementation of Alternative #3, the No Action Alternative, would result in the most rapid increase in wild horse numbers. Population modeling shows there would likely be an increase to over 1900 horses in the HMA within 10 years (see Appendix A). As a result, Alternative #3 would have the greatest negative impact on recreation involving hunting, camping, and wildlife viewing and the greatest positive impact on recreation involving wildhorse viewing. Implementation of Alternative #2 would have a slightly higher negative impact on hunting and wildlife viewing, than implementation of the Proposed Action.

3.5 Social and Economic

Affected Environment

The Fox-Hog HMA is located within the Bare livestock grazing allotment. This allotment is divided into eight pastures: Lost Creek, Hoover (including 2 use areas), Old Camp, West Summit, East Summit, Clover Creek, Fox Mountain, and Hog Mountain. There is one grazing permittee who is authorized to utilize up to 13,260 Animal Unit Months (AUM's) during a nine-month season of use (March 1 to November 30). Cattle are rotated through nine pastures/use areas and are distributed to stay within the carrying capacity of each.

Environmental Consequences

Indirect, long-term impacts are related to the wild horse population sizes and growth rates associated with each of the Alternatives. As wild horse numbers increase, utilization of forage and water increases. When vegetation is used continuously, heavily, and annually, and soils are trampled and compacted, plant vigor, production, and diversity are reduced, and the potential carrying capacity for livestock production is reduced.

Implementation of Alternative #1, the Proposed Action, would result in the slowest wild horse population growth rates, and the greatest period of time when wild horse numbers are at or below maximum AML's. As a result, Alternative #1 would have the least negative impact on livestock operations, and on the social and economic values associated with livestock grazing. Implementation of Alternative #3, the No Action Alternative, would result in the most rapid increase in wild horse numbers. Population modeling shows there would likely be an increase to over 1900 horses in the HMA within 10 years (see Appendix A). As a result, Alternative #3 would have the greatest negative impact on livestock operations, and on the social and economic values associated with livestock grazing. Implementation of Alternative #2 would have a slightly higher negative impact on livestock operations, and on the social and economic values associated with livestock grazing, than implementation of the Proposed Action.

3.6 Soils/Watershed

<u>Affected Environment</u>
The extreme southwest portions of the HMA drain into Duck Flat (Massacre Lake Watershed #16040204). The remainder of the Fox-Hog HMA drains into High Rock Lake (Smoke Creek Watershed #16040203).

The Fox-Hog HMA is included in the area described in the Surprise Valley-Home Camp Soil Survey, issued in April of 1974. The primary soils on the high elevation areas include: Home Camp and Newlands stony loams, 5 to 30% slope; Hapgood stony fine sandy loam, 5 to 30% slope; Hartig gravelly loam, 15 to 30% slope; and Mosquet very stony fine sandy loam, 5 to 30% slope. There are inclusions of Foxmount gravelly loam, 15 to 30% slope and Bregar rocky loam, 2 to 15% slope. The mid elevation soils include: Powley gravelly fine sandy loam, 2 to 15% slope; Mascamp extremely stony sandy loam, 2 to 15% slope; Espil gravelly sandy loam, 0 to 15% slope; Fertaline gravelly fine sandy loam, 0 to 9% slope; Mosquet very stony fine sandy loam, 5 to 30% slope; and Old Camp extremely stony loam, 5 to 15% slope. The lowest elevations on the north end of the HMA include large areas of Olson fine sandy loam, 0 to 15% slope and Badland soils.

The entire HMA is dissected by a number of intermittent and ephemeral creek systems, including No Savvy, Cottonwood, Clover, Jims, Big Hog John, Little Hog John, Van Norman, Leadville, and Little High Rock Creeks. Soils along these systems are composed of Welch silty clay loam, <9% slope; Disabel silty clay loam, <2% slope; and Jesse Camp silt loam overwash, <2% slope.

<u>Environmental Consequences</u>
Indirect, long-term impacts on soils are related to the wild horse population size and the growth rates associated with each of the Alternatives. As wild horse numbers increase, utilization of vegetation and trampling/compaction of soils increase. When vegetation is heavily used and soils are trampled and compacted, soil erosion increases.

Implementation of Alternative #1, the Proposed Action, would result in the slowest wild horse population growth rates, and the greatest period of time when wild horse numbers are at or below maximum AML. As a result, wild horse use under Alternative #1 would have the least negative impact on soils and watershed health. Implementation of Alternative #3, the No Action Alternative, would result in the most rapid increase in wild horse numbers. Without management, population modeling shows there would likely be an increase to over 1900 horses in the HMA within 10 years (see Appendix A). As a result, wild horse use levels under Alternative #3 would have the greatest negative impact on watershed health. Implementation of Alternative #2 would have a slightly higher negative impact on watershed health than implementation of the Proposed Action.

3.7 Water Sources and Water Quality (Surface and Ground)

Affected Environment

The vast majority of the water and riparian habitat associated with creeks and springs in the HMA are on private lands. In addition to natural water sources, there are many wells and reservoirs in the HMA. Most provide water until mid summer on normal years. However, in the late summer and during dry years, many of the reservoirs are dry, and large portions of the HMA are poorly watered or only have water on private land. Water quality within the Fox-Hog HMA meets the needs of beneficial uses for livestock, wildlife and wild horses.

Availability of public water sources has been determined to be one of the key limiting factors for wild horses in the Fox-Hog Herd Management Area. Public water sources almost exclusively consist of man made reservoirs and wells. There are also a few seasonal lakes and streams that provide water during the early season. During the late season, when the reservoirs have the potential for becoming dry, almost all of the water available to wild horses is from private springs and streams.

Environmental Consequences

Under the Proposed Action and Alternative #2, it is expected that conditions on private and public riparian habitats would be maintained as utilization and trampling by wild horses would be reduced. As a result, it would be expected that water quality would continue to meet the needs of beneficial uses for livestock, wild horses and wildlife.

Under the No Action Alternative, wild horses populations would continue to grow, resulting in increased use of private and public waters by wild horses. As the wild horse population continues to grow, an increased number of wild horses would utilize private water sources, increasing trampling damage to springs and utilization of riparian areas. The increased numbers of wild horses would cause more disturbance to soils, increasing silt load. Pollutants such as animals feces would also be increased.

3.7 Wetlands/Riparian Zones

Affected Environment
The entire HMA is dissected by a number of intermittent and ephemeral creek systems, including No Savvy, Cottonwood, Clover, Jims, Big Hog John, Little Hog John, Van Norman, Leadville, and Little High Rock Creeks. The majority of the drainages and springs at the mid and lower elevations support herbaceous plant communities, including grasses, forbs, sedges, and rushes. Most of the higher elevation drainages and a few of the most perennial lower elevation drainages, especially Cottonwood Creek, also contain some woody riparian vegetation, including willow, rose, and aspen.

Environmental Consequences
Under the Proposed Action and Alternative #2, it is expected that conditions on private and public riparian habitats would be maintained as utilization and trampling by wild horses would be reduced.

The No Action Alternative #3 would allow wild horses populations to continue to grow, resulting in increased use of private and public waters by wild horses. As the wild horse population continues to grow, an increased number of wild horses would utilize private water sources, increasing trampling damage to springs and utilization of riparian areas.

3.8 Wilderness

Affected Environment
Approximately 18,000 acres on the north end of the HMA is in the Little High Rock Wilderness Area (WA) and the Black Rock Desert/High Rock Canyon National Conservation Area (NCA). Approximately 2,000 of these acres on the north end of the HMA are also in the High Rock Canyon Area of Critical Environmental Concern (ACEC). The ACEC encompasses all of Little High Rock Canyon.

Environmental Consequences
Direct, short-term impacts to the wilderness values within the Little High Rock WA with implementation of the Proposed Action and Alternative #2 would consist of the sight and noise of the helicopter used to herd wild horses to gather sites located outside of wilderness area. During the time frame of the proposed gather, solitude and primitive recreation may be negatively impacted for recreationists who would be subjected to the sight and sound of the helicopter. This impact would be temporary and relatively short term in nature.

Indirect, long-term impacts are related to the wild horse population sizes and growth rates associated with each of the Alternatives. As wild horse numbers increase, utilization of vegetation and trampling/compaction of soils increases. When vegetation is used continuously, heavily, and annually, and soils are trampled and compacted, plant vigor, production, and diversity are reduced and overall ecological site conditions are reduced. Ecological sites in degraded condition detract from the natural character of wilderness areas.

Implementation of Alternative #1, the Proposed Action, would result in the slowest wild horse population growth rates, and the greatest period of time when wild horse numbers are at or below maximum AML. As a result, Alternative #1 would have the least negative impact on wilderness values in the Little High Rock WA. Implementation of Alternative #3, the No Action Alternative, would result in the most rapid increase in wild horse numbers. Population modeling shows there would likely be an increase to over 1900 horses in the HMA within 10 years (see Appendix A). As a result, Alternative #3 would have the greatest negative impact on wilderness values in the Little High Rock WA. Implementation of Alternative #2 would have a slightly higher negative impact on wilderness values in the Little High Rock WA, than implementation of the Proposed Action.

3.9 Wildlife, including Threatened and Endangered Species

Affected Environment

The wide range of elevation and habitat types in the HMA results in a wide variety of wildlife habitat types. The mosaics of low sagebrush and big sagebrush communities provide spring, summer, and fall habitat for pronghorn antelope and Greater sage-grouse. The big sagebrush, mountain brush, and aspen communities on Fox Mountain and Hog Mountain provide spring, summer, and fall habitat for mule deer and for neotropical bird species. The canyons support several species of raptors, as well as chukar and quail. The riparian systems are important for all species of wildlife, with the perennial, low elevation systems being particularly important due to their scarcity. The HMA does not provide significant waterfowl or any cold-water fish habitat, although there are populations of warm-water fish species (dace) in Cottonwood and Little High Rock Creeks.

There are no known federally listed Endangered, Threatened, Proposed, or Candidate wildlife species using the areas in the HMA. However, Greater sage-grouse, a species which has been petitioned for federal listing throughout its range, use the low sagebrush, riparian, and mountain big sagebrush communities for year-round habitat. In addition, the steep canyons associated with Little High Rock Canyon provide nesting habitat for a variety of raptor species.

Environmental Consequences

Direct, short-term impacts to wildlife with implementation of the Proposed Action or Alternative #2 would consist primarily of disturbance and displacement to wildlife by the low-flying helicopter. Typically, the natural survival instinct response of wild animals to this type of disturbance results in fleeing from the perceived danger. Some mammals, reptiles, and birds may be temporarily displaced by the construction and use of temporary gather sites and holding facilities. These impacts would be temporary, minimal, and of short duration. A slight possibility exists that non-mobile or site-specific animals would be trampled. No direct impacts are associated with the No Action Alternative #3.

Indirect, long-term impacts are related to the wild horse population sizes and growth rates associated with each of the Alternatives. As wild horse numbers increase, utilization of cover, space, forage, and water increases. When vegetation is used continuously, heavily, and annually, and soils are trampled and compacted, plant vigor, production, and diversity, and the value of plant communities for wildlife habitat are reduced. Excessive wild horse numbers also have impacts on Greater sage-grouse by consuming herbaceous cover needed in nesting sites, and by reducing the diversity and quantity of forbs available on uplands in the early spring and on riparian areas season-long.

Implementation of Alternative #1, the Proposed Action, would result in the slowest wild horse population growth rates, and the greatest period of time when wild horse numbers are at or below maximum AML's. As a result, Alternative #1 would have the least negative impact on wildlife habitat, including sensitive animal species populations. Implementation of Alternative #3, the No Action Alternative, would result in the most rapid increase in wild horse numbers. Population modeling shows there would likely be an increase to over 1900 horses in the HMA within 10 years (see Appendix A). As a result, Alternative #3 would have the greatest negative impact on wildlife habitat, including sensitive animal species populations. Implementation of Alternative #2 would have a slightly higher negative impact on wildlife habitat, including sensitive animal species populations, than implementation of the Proposed Action.

3.10 Wild Horses

Affected Environment

The Tuledad/Home Camp Management Framework Plan established the Fox-Hog HMA and specified a planned management level of at least 50 wild horses. Current populations are estimated to be approximately 547 wild horses, based on a helicopter census conducted in May 2001, adjusted for the 2002, 2003, and 2004 foaling seasons. Gathers and census information indicates that the Fox-Hog wild horse herd increases at a fairly consistent rate of about 20% per year (See Appendix A, Table 8)

The Fox-Hog HMA has undergone several removals since passage of the Act. These removals have incorporated all of the removal strategies identified in the proposed action, with the exception of fertility control.

The last full gather of the Fox-Hog HMA was conducted in 1999. At that time, a total of 278 horses were removed from the HMA and approximately 267 horses remained in the HMA. After the partial 2001 gather, sex ratios for the 69 adult wild horses removed from the Fox-Hog HMA were approximately 52% female and 48% male.

Wild horses from the Fox-Hog HMA are known to winter in areas outside of and to the west of the HMA on the flats east and south of Duck Lake.

Environmental Consequences

Long-term, the impacts of maintaining an AML designed to achieve a thriving, natural ecological balance would be a benefit to the wild horses in the Fox-Hog HMA. At this population level, wild horses would be assured adequate forage and water during even the hottest and driest periods of the year.

Direct impacts to wild horses under the Action Alternatives may occur to individual animals. These impacts include:

1) Handling stress associated with the herding, capture, processing, and transportation of animals from temporary trap sites to temporary holding facilities (if used), and from the trap sites or temporary holding facilities to an adoption preparation facility. Under the two action alternatives, wild horses gathered in the HMA would be transported, by truck, approximately 100 miles to the Litchfield wild horse corrals. Animals selected for return to the HMA would be transported by truck back to the HMA. The advantages of transporting all of the animals to Litchfield include access to better veterinary care for immunizations, genetic work, and treatment of injuries; access to better sorting facilities (chutes, pens, etc.) that allow for safer and more humane handling of horses; and access to larger and safer pens, water, and forage facilities for horses to be kept in while gather and processing operations are conducted.

2) Exposure of wild horses to domestic horse diseases, such as strangles. Domestic horses used during gather operations would be present at the capture sites. The trucks, chutes, and panels used at the capture sites have been used to handle horses in the past and may harbor disease agents. Domestic and wild horses from other areas are also present at the Litchfield holding facility and may transmit diseases to the Fox-Hog wild horses, even though horses from the herd would not be kept in the same corrals as the other horses.

Following administration of the immuno-contraceptive fertility control vaccines, as called for in the Proposed Action, minor swelling may occur at the injection site and/or an injection site injury may occur, however this is rare. The intensity of these impacts varies by individual, and is indicated by behaviors ranging from nervous agitation to physical distress. Mortality of wild horses captured during a gather does occur, however it is infrequent and typically is no more than one half to one percent of the animals captured.

Impacts that can occur after the initial stress may include spontaneous abortion in mares, and increased social displacement and conflict in studs. Spontaneous abortion following capture is very rare. Traumatic injuries that may occur typically involve biting and/or kicking that may result in bruises and minor swelling which normally does not break the skin. These impacts are known to occur intermittently during wild horse gather operations. The frequency of occurrence of these impacts among a population varies with the individual.

Population-wide impacts can occur during or immediately following implementation of the Action Alternatives. They include the displacement of bands during capture and the associated re-dispersal, modification of herd demographics (age and sex ratios), temporary separation of members of individual bands of horses, re-establishment of bands following releases, and the removal of animals from the population. With the exception of changes to herd demographics, direct population-wide impacts over the last 20 years have proven to be temporary in nature with most, if not all, impacts disappearing within hours to several days of release. No observable effects associated with these impacts would be expected within one month of release except a heightened shyness toward human contact. Observations of animals following release have shown horses relocate themselves back to their home ranges within 12 to 24 hours of release.

The effect of removing wild horses from the population would not be expected to have a significant impact on herd dynamics or population variables, as long as the selection criteria for removal ensured a typical population structure was maintained. Obvious potential impacts on horse herds and populations from exercising poor selection criteria not based on herd dynamics include modification of age or sex ratios to favor a particular class of animal.

Under the Proposed Action and Alternative #2, blood would be drawn for genetic analysis. This data would be used to determine actions necessary to keep the populations viable. The Proposed Action, including the use of immuno-contraception would limit the numbers of mares that would conceive and deliver foals. This would reduce the genetic variability entering the population for the two years after treatment, and after each subsequent treatment. Animals from other HMA's in Nor-Cal East, or adjacent states could be used to add to the breeding population if necessary to ensure genetic viability. Animals selected for population augmentation would be selected to adhere to the type and colors characteristic of the herd.

The Proposed Action would mitigate the potential adverse impacts on wild horse populations by establishing a procedure for determining what selective removal criteria is warranted for the herd. The flexible procedures (Appendix B SOP's) would allow for correction of any existing discrepancies in herd demographics that could predispose a population to increased chances for catastrophic impacts. The Proposed Action would also establish a standard for selection that would minimize the possibility for developing negative age or sex based selection effects to the population in the future.

Population-wide indirect impacts would not appear immediately as a tangible effect and are more difficult to quantify. Population wide indirect impacts would be associated primarily with the use of fertility control drugs and involve reductions in short term fecundity of initially a large percentage of mares in a population, increasing herd health as AML is achieved, and potential genetic issues regarding the control of contributions of mares to the gene pool, especially in small populations

Implementation of the Proposed Action or Alternative 2 would allow immediate achievement of AML.

If forage and available water was unlimited, it is projected that the No Action alternative would allow the populations to increase dramatically during the next 10 years (projected to over 1900 head). However, water and forage would limit this growth, and could possibly lead to large-scale die-offs, especially during drought or severe winters.

In an attempt to predict population dynamics, a computer simulation was run using the wild horse population model developed by Dr. Stephen Jenkins of the University of Nevada, Reno

(Jenkins 1996). For each alternative, populations were predicted for the next 5, 10, and 15 years (see Appendix A).

3.11 Vegetation, including Threatened and Endangered Species

The lowest elevations (below 5600') in the HMA occur on the northwest and southwest portions of the area. The Old Camp and Olson soils in these zones are Loamy 8-10" ecological sites capable of supporting primarily Wyoming big sagebrush/Thurber's needlegrass dominated communities.

The mid elevations (5600' to 6900') occupy the largest portion of the HMA. The Mascamp and Powley soils in these zones are Loamy 10-12" ecological sites which support communities dominated by big sagebrush, bluebunch wheatgrass, and Thurber's needlegrass. The Espil and Fertaline soils are mapped as Scabland 10-14" ecological sites that support low sagebrush and Sandberg's bluegrass dominated communities. The Home Camp and Newlands soils are Loamy 14-16" ecological sites which support mountain big sagebrush, Idaho fescue, and bluebunch wheatgrass dominated communities. The Mosquet soils are Shallow Loam 14+ ecological sites that support low sagebrush and Idaho fescue dominated communities.

The highest elevations of the HMA (6900'-8200') are limited to the upper reaches of Fox and Hog Mountains. The Home Camp and Newlands soils in these zones are Loamy 14-16" ecological sites which support mountain big sagebrush, Idaho fescue, and bluebunch wheatgrass dominated communities. The Hartig soils are South Slope 12-16" ecological sites that support mountain big sagebrush, bluebunch wheatgrass, and antelope bitterbrush. The Mosquet soils are Shallow Loam 14+ ecological sites that support low sagebrush and Idaho fescue dominated communities. The inclusions of Foxmount soils support mountain mahogany savannas and thickets.

The majority of the drainages and springs at the mid and lower elevations support herbaceous plant communities, including grasses, forbs, sedges, and rushes. Most of the higher elevation drainages and a few of the most perennial lower elevation drainages, especially Cottonwood Creek, also contain some woody riparian vegetation, including willow, rose, and aspen.

Wild horses from the Fox-Hog HMA are also known to winter in areas outside of and to the west of the HMA on the flats east and south of Duck Lake in salt desert shrub/Wyoming big sagebrush communities.

Astragalus tiehmii, *Cryptantha schoolcraftii*, and *Eriogonum crosbyae*, U.S. Fish and Wildlife Service and Nevada BLM "watch" plant species occur on upland areas on Badland soils in the northeastern portions of the HMA.

<u>Environmental Consequences</u>
Direct impacts to vegetation with implementation of the Proposed Action or Alternative #2 could include disturbance of native vegetation immediately in and around temporary trap sites, and

holding and processing facilities. Impacts are created by vehicle traffic, and hoof action of penned horses, and can be locally severe in the immediate vicinity of the corrals or holding facilities. Generally, these activity sites would be small (less than one half acre) in size. Since most trap sites are re-used during recurring wild horse gather operations, any impacts would remain site specific and isolated in nature. In addition, most trap sites are selected to enable easy access by transportation vehicles and logistical support equipment and would therefore generally be adjacent to or on roads, pullouts, water haul sites, or other flat spots that were previously disturbed. There would be no direct impacts of trapping or transportation activities on soils or vegetation under the No Action Alternative.

Indirect, long-term impacts on vegetation are related to the wild horse population size and the growth rates associated with each of the Alternatives. Wild horses are large ungulates with few natural predators. They are present in native plant communities within the HMA year-round, and they congregate around water sources and trail along drainages. They utilize primarily herbaceous vegetation and trample and compact soils, especially when soils are wet. As wild horse numbers increase, utilization of vegetation and trampling/compaction of soils increase. These impacts are greatest where wild horses tend to congregate; however, when wild horse numbers become excessive, the impacts become noticeable on the slopes and tables at greater distances from water and trail corridors. When vegetation is heavily used and soils are trampled and compacted, plant vigor, production, and diversity are reduced.

The No Action Alternative #3 would allow wild horses to increase to the highest populations. Population modeling, as shown in Appendix A, indicate that there could be an increase to over 1900 head of horses in 10 years. This number of wild horses, and the fact that they are on the range 12 months out of the year, would have negative impacts to the vegetative resources. The Proposed Action and Alternative #2 would maintain wild horse numbers at a level that would limit the majority of the negative effects of wild horse grazing to areas where wild horses congregate, around water sources, and along drainages.

<u>Cumulative Impacts (Proposed Action & Alternatives)</u>

Cumulative impacts are impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Implementation of the Proposed Action or Alternative #2 would reduce the wild horse population to AML in the Fox-Hog HMA which would help promote a thriving natural ecological balance. The achievement and maintenance of AML would result in an increase in vegetation density, vigor, reproduction, productivity, diversity, and forage availability. Subsequent removals would maintain animal populations in a thriving natural ecological balance and would contribute to maintaining ecological sites in good condition.

Adverse impacts to vegetation with implementation of Alternatives #1 or #2 would include disturbance of small quantities of native vegetation and soils immediately in and around temporary trap sites, holding, and processing facilities. Impacts created by vehicle traffic, and hoof action of penned horses, can be locally severe in the immediate vicinity of these facilities, and the impacts would re-occur each time horses were gathered. Since most trap sites and holding facilities are re-used during recurring wild horse gather operations, any impacts would remain site specific and isolated in nature. In addition, most trap sites or holding facilities are selected to enable easy access by transportation vehicles and logistical support equipment and would therefore generally be adjacent to or on roads, pullouts, water haul sites, or other flat spots that were previously disturbed. These common practices would minimize the cumulative effects of these impacts.

The removal of animals to and the subsequent maintenance of AML would allow reduced utilization of riparian and upland habitats on a year- long basis. This management coupled with a livestock grazing program which is based on the physiological needs of the vegetation would result in improved rangeland health.

Under the No Action Alternative #3, the cumulative impacts of large numbers of wild horses would increase each year that horses are not gathered. These impacts would affect all of the resources that depend on stable soils and intact vegetative communities, including wildlife, wildlife viewing, and hunting, wilderness, cultural resources, water quality, and the social and economic values associated with livestock grazing.

The Surprise Field Office would continue to identify any adverse impacts as they occur, and mitigate them as needed on a project specific basis to maintain habitat and herd quality. The Proposed Action would contribute to the cumulative impacts of future actions by maintaining the herd at AML, and establishing a process whereby biological and/or genetic issues associated with herd or habitat fragmentation would become apparent sooner and mitigating measures implemented more quickly.

Mitigation Measures

The Proposed Action and Alternatives incorporate proven standard operating procedures that have been developed over time. These SOP's (Appendix B) represent the "best methods" for reducing impacts associated with gathering, handling, and transporting wild horses, and collecting herd data. Additional mitigation measures have been incorporated into the alternatives.

Consultation and Coordination

List of Preparers

Rob Jeffers	Environmental Coordinator
Penni Van Ornum	Cultural Resource Specialist
Elias Flores	Wildlife Biologist
Alan Uchida	Soil, Water, Air, and Riparian/Wetlands Specialist
Tara de Valois	Rangeland Management Specialist

Persons, Groups, and Agencies Consulted

Copies of this environmental assessment have been sent to the following groups and individuals for review and comment:

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Cathy Barcomb, Nevada Commission for the Preservation of Wild Horses
Dawn Lappin, Wild Horse Organized Assistance
Roy Leach, Nevada Department of Wildlife
Dan Heinz, former member, N.E. California Resource Advisory Council (RAC)
Andrea Lococo, Rocky Mountain Coordinator, The Fund For Animals, Inc.
Frances Benally, Chair, Ft. Bidwell Tribal Council
Ms. Virginia Lash, Chair, Cedarville Rancheria
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Nevada Cattlemen's Association, North Washoe Unit, c/o Sam Parriott
Northwest Great Basin Association
Colorado Wild Horse and Burro Coalition
Barbara Burhans

APPENDIX A
Summary of Population Modeling of Wild Horses

Population Model Overview

WinEquus is a computer software program designed to simulate population dynamics based on various management alternatives concerning wild horses. It was developed by Stephen H. Jenkins of the Department of Biology, University of Nevada at Reno. For further information about the model, please contact Stephen H. Jenkins at the Department of Biology/314, University of Nevada, Reno, NV 89557.

The following data was summarized from the information provided within the WinEquus program. It will provide background about the use of the model, the management options that may be used, interpretation of modeling results, and the types of output that may be generated.

The population model for wild horses was designed to help wild horse and burro specialists 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 a wild horse population's demographics can not be established in advance. Therefore, each trial 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 Data: Age-Sex Distribution

An important point about the initial age-sex distribution is that it is NOT necessarily the starting population for each of the trials in a simulation. This is because the program assumes that the initial age-sex distribution supplied on this form or calculated from a population size that the user enters is not an exact and complete count of the population. For example, if the user enters an initial population size of 100 based on an aerial survey, this is really an estimate of the population and not a census. Furthermore, it is likely to be an underestimate because some horses will be missed in the survey. Therefore, the program uses an average sighting probability of approximately 90% (Garrott et al. 1991) to "scale-up" the initial population estimate to a starting population size for use in each trial. This is done by a random process, so the starting population sizes are different for all trials. An option does exist to consider the initial population size to be exact and bypass this scaling-up process.

Population Data: Survival Probabilities

A fundamental requirement for a population model are data on annual survival probabilities of each age class. The program contains files of existing sets of survival or it is possible to enter a new set of data in the table. In most cases, Wild Horse and Burro Specialists do not have data on survival probabilities for their herd populations, so the sample data files provided with WinEquus are used and assume that average survival probabilities in the populations are similar. These data are more difficult to get than is often assumed, because they require keeping track of known individuals over time. A "snapshot" of a population, providing information on the age distribution at a single gather, can NOT be used to estimate survival probabilities without assuming a particular growth rate for the population (Jenkins, 1989). More data from long-term studies of marked horses are needed to develop estimates of survival in various habitats.

Population Data: Foaling Rates

Foaling rates are the proportions of females in each age class that produce a foal at that age. Files are available within the program that set foaling rates or the user may enter a new set of data in the table. The user may also enter the sex ratio at birth, another necessary parameter for population simulation.

Environmental Stochasticity

For any natural population, mortality and reproduction vary from year to year due to unpredictable variation in weather and other environmental factors. This model mimics such environmental stochasticity by using a random process to increase or decrease survival probabilities and foaling rates from average values for each year of a simulation trial. Each trial uses a different sequence of random values to give different results for population growth. Looking at the range of final population sizes in many such trials will give the user an indication of the range of possible outcomes of population growth in an uncertain environment.

How variable are annual survival probabilities and foaling rates for wild horses? The longest study reporting such data was done at Pryor Mountain, Montana by Garrott and Taylor (1990). Based on 11 years of data at this site, survival probability of foals and adults combined was greater than 98% in 6 years, between 90 and 98% in 3 years, 87% in 1 year, and only 49% in 1 year of severe winter weather. These values clearly are not normally distributed, but can be approximated by a logistic distribution. This pattern of low mortality in most years but markedly higher mortality in occasional years of bad weather was also reported by Berger (1986) for a site in northwestern Nevada. Therefore, environmental stochasticity in this model is simulated by drawing random values from logistic distributions. If desired, different values can be entered to change the scaling factors for environmental stochasticity.

Because year-to-year variation in weather is likely to affect foals and adults similarly, this model makes foal and adult survival perfectly correlated. This means that when survival probability of foals is high so is the survival probability of adults, and vice versa. By contrast, the correlation between survival probabilities and foaling rates can be adjusted to any value between -1 and +1. The default correlation is 0 based on the Pryor Mountain data and the assumption that most mortality occurs in winter and winter weather is not highly correlated with foaling-season weather.

The model includes another form of random variation called demographic stochasticity. This means that mortality and reproduction are random processes even in a constant environment (i.e., a foaling rate of 40% means that each female has a 40% chance of having a foal). Because of demographic stochasticity, even if scaling factors for both survival probabilities and foaling rates were set equal to 0, different runs of the simulation would produce different results. However, variation in population growth due to demographic stochasticity will be small except at low population sizes.

Gathering Schedule

There are three choices for the gather schedule: gather at a regular interval, gather at a minimum interval (the default), or gather in specific years. Gathering at a minimum interval means that gathers will be conducted no more frequently than a prescribed interval (e.g., 3 years), but will not be conducted if the time interval has passed unless the population is above a threshold size that triggers a gather.

Gather Interval

This is the number of years between gathers.

Gather for fertility treatment regardless of population size?

If this option is selected (the default), then gathers occur according to the gathering schedule specified regardless of whether or not the population exceeds a threshold population size. One effect of this is that a minimum-interval schedule really functions as a regular interval.

Continue gather after reduction to treat females?

Continuing a gather after a reduction to treat females (with fertility control management options) means that, if a gather for a removal has been triggered because the population has exceeded a threshold population size, then horses will continue to be processed even after enough have been removed to reduce the population to the target population size. As additional horses are processed, females to be released back will be treated with an immunocontraceptive according to the information specified in the Contraceptive Parameters form.

Threshold for Gather

The threshold population size for triggering a gather is the actual population size in a particular year estimated by the program. This is NOT the same as the number of horses counted in an aerial census, but closer to an estimate of population size taking into account the fact that an aerial census typically underestimates population size.

Target Population Size

This is the goal for the population size following a gather and removal. Horses will be removed until this target is reached, although it may not be possible to achieve this goal, depending on the removal parameters (percentages of each age-sex class to be removed) and gathering efficiency.

Are foals included in AML?

In most districts, foals are counted as part of the appropriate management level (AML).

Gathering Efficiency

Typically, some horses will successfully resist being gathered, either by hiding in habitats where they can not be seen or moved by a helicopter, or by following escape routes that make it dangerous or un-economical for them to be herded from the air. These horses are not available for removals or fertility treatment. The default gathering efficiency is 80%, meaning that the program assumes that 20% of the population will successfully resist being gathered. This value may be changed.

Note that the program assumes that horses of all age-sex classes are equally likely to be gathered. This is an unrealistic assumption because bachelor males, for example, may be more likely to successfully avoid being gathered than females or foals or band stallions.

Sanctuary-bound Horses

Age-selective removals typically target younger age classes such as 0 to 5 year-olds or 0 to 9 year-olds because these horses are more easily adopted. However, it may not be possible to reduce the population to a target size by restricting removals to these younger age classes, especially if age-selective removals have been conducted in the past. In this case, an option is available to remove older animals as well, who may be destined for permanent residence in a long term holding facility rather than for adoption. The minimum age of these long term holding facility horses is specified for this element. When older age classes as well as younger age classes are identified for removal on the Removal Parameters form, horses of these older age classes are selected along with younger age class horses as the population is reduced to the target value. If a minimum age for long term holding facility horses is specified, then older animals are only removed if the population can not be reduced to the target population size by removing the younger ones.

Percent Effectiveness of Fertility Control

These percentages represent the percentage of treated females that are in fact sterile for one year, two years, etc. (i.e., the efficacy or effectiveness of fertility treatment). The default values are 90% efficacy for one year. However, the user may specify the effectiveness year by year for up to five years.

Removal Parameters

This allows the user to determine the percentages of horses in each sex and age class to be removed during a gather. The program uses these percentages to determine the probabilities of removing each horse that is processed during a gather. If the percentage for an age-sex class is 100%, then all horses of that age-sex class that are processed will be removed until the target population size is reached. If the percentage for an age-sex class is 0%, then all horses of that age-sex class will be released. If the percentage for an age-sex class is greater than 0% but less than 100%, then the proportion of horses of that age-sex class removed will be approximately equal to the specified percentage.

Contraception Parameters

This allows the user to specify the percentage of released females of each age class that will be treated with an immunocontraceptive. The default values are 100% of each age class, but any or all of these may be changed.

Most Typical Trial

This is the trial that is most similar to each of the other trials in a simulation

Population Size Table

The default is both sexes and all age classes, but summary results may also be chosen for a subset of the population. The table identifies some key numbers such as the lowest minimum in all trials, the median minimum, and the highest minimum. Thinking about the distribution of minima for example, half of the trials have a minimum less than the median of the minima and half have a minimum greater than the median of the minima. If the user was concerned about applying a management strategy that kept the population above some level because the population might be at risk of losing genetic diversity if it were below this level, then one might look at the 10th percentile of the minima, and argue that there was only a 10% probability that the population would fall below this size in x years, given the assumptions about population data, environmental stochasticity, and management that were used in the simulation.

Gather Table

The default is both sexes and all age classes, but summary results may be for a subset of the population. The table shows key values from the distribution of the minimum total number of horses gathered, removed, and (if one elected to display data for both sexes or just for females) treated with a contraceptive across all trials. This output is probably the most important representation of the results of the program in terms of assessing the effects of your management strategy because it shows not only expected average results but also extreme results that might be possible. For example, only 10% of the trials would have entailed gathering fewer animals than shown in the row of the table labeled "10th percentile", while 10% of the trials would have entailed gathering more than shown in the row labeled "90th percentile". In other words, 80% of the time one could expect to gather a number of horses between these 2 values, given the assumptions about survival probabilities, foaling rates, initial age-sex distribution, and management options made for a particular simulation

Growth Rate

This table shows the distribution of the average population growth rate. The direct effects of removals are not counted in computing average annual growth rates, although a selective removal may change the average foaling rate or survival rate of individuals in the population (e.g., because the age structure of the population includes a higher percentage of older animals), which may indirectly affect the population growth rate. Fertility control clearly should be reflected in a reduction of population growth rate.

Results - Population Modeling, Fox-Hog HMA

To complete the population modeling for the Fox-Hog HMA, 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. The developer, Stephen Jenkins, recommends thinking about the range of possible outcomes and not just focusing on one average or typical trial. 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?

Population Data, Criteria, and Parameters utilized for Population Modeling

Initial age structure for the 2004 herd was developed from age structure data collected during the 2001 Fox-Hog wild horse gather as a result of drought. The age distribution of the 87 horses that were removed from the HMA was applied to the estimated 324 horses that remained in the HMA, as follows:

Table 1. Initial Age Structure 2001 – Fox-Hog HMA

Age Class	**Horses removed from the HMA**		**Age Structure of horses not removed from the HMA**	
	Females	Males	Females	Males
Foals	10	8	33	27
1	6	7	23	27
2	2	6	10	22
3	4	3	13	12
4	1	2	5	7
5	0	0	2	1
6	5	1	19	5
7	9	5	29	16
8	0	1	4	5
9	1	0	6	2
10-14	7	5	22	15
15-19	1	0	6	3
20+	0	3	0	10
Total	**46**	**41**	**172**	**152**

A simulation, using the estimated 2001 post gather population as the initial age structure was then run for the years 2001 to 2004 under the "no management" management option. The most typical trial obtained from this simulation was saved and used to represent the 2004 age structure of the herd. The following table displays the initial age structure used for the Fox-Hog HMA 2004 wild horse population utilized in the population model for each Alternative (1, 2, and 3).

Table 2. Initial Age Structure (Modeled) - 2004

Age Class	Fox Hog HMA Initial Age Structure 2004	
	Females	Males
Foals	54	46
1	51	55
2	38	28
3	25	24
4	20	25
5	8	18
6	11	9
7	5	4
8	2	0
9	17	3
10-14	42	26
15-19	8	4
20+	2	11
Total	283	253

All simulations used the survival probabilities and foaling rates supplied with the WinEquus population model for the Granite Range HMA. Survival and foaling rate data were extracted from, *Wild Horses of the Great Basin*, by J. Berger (1986, University of Chicago Press, Chicago, IL, xxi + 326 pp.). Rates are based on Joel Berger's 6 year study in the Granite Range HMA in northwestern Nevada.

Table 3. Survival Probabilities and Foaling Rates for each Alternative

Age Class	Survival Probabilities		Foaling Rates
	Females	Males	
Foals	.917	.917	--
1	.969	.969	--
2	.951	.951	.35
3	.951	.951	.40
4	.951	.951	.65
5	.951	.951	.75
6	.951	.951	.85
7	.951	.951	.90
8	.951	.951	.90
9	.951	.951	.90
10-14	.951	.951	.85
15-19	.951	.951	.70
20	.951	.951	.70

Table 4. Removal Criteria – Standard for each Alternative

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

Population Modeling Criteria

The following population modeling criteria are common to all of the Alternatives (as applicable):

- Starting Year: 2004
- Initial gather year: 2004
- Gather interval: minimum interval of 3 years
- Sex ratio at birth: 57% male, 43% female
- Percent of the population that can be gathered: 90%
- Foals are included in the AML
- Simulations were run for four, nine, and fourteen years with 100 trials each
- Gathers to be triggered by the population reaching AML (226 head)
- Target population following gathers is 40% below AML (136 head). Depending upon the alternative, this target may not be met at each gather.
- For Alternative #1, fertility control effectiveness for treated mares is assumed to be 94% the first year, 82% the second year, and 68% the third year following treatment.
- For Alternative #1, the HMA would not be gathered for fertility control regardless of the population size. However, ongoing gathers would continue after population goals are met to secure additional mares for fertility treatment.

Population Modeling Results

Population size, growth rate, and number of animals handled in five, ten, and fifteen years

Out of 100 trials in each simulation, the model tabulated minimum, average, and maximum population sizes, growth rates, and number of animals handled. The model was run for four, nine, and fourteen years to determine what the potential effects would be on population size for all Alternatives. These numbers are useful to make relative comparisons of the different Alternatives and of the potential outcomes under different management options. The data displayed within the tables are broken down into different levels. The lowest trial, highest trial, and several percentile trials are displayed for each simulation completed. According to the model developer, this output is probably the most important representation of the results in terms of assessing the effects of proposed management. The trials show not only the expected average results, but also extreme high and low results of the modeling scenario.

Table 5. Growth Rates (%)

Trial	4 years			9 years			14 years		
	Alt #1	**Alt #2**	**Alt #3**	**Alt #1**	**Alt #2**	**Alt #3**	**Alt #1**	**Alt #2**	**Alt #3**
Lowest	-10.8	2.0	7.4	1.7	0.8	7.2	-2.8	8.4	4.6
10%	2.6	7.9	11.3	7.2	9.9	10.0	8.7	10.6	7.5
25%	7.2	11.7	13.0	8.4	12.5	12.7	12.2	12.1	9.1
Median	10.1	16.5	14.4	9.7	14.3	14.8	15.0	14.2	10.6
75%	13.4	18.8	16.2	11.9	16.3	16.4	18.1	16.1	11.7
90%	14.8	20.7	17.3	13.7	18.4	18.0	20.4	17.5	13.3
Highest	20.6	28.7	19.0	17.0	23.3	19.4	25.1	20.8	15.5

Table 6.1 Population sizes in 5 years

Trial	Alternative #1			Alternative #2			Alternative #3		
	min	Med	max	min	med	max	min	med	max
Lowest	**66**	174	547	**106**	217	547	**402**	473	547
10%	131	227	547	131	239	547	547	663	804
25%	143	238	547	141	254	547	547	689	868
Median	**156**	**251**	**547**	**152**	**262**	**547**	**547**	**731**	**956**
75%	165	261	547	160	270	547	547	782	1065
90%	170	267	547	167	276	547	547	824	1150
Highest	190	288	**547**	183	291	**547**	547	907	**1341**

Table 6.2 Population sizes in 10 years

Trial	Alternative #1			Alternative #2			Alternative #3		
	min	Med	max	min	med	max	min	med	max
Lowest	**82**	186	547	**93**	170	547	**401**	721	1137
10%	126	204	547	123	216	547	547	912	1305
25%	136	208	547	138	222	547	547	1005	1645
Median	**145**	**216**	**547**	**146**	**228**	**547**	**547**	**1126**	**1924**
75%	156	223	547	153	232	547	547	1226	2150
90%	160	229	547	160	236	547	547	1327	2430
Highest	173	244	**547**	171	248	**547**	547	1475	**2692**

Table 6.3 Population sizes in 15 years

Trial	Alternative #1			Alternative #2			Alternative #3		
	min	Med	max	min	med	max	min	med	max
Lowest	**92**	180	547	**104**	196	547	**454**	981	1479
10%	122	194	547	123	205	547	547	1338	2480
25%	133	200	547	137	211	547	547	1493	3066
Median	**142**	**207**	**547**	**143**	**216**	**547**	**547**	**1667**	**3626**
75%	150	212	547	151	220	547	547	1947	4480
90%	156	216	547	156	223	547	547	2138	5122
Highest	163	222	**547**	162	228	**547**	547	2650	**6281**

Table 7.1 Number of horses Gathered (G), Removed (R), and Treated (T) in 5 years

Trial	Alternative #1			Alternative #2			Alternative #3		
	G	R	T	G	R	T	G	R	T
Lowest	469	352	19	**390**	355	n/a	n/a	n/a	n/a
10%	470	356	22	392	358	n/a	n/a	n/a	n/a
25%	471	359	24	396	362	n/a	n/a	n/a	n/a
Median	**472**	**362**	**26**	**492**	**454**	n/a	n/a	n/a	n/a
75%	571	404	42	514	475	n/a	n/a	n/a	n/a
90%	675	450	66	525	486	n/a	n/a	n/a	n/a
Highest	722	502	70	556	518	n/a	n/a	n/a	n/a
Gather years	2004			2004					

Table 7.2 Number of horses Gathered (G), Removed (R), and Treated (T) in 10 years

Trial	Alternative #1			Alternative #2			Alternative #3		
	G	R	T	G	R	T	G	R	T
Lowest	**662**	428	43	**392**	356	n/a	n/a	n/a	n/a
10%	668	445	50	494	456	n/a	n/a	n/a	n/a
25%	673	451	55	526	488	n/a	n/a	n/a	n/a
Median	**684**	**462**	**61**	**594**	**550**	n/a	n/a	n/a	n/a
75%	704	480	68	618	574	n/a	n/a	n/a	n/a
90%	874	539	95	638	590	n/a	n/a	n/a	n/a
Highest	930	596	113	741	692	n/a	n/a	n/a	n/a
Gather years	2004, 2009			2004, 2008					

Table 7.3 Number of horses Gathered (G), Removed (R), and Treated (T) in 15 years

Trial	Alternative #1			Alternative #2			Alternative #3		
	G	R	T	G	R	T	G	R	T
Lowest	**661**	438	47	**561**	516	n/a	n/a	n/a	n/a
10%	688	470	62	592	548	n/a	n/a	n/a	n/a
25%	868	534	86	626	582	n/a	n/a	n/a	n/a
Median	**893**	**560**	**92**	**690**	**644**	n/a	n/a	n/a	n/a
75%	914	584	99	734	687	n/a	n/a	n/a	n/a
90%	1068	630	118	774	724	n/a	n/a	n/a	n/a
Highest	1118	672	151	840	792	n/a	n/a	n/a	n/a
Gather years	2004, 2009, 2015			2004, 2008, 2013, 2018					

Table 8. Historic Reproductive Rates

Gather/Census	Fox-Hog HMA		
	Adult	Foal	Rate (%)
1993	161	23	14.3
1994	161	32	19.9
1996	248	66	26.6
1997	283	60	21.2
2001	344	67	19.5

Population Modeling Summary

To summarize the results obtained by simulating the range of Alternatives for the Fox Hog HMA wild horse gather, the original questions can be addressed.

- Do any of the Alternatives "crash" the population?

None of the Action Alternatives indicate that a crash is likely to occur in the Fox-Hog population. The minimum population level is 66 horses under the extreme lowest trial of Alternative #1. Median growth rates are all within reasonable levels, and adverse impacts to the population are not likely. The No Action Alternative #3 could result in a crash. If no horses are removed from the HMA's, the populations would be expected to reach more than 3000 animals by 2018. By that time, horses would be causing serious impacts on soil stability, vegetation, water sources (springs and creeks), wildlife habitat, and livestock operations. Horses would begin running out of forage and water, and would be in poor shape going into winter. At some point the populations would crash, probably during an unusually cold or snowy winter.

- What effect does fertility control have on population growth rate?

The alternative implementing fertility control along with gate-cut gathers (Alternative #1, Proposed Action) reflects the lowest overall growth rates. Median growth rates for Alternative #1 ranged from 10.1 to 14.4, as compared to Alternative #2 and the No Action Alternative #3 which ranged from 9.7 to 15.0.

- What effect do the different Alternatives have on the median population size?

Implementation of Alternative #1 or #2 would result in stable median population numbers that are close to AML's over the long term. The impacts of these two Alternatives on long term populations are virtually identical. Implementation of Alternative #3 would result in population sizes that would exceed the carrying capacity of the HMA's within 10 years (probably by 2013).

- What effect do the different Alternatives have on the number of horses handled and/or removed from the HMA's?

Implementation of the No Action Alternative #3 would result in the fewest numbers of horses being handled or removed. Under this Alternative no horses would be gathered, removed, or treated for fertility control.

Of the Action Alternatives (#1 and #2), implementation of Alternative #1 would result in the fewest number of horses being removed from the two HMA's (560 horses under Alternative #1 vs. 644 horses under Alternative #2). In addition, Alternative #1 would require three gathers over the next 15 years to meet AML's, versus the four gathers needed under Alternative #2. Implementation of Alternative #2 would result in the fewest number of horses being handled (690 horses under Alternative #2 vs. 893 horses under Alternative #1).

APPENDIX B

STANDARD OPERATING PROCEDURES

Gathers will be conducted by contractors or agency personnel. The same procedures for gathering and handling wild horses and burros apply, whether a contractor or BLM personnel are used. The following stipulations and procedures will be followed to ensure the welfare, safety and humane treatment of the wild horses and burros (WH&B) in accordance with the provisions of 43 CFR 4700.

Gathers are normally conducted for one of the following reasons:

1. Regularly scheduled gathers to obtain or maintain the Appropriate Management Level (AML).

2. Drought conditions that could cause mortality to WH&B due to the absence of water or forage, and where continued grazing may result in a downward trend to the vegetative communities due to plant mortality and reduced vigor and productiveness.

3. Fires that remove forage to the extent that there is inadequate forage to sustain the population or to allow recovery of native vegetation.

4. Utilization levels that reach a point where a continued increase in utilization would cause a downward trend in the plant communities and impede meeting standards for rangeland health.

5. Monitoring indicates that WH&B use would begin to cause a downward trend in riparian function or not permit the recovery of riparian vegetation determined to be in undesirable condition.

CAPTURE METHODS USED IN THE PERFORMANCE OF A GATHER

Contract Operations

1. **Helicopter - Drive Trapping**. Capture attempts may be accomplished by utilizing a helicopter to drive animals into a temporary trap. If this method is selected the following applies:

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

b. The contractor/BLM shall assure that bands remain together, and that foals shall not be left behind.

c. A domestic saddle horse(s) may be used as a pilot (or "Judas") horse to lead the wild horses into the trap site. Individual ground hazers may also be used to assist in the gather.

2. **Helicopter – Roping.** Capture attempts may be accomplished by utilizing a helicopter to drive animals to ropers. If this method is selected the following applies:

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

b. The contractor shall assure that bands remain together, and that foals shall not be left behind.

3. **Bait Trapping.** Capture attempts may be accomplished by utilizing bait (feed or water) to lure animals into a temporary trap. If this 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 BLM prior to capture of animals.

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

CAPTURE METHODS USED IN THE PERFORMANCE OF A GATHER
BLM Operations

1. Gather operations will be conducted in conformance with the Wild Horse and Burro Aviation Management Handbook (March 2000).

2. Two-way radio communication between the helicopter and the ground crew will be maintained at all times during the operation.

SAFETY AND COMMUNICATION

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

   a. The proper operation, service and maintenance of all contractor furnished property 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 BLM violate contract rules, are unsafe or otherwise unsatisfactory. In this event, the Contractor will be notified in writing to furnish replacement personnel or equipment within 48 hours of notification. All such replacements must be approved in advance of operation by the BLM.

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

   c. All accidents occurring during the performance of any delivery order shall be immediately reported to the BLM.

2. Should the helicopter be employed, the following will apply:

   a. The Contractor must operate in compliance with all applicable Federal, State, and Local laws and regulations.

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

   c. The Interagency Helicopter Operations Guide (IHOG) shall be followed during in-house gathers.

TRAPPING AND CARE

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

   a. All trap and holding facilities locations must be approved by the BLM prior to construction. The Contractor may also be required to change or move trap locations as determined by the BLM. All traps and holding facilities not located on public land must have prior written approval of the landowner.

2. The rate of movement and distance the animals travel shall not exceed limitations set by the BLM who will consider terrain, physical barriers, weather, condition of the animals and others factors.

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

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

b. All loading chute sides shall be a minimum of 6 feet high and shall be fully covered with plywood (without holes) or like material.

c. All runways shall be 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 restraining chute to restrain, age, or provide additional care for animals shall be placed in the runway in a manner as instructed by or in concurrence with the BLM.

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, 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. Eight linear feet of this material shall be capable of being removed or let down to provide a viewing window.

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

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

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

6. If required, alternate pens, within the holding facility shall be furnished by the Contractor to separate mares or jennies with small foals, sick and injured animals, and estrays from the other animals. Animals may be sorted as to age, number, size, temperament, sex, and condition when in the holding facility so as to minimize, to the extent possible, injury due to fighting and trampling. Under normal conditions, the government will require that animals be restrained for the purpose of determining an animal's age or other similar practices. In these instances, a portable restraining chute will be provided by the government. Alternate pens shall be furnished by the Contractor to hold animals if the specific gathering requires the animals be released back into the capture area(s). In areas requiring one or more satellite traps, and where a centralized holding

facility is utilized, the Contractor may be required to provide additional holding pens to segregate animals transported from remote locations so they may be returned to their traditional ranges. Either segregation or temporary marking and later segregation will be at the discretion of the BLM.

7. The Contractor/BLM shall provide animals held in the traps and/or holding facilities with a continuous supply of fresh clean water at a minimum rate of 10 gallons per animal per day. Animals held for 10 hours or more in the traps or holding facilities shall be provided good quality hay at the rate of not less than two pounds of hay per 100 pounds of estimated body weight per day.

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

9. The Contractor/BLM shall restrain sick or injured animals if treatment is necessary. A veterinarian may be called to make a diagnosis and final determination. Destruction shall be done by the most humane method available. Authority for humane destruction of wild horses (or burros) is provided by the Wild Free-Roaming Horse and Burro Act of 1971, Section 3(b)(2)(A), 43 CFR 4730.1, BLM Manual 4730 - Destruction of Wild Horses and Burros and Disposal of Remains, and is in accordance with BLM policy as expressed in Instructional Memorandum No. 98-141.

   Any captured horses that are found to have the following conditions may be humanely destroyed:
   a. The animal shows a hopeless prognosis for life.
   b. Suffers from a chronic disease.
   c. Requires continuous care for acute pain and suffering.
   d. Not capable of maintaining a body condition rating of one.
   e. The animal is a danger to itself or others.

10. Animals shall be transported to final destination from temporary holding facilities within 24 hours after capture unless prior approval is granted by the BLM 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 BLM. Animals shall not be held in traps and/or temporary holding facilities on days when there is no work being conducted except as specified by the BLM. 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 BLM. Animals shall not be allowed to remain standing on trucks while not in transport for a combined period of greater than three (3) hours. Animals that are to be released back into the capture area may need to be transported back to the original trap site. This determination will be at the discretion of the BLM.

MOTORIZED EQUIPMENT

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

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

3. Only tractor-trailers or stock trailers with a covered top shall be allowed for transporting animals from trap site(s) to temporary holding facilities, and from temporary holding facilities to final destination(s). Sides or stock racks of all trailers used for transporting animals shall be a minimum height of 6 feet 6 inches from the floor. Single deck tractor-trailers 40 feet or longer shall have two (2) partition gates providing three (3) compartments within the trailer to separate animals. Tractor-trailers less than 40 feet shall have at least one partition gate providing two (2) compartments within the trailer to separate the animals. Compartments in all tractor-trailers shall be of equal size plus or minus 10 percent. Each partition shall be a minimum of 6 feet high and shall have a minimum 5 foot wide swinging gate. The use of double deck tractor-trailers is 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 that is capable of sliding either horizontally or vertically. The rear door(s) 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 BLM.

5. Floors of tractor- trailers, stock trailers, and the loading chute shall be covered and maintained with wood shavings to prevent the animals from slipping.

6. Animals to be loaded and transported in any trailer shall be as directed by the BLM 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 sq. ft. per adult horse (1.4 linear ft. in an 8ft. wide trailer);
    8 sq. ft. per adult burro (1.0 linear ft. in an 8ft. wide trailer);
    6 sq. ft. per horse foal (.75 linear ft. in an 8ft. wide trailer);
    4 sq. ft. per burro foal (.50 linear ft. in an 8ft wide trailer);

7. Prior to any gathering operations, the BLM will provide for a pre-capture evaluation of existing conditions in the gather areas. The evaluation will include animal condition, prevailing temperatures, drought conditions, soil conditions, road conditions, and a topographic map with location of fences, other physical barriers, and acceptable trap locations in relation to animal distribution. The evaluation will determine the level of activity likely to cause undue stress to the animals, and whether such stress would necessitate a veterinarian be present. If it is determined that capture efforts necessitate the services of a veterinarian, one would be obtained before capture would proceed. The Contractor will be apprised of all the conditions and will be given directions regarding the capture and handling of animals to ensure their health and welfare is protected.

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

9. Trap sites will be located to cause as little injury and stress to the animals, and as little damage to the natural resources of the area, as possible. Sites will be located on or near existing roads. Additional trap sites may be required, as determined by the BLM, to relieve stress caused by specific conditions at the time of the gather (i.e. dust, rocky terrain, temperatures, etc.).

ANIMAL CHARACTERISTICS AND BEHAVIOR

Releases of wild horses would be near available water. 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.

PUBLIC PARTICIPATION

It is BLM policy that the public will not be allowed to come into direct contact with WH&B being held in BLM facilities. Only BLM personnel, or contractors may enter the corrals or directly handle the animals. The general public may not enter the corrals or directly handle the animals at anytime or for any reason during BLM operations.

RESPONSIBILITY AND LINES OF COMMUNICATION

If a contractor is used for gathering operations, the Contracting Officer's Representative, Rob Jeffers, and Project Inspectors, Steve Surian, and Jerry Bonham from Nor-Cal East, have the direct responsibility to ensure the Contractor's compliance with the contract stipulations. The Surprise Field Office Manager will take an active role to ensure that appropriate lines of communication are established between the field, Field Office, State Office, and National Program Office. All employees involved in the gathering operations will keep the best interests of the animals at the forefront at all times.

All publicity, formal public contact and inquiries will be handled through the Surprise Field Manager.

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 capture of the animals. The specifications will be vigorously enforced.

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

APPENDIX C
Summary of Wild Horse Genetic Viability Issues

The following summarizes current knowledge of genetic diversity as it pertains to wild horses. This summary was developed by the Winnemucca, BLM office and was included as Appendix B of their environmental assessment #NV-020-03-22:

> 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, 2000).
>
> 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, 2000).
>
> 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 includes excerpts from the *Summary Recommendations, BLM Wild Horse and Burro Population Viability Forum April 21, 1999* (Coates-Markle, 2000)

BLM regulations and policy state that wild horses and burros shall be managed as *viable, self-sustaining populations* of healthy animals in balance with other multiple uses and the productive capacity of their habitat (CFR 4700.0-6).

BLM regulations and policy state that HMAs should be inventoried and monitored for *population size, animal distribution, herd health* and condition and habitat characteristics at least every 4 years (CFR 4710.2). As such, BLM is required to provide reliable estimates of population size and distribution within each herd management area on a regular interval.

Self-sustaining refers to the process whereby established populations are able to persist and successfully produce viable offspring which shall, in turn, produce viable offspring, and so on over the long term. The absolute size which a population must attain to achieve a self-sustaining condition varies based on the demographic and sociological features of the herd (and adjoining herds), and these aspects should be evaluated on a case by case basis. In many cases it is not necessary that populations be isolated genetic units, but both naturally-occurring and management-induced ingress and egress activity can be considered, in order to maintain sufficient genetic diversity within these populations.

Reproductive capacity is, to a large degree, dictated by the genetic fitness of a population. Generally speaking, the higher the level of genetic diversity, within the herd, the greater its long-term reproductive capacity. Inbreeding, random matings (genetic drift), and/or environmental catastrophes can all lead to the loss of genetic diversity within the population. In most herds, though, genetic resources will tend to be lost slowly over periods of many generations (~10 years/generation), and there is little imminent risk of inbreeding or population extinction. Potential negative consequences of reduced diversity, however, may include reduced foal production and survival, as well as reduced adult fitness and noted physical deformities. Smaller, isolated populations (<200 total census size) are particularly vulnerable when the number of animals participating in breeding drops below a minimum needed level. This minimum level can be calculated and is different for each population.

In order to fully evaluate genetic viability issues, populations which participate in a measurable level of natural ingress or egress activity and which are, in reality, a component of larger metapopulations, should be identified, and the genetic impact of this activity should be estimated.

Metapopulation refers to two or more local breeding populations which are linked to one another by dispersal activities of individual animals. These populations may have unique demographic features (birth and death rates) but ultimately may share some genetic material if interbreeding is occurring between individuals. This sharing of genetic material may act to enhance genetic diversity within participating herds, and as such, these populations should be evaluated as one larger metapopulation.

A complete population census of each herd management area is unrealistic, especially for the larger populations (>200 total census size). However, population size can and should be estimated using reliable scientific techniques. These survey techniques are under continual revision and BLM continues to participate in these research efforts. On a more critical level, however, is the determination of size of the many smaller populations (<200 total census size) over which BLM has responsibility. Available data indicates that almost 70% of the managed herds have AMLs (appropriate management levels) set at 150 animals or less. In fact, almost 40% of the herds in Nevada, Utah, Wyoming, Colorado, and Arizona (71 out of 177 total HMAs) are indicated to have population sizes of less than 50 animals. There is a real possibility that some of these 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 2 to 3 breeding age animals (specifically females), every 10 years, is often sufficient to maintain genetic diversity within a given herd. Estimates of existing genetic diversity can be calculated for each wild horse and burro population.

Within the context of wild horse and burro populations, the ability to maintain the quality of "reproductively self-sustaining" is required. This can primarily be accomplished through evaluation and the maintenance of an acceptable level of genetic diversity within the population over the long term.

Establishing baseline genetic diversity, for a wild horse population, often refers to typing up to 29 genetic marker systems from a sample of individual animals (~25 individuals or up to 25% of the population) within a specific herd. Traditionally, these marker systems have included blood group and biochemical systems, and have required fresh blood samples. These systems were originally developed for verifying parentage or founder animals within a herd. Analysis of genetic diversity, however, can also be done through the use of DNA genetic marker systems, and direct testing can utilize almost any bodily product including hair or even feces. Only DNA marker analysis can be used for burros, however, due to the very limited variation in blood protein genes.

Most wild horse herds, sampled to date, have shown fairly high levels of genetic diversity. In some cases, however, this diversity is attributed to a large number of low frequency and relatively rare genetic material which is often easily lost from the herd. Thus, it becomes important to understand the genetic makeup of individual herds. Baseline data needed to establish current levels of genetic diversity in populations is relatively easy to gather. Individual samples cost about $25 to process, and if ~25-50 individuals are sufficient to establish baseline information for herds ranging in size from 100 to 200 animals, then the cost would be approximately $1250 for herds of this size. As a result, a comparison of genetic viability levels in the tested population can be made to existing information from over 100 domestic and wild horse populations representing different herd sizes and demographic backgrounds.

Previous wildlife conservation research, and 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. Existing diversity should be sufficient to ensure a self-sustaining reproductive capacity within the herd.

Genetic diversity, within wild horse and burro populations, refers to the entire complement of genetic material representative of all individuals (or a sample of individuals) from within the population. Some populations may possess genetic uniformity to a certain "type" or breed of horse, but management interests are specific to maintaining a maximum diversity of genetic material which appears representative of each herd. Promotion of diversity will minimize the effects of genetic drift, or the random loss of genetic material due to mating processes, and maximize genetic health of the herds.

Once baseline genetic data has been established, the main focus of genetic management, especially for the smaller populations (<200 total census size), becomes the attempt to preserve as much of the existing genetic diversity as possible. Establishing a genetic conservation goal will require re-testing of herd diversity on at least a five-year cycle, with subsequent evaluations of the potential impact of management decisions (including the establishment and/or revision of appropriate management levels) on that diversity. Management may need to evaluate ways to introduce genetic material into a herd which appears genetically deficient in order to be self-sustaining over the long-term (see subsequent recommendations). Baseline genetic data can also be incorporated into PVA (population viability analysis) models, which attempt to predict the impact of management decisions (as well as environmental catastrophes) on existing diversity levels. Most models require reasonably accurate data in terms of age class foaling and mortality rates, as well as individual genetic information. As such, the means to collect accurate data necessary for a genetically-based PVA, for most herds, is probably unavailable at the present time.

BLM should, in its efforts to evaluate the genetic diversity and self-sustaining nature of managed herds, estimate the genetic effective population size (Ne) of all populations, or metapopulations, with a total census size of 200 animals or less.

The genetic effective population size (Ne) is a measure of the total number of mares and stallions which contribute genetically, through successful breeding, to the next generation. Although no standard goal for Ne currently exists for wild horse and burro herds, a goal of Ne=50, which comes from domestic breeding guidelines, can be conservatively applied. Populations, where Ne is calculated to be less than 50, may experience higher rates of loss of genetic diversity than would be considered acceptable under recommended management goals.

Limited research into wild horse herds (Pryor Mountain Wild Horse Range and Assateague Island National Seashore populations) has demonstrated that the "Ne", for a herd under a natural age structure, is about 30-35% of the total census population size. In other words, a total population size of about 150 animals might support only a minimum (Ne=50) genetic effective population size. Ne, however, is difficult to calculate for wild horses, since the calculation is complicated by a number of issues. The harem structure of the population, for example, greatly limits male participation in breeding, creating an uneven ratio of breeding sexes which reduces Ne and contributes to a high variation in individual reproductive success. Extreme fluctuations in population size, due to the effects of removals, can also act to reduce the value of Ne. Ne is also highly influenced by the sex ratio and age class structure of a population. A sex ratio which favors males and results in larger numbers of smaller sized harems, within the herd, will act to increase Ne (and male participation in breeding) to a point. A population with an age structure involving high numbers of young animals (<5 years of age) will have a lower value of Ne than a similar sized population with a larger component of older breeding-age animals (>5 years of age). Also, there is no single, uniformly accepted method to calculate Ne. However, researchers have used and applied several formulas to certain wild horse herds and have found this comparative approach to provide the best estimates. Generally, the best possible data on population sex ratios and age structures, coupled with reasonable estimates of foaling and mortality rates, will enable managers to evaluate the genetic health of most herds.

BLM should evaluate viable management alternatives for conserving or enhancing genetic diversity within populations (or metapopulations) having a known limited level of diversity, a total census size of less than 200 animals and/or an estimated genetic effective population size (Ne) of less than 50.

Viable management alternatives for conserving genetic diversity within managed wild horse and burro herds may take several forms. Some options to be considered might include: altering population age structure (through removals) to promote higher numbers of reproductively-successful animals; altering breeding sex ratios (through removals) to encourage a more even participation of breeding males and females; increasing generation intervals (and reducing the rate of loss of genetic material) by removing (or contracepting) younger versus older mares; and/or introducing breeding animals (specifically females) periodically from other genetically similar herds to help in conservation efforts. In this last scenario, only one or two breeding animals per generation (~10 years) would need to be introduced in order to maintain the genetic resources in small populations of less than 200 animals.

Simply increasing the total herd size by adding additional animals (adjusting the management AML upward) is not the only viable technique for enhancing the genetic effective population size (Ne) of a wild horse and burro population. With sound knowledge of existing herd demographic information, management alternatives for specific populations can be evaluated through research modeling efforts. As such, management also has the option of adjusting certain aspects of herd structure in order to promote genetic conservation. It should also be noted that any adjoining herds, which are naturally participating in an exchange of animals and genetic material through interbreeding, are probably self-maintaining their genetic diversity and management should consider both supporting and estimating this type of activity.

BLM should continue to manage wild horse and burro herds, beneath the level which is scientifically referred to as the ecological carrying capacity of the population. This is the level at which science has determined that density-dependent population regulatory mechanisms would take effect within the herd. Most herds are currently managed close to their "economic carrying capacity" which is approximately 50-65% of the ecological carrying capacity. At this level of management, health of both the horse herd and range ecosystem are prioritized.

BLM regulations and policy state that wild horses and burros shall be managed as viable, self-sustaining populations of healthy animals *in balance with other multiple uses and the productive capacity of their habitat* (CFR 4700.0-6). Thus appropriate management levels (AMLs) are established which provide for a level of use by wild horses and burros which results in a thriving natural ecological balance and avoids deterioration of the range. Furthermore, proper management requires that wild horses and burros be in good health and reproducing at a rate that sustains the population and that population control methods be considered before the herd size causes damage to the rangeland.

Ecological carrying capacity of a population, is a scientific term which refers to the level at which density-dependent population regulatory mechanisms would take effect within specific herds. At this level, however, the herds would show obvious signs of ill-fitness including poor individual animal condition, low birth rates, and high mortality rates in all age classes due to disease and/or increased vulnerability to predation. In addition, supporting range conditions would be noticeably deteriorated, with much of the available habitat showing symptoms of irreparable over-grazing.

Populations of wild horses on western rangelands have the capacity for rates of increase as high as 20-25% per year. Recent research has shown that unmanaged populations of wild horses and/or burros might eventually stabilize (due to density-dependent regulatory mechanisms) at very high numbers, near what is known as their food-limited ecological carrying capacity. At these levels, however, the herds would show obvious signs of ill-fitness including poor individual animal condition, low birth rates, and high mortality rates in all age classes due to disease and/or increased vulnerability to predation. In addition, supporting range conditions would be noticeably deteriorated, with much of the available habitat showing symptoms of irreparable over-grazing. Most wild herds are currently managed close to economic carrying capacity which allows the herds to be healthy with strong foal production and high individual survival rates. This approach should be continued, as it benefits the populations and also allows for the maintenance of healthy and in-balance rangeland systems.

The following was summarized from *Genetic Effective Population Size in the Pryor Mountain Wild Horse Herd: Implications for conservation genetics and viability goals in wild horses* by Francis J. Singer and Linda Zeigenfuss, Biological Resources Division of US Geological Survey, Natural Resources Ecology Lab, Colorado State University (Singer, 2000).

Background

Genetics are typically presumed to be the least important component of minimum viable population predictions and catastrophe is the most important. Catastrophe can be guarded against with large populations of longer predicted persistence times, but also with better management of any given population. Consider the concepts of food-limited ecological carrying capacity and economic carrying capacity. The tarpan and Przewalski's wild horses of Europe and Asia might have been limited by predation by a combination of wolves, brown bears and one or more large cats, but predation (mostly by mountain lions) is significant in only a very small number of wild horse herds in the US west. Most herds grow at phenomenal rates, for ungulates, of 16-22% per year. We observe that most wild horse herds are managed close to economic carrying capacity (which is typically 50-65% of ecological carrying capacity in numbers) and, at this lowered population level, animals are in better body condition, survival is higher (there is less starvation or dehydration), recruitment is higher, there is less conflict with other vertebrates and soil and vegetation resources, population fluctuations are less, and there is less risk of a resource-limited catastrophe.

Furthermore, while genetics is not a consideration in many free-ranging vertebrates, genetic conservation will become a serious consideration over future decades in wild horse management since so many of the herds are now isolated and small. In the Intermountain West region, 61% of all wild horse populations numbered less than 100 and 41% numbered less than 50 animals. Herds managed at these low numbers for decades might become inbred.

Discussion

Evidence from the Pryor Mountain wild horse herd supports the hypothesis that long-term management of wild horse numbers below the unmanaged maximum, has resulted in improved wild horse conditions, apparently improved range conditions, and a lower probability of a large starvation losses. Genetic effective population size (commonly referred to as Ne) is defined as the number of breeding individuals (both male and female) that contribute to the next generation. Ne is a useful number since it can be used to calculate the loss of genetic variation through genetic drift and/or inbreeding from one generation to the next with the formula 1/4Ne. But Ne is a difficult number to calculate for wild horses, since the calculation is complicated by overlapping generations, a harem structure greatly limiting male participation in breeding (an uneven ratio of breeding sexes reduces Ne), high variance in reproductive success of both sexes, population fluctuations due to removals, and by a typical failure to breed until the age of 3 years for mares and 7 years for stallions. No single, universally acceptable formula exists to deal with these complexities.

No standard goal for Ne or for loss of genetic resources currently exists for wild horse herds. If a goal of Ne=50 was applied, the goal for maintenance of domestic livestock production and thus probably an absolute minimum for a population in the wild, census N would need to be in excess of 139-185 wild horses, the excess to account for 3-5 removals per wild horse generation. Management could greatly alter this relationship by: (a) altering breeding sex ratios to increase Ne through removals, (b) increasing generation length through removal scenarios (which reduces the rate of loss of genetic resources, or (c) introducing breeding animals periodically from other genetically similar herds to maintain genetic resources. Only one to two breeding animals per generation (about every 10 years in wild horses) would maintain the genetic resources in small populations of about 100 animals, thus obviating the need for larger populations in all cases. We stress that there is little imminent risk of inbreeding since most wild horse herds sampled have large amounts of genetic heterozygosity, genetic resources are lost slowly over periods of many generations, and wild horses are long-lived with long generation interval.