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United States Department of the Interior

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(NV-022.44)

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RETURN RECEIPT REQUESTED

NV Comm. Preservation of Wild Horses
885 Eastlake Blvd
Carson City, NV 89704

Dear Reader:

Enclosed are two wild horse and burro gather plans and ~~environmental assessments~~ (EAs), the **Augusta Mountains Herd** Management Area and the South Blue Wing Complex, that have been prepared by the Bureau of Land Management, ~~Winnemucca~~ Field Office.

The Augusta Mountains EA analyzes the impacts of gathering excess wild horses from the Augusta Mountains Herd Management Area (HMA) for the proposed action and several alternatives, including the No Action alternative. The Augusta Mountains HMA is located approximately 75 miles southeast of Winnemucca in Churchill, Lander, and Pershing Counties, Nevada. The South Blue Wing Complex EA analyzes the impacts of gathering wild horses and burros from the Blue Wing Mountains, Nightingale Mountains, and Shawave Mountains HMAs. The South Blue Wing Complex is located approximately 55 miles northeast of Reno in Pershing County, Nevada.

Comments to one or both EAs must be received by the Winnemucca Field Office by August 28, 2003. All comments received will be considered during the preparation of the Decision Record and Finding of No Significant Impacts for each EA. If you have any questions, please contact Nadine Paine, Glenna Eckel, or Rodger Bryan at (775) 623-1500.

Sincerely,

Les W. Boni
Assistant Field Manager,
Renewable Resources

Enclosures: 1. Augusta Mountains Herd Management Area Gather Plan and Environmental Assessment (74pp)
2. South Blue Wing Complex Gather Plan and Environmental Assessment (62pp)

7-25-03

South Blue Wing Complex (SBWC)

(Blue Wing Mountains HMA, Nightingale Mountains HMA, Shawave Mountains HMA, Trinity Range HA)

Wild Horse & Burro Gather Plan
and
Environmental Assessment

NV-020-03-21

July 25, 2003

Winnemucca BLM Field Office

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I. Purpose and Need For Action

A. Background Information

With passage of the *Wild Horse and Burro Act of 1971*, Congress found that, "Wild horses are living symbols of the pioneer spirit of the West." The Secretary was ordered to "manage wild free-roaming horses and burros in a manner that is designed to achieve and maintain a thriving natural ecological balance on the public lands." From the passage of the Act through present day, the Bureau of Land Management (BLM) Winnemucca Field Office (WFO), has endeavored to meet the requirements of the Act. The procedures and policies implemented to accomplish this mandate have evolved over the years.

BLM experience has grown and the knowledge of the effects of current and past management on wild horses and burros has increased. For example, wild horses have been shown to be capable of 18 to 25% increases in numbers annually. Wild burros increase at a slower rate of 11 to 15%. This can result in a doubling of the wild horse population about every 3 years. Field Offices have learned more about individual herds through vegetation studies, census data, and gather activities. Nationwide awareness and attention has grown and the emphasis of the wild horse and burro program has shifted. Program goals have expanded beyond simply establishing a "thriving natural ecological balance" (setting appropriate management level (AML)) for individual herds to achieving and maintaining viable, vigorous, and stable herd populations.

The National Wild Horse and Burro Strategy is to establish and achieve AML on all Herd Management Areas (HMAs) managed by the BLM and to achieve/maintain AML on all HMAs following a four-year gather cycle. The numbers of animals projected to be removed (based on a four-year cycle) were estimated based on the use of the wild horse population model developed by Dr. Steve Jenkins of the University of Nevada Reno. Those numbers by state and year were first proposed through the Presidents 2001 budget request as a *Strategy to Achieve Healthy Lands and Viable Herds, The Restoration of Threatened Watersheds Initiative*, and later funded by Congress.

This Environmental Assessment and Gather Plan for the South Blue Wing Complex (SBWC) includes the Blue Wing Mountains (NV-217), Nightingale Mountains (NV-219), and Shawave Mountains (NV-218) HMAs. This Plan also includes a gather of the Trinity Range Herd Area (HA) (NV-232). Please refer to the Project Location Map for location details.

The SBWC Plan will analyze impacts associated with five Alternatives, including the Proposed and No Action Alternatives. A Population Management Plan (PMP) has not been completed for the SBWC. A PMP will ultimately incorporate available data, current knowledge, and management objectives for wild horse and burro populations within the SBWC. However, a Herd Management Area Plan (HMAP) titled the "Blue Wing-Seven Troughs Wild Horse and Burro Herd Management Area Plan" does exist and was completed in 1986. This document designates management of the aforementioned HMAs as a complex

due to the high degree of herd interaction within the HMAs.

B. Purpose of and Need for Action

The purpose of the action is to achieve and maintain appropriate management levels (AMLs) of wild horses and burros in the SBWC and to remove wild horses from the Trinity Range HA. The action allows collection of information on herd characteristics, determination of herd health, and the implementation of a fertility control research project. Achievement and maintenance of AMLs support BLM's management objectives for the HMAs/HAs. These objectives include:

- *Manage HMAs to achieve and maintain a thriving natural ecological balance and multiple-use relationship;*
- *Manage wild horse and burro populations to preserve and enhance the historic physical and biological characteristics of the herds;*
- *Maintain sex ratios and age structures, which allow for the continued physical, reproductive, and genetic health of the herds;*
- *Preserve and maintain healthy, viable wild horse and burro populations at levels likely to survive years when habitat resources are limited due to severe winter conditions, drought, or other uncontrollable and unforeseeable environmental influences;*
- *Manage wild horse and burro herds as self-sustaining populations of healthy animals in balance with other uses and within the productive capacity of the habitat;*
- *Maintain the wild free-roaming characteristics of the animals;*
- *Preserve and perpetuate unique spotted and pinto burro populations;*
- *Acquire data on wild horse and burro populations;*
- *Remove wild horses and burros from checkerboard HAs.*

Wild horses and burros were last gathered in the SBWC in 1998. The post-gather population in 1998 was estimated to be 366 wild horses and 12 burros. The last aerial census was flown in 2001, the count was 616 horses and 98 burros. Currently, the population is estimated to be 824 wild horses and 121 burros. These numbers exceed AML by 379% (652 head) for horses and by 332% (93) head for burros. The action is needed to reduce wild horse and burro populations within the SBWC below AMLs of 172 head and 28 head, respectfully (Table 1) to protect habitat resources from deterioration associated with over-population and to insure healthy, viable herds.

Table 1. Current AML in the SBWC

HMA/HA	Horses	Burros	Total
Blue Wing Mountains	36	28	64
Nightingale Mountains	63	0	63
Shawave Mountains	73	0	73
Trinity Range	0	0	0
Total	**172**	**28**	**200**

The fourth consecutive year of drought and stressed resource conditions add an element of urgency to this action.

This document will analyze five alternatives including the Proposed Action (Alternative I) and the No Action (Alternative V).

C. Conformance with Existing Land Use Plans

The Sonoma-Gerlach Resource Area Management Framework Plan (MFP) Record of Decision (ROD), which directs management in the project area, approved on July 9th, 1982 has been reviewed. The Alternatives are in conformance with this Plan and are consistent with federal/state laws, regulations, and plans.

The Alternatives also conform to objectives from the 1982 *Sonoma-Gerlach MFP (Land Use Plan) Grazing Decision for Livestock, Wild Horses and Burros, and Wildlife.*

Both the *Blue Wing/Seven Troughs Coordinated Resource Management Plan* (CRMP), adopted July 24th, 1984 and the *Blue Wing – Seven Troughs Wild Horse and Burro Herd Management Area Plan* (HMAP), approved March 4th, 1987 have been reviewed. The Alternatives (except Alt. V, No Action) are in conformance with both of these additional WFO management plans.

D. Relationship to Statutes, Regulations, Policies, Plans, or Other Environmental Analyses

The Alternatives are in conformance with the *Wild Free-Roaming Horse and Burro Act of 1971* (PL 92-195 as amended); all applicable regulations at 43 CFR 4700 and BLM policies; the *Strategic Plan for the Management of Wild Horses and Burros on the Public Lands*; and, the *Nevada BLM Revised Tactical Plan – Wild Free-Roaming Horses and Burros, Ensuring the Legend Lives Free.*

AMLs for the Blue Wing Mountain, Nightingale, and Shawave HMAs were established through an allotment evaluation and a Final Multiple Use Decision (FMUD) for the Blue Wing/Seven Troughs Allotment dated December 5th, 1994. A stipulated management agreement dated June 2nd, 1999 and titled *Management Agreement for the Blue Wing and Seven Troughts Allotment between C-Punch Corporation, Permittee, and USDI, BLM* revised the 1994 FMUD AML numbers from 141 to 172 wild horses and from 23 to 28 burros in accordance with the provisions of the FMUD and from monitoring results. Table 1 above reflects the current AML numbers.

The carrying capacity for livestock and wild horses/burros, multiple use management objectives, and the Terms and Conditions for livestock grazing within the Blue Wing/Seven Troughs Allotment were established in conformance with the Land Use Plan, BLM policy, and the Sierra Front/Northwest Great Basin Resource Advisory Council Area Standards and Guidelines.

Sierra Front-Northeastern Great Basin Area Resource Advisory Council (RAC) Standards and Guidelines for livestock, approved February 12, 1997, were adopted for use with wild horse and burro populations. These Standards and Guidelines reflect the stated goals of improving rangeland health while providing for the viability of the livestock industry, all wildlife species, and wild horses/burros.

Environmental analysis (EA) have been conducted in past years which analyzed the impacts of various gather methods on wild horses and other critical elements of the human environment, to achieve AML. These documents include:

1. Programmatic Environmental Assessment, Wild Horse Fertility Control Research, EA No. NV-020-00-02, November 1999.
2. Winter 19985 Wild Horse & Burro Removal Plan, Blue Wing Planning Unit. EA No. NV-020-05-05, December 1994.
3. Winnemucca District Wild Horse/Burro Removal Programmatic Environmental Assessment, EA No. NV-020-7-24, August 1987.

The above documents are available for public review at the Winnemucca Field Office.

II. Alternatives

Five alternatives including the Proposed Action and the No Action Alternatives will be analyzed. Details of each Alternative will follow the "Actions in Common" section below.

Actions in Common - Alternatives I, II, III, IV

During the gather activities, the Winnemucca Field Office (WFO) Wild Horse and Burro (WH&B) Specialists would determine animal sex, age, and color; assess herd health (e.g., pregnancy, parasite loading, physical condition, etc); and, sort individuals as to age, size, sex, temperament and/or physical condition. Data would be collected, including biological samples, for analysis and inclusion into future planning documents. Selected animals would be returned to the range. Excess animals would be transported to a BLM adoption preparation/holding facility.

The gather operation is scheduled to occur in late summer of 2003. Tentative dates are September 12th through September 30th, 2003 although gather dates are set by the Washington Office and are subject to change.

A. South Blue Wing Complex

1. Management Range

Maintain a management range in the SBWC of 104 - 172 wild horses and 17 - 28 head of wild burros as shown in Table 2.

Table 2. SBWC Management Range

HMA	Management Range (Horses)
Blue Wing Mountains	22 to 36 head
Nightingale Mountains	38 to 63 head
Shawave Mountains	44 to 73 head
Total	**104 to 172 head**
HMA	Management Range (Burros)
Blue Wing Mountains	17 to 28 head
Total	**17 to 28 head**

Information has been gathered on horse and burro movements between HMAs in the Blue Wing Complex. To better manage HMAs and more accurately reflect true horse and burro populations, HMAs are managed as a northern subunit and a southern subunit (1987 *Blue Wing – Seven Troughs Wild Horse and Burro Herd Management Area Plan*). The southern subunit is identified in this document as the SBWC and includes the Blue Wing Mountains, Nightingale Mountains, and Shawave Mountains HMAs. The management range for animals in each HMA may not represent individual genetically viable populations. However, animals move freely across unfenced HMA boundaries within the SBWC and between the northern subunit HMAs. AML for wild horses in the northern subunit HMAs is 381 head and 62 head for burros. This interaction and larger population ensures genetic viability of both the wild horse and burro herds.

2. Selective Removal Criteria

Determination of which horses would be returned back to the range would be based on an analysis of individual animals to existing population characteristics and HMA objectives. Wild horses and burros would be selected and released back into the HMAs based on historic herd characteristics of the area such as color, sex ratio, and conformation. Objectives for the herds were detailed previously under the "Purpose of and Need for Action" section and historic population characteristics are described in Chapter III, Affected Environment.

Wild horses selected for release back into the SBWC would adhere to the National Selective Removal Policy (not applicable to burros) to the extent possible, in accordance with the *Gather Policy and Selective Removal Criteria for Wild Horses, Washington Office IM 2002-095*. The selective removal priorities are:

a. Age Class Five Years and Younger: Wild horses five years of age and younger may be removed and placed into the national adoption program.

b. Age Class Ten Years and Older: Wild horses ten years of age and older may be removed and placed into long-term holding.

Any animals within this age class that are in the Henneke category of 2 or less and have no chance of timely improvement would be evaluated for euthanasia. Any euthanasia would be in accordance with Washington Office Instruction Memorandum 2001-165. Older horses that, in the opinion of the Authorized Officer, may survive if released but probably would not tolerate the stress of removal, preparation, and holding would be evaluated for return to the HMA.

c. Age Class Six to Nine Years: Wild horses aged six to nine years old should be removed last and only if the HMA cannot achieve AML without their removal.

The National selective removal criteria would be followed to the extent possible, however population modeling estimated that only 70 wild horses (34 mares and 36 studs) would fall into the of 6-9 year old age categories (Appendix C, Population Modeling).

Therefore, it is anticipated that additional animals from the younger and/or older categories would need to be released to meet the Alternative objectives. Release of animals older than 9 years of age would be preferred for several reasons that include decreased adoption demand for older animals and the cost to place them in long-term holding facilities. Exceptional animals that represent historic color, size, and/or confirmation may be chosen for release outside of the selective removal priorities. Weak, unhealthy, and/or unthrifty animals would not be selected for release back onto the SBWC.

To enhance the selection process, more animals than required by the selected Alternative would initially be separated for release. A final sorting would then be completed to select the exact animals for release (based on analysis of traits and ages of all animals initially selected for release). In the event that a certain number of wild horses/burros evade gather and have been confirmed by the WFO WH&B Specialist, the total number of animals released may be reduced by this number.

3. Trinity Range HA Gather and Removal

Gather and remove wild horses from the Trinity Range HA. The District Manager's decision in the *Sonoma-Gerlach MFP (Land Use Plan)* states that all wild horses and burros will be removed from checkerboard HAs unless a cooperative agreement concerning the retention and protection of wild horses and burros is consummated with the affected private landowner(s). The BLM has not received any requests for nor has consummated any cooperative agreements to maintain wild horses or burros on private lands within the Trinity Range HA.

B. Gather Operations

The gather would be conducted through use of the *Great Basin Wild Horse and Burro Gather Contract*. Multiple gather sites (traps) may be used to gather wild horses/burros from the SBWC. To the extent possible, gather sites would be located in previously disturbed areas. All gather and handling activities (including gather site selections) would be conducted in accordance with the *Standard Operating Procedures* (SOPs) described in Appendix A. The helicopter drive trap gather technique would be utilized for this gather. It may be necessary to utilize the helicopter rope technique to remove selected animals that could not be trapped. It is estimated that several trap sites would be required to complete the gather. Efforts would be made to release animals back into the same general area from which they were gathered.

An Animal & Plant Health Inspection Service (APHIS) veterinarian may be on-site during gather operations to examine animals and make recommendations to the WFO WH&B Specialists concerning the care and treatment of wild horses and/or burros. Consultation with a veterinarian would take place prior to euthanasia in accordance with Washington Office Instruction Memorandum 2001-165.

C. Data Collection

The following data would be collected from animals during the gather to facilitate the development of a Population Management Plan (PMP):

1. **Blood Samples.** Blood samples may be collected and analyzed to establish/maintain genetic baseline data (e.g., genetic diversity, historical origins of the herd, unique markers) for SBWC animals in accordance with the *Gather Policy and Selective Removal Criteria for Wild Horses, Washington Office IM 2002-095*. Samples would be collected from release animals. The minimum sample size is 25% of the upper end of the management range (50 head for the SBWC) or a minimum of 25 samples and not more than 100 samples per population. Blood would be drawn from both males and females in a ratio similar to the sex ratio released. The blood sample analysis would provide a comparison with domestic breeds and other wild populations that have been tested. A veterinarian or other trained personnel would collect the blood samples.

2. **Sex Ratio/Age Structure.** The sex, age, and disposition (remove or release) for each animal gathered would be recorded. This data would be used to develop a pre-gather and release sex ratio/age structure summary for the SBWC. The pre-gather sex ratio/age structure would be developed by combining the release sex ratio/age structure data collected at the gather with sex ratio/age structure data collected at the adoption preparation/holding facility receiving the removed animals. Based on analysis of existing data a sex ratio of approximately 50/50 post gather is desired for wild horse populations and an approximate 60/40 (females/males) sex ratio is desired for burros.

3. **Reproduction and Survival.** Data on reproduction and survival would be collected through documentation of animals gathered and the age of those released.

4. **Herd Characteristics.** Color and size of the animals would be recorded. The type of horse would be noted or a general impression of the herd type recorded. Incidence of albinism, parrot mouth, club feet, severely crooked legs, or other negative trait believed to be genetic would be recorded along with the disposition of the animal.

5. **Condition Class.** Condition class would be recorded using the Henneke System for animals that are noticeably thin or fat.

6. **Other Data.** All other data believed to be essential to the Population Management Plan would be collected during the gather. This may include parasite load, disease (from blood samples), percentage and age of pregnant mares, or other data.

ALTERNATIVE I: PROPOSED ACTION

Removal to the Lower Limit of Management Range with Fertility Control

Alternative I, the Proposed Action, is to gather approximately 734 wild horses, remove approximately 712 wild horses, and release approximately 22 wild horses (13 mares and 9 studs) within the SBWC. Implement an immunocontraceptive research project on 100% of the mares released, about 13 head (60% of the release animals), monitoring results as appropriate. The post gather herd population would represent the lower limit of the management range (104 head) for wild

horses in the SBWC.

Gather approximately 109 wild burros and remove approximately 104 wild burros from the SBWC. Release approximately 5 wild burros to the Blue Wing Mountains HMA. The post gather herd population would represent the lower limit of the management range (17 head) for wild burros in the SBWC.

Gather and remove approximately 8 wild horses from the Trinity Range HA.

All of the mares released back to the HMA would be treated with an immunocontraceptive vaccine, Porcine zona pellucidae (PZP), administered by trained BLM personnel. The inoculation of mares would consist of a liquid dose of PZP vaccine and a time released portion of the drug in the form of pellets. The approach incorporates the PZP into a non-toxic, bio-degradable material which can be formed into small pellets. The pellets are injected with the liquid and are designed to release PZP at several points in time much the way time-release cold pills work. Delivery of the vaccine would be by means of syringe or dart with a 12 gauge needle or 1.5" barbless needle respectfully. 0.5 cc of the PZP vaccine would be emulsified with 0.5 cc of adjuvant (a compound that stimulates antibody production) and loaded into the delivery system. The pellets would be placed in the barrel of the syringe or dart needle and would be injected with the liquid. Upon impact the liquid in the chamber would be propelled into the muscle along with the pellets. This formulation would be delivered as an intramuscular injection by a jab stick syringe, while mares are restrained in the working chute. This delivery method has been used previously to deliver immunocontraceptive vaccine with acceptable results.

Effectiveness of the two-year vaccine is 94% in year one, 82% in year two, and monitoring results from Clan Alpine show a residual effect in year three of 32%. However, administration of this two-year vaccine to mares in late summer (before November) would be expected to be 90% effective the first year and minimally effective the next year.

Wild horse mares treated with PZP will, at a minimum, be freeze-marked on the hip for identification purposes. The WFO will assure that these animals do not enter the adoption market for three years following treatment. A field data sheet will be forwarded to the field from NPO prior to treatment. This form will be used to record all pertinent data relating to identification of the mare (including photo when possible), date of treatment, type of treatment (1 yr, 2yr, and Adjuvant used), 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 Ron Hall at the National Program Office (NPO), Reno, NV.

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, a 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 tree year holding period. In the event it is necessary to remove treated mares, their removal and disposition will be coordinated through NPO. After expiration of the holding period, the animal may

be placed in the adoption system.

In addition to field and routine monitoring, aerial monitoring to determine contraceptive efficacy would be scheduled subsequent to breeding seasons in years 2 and 4 after application of the vaccine.

ALTERNATIVE II:

Removal to the Lower Limit of the Management Range without Fertility Control

Alternative II is to gather approximately 734 wild horses, remove approximately 712 wild horses, and release approximately 22 wild horses (13 mares and 9 studs) within the SBWC. The post gather herd population would represent the lower limit of the management range (104 head) for wild horses in the SBWC.

Gather approximately 109 wild burros and remove approximately 104 wild burros from the SBWC. Release approximately 5 wild burros to the Blue Wing Mountains HMA. The post gather herd population would represent the lower limit of the management range (17 head) for wild burros in the SBWC.

Gather and remove approximately 8 wild horses from the Trinity Range HA.

ALTERNATIVE III:

Removal to the Upper Limit of the Management Range with Fertility Control

Alternative III is to gather approximately 734 wild horses, remove approximately 644 wild horses, and release approximately 90 wild horses (54 mares and 36 studs) within the SBWC. Implement an immunocontraceptive research project on 100% of the mares released, about 54 head (60% of the release animals), monitoring results as appropriate. The post gather herd population would represent the upper limit of the management range (172 head) for wild horses in the SBWC.

Gather approximately 109 wild burros and remove approximately 93 wild burros from the SBWC. Release approximately 16 wild burros to the Blue Wing Mountains HMA. The post gather herd population would represent the upper limit of the management range (28 head) for wild burros in the SBWC.

Gather and remove approximately 8 wild horses from the Trinity Range HA.

Delivery of the immunocontraceptive vaccine would be as described under the Alternative I, the Proposed Action.

ALTERNATIVE IV:

Removal to the Upper Limit of the Management Range without Fertility Control

Alternative IV is to gather approximately 734 wild horses, remove approximately 644 wild horses, and release approximately 90 wild horses (54 mares and 36 studs) within the SBWC. The post gather herd population would represent the upper limit of the management range (172 head) for wild horses in the SBWC.

Gather approximately 109 wild burros and remove approximately 93 wild burros from the SBWC. Return approximately 16 wild burros to the Blue Wing Mountains HMA. The post gather herd population would represent the lower limit (28 head) of the management range for wild burros in the SBWC.

Gather and remove approximately 8 wild horses from the Trinity Range HA.

ALTERNATIVE V:

No Action

Alternative V, No Action is to defer gathering and removing animals. This Alternative postpones direct management of the wild horse and burro populations in the SBWC at this time. Wild horse populations are estimated to increase at 18-25%/year and wild burro populations are estimated to increase at a rate of 11-15%/year. The wild horse and burro populations may eventually reach equilibrium by regulating their numbers through periodic elevated mortality rates caused by drought, insufficient forage, water and/or space availability, disease, predation, or a combination of these environmental factors. Or, a management action to reduce herd numbers may be evaluated and implemented at another time. BLM would continue habitat monitoring and obtain census data on wild horse and burro populations within the SBWC.

Table 3: Comparison of Alternatives

Alternative	Gather Wild Horses/(Burros)	Remove Wild Horses/(Burros)	Post Gather Population Horse/(Burro)	Data Collection (Demographics)	Fertility Control	Fertility Control Mares Treated
Alternative I - Proposed Action Lower limit of Management Range with Fertility Control	742/(109)	712/(104)	104/(17)	Yes	Yes	13
Alternative II Lower limit of Management Range without Fertility Control	742/(109)	712/(104)	104/(17)	Yes	No	-
Alternative III	742/(109)	644/(93)	172/(28)	Yes	Yes	54

Upper limit of Management Range **with** Fertility Control						
Alternative IV Upper limit of Management Range **without** Fertility Control	742/(109)	644/(93)	172/(28)	Yes	No	-
Alternative V No Action at this Time	0/(0)	0/(0)	824/(121) (6/03 estimate)	No	No	-

III. Affected Environment

Table 4 lists the critical elements of the human environment whose review is mandated by law, regulation, or executive order. Elements marked as not Affected will not be impacted by the Alternatives or are not present in the area.

Table 4. Critical Elements Checklist

Critical Element	Present	Affected
Air Quality	Yes	No
Areas of Environmental Concern (ACECs)	No	No
Cultural Resources	Yes	Yes
Environmental Justice	No	No
Floodplains	No	No
Invasive, Non-native Species	Yes	Yes
Migratory Birds	Yes	No
Native American Religious Concerns	No	No
Prime or Unique Farmlands	No	No
Special Status Species	Yes	No
Waste, Hazardous or Solid	No	No
Water Quality (Surface and Ground)	Yes	No
Wetlands and Riparian Zones	Yes	Yes
Wild and Scenic Rivers	No	No
Wilderness	No	No

A. Wild Horses

1. SBWC HMA Descriptions

The SBWC consists of the Blue Wing Mountains, Nightingale Mountains, and Shawave Mountains HMAs. The complex is located approximately 55 air miles northeast of Reno, Nevada. It encompasses over 201,000 acres of unfenced public and private lands in western Pershing county. The area is approximately 29 miles long and 21 miles wide (refer to the Project Location Map). The gather area is located in the Blue Wing, Nightingale, and Shawave mountain ranges. The SBWC falls within one livestock grazing allotment - the Blue Wing/Seven Troughs Allotment. This allotment encompasses over 1 million unfenced acres.

Climate throughout this area is characterized by warm dry days, cool nights and low yearly precipitation ranging from 4 to 6 inches in lower elevations and from 8 to 10 inches at higher elevations. Vegetation varies from salt desert shrub communities at lower elevations to big sagebrush/grass communities at upper elevations. Typical species in the salt desert shrub community includes shadscale, bud sage, winterfat, black greasewood, Indian ricegrass, squirreltail, and desert needlegrass. Species typical of sagebrush/grass communities include low sage, Wyoming sage, desert peach, rabbitbrush, needlegrass, basin wildrye, squirreltail, Indian paintbrush, and phlox.

Horses within the HMAs are descendants of ranch horses and horses that either escaped or were released into the area. The majority of horses exhibit a bay, brown, or sorrel color. Burros within the HMA are descendants of pack animals used by miners and sheep ranchers. The majority of burros exhibit a gray color, however both white and pinto burros are found in the area.

a. Blue Wing Mountains HMA (NV-217)

The Blue Wing Mountains HMA is located in the northeast portion of the SBWC. It is relatively small, comprised of approximately 17,874 acres of public land. Elevation ranges from 4,000 feet at the valley floor to 6,592 feet at Black Mountain.

The established AML for this HMA is 36 horses and 28 burros. The current estimated population (July 2003) is 15 horses and 102 burros.

b. Nightingale Mountains HMA (NV-219)

The Nightingale Mountains HMA is located in the western portion of the Blue Wing Complex - South. It is comprised of approximately 70,079 acres of public land and 8,299 acres of private land for a total of 78,378 acres. Elevation ranges from 4,800 feet at the valley floor to 6,584 feet.

The established AML for this HMA is 63 horses and 0 burros. The current estimated population (July 2003) is 450 horses and 0 burros.

c. Shawave Mountains HMA (NV-218)

The Shawave Mountains HMA is adjacent and east of the Nightingale Mountains HMA. It is comprised of approximately 124,040 total acres - 87,796 acres of public land and 36,244 acres of private land. Elevation ranges from 4,000 feet at the valley floor to 7,771 feet at Juniper Mountain.

The established AML for this HMA is 73 horses and 0 burros. The current estimated population (July 2003) is 351 horses and 19 burros.

2. Trinity Range HA (NV-232)

The Trinity Range HA is located fourteen miles to the east of the SBWC. It encompasses approximately 161, 400 acres of checkerboard public and private lands. The Trinity Range

HA falls within four livestock grazing allotments – Ragged Top, Coal Canyon-Poker, Rye Patch, and Majuba. This HA is not managed for wild horses or burros.

3. Gather History and Population Characteristics

Wild horse and burro gathers were conducted in the SBWC in 1998, 1995, 1985, and 1981 (Table 5). In 1998, wild horses 9 years of age or younger and all burros except for selected pintos were removed from the area to achieve AML. In 1995, all wild horses 5 years of age or younger were removed and all burros down to AML.

Table 5. SBWC Gather History

Year	Number Gathered Horse/(Burro)	Number Removed Horse/(Burro)	Number Released Horse/(Burro)
1998	823/(29)	622/(26)	201/(3)
1995	1,085/(314)	878/(299)	207/(15)
1985	510/(37)	510/(37)	0/(0)
1981*	553/(0)	553/(0)	0/(0)

* Nightingale Mtns. And Shawave Mtns. HMAs only

As a result of the age selective removal in 1998 and 1995, the current wild horse population is anticipated to be made up primarily of younger horses (foals to 5 years of age) and older horses (14 years old and older).

Overall sex ratios for the gathered wild horse population in 1998 was 46.3% female and 53.7% male. At completion of the 1998 gather, 201 wild horses and 3 wild burros were released. The sex ratio of the current population is expected to be approximately 50% females and 50% males. The reproductive rate calculated from 1998 gather data was 27.8% (foals/adults).

For historical reference, 1981 gather data of 553 animals was used to determine colors and the approximate frequency of color within the herd. The frequency of colors found during the 1981 gather were: bay (32.2.6%), sorrel (12.5%), red/strawberry roan (12.4%), brown (10.75%), buckskin (4.9%), black (3.6%), and gray (3.4%). Other colors present but representing less than 3.0% of the population include: pinto, albino, sevina, cremello roan, grulla, red dun, palomino, blue roan, chestnut, and dun.

Wild horses in the Trinity Range HA were gathered in 1998, 1993, 1988, and 1985 (Table 6). All horses were removed from the Trinity Range in 1998, except for two animals known to be missed during the gather operation.

Table 6. Trinity Range HA Gather History

Year	Number Gathered Horse/(Burro)	Number Removed Horse/(Burro)	Number Released Horse/(Burro)
1998	19/(0)	17/(0)	2/(0)
1993	28/(56)	22/(51)	6/(5)
1988	78/(33)	71/(33)	7/(0)
1985	375/(0)	375/(0)	0/(0)

Table 7 displays the estimated July 2003 populations by HMA/HA. The population estimate is based on a 2001 helicopter census, using an estimated 15% rate of annual increase for horses and a 11% rate of annual increase for burros. A census of the SBWC is planned for June 30th and July 1st, 2003, to validate/confirm the estimated populations.

Table 7. Estimated Horse/Burro Populations (July 2003)

HMA/HA	Estimated Population Horse/(Burro)
Blue Wing Mtns.	15/(102)
Nightingale Mtns.	450/(0)
Shawave Mtns.	351/(19)
Trinity Range	8/(0)
Total	824/(121)

4. Genetic Diversity and Viability

Blood samples were collected from 57 mares, 29 studs, and 26 burros during the SBWC 1995 gather to develop genetic baseline data (e.g. genetic diversity, historical origins of the herd, unique markers). The samples were analyzed by a geneticist to develop a genetic frequency for the herd, however there were no other interpretations made from the data. Additional blood samples will be drawn during the proposed gather to establish the current level of genetic diversity for the SBWC herds. These data will be incorporated into a Population Management Plan. At this time, there is no evidence to indicate that the SBWC animals suffer from reduced genetic fitness. Please refer to *Appendix B, Summary of Wild Horse Genetic Viability Issues* for information concerning genetic diversity in wild horse herds.

The following summarizes what is known about the genetic diversity of SBWC:

- The current estimated populations for the SBWC are 816 horses and 121 burros;
- Analysis of the 1995 genetic frequency data indicated a close genetic match between mares and studs in the SBWC compared to other WFO HMAs;
- Genetic results for burros were very similar to other burro studies;
- Comparison to burros from a different gather location were desired;
- Animals disperse and interact freely across HMAs within the SBWC and with the northern subunit HMAs;
- Ne (genetic effective population size) for the SBWC has not been established;
- Current knowledge is limiting for the application of these concepts to wild horse and burro herds managed by the BLM. As more research is completed and knowledge increases, it will be applied to the herds managed by the WFO.

B. Air Quality

Air quality within the SBWC is considered good and is typical of rural areas within the northern Great Basin.

C. Cultural Resources

A complete inventory of archeological sites in the SBWC has not been completed. Previous inventories have identified pre-historic sites (lithic scatters, isolated projectile points, etc.) in the area. Historic sites associated with ranching and mining are known to occur in this area as well. The highest concentration of prehistoric sites is in association with permanent and intermittent water sources.

D. Wildlife

Wildlife habitat is comprised largely of three generalized plant communities: the salt desert shrub community, found at lower elevations, the Wyoming sagebrush community that occupies middle elevations, and a mountain brush community at higher elevations. Wildlife species found in these habitats vary in abundance and diversity depending on the type and condition of the vegetation. Approximately 300 species of wildlife, including mammals, birds, amphibians, and reptiles are seasonal or yearlong residents.

Within the proposed project area, numerous species of wildlife occur. Mule deer (*Odocoileus hemionus)*, pronghorn antelope *(Antilocapra americana)*, California bighorn sheep (*Ovis canadensis California),* mountain lions *(Felis concolor)*, coyotes *(Canis latrans)*, and bobcats *(Lynx rufus)* are the main game and fur bearing species present. Chukar *(Alectoris chukar)*, California quail *(Lophortyx californicas)*, morning doves *(Zenaida macroura)*, and cottontail rabbits *(Sylvilagus sp)* constitute the major upland game species. In addition, a variety of non-game mammals, birds, and reptiles occur in the project area.

E. Migratory Birds

A migratory bird inventory has not been completed for the SBWC. Common migratory birds which may use the area as habitat include: various song birds, blue birds, nighthawks, swallows, swifts, fly catchers, kingbirds, ravens, dippers, blackbirds, crows, raptors, various waterfowl and shorebirds, snipe, sandpipers, phalaropes, wading birds, hummingbirds, warblers, finches, doves, juncos, wrens, sparrows, killdeer, robins, and meadowlarks.

F. Special Status Species

There has not been an inventory for candidate or species of concern conducted in the SBWC. However, according to the US Fish and Wildlife Service, "to the best of our knowledge, there are no endangered, threatened, proposed, or candidate species in the project area" (Pershing County, Nevada, File No. 1-5-03-SP-204, June 13, 2003).

No comprehensive on-the-ground field investigation has been conducted for sensitive/protected plant and animal species. However, according to the Nevada Natural Heritage's program data (January 2003) two endemic wetlands have the western Lahontan springsnail (*Pyrgulopsis longiglans*) in the Nightingale Mountain range. This species is restricted to spring sources and is listed as imperiled due to rarity and/or other demonstrable factors. No endangered, threatened, candidate, or sensitive plants have been reported in the project area.

G. Invasive, Non-Native Species

Noxious weed surveys, including invasive and non-native species, have not been conducted in

the SBWC. No known weed populations exist, however, they may occur or may potentially occur in a variety of habitats within the SBWC.

H. Water Quality, Wetlands and Riparian Zones

Riparian areas are limited within the SBWC and are generally associated with springs/seeps that include: Blue Wing, Sage Hen, Upper Stonehouse, Lower Stonehouse, Tunnel, and Juniper springs. Resource degradation including over-utilization of riparian forage, trailing, bank erosion, trampling, and soil movement caused by wild horses and burros is currently occurring at most springs within the SBWC. Animals are known to utilize winter snow for water in this area and often dig for water at undeveloped springs during the dry summer months. Riparian sites are heavily utilized especially when the water flow is low as occurs during droughts. This is the fourth consecutive drought year for the area.

I. Vegetation and Soils

Vegetation varies from salt desert shrub communities at lower elevations, to low and big sagebrush/grass communities at higher elevations. The lower elevations are comprised of salt tolerant plants such as bud sagebrush (*Artemisia spinescens*), shadscale (*Atriplex confertifolia*) and, baileys and black greasewood (*Sarcobatus spp.*). Mid-elevations and alluvial fans consist of Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) or Lahontan sagebrush (*Artemisia arbuscul ssp. longicaulis*), with an understory of Sandberg's bluegrass (*Poa secunda*), bottlebrush squirreltail (*Sitanion hystrix*), and Thurber's needlegrass (*Stipa thurberiana*). Within the mid and higher elevations, there is an occurrence of Utah juniper (*Juniperus osteosperma*). The higher elevation sites are comprised of mountain big sagebrush (*Artemisia tridentata vaseyana*), bluebunch wheatgrass (*Agropyron spicatum),* Idaho fescue *(Festuca idahoensis),* and also support mountain browse species that include serviceberry *(Amelanchier alnifolia)*, snowberry (*Symphoriocarpos spp.*), and currant *(Ribes spp.)*. Riparian areas at mid to higher elevations support cottonwood (*Populus sp.*) and willows (*Salix spp)*.

The SBWC is in the Major Land Resource Area 27. The majority of the project area falls in the salt desert and sagebrush scrub vegetation communities. These communities have low precipitation and vegetative cover (basal and canopy between 15 to 25 percent). The salt desert scrub is represented by range site Loamy 4-8". The sagebrush scrub is represented at low and mid elevations by range site Loamy Slope 8-10". The higher elevations are represented by range site Loamy Slope 10-12".

Surface soils are medium to moderately coarse textured. The potential for water erosion is moderate to high depending on slope gradient. The potential for wind erosion is moderate for the valleys and slight for the mountains. Forage production has been low (250 to 500 pounds/acre, dry weight) as a result of four years of drought.

J. Recreation

Most of the recreation that occurs in this area is of a dispersed type. People enjoy driving their vehicles for pleasure, explore with their four-wheel drives and motorcycles, and just enjoy the out-of-doors. They also hunt, rock hound, camp, and picnic. Many of them do come to the area to look at wild horses. For the most part, there are no areas where

recreationers congregate. One exception concerns the vehicle races that sometimes occur in the area. There is a possibility that a motorcycle race will occur in the vicinity during September 2003. Although it has occurred in September of 2002 and the race promoter has voiced an interest in conducting one in 2003, no official application has been submitted to the BLM yet for such an event. If one were to occur it would take place on one or two days during a weekend in September. It would start at the motorcross site near Lovelock and proceed into the hills, returning to the track after creating a loop. There would be several laps along this loop.

The SBWC falls in Nevada Hunt Unit 041. A rifle California bighorn sheep hunt (1 tag) is scheduled September 6th through October 3rd. An archery mule deer hunt (19 tags) is scheduled August 16th through September 12th and a muzzle loader mule deer hunt (5 tags) is scheduled September 13-28. Dove season will also be open in the area during the month of September.

K. Visual Resources

The proposed gather would take place in areas rated as Class III and IV for Visual Resource Management. Class III – Changes to the visual resource should remain subordinate to the visual strength. Class IV – changes may subordinate the visual character but must reflect what could be a natural occurrence.

L. Wilderness/Wilderness Study Area

There are no wilderness or wilderness study areas within the gather area.

IV. Environmental Consequences

The following elements of the human environment are present and may be affected by the action.

A. Wild Horses

Actions in Common - Alternatives I, II, III, IV

1. South Blue Wing Complex Herd Management Range

The Wild Free-Roaming Horse and Burro Act of 1971 (Public Law 92-195 as amended) states that all management activities shall be implemented at the minimum feasible level. The minimum feasible level of management would require that removals and other management actions that directly impact the population, such as helicopter census, occur as infrequently as possible (3 to 5 years). To the extent practical, the lower limit of the management range should allow maintenance of a self-sustaining population and the upper limit of the management range must be consistent with the objective of maintaining a thriving natural ecological balance.

Population modeling (Appendix C) conducted for Alternative I and II (removal to the lower limit of the management range with and without fertility control) indicate that the lower level

of the management range should allow for maintenance of a self-sustaining population. For Alternative I, the Proposed Action, the minimum population size in 5 years found that the lowest number of 0-20+ year old horses ever obtained was 136 head, with a Median Trial population of 204 head. The average population size in 5 years found that the Lowest Trial had 303 head, with a median trial population of 367 head. For Alternative II, the minimum population size in 5 years found that the lowest number of 0-20+ year old horses ever obtained was 148 head, with a Median Trial population of 205 head. The average population size in 5 years found that the Lowest Trial had 321 head, with a Median Trial population of 380 head.

Attainment of the lower limit of the management range in the SBWC would meet the intent of the Wild Free Roaming Horse and Burro Act, that all management actions shall be at the minimum feasible level. The following positive impacts for wild horses, burros, and their habitat would occur:

- Achieve and maintain a thriving natural ecological balance by reducing the wild horse and burro population to the lower limits of the management range;
- Ensure a viable population of wild horses and burros are likely to survive during years when resources are limited due to severe winter conditions, drought, or other uncontrollable and unforeseeable environmental influences;
- Annual gathers would not be required which would allow for a greater level of herd stability and band integrity;
- Gathers would only occur when the population approaches or exceeds the upper limit of the management range;
- The wild horse and burro populations would be subjected to the stresses associated with gathering and handling as infrequently as possible.

If a management range is not maintained in the SBWC, the intent of the Wild Free Roaming Horse and Burro Act, that all management actions shall be at the minimum feasible level, would not be met. The following impacts would occur:

- A thriving natural ecological balance would not be maintained if yearly gathers to remove the annual increase do not take place. Resource degradation would begin occurring the year following the last gather and increase each year that a gather is postponed;
- Annual gathers would be required to remove the annual increase in population numbers each year, approximately 26 horses and 4 burros;
- Annual gathers would have greater impacts to herd stability and band integrity;
- The wild horse and burro populations would be subjected to the stress associated with gathering and handling annually. There would be a greater likelihood that more animals would be injured or killed.

2. Selective Removal Criteria

Direct impacts associated with the Alternatives I, II, III, or IV would consist of selecting wild horses/burros for release that possess historic characteristics (color pattern, sex ratio) and age

structure that are typical of the herd demographics. The National Selective Removal Policy (described in Section II.A.2.) would be followed to the extent possible. Animals selected for release would be the most capable of surviving environmental extremes, thus ensuring a viable population is present in the HMA. As a result of the age selective removals in 1998 and 1995, there will be horses in the five years and younger age class and the ten years and older age class to select for release which will ensure a more normal age structure population than may result from strict adherence to the National Selective Removal Policy. Utilizing the selective removal criteria would result in a positive impact for the long term health and stability of the population.

The effect of removal of horses and burros from the population would have a minimal impact on herd population dynamics, age structure, and sex ratio, as long as selection criteria for the removal maintains the social structure and breeding integrity of the herd. The selective removal strategy for the SBWC would maintain the age structure (of critical breeding age animals), the sex ratio, and the historic range of characteristics currently within the herd. This flexible procedure would allow for the correction of any existing discrepancies in herd dynamics which might predispose a population to increased chances for catastrophic impacts.

Potential negative impacts to the long-term health and stability of the population could occur from exercising poor selection criteria not based on herd demographics and age structure. These negative impacts would include modification of age or sex ratios to favor a particular class of animal. Effects resulting from successive removals causing shifts in sex ratios away from normal ranges are fairly self-evident. If selection criteria favors studs, band size would be expected to decrease, competition for mares would be expected to increase, and the size and number of bachelor bands would be expected to increase. If selection criteria favors mares, band size would be expected to increase, competition for mares would be expected to decrease, and the size and number of bachelor bands would be expected to be smaller and fewer.

The effects of successive removals on populations causing shifts in herd demographics favoring younger horses (under 15 years) would also have direct consequences on the population. These impacts are not thought of typically as adverse to a population. They include development of a population which is expected to be more biologically fit, more reproductively viable, and more capable of enduring stresses associated with traumatic natural and artificial events.

3. Gather Operations

These direct impacts include: handling stress associated with the gathering, processing and transportation of animals from gather sites to temporary holding facilities, and from the temporary holding facilities to an adoption preparation facility. The intensity of these impacts varies by individual and is indicated by behaviors ranging from nervous agitation to physical distress. Mortality does occur during a gather, however it is infrequent and typically occurs to no more than one half to one percent of the total animals gathered.

Impacts which may occur after the initial stress of herding and capture include: spontaneous

abortion in mares and increased social displacement/conflict in studs. Spontaneous abortion following capture is rare, depending on the time of year gathered. Traumatic injuries that may occur typically involve bites and/or kicks that result in bruises and minor swelling. These impacts occur intermittently and the frequency of occurrence varies with the individual and situation.

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

All activities would be carried out in accordance with current BLM policy with the intent of conducting as safe and humane a gather as possible. Recommended actions would incorporate proven Standard Operation Procedures (SOPs, Attachment 1). SOPs represent the best methods for reducing impacts to animals associated with gathering, handling, transporting and collecting data.

4. Data Collection

Direct impacts associated with data collection involve increased stress levels to the animals as they are restrained in the portable aging chute. Animals selected for blood sampling may become very agitated as samples are drawn. Animal stress levels decrease rapidly once the animal is released from the chute. The collection of data is a positive impact to the long term management of the population. These data will be used to develop population specific objectives that will help ensure the long-term viability of the population. This procedure is within the intent of Public Law 92-195 as amended.

ALTERNATIVES -

Population modeling was completed for Alternatives I through V. One objective of the modeling was to identify if any of the Alternatives "crash" the population or cause extremely low population numbers or growth rates. Modeling results do not indicate a crash is likely to occur under any of the Alternatives. Minimum population levels and growth rates were found to be within reasonable levels and adverse impacts to the population are not likely. It is expected that implementation of any Alternative would not significantly impact the genetic viability or genetic health of the SBWC herds. At this time, there is no evidence to indicate that the SBWC herds suffer from reduced genetic fitness in any way.

Table 8 displays differences between Alternatives (I-V) based on the results of the population modeling. This table shows the average population size for the median trial in five years and average growth rate for the median trial in four years following a gather under different

Alternatives. Refer to Appendix C, Population Modeling, for a complete summary of data and tables obtained from the wild horse population modeling.

Table 8. Population Modeling: Average Population and Growth Rates

Alternative	Average Population Size	Average Growth Rate - % (year 4)
Alternative I - Proposed Action (Lower Limit of the management range with fertility control)	367	14.6
Alternative II (Lower Limit of the management range without fertility control)	380	18.2
Alternative III (Upper limit of the management range with fertility control)	383	14.9
Alternative IV (Upper limit of the management range without fertility control)	399	17.9
Alternative V – No Action (No management action at this time)	1,196	15.5

Alternative I (Proposed Action)

Removal to the Lower Limit of the Management Range with Fertility Control

Direct impacts associated with Alternative I, the Proposed Action include potential changes to herd demographics, stress associated with gathering, and the effects from implementing an immunocontraceptive fertility control research project. The effect on herd demographics was discussed in the "Selective Removal Criteria" section (refer to Section IV.A.2) and the stress associated with gathering would be the same as those discussed under "Gather Operations" (refer to Section IV.A.3).

Implementation of the Proposed Action would likely prevent the wild horse population from increasing beyond the upper limit of the management range (172 head) until 2007 and the wild burro population from increasing beyond the upper limit of the management range (28) until 2008. This would allow implementation of a four-year gather cycle to maintain horse/burro numbers within the management range. Gathering to the lower limit of the management range (104 horses/17 burros) would allow the wild horse/burro population to increase over time to the upper limit of the management range (172 horses/28 burros).

Population modeling found that Alternative I, the Proposed Action resulted in the lowest average population size of 367 horses four years after the gather. The average population size for Alternatives II, III, IV, and V were 3.5%, 4.4%, 8.7%, and 225.9% greater than Alternative I. This Alternative also modeled the lowest average growth rate of 14.6% for horses. The average growth rates for Alternatives II, III, IV, and V were 24.7%, 2.0%, 22.6%, and 6.2% greater than Alternative I. Population modeling is only available for wild

horses and not burros. Refer to Table 8 for additional details.

Re: Fertility Control. Each mare to be released would receive a single-dose of the two-year PZP contraceptive vaccine, as described in Section II. When injected, PZP (antigen) causes the mare's immune system to produce antibodies that bind to her eggs, effectively blocking sperm penetration and fertilization (Zoo Montana, 2000). PZP is relatively inexpensive, meets BLM requirements for safety to mares and the environment, and can easily be administered in the field. PZP contraception appears to be completely reversible and to have no ill effects on ovarian function if mares are not vaccinated for more than 3 consecutive years. PZP will not affect normal development of the fetus, hormone health of the mare, or behavioral responses to stallions should the mare already be pregnant when vaccinated (Kirkpatrick, 1995). Turner (1997) also found that the vaccine has proven to have no apparent affects on pregnancies in progress, the health of offspring, or on the behavior of treated mares. Based on Clan Alpine studies, the PZP two-year vaccine has proven 94% effectiveness in year one, 82% effectiveness in year two, and 32% in year three if mares are inoculated during the winter months. However, administration of this drug in September would only be expected to limit foal production one year. Inoculated mares would foal normally in 2004 and the contraceptive would limit foal production in 2005. Near normal foaling rates would be expected to resume in 2006.

Mares receiving the vaccine would experience slightly increased stress levels from additional handling while being inoculated and freeze marked. There may be some swelling at the injection site following the administration of the fertility control vaccine, but this would be a temporary, short term impact. Injection site injury associated with fertility control is extremely rare in treated mares. Injection of the vaccine would be controlled, handled and administered by a trained BLM employee, researcher or veterinarian. Any direct impacts associated with fertility control are expected to be minor in nature and of short duration. The mares would quickly recover once released.

Syringes, darts, needles, vaccine containers, etc. used in the administration of the immunocontraceptive vaccine are considered regulated medical waste. Regulated medical waste must be placed in leak proof containers that are contained in a red plastic bag labeled medical waste. Medical waste must be handled and transported separately from other waste to an approved disposal facility (WFO Programmatic EA, 1999).

The use of fertility control is not expected to have any long-term direct or indirect impacts to the SBWC population's genetic health, long term viability, or future reproductive success of mares within the herd (WFO Programmatic EA, 1999). Implementation of fertility control is expected to improve the health of mares and foals. Results from the population modeling indicate the action would decrease foal production for one year, but would not negatively impact the wild horse population in long term management.

The outcome of Alternative I would provide more forage available to wild horses and burros during drought or extreme winters than would be under Alternatives III or IV which gather to the upper limit of the management range. Improved condition of mares and foals would aid

in the long-term health and viability of the SBWC wild horse population. Reduced growth rates would occur with the implementation of fertility control, reducing competition for resources and utilization levels of those resources. Reduced growth rates would increase the time interval between gathers, having overall beneficial impacts to wild horse and burro populations, wildlife, and domestic livestock. It would also contribute to the achievement and maintenance of a thriving natural ecological balance. This action would support a vigorous and viable breeding population, reduce stress on vegetative communities and wildlife, and be in compliance with the Wild Free Roaming Horse and Burro Act, the Land Use Plan, and the multiple use management objectives established through the Allotment Evaluation and Multiple Use FMUD and HMAP.

Alternative II

Removal to the Lower Limit of the Management Range without Fertility Control
Direct impacts associated with Alternative II include potential changes to herd demographics and stress associated with gathering. The effect on herd demographics was discussed in the Selective Removal Criteria section (refer to Section IV.A.2) and the stress associated with gathering would be the same as those discussed under Gather Operations (refer to Section IV.A.3).

Implementation of Alternative II would likely prevent the wild horse population from increasing beyond the upper limit of the management range (172 head) until 2007 and the wild burro population from increasing beyond the upper limit of the management range (28) until 2008. This would allow implementation of a four-year gather cycle to maintain horse/burro numbers within the management range. Gathering to the lower limit of the management range (104 horses/17 burros) would allow the wild horse/burro population to increase over time to the upper limit of the management range (172 horses/28 burros).

Population modeling found that the average population size in four years following the gather for Alternative II was less than Alternatives III, and IV, but slightly higher than Alternative I. The average population size for Alternatives III, and IV were 20.4% and 32.8% greater than Alternative II, but Alternative I was 7.4% less. The average growth rate for Alternative II is slightly higher than the other non-fertility control Alternative (IV). Average growth rates for fertility-control Alternatives (I, III) were about 3.5% less than this Alternative. Refer to Table 8 for additional details.

The outcome of Alternative II would provide more forage available to wild horses and burros during drought or extreme winters than would be under Alternatives III or IV which gather to the upper limit of the management range. This action would support a vigorous and viable breeding population, reduce stress on vegetative communities and wildlife, and be in compliance with the Wild Free Roaming Horse and Burro Act, the Land Use Plan, and the multiple use management objectives established through the Allotment Evaluation and Multiple Use FMUD and HMAP. No fertility control would be administered.

Alternative III

Removal to the Upper Limit of the Management Range with Fertility Control
Direct impacts associated with Alternative III include potential changes to herd demographics, stress associated with gathering, and the effects from implementing an immunocontraceptive fertility control research project. The effect on herd demographics was discussed in the "Selective Removal Criteria" section (refer to Section IV.A.2) and the stress associated with gathering would be the same as those discussed under "Gather Operations" (refer to Section IV.A.3). Impacts associated with implementing an immunocontraceptive fertility control research project are the same as discussed in Alternative I above.

Implementation of Alternative III involves gathering only to the upper limit of the management range (172 horses/28 burros). As soon as the gather is completed, mares will foal and the upper limit of the management range will be exceeded almost immediately. Overuse of forage and water resources will resume. Inoculated mares would foal normally in 2004 and the contraceptive would limit foal production in 2005. Near normal foaling rates would be expected to resume in 2006. The population will increase each year (Alternative III to a lesser degree due to fertility control) until the next gather is scheduled in approximately four years. A thriving natural ecological balance would not be maintained. Resource degradation would include over-utilization of upland and riparian forage resources. Wild horses and burros contribute to degradation of upland California bighorn sheep, pronghorn antelope, and mule deer forage species. Lahontan springsnail habitat would be impacted by trampling and vegetation removal. Degradation to resources would increase as wild horse and burro numbers increase. This degradation would be worsened during years affected by drought or other environmental extremes that cause additional stress to resources or shortages of resources to rangeland users.

Population modeling found the average population size in four years after the gather for Alternative III was extremely similar to Alternative II (gather to lower limit of the management range without fertility control). The average growth rate for Alternative III is also very similar to Alternative I (with fertility control) and slightly lower than the non-fertility control Alternatives (II and IV). Refer to Table 8 for additional details.

The outcome of Alternative III would not ensure the SBWC would be a successful self-sustaining population of healthy animals in balance with other uses and the productive capacity of the habitat. The herd would be over the upper limit of the management level almost immediately after the action. The wild horse and burro populations would be at a higher risk of ill fitness and disease should elements of the habitat become limited due to drought or winter extremes. Fertility control would be implemented, however herd size would be over AML in the first post gather year.

Alternative IV

Removal to the Upper Limit of the Management Range without Fertility Control
Direct impacts associated with Alternative IV include potential changes to herd demographics and stress associated with gathering. The effect on herd demographics was discussed in the "Selective Removal Criteria" section (refer to Section IV.A.2) and the stress associated with gathering would be the same as those discussed under "Gather Operations" (refer to Section IV.A.3).

Implementation of Alternative IV involves gathering only to the upper limit of the management range (172 horses/28 burros). As soon as the gather is completed, mares will foal and the upper limit of the management range will be exceeded almost immediately. Overuse of forage and water resources will resume. No fertility control would be administered. The population would increase each year until the next gather is scheduled in approximately four years. A thriving natural ecological balance would not be maintained. Resource degradation would include over-utilization of upland and riparian forage resources. Wild horses and burros contribute to degradation of upland California bighorn sheep, pronghorn antelope, and mule deer forage species. Lahontan springsnail habitat would be impacted by trampling and vegetation removal. Degradation to resources would increase as wild horse and burro numbers increase. This degradation would be worsened during years affected by drought or other environmental extremes that cause additional stress to resources or shortages of resources to rangeland users.

Population modeling found Alternative IV has the fourth highest average population sizes in 5 years, and the second highest average growth rate as compared to Alternatives I, II, and III. Refer to Table 8 for additional details.

The outcome of Alternative IV would not ensure the SBWC would be a successful self-sustaining population of healthy animals in balance with other uses and the productive capacity of the habitat. The herd would be over the upper limit of the management level almost immediately after the action. The wild horse and burro populations would be at a higher risk of ill fitness and disease should elements of the habitat become limited due to drought or winter extremes. No fertility control would be implemented.

Alternative V (No Action)

Direct impacts associated with Alternative V include potential changes to herd demographics and stress associated with overpopulation and habitat degradation. The current population of 824 wild horses and 121 wild burros would continue to increase and exceed the carrying capacity of the range. Though it may require many years for the population to reach catastrophic levels, Alternative V poses the greatest risk to the long-term health and viability of the SBWC wild horse and burro populations, wildlife populations, vegetative health, habitat conditions, and water resources.

Implementation of Alternative V would maximize competition for available water, forage resources, and space by wild horses and burros. Animals would move out of the SBWC into unmanaged areas. The areas closest to water sources would experience severe utilization and

degradation of the range resource. Over the course of time, animals would deteriorate in condition as a result of declining forage availability and the increasing distance traveled between forage and water sources. Mares, jennies, and foals would be affected most severely. The continued increase in population would eventually lead to catastrophic losses to the herd which would be a function of the available forage, water, and the degradation of habitat. A point would be reached where the herd reaches the ecological carrying capacity and both the habitat and the wild horse and burro populations would be critically unhealthy. Irreparable damage to the resources, which would include primarily vegetative, soil and riparian resources, would have obvious impacts to the future of the SBWC and all other uses of the resources which depend upon them for survival.

Population modeling found Alternative V, No Action had highest average population size as no gather action would occur at this time. The Average Median Trial reported a potential wild horse population of almost 1,200 animals in 2007. This number is almost 700% over AML for the SBWC. The average growth rate for this Alternative falls between the fertility (I and III) and non-fertility (II and IV) Alternatives. Refer to Table 8 for additional details.

The outcome of Alternative V would not ensure the SBWC would be a successful self-sustaining population of healthy animals in balance with other uses and the productive capacity of the habitat. The wild horse and burro populations would be at a higher risk of ill fitness and disease should elements of the habitat become limiting due to drought or winter extremes. No gather action or fertility control would be implemented at this time.

B. Air Quality

Direct impacts associated with Alternatives I, II, III, or VI would consist of an increase in dust as wild horses/burros 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/burros are transported from the temporary holding site to a BLM adoption preparation/holding facility. These impacts would be temporary, with a short duration, and minimal. No direct or indirect impacts would occur with Alternative V.

C. Cultural Resources

Direct impacts to cultural resources are not anticipated to occur due to implementation of any of the action Alternatives (I-IV) because gather sites and temporary holding facilities would be inventoried for cultural resources prior to construction. The WFO 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 are 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 V.

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 and burros concentrate in these areas, these areas are most likely to be impacted by trampling and erosion. Indirect impacts associated with Alternative (I-V) would be related to wild horse/burro population size. Impacts would be the least with implementation of Alternative I, the Proposed Action. Impacts would be anticipated to increase with each successive Alternative with Alternative V being likely to have the most impacts.

D. Wildlife

Direct impacts associated with Alternatives I, II, III, or IV would consist primarily of disturbance and displacement to wildlife by the low-flying helicopter. Typically, the natural survival instinct 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, with short duration, and minimal. A slight possibility exists that non-mobile or site-specific animals would be trampled. No direct impacts are associated with Alternative V.

Indirect impacts for all Alternatives (I-V) would be related to population size. Population modeling completed for the Alternatives found that the average median population size progressively increased from Alternative I, Proposed Action (lowest average population) thru Alternative V, No Action (highest average population). A reduction in the number of wild horses/burros from current levels would decrease competition for available cover, space, forage, and water. A reduction in forage utilization levels and hoof action around un-improved springs would improve stream bank stability and riparian habitat condition. Reduced utilization levels should allow for increased plant vigor, seed production, and seedling establishment thereby supporting the ecological health of the habitat. Implementation of Alternatives I or II would provide the opportunity for the greatest improvement of habitat and reduced competition for cover, space, forage, and water, which would positively affect wildlife. The opportunity for habitat improvement and reduced competition for cover, space, forage, and water decreases for each successive Alternative. Implementation of Alternative V (No Action) would cause the greatest impacts to habitat and contribute to intense competition for cover, space, forage, and water. Impacts would increase each year that a gather is postponed, which would negatively impact ecological condition, wildlife populations, livestock production, and other resource values.

E. Migratory Birds

None of the Alternatives would directly impact migratory bird populations with the exception of possible displacement from small areas of their habitat. This impact would be minimal, temporary, and short-term in nature.

Indirect impacts would be related to the wild horse/burro population size. Reduction of the current populations provides the opportunity for vegetative communities to progress toward achieving a thriving natural ecological balance. Implementation of Alternatives I or II would

result in a positive impact to migratory birds by creating a diverse vegetative structure through improvement and maintenance of healthy populations of native perennial plants. Implementation of Alternative I, the Proposed Action would provide the greatest opportunity for the improvement of vegetative communities. Implementation of Alternative III or IV would not be as likely to support healthy populations of native perennial plants. The opportunity for improvement decreases for each successive Alternative. Implementation of Alternative V (No Action) would allow impacts to vegetative communities to increase each year that a gather is postponed, which would be a potential negative impact to migratory bird habitat.

F. Special Status Species

The potential direct and indirect impacts associated with the Alternatives (I-V) would be related to the wild horse/burro population size. Reduction of the current wild horse/burro population provides the best opportunity for conservation, protection, and preservation of the two western Lahontan springsnail populations and habitat. Implementation of Alternatives I, II, III, or IV would result in a positive impact to the springsnails and their habitat. Implementation of Alternative I, the Proposed Action, would provide the greatest opportunity for the conservation, protection, and preservation of the springsnails and their habitat. The opportunity for improvement decreases for each successive Alternative. Implementation of Alternative V (No Action) would allow potential impacts to the springsnails and their habitat to increase each year that a gather is postponed, which would be a potential negative to this species.

G. Invasive Non-Native Species

Direct impacts associated with Alternatives I, II, III, or IV 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 SBWC. These impacts would potentially occur if contractor vehicles are carrying noxious weed seeds and plant parts when they arrive on site or 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/burros which are released before the seeds pass through their digestive system could also spread noxious weeds. There are no direct impacts associated with Alternative V.

Indirect impacts associated with Alternatives I through V would include the potential increase in noxious weeds from increasing utilization levels and ground disturbance. Noxious weeds can increase with overuse of the range by grazing animals or through surface disturbance. Maintenance of healthy populations of native perennial plant species minimizes the establishment of invasive, non-native weeds. Implementation of Alternative I, the Proposed Action, would provide the greatest opportunity for healthy plant communities and thus provide the lowest potential for invasive non-native species. The opportunity for improvement decreases for each successive Alternative. Implementation of Alternative V (No Action) would provide the highest potential for species to invade due to degraded native vegetative populations.

H. Water Quality, Wetlands and Riparian Zones

There are no direct impacts associated with Alternative I through IV concerning water quality, wetlands or riparian zones within the project area, with the exception of some wild horses or

burros crossing streams or springs as they are herded to temporary gather sites. This impact would be temporary and relatively short term in nature. There are no direct impacts associated with Alternative V.

Indirect impacts for Alternatives I through V would be related to wild horse population size. Population modeling completed for the Alternatives found that the average median population size increased from Alternative I (lowest herd population) thru Alternative V (highest herd population). Reduction of the population from current levels would decrease competition for available water sources which should lead to a reduction in hoof action around unimproved springs, improvement in stream bank stability, and improved riparian habitat condition. Implementation of Alternative I, the Proposed Action would provide opportunity for the greatest improvement of riparian habitats and water quality. The opportunity for improvement decreases for each successive Alternative. Implementation of Alternative V (No Action) would allow degradation to riparian habitats and water quality to increase each year that a gather is postponed.

I. Vegetation and Soils

Direct impacts associated with Alternatives I, II, III, or IV would consist of disturbance to vegetation and soils immediately in and around the temporary gather site(s) and holding facilities. Impacts would be created by vehicle traffic, hoof action as a result of concentrating horses, and could be locally severe in the immediate vicinity of the gather sites and holding facilities. Generally, these sites would be small (less than one half acre) in size. Any impacts would remain site specific and isolated in nature. In addition, most gather sites and holding facilities would be selected to enable easy access by transportation vehicles and logistical support equipment. Normally, they are located near or on roads, pullouts, water haul sites, or other flat areas which have been previously disturbed. These common practices would minimize the cumulative effects of these impacts.

Indirect impacts would differ among the Alternatives. Implementation of Alternatives I, II, III, or IV would reduce the current wild horse/burro population and provide the opportunity for vegetative communities to progress toward achieving a thriving natural ecological balance. Reduced concentrations of wild horses/burros would contribute to the recovery of the vegetative resource. Forage utilization levels would be reduced which would result in improved forage availability, vegetation density, increased plant vigor, seed production, seedling establishment, and forage production over current conditions.

Population modeling completed for Alternative I and II (lower limit of the management range with and without fertility control) found that the average median population size in 5 years is predicted to be 367 and 380 wild horses, respectively. The greatest opportunity for a positive impact to vegetation and soils would be provided by implementing Alternative I or Alternative II.

Population modeling completed for Alternative III and IV (upper limit of the management range with and without fertility control) found that the average median population size in 5 years is predicted to be 383 and 399 wild horses, respectively. Implementation of either of these two Alternatives would initially provide the opportunity for the vegetative communities to progress toward achieving a thriving natural ecological balance. However, wild horses would exceed

their carrying capacity the year following the proposed gather.

Implementation of Alternative V (No Action) would allow herd populations to continue to grow. Animal impacts to vegetation and soils would increase each year the gather is postponed, having a negative affect on vegetation and soils. Utilization levels would exceed objectives and progression toward achieving a thriving natural ecological balance would not be possible.

J. Recreation

There would be little, if any, direct or indirect impacts upon the recreation resource or to recreation users from implementation of Alternative I through IV. The area is of such a large size that if any recreationist happened upon a gather, that individual could very easily move to a similar location with little difficulty. There might need to be persons present warning visitors of the on-going action so they would not interfere. If a motorcycle race were to occur at that time, it should be fairly easy to move the site of the gather for that weekend so they do not overlap. However, individuals who come to look at the wild horses may find it more difficult to do since there will be fewer animals.

There would be no direct or indirect impact upon the recreation resource by implementation of Alternative V.

K. Visual Resources

There would be no direct or indirect impacts upon the visual resource from any of the action Alternatives (I-IV). The action would be temporary and would not have any impact upon the basic characteristics of form, line color or texture. There would be no direct or indirect impacts upon the visual resources from Alternative V, No Action.

L. Wilderness/Wilderness Study Area

There would be no impacts to wilderness or wilderness study areas as the proposed gather is located outside of these boundaries.

V. Cumulative Impacts

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

The area affected by the Alternatives is the SBWC (Refer to the Project Location Map). Past, proposed, and reasonably foreseeable actions that may have similar effects to the wild horse/burro populations would include past and future wild horse/burro gathers. Four gathers have been completed in the past and future gathers would be scheduled on a 4-5 year gather cycle. As wild horse and burro population levels are maintained in an acceptable management range, a thriving natural ecological balance would be achieved and maintained. Cumulative effects that may result would include continued improvement of range and riparian/wetland conditions. Cumulative beneficial effects from implementation of a gather Alternative to wildlife, wild horse/burro

populations and domestic livestock would occur as forage availability and quality is maintained and improved. Water quality and riparian habitat would also continually improve. The opportunity for cumulative beneficial effects decreases for each successive Alternative (I through V).

Adverse cumulative impacts on natural resources would occur by degree depending on which Alternative is selected. In general, adverse cumulative impacts increase for each successive Alternative (I through V) since the modeled wild horse/burro population is higher for each Alternative. Adverse cumulative impacts would include periodic over-utilization of vegetative resources resulting in decreased vegetative density, plant vigor, seed production, seedling establishment, and forage production. This may result in periodic decreases of the ecological status of plant communities.

Adverse cumulative impacts on natural resources for Alternative V, No Action, would include continued heavy over-utilization of vegetative resources which would result in decreased vegetative density, plant vigor, seed production, seedling establishment, and forage production. A potential increase of non-native species to new areas in the SBWC may result. Continued overuse of the vegetative community would result in a loss of ecological status of the plant communities which may take decades to restore. Decreased vegetative density would result in an increase of bare ground, which may lead to increased erosion and increased negative impacts to stream banks and riparian habitat condition. Wildlife, migratory birds, livestock, and wild horses/burros would all be negatively affected by these adverse cumulative impacts to the natural resources.

Based upon these considerations, the effects of other existing and reasonably foreseeable future activities including Alternatives I, II, III, or IV would not cause a major affect to the environment. Alternative V, No Action, may cause a greater impact to the environment depending on how long a gather is deferred.

There would be no known adverse cumulative impacts to any of the resources analyzed in this document as a result of the Alternative I, Proposed Action or Alternative II. There would be minor adverse cumulative impacts to vegetation, soils, and riparian habitat from implementing Alternatives III or IV due to increased wild horse and burro populations. Adverse cumulative impacts to vegetation, soils, and riparian habitat would occur from Alternative V, No Action.

VI. Consultation and Coordination

Public hearings are held prior to gathers using helicopters and motorized vehicles to capture wild horses (or burros). During these meetings, the public is given the opportunity to present new information and to voice any concerns regarding the use of these methods to capture wild horses.

Additionally, this Gather Plan and Environmental Assessment is being sent out to individuals and organizations on the interested public mailing list for review and comment.

VII. List of Preparers

Glenna Eckel	Wild Horse and Burro Specialist

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Jeff Johnson	Environmental Coordinator
Peggy McGuckian	Archaeologist
Lynn Clemons	Recreation Specialist
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Ron Pearson	Rangeland Management Specialist (Range)
Chuck Neill	Rangeland Management Specialist (Weeds)
Mike Zielinski	Soil Scientist

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APPENDIX A
Standard Operating Procedures (SOPs)

Gathers would be conducted by utilizing contractors from the Wild Horse and Burro Gathers, Western United States Contract, or BLM personnel. The following procedures for gathering and handling wild horses and burros would apply whether a contractor or BLM personnel conduct a gather. For helicopter gathers conducted by BLM personnel, gather operations will be conducted in conformance with the *Wild Horse and Burro Aviation Management Handbook* (March 2000).

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

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

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

A. Capture Methods Used in the Performance of a Gather

1. Helicopter Drive Trapping

This capture method involves utilizing a helicopter to herd wild horses and burros into a temporary trap. The following stipulations apply:

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

c. Domestic saddle horses may be used as a pilot (i.e. Judas) horse to lead the wild horses into the trap. Individual ground hazers may also be used to assist in the gather.

2. Helicopter Assisted Roping

This capture method involves utilizing a helicopter to herd wild horses or burros to ropers. The following stipulations apply:

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

b. Roping shall be performed in such a manner that bands will remain together. Foals shall not be left behind.

3. Bait Trapping

This capture method involves utilizing bait (water or feed) to lure wild horses or burros into a temporary trap. The following stipulations apply:

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

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.

B. Trapping and Care

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

1. All trap and holding facility 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 land owner. Prior to setting up a trap or temporary holding facility, BLM will conduct all necessary clearances (archaeological, T&E, etc.).

2. Proposed trap sites and holding facility sites would be examined for the presence of noxious weeds prior to construction. If noxious weeds were found, the trap/holding facility location would be moved to an alternate location.

3. 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 other factors.

4. All traps, wings, and holding facilities shall be constructed, maintained and operated to handle 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 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 30 feet long and a minimum of 6 feet high for horses, and 5 feet high for burros, and shall be covered with plywood, burlap, plastic snow fence or like material a minimum of 1 foot to 5 feet for burros and 1 foot to 6 feet for horses. The location of the government furnished portable restraining chute used to restrain, age, or to 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, snow fence etc.) and shall be covered a minimum of 1 foot to 5 feet above ground level for burros and 2 feet to 6 feet for horses. 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.

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

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

7. Alternate pens, within the holding facility, shall be furnished by the Contractor to separate mares or jennies with small foals, sick and/or injured animals, and strays from the other animals. Animals shall be sorted as to age, number, size, temperament, sex and condition when in the holding facility so as to minimize, to the extent possible, injury due to fighting and trampling. Under normal conditions, the government will require that animals be restrained for the purpose of determining an animal's age, sex or other necessary procedure. 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 to be released back into the capture area(s). In areas requiring one or more trap sites, and when 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.

8. The Contractor shall provide animals held in the traps and/or holding facilities with a continuous supply of fresh clean water at a minimum rate of 10 gallons per animal per day. Separate water troughs shall be provided at each pen where animals are being held. Water troughs shall be constructed of such material (e.g. rubber, galvanized metal with rolled edges, rubber over metal) so as to avoid injury to the animals.

9. 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 2 pounds of hay per 100 pounds of estimated body weight per day. The contractor together with the on-site BLM representative would examine hay for noxious weed seeds or plant parts prior to initiating the gather. If noxious weed seeds or plant parts are found in the hay, the hay would be removed from the area.

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

11. The Contractor shall restrain sick or injured animals if treatment is necessary. The BLM will determine if injured animals must be destroyed and provide for destruction of such animals. A veterinarian may be called to make a diagnosis and final determination for the disposition of sick or injured animals. The contractor may be required to dispose of the carcasses as directed by the BLM. Destruction shall be done by the most humane method available, in accordance with BLM policy outlined in Washington Office Instruction Memorandum No. 2001-165 which states;

    A BLM authorized officer may authorize the euthanasia of a wild horse or burro with any of the following conditions:

    a. Displays a hopeless prognosis for life;

    b. Suffers from a chronic or incurable disease or serious congenital defect;

    c. Requires continuous treatment for the relief of pain and suffering; or

    d. Is incapable of maintaining a Henneke body condition score greater than 2, in a normal rangeland environment.

12. 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.

13. Branded or privately owned animals captured during gather operations will be handled in accordance with state estray laws and existing BLM policy.

C. 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 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 vehicle 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 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 at the minimum a 5 foot wide swinging gate. The use of double deck trailers is unacceptable and will not be allowed.

4. All tractor-trailers used to transport animals to final destination(s) shall be equipped with at least one (1) door at the rear end of the trailer, which is capable of sliding either horizontally of vertically. The rear door(s) of tractor-trailers and stock trailers must be capable of opening the full width of the trailer. Panels facing the inside of all trailers must be free of sharp edges or holes that could cause injury to the animals. The material facing the inside of the trailer 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 square feet/adult horse (1.4 linear feet in an 8 foot wide trailer)
   - 8 square feet/adult burro (1.0 linear feet in an 8 foot wide trailer)
   - 6 square feet/horse foal (0.75 linear feet in an 8 foot wide trailer)
   - 4 square feet/burro foal (0.50 linear feet in an 8 foot wide trailer)

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

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

9. The contractor together with the on-site BLM representative would examine vehicles for noxious weed seeds or plant parts prior to initiating the gather. If noxious weed seeds or plant parts are found on vehicles, the vehicle would be cleaned.

D. Safety and Communications

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.

2. The proper operation, service and maintenance of all contractor furnished property is the responsibility of the Contractor. The BLM reserves the right to remove from service any contractor personnel or contractor furnished equipment which, in the opinion of the 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.

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

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

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

E. Public Participation

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

F. Responsibility and Lines of Communication

The Contracting Officer's Representative, and Project Inspectors, from the Winnemucca Field Office, will have the direct responsibility to ensure the Contractor's compliance with the contract stipulations. All employees involved in the gathering operation will keep the best interests of the animals at the forefront at all times.

The Assistant Field Manager for Renewable Resources and the Field Manager will take an active role to ensure that appropriate lines of communication are established between the field, Field Office, Nevada State Office, National Wild Horse and Burro Program Office, and the Palomino Valley Wild Horse and Burro Center. All publicity, formal public contact and inquiries will be handled through the Assistant Field Manager for Renewable Resources.

G. Cultural Resources

Personnel working at gather sites will be advised of illegality of collecting artifacts.

Prior to implementation of gather operations, trap sites and temporary holding facilities would be evaluated for cultural resources. Gather sites and temporary holding facilities would not constructed on wetlands or riparian zones.

APPENDIX B
Summary of Wild Horse Genetic Viability Issues

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

Smaller, isolated populations (<200 total census size) are particularly vulnerable when the number of animals participating in breeding drops below a minimum needed level (Coates-Markle, 2000).

It is possible that small populations will be unable to maintain self-sustaining reproductive ability over the long term, unless there is a natural or management-induced influx of genetic information from neighboring herds. An exchange of only 1-2 breeding age animals per generation would maintain the genetic resources in small populations of about 100 animals, thus obviating the need for larger populations in all cases (Singer, 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.

APPENDIX C
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, South Blue Wing Complex

To complete the population modeling for the South Blue Wing Complex (Blue Wing Mountains, Nightingale Mountains, Shawave Mountains HMAs), 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 2003 herd was developed from age structure data collected during the 1998 Southern Blue Wing Complex wild horse gather. The 1998 release data was combined with a data set developed for an estimated 165 animals not gathered. This data set was based on age structure data from the 1998 gather population.

The following table displays the age structure for released animals, the estimated age structure for animals not gathered/released without age data, and the estimated post gather population for 1998.

Initial Age Structure 1998

Age Class	South Blue Wing Complex Released Animals - 1998		Typical Population for 165 un-gathered animals		South Blue Wing Complex Estimated Post Gather Population 1998	
	Females	Males	Females	Males	Females	Males
Foals	4	5	14	18	18	23
1	0	1	2	2	2	3
2	1	0	7	11	7	11
3	0	0	16	16	16	16
4	0	0	7	8	7	8
5	0	0	5	3	5	3
6	0	0	4	1	4	1
7	0	0	3	4	3	4
8	0	0	2	3	2	3
9	0	0	0	0	0	0
10-14	29	47	6	9	35	56
15-19	26	38	7	7	33	45
20+	21	30	4	6	25	36
Total	80	121	77	88	157	209

A simulation, using the estimated 1998 post gather population as the initial age structure was then run for the years 1998 to 2003 under the "no management" management option. The most typical trial obtained from this simulation was saved and used to represent the 2003 age structure of the herd and rescaled to an initial population of 816 which represents the estimated population in 2003.

The following table displays the initial age structure used for the South Blue Wing Complex 2003 wild horse population utilized in the population model for each Alternative (I-V).

Initial Age Structure (Modeled) - 2003

Age Class	South Blue Wing Complex Initial Age Structure 2003	
	Females	Males
Foals	42	65
1	58	54
2	53	56
3	49	51
4	26	27
5	14	14
6	6	7
7	7	11
8	12	11
9	9	7
10-14	13	19
15-19	23	49
20+	46	87
Total	358	458

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. The sex ratio at birth observed by Berger in the Granite Range was modified from 57% males at birth to 50% males at birth for this modeling effort based on historic.

Survival probabilities and foaling rates utilized in the population model for each Alternative (I-V) are displayed in the following table:

Survival Probabilities and Foaling Rates

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

The next table displays the selective removal criteria utilized in the population model for the Action Alternatives (I-IV):

Removal Criteria - Standard

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	--	--
7	--	--
8	--	--
9	--	--
10-14	100%	100%
15-19	100%	100%
20+	100%	100%

Population Modeling Criteria

The following summarizes the population modeling criteria that are common to all of the Action Alternatives (I-IV):

- Starting Year: 2003
- Initial gather year: 2003
- Gather interval: minimum interval of five years (4 year run)
- Sex ratio at birth: 50% male
- Percent of the population that can be gathered: 90%
- Minimum age for long term holding facility horses: 10 years old
- Foals are included in the AML
- Simulations were run for four years with 100 trials each

The following summarizes the population modeling criteria for Alternative V, No Action:

- Starting Year: 2003
- Sex ratio at birth: 50% male

- Simulations were run for four years with 100 trials each

The following table displays additional population modeling parameters utilized in the model for the Action Alternatives (I-IV):

Population Modeling Parameters, Action Alternatives (I-IV)

Alternative	I	II	III	IV
AML Range	104	104	172	172
Management by removal only	--	Yes	--	Yes
Management by removal and fertility control	Yes	--	Yes	--
Threshold population size for gathers	172*	172*	433**	433**
Target population size following gathers	104	104	172	172
Gather for fertility control regardless of population size?	Yes	--	Yes	--
Gathers continue after removals to treat additional females?	NA	--	NA	--
Effectiveness of Fertility Control: year 1	90%	--	90%	--
Effectiveness of Fertility Control: year 2	0%	--	0%	--

* High range of AML

** Expected population in four years based on results of modeling runs

Population Modeling Results

Population size in five years

Out of 100 trials in each simulation, the model tabulated minimum, average, and maximum population sizes. The model was run from 2003 to 2007 to determine what the potential effects would be on population size for all Alternatives (I-V). 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.

Population Sizes in 5 years - Minimum

Alternative	I	II	III	IV	V (No Action)
Lowest Trial	136	148	148	126	659
10th Percentile	172	172	184	195	832
25th Percentile	188	190	200	210	852
Median Trial	**204**	**205**	**215**	**217**	**885**
75th Percentile	218	216	226	224	944
90th Percentile	234	232	234	235	1000
Highest Trial	262	258	260	255	1248

The above table shows that in five years (based on 100 trials for each Alternative) the lowest population of 0-20+ year old horses, 126 animals, resulted under Alternative IV. Half of the trials were greater than the median and half were less than the median. Additional interpretation may be made by comparing the various percentile points. In Alternative I, the Proposed Action, 10% of the trials resulted in fewer than 172 wild horses as the minimum population, and 10% of the trials resulted in a minimum population larger than 234 wild horses. Therefore, one could expect a minimum population between these two values 80% of the time for the Proposed Action (given the assumptions about survival probabilities, foaling rates, initial age-sex distribution, and management options made for this simulation). Alternative V, the No Action Alternative, reflects the highest range of minimum population level of all the trials as no management action would occur. Minimum population size modeling results indicate a population crash would not occur with implementation of any of the Alternatives.

Population Sizes in 5 years - Average

Alternative	I	II	III	IV	V (No Action)
Lowest Trial	303	321	305	303	817
10th Percentile	332	347	348	361	1041
25th Percentile	350	363	366	382	1114
Median Trial	**367**	**380**	**383**	**399**	**1196**
75th Percentile	395	405	401	414	1290
90th Percentile	422	433	417	436	1409
Highest Trial	490	482	460	485	1823

The "Population sizes in 5 years – Average" table above displays the average population size expected after implementation of each Alternative (100 runs each) after five years. The average population size ranged from a low of 303 wild horses under Alternatives I and IV, to a high of 1823 wild horses under Alternative V, No Action. Results among Action Alternatives are again very similar, although comparison of the Median Trial across Alternatives reflects the expected outcomes associated with gathering to lower or upper AML limits and with implementation of fertility control or not. Alternative I - gather to low AML and implement fertility control results in the lowest average population in five years. Alternative II – gather to low AML and do not implement fertility control results in a slightly higher five year population. Alternative III – gather to high AML and implement fertility control is most similar to the expected population of Alternative II. Gathering to low AML without fertility control results in an expected five year population similar to gathering to high AML and implementing fertility control. Alternative IV – gathering to high AML without fertility control results in the highest predicted five year population out of the four action Alternatives. The Median Trial population for Alternative V, No Action, is approximately three times greater than Alternative IV.

Population Sizes in 5 years - Maximum

Alternative	I	II	III	IV	V (No Action)
Lowest Trial	823	829	821	818	925
10th Percentile	842	839	838	841	1282
25th Percentile	856	854	856	861	1428
Median Trial	**888**	**877**	**882**	**886**	**1557**
75th Percentile	936	934	931	920	1730
90th Percentile	1004	962	970	970	1862
Highest Trial	1234	1092	1225	1113	2372

This table displays the largest populations that could be expected out of 100 trials for each Alternative. The same discussion applies to the population results as discussed under the Minimum table. All figures are very similar because under all of the Alternatives, the same starting population, gather efficiency, etc. is assumed and the range of AML is not great. The numbers vary due to randomness and assumptions inherent to the modeling program.

Average Growth Rates in 5 years

Average growth rates were obtained by running the model for 100 trials from 2003 to 2007 for each Alternative. The following table displays the results obtained from the model:

Average Growth Rate in 4 Years

Alternative	I	II	III	IV	V (No Action)
Lowest Trial	0.7%	4.4%	3.2%	0.7%	1.4%
10th Percentile	7.3%	12.0%	7.9%	11.4%	8.6%
25th Percentile	11.2%	14.5%	12.5%	14.7%	12.6%
Median Trial	**14.6%**	**18.2%**	**14.9%**	**17.9%**	**15.5%**
75th Percentile	17.7%	20.5%	18.2%	20.8%	18.2%
90th Percentile	20.0%	22.4%	19.8%	22.3%	20.2%
Highest Trial	25.0%	28.54%	23.0%	26.5%	24.1%

As expected, the two Alternatives implementing fertility control (Alternative I, Proposed Action

and Alternative III) reflect the lowest overall median growth rate. The target size to which the population is gathered (104 or 172 wild horses) appears to have minimal impacts to growth rates. This is demonstrated by the growth rates being quite similar for Alternative I, Proposed Action and Alternative III (fertility control alternatives); and, by Alternative II and IV (no fertility control alternatives).

The Lowest Trial growth rate of 0.7% does not appear to be a direct result of management options, but instead, appears to reflect the random nature of the model and the ability to simulate extreme scenarios. The range of growth rates is a reasonable representation of what could be expected to occur in a wild horse population.

Totals in five years – Gathered, Removed, and Treated

The same type of tabular data was obtained from the model for the numbers of wild horses gathered, removed and treated under each Alternative. The data is for one gather only that is proposed to occur in 2003 and includes all animals 0-20+ years of age.

Totals in 5 Years -- Gathered

Alternative	I	II	III	IV	V (No Action)
Lowest Trial	683	684	678	652	NA
10th Percentile	698	696	694	680	
25th Percentile	709	780	709	700	
Median Trial	**736**	**727**	**731**	**725**	
75th Percentile	777	772	770	556	
90th Percentile	833	800	805	808	
Highest Trial	1020	902	1014	926	

Totals in 5 Years -- Removed

Alternative	I	II	III	IV	V (No Action)
Lowest Trial	576	583	558	561	NA
10th Percentile	597	594	578	583	
25th Percentile	607	602	593	598	
Median Trial	**628**	**623**	**616**	**620**	
75th Percentile	663	657	657	647	
90th Percentile	715	681	684	686	
Highest Trial	886	771	869	791	

Totals in 5 Years -- Treated

Alternative	I	II	III	IV	V (No Action)
Lowest Trial	30	NA	35	NA	NA
10th Percentile	32		37		
25th Percentile	34		38		
Median Trial	**36**		**39**		
75th Percentile	39		41		
90th Percentile	40		42		
Highest Trial	48		49		

The number of horses gathered does not differ greatly between Alternatives because gather criteria is the same for all Alternatives. What does differ widely is the number of wild horses removed and treated under the different alternatives. Alternative I, Proposed Action and Alternatives II are similar in the number of animals removed, because each of these alternatives includes gathering to the target number of 104 which is the lower limit of the management range. Similarly, Alternatives III and IV are also similar because they both include a target number of 172.

The model indicates that nearly twice as many mares would be treated with immuno-contraception under Alternative III than under Alternative I, Proposed Action. More animals would be released under Alternative III as the target population is higher than the Proposed Action.

Population Modeling Summary

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

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

None of the alternatives indicate that a crash is likely to occur to the population. Minimum population levels and growth rates are all within reasonable levels, and adverse impacts to the population are not likely.

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

As expected, the two alternatives implementing fertility control (Alternative I, Proposed Action and Alternative III) reflect the lowest overall growth rate. The target size to which the population is gathered to (104 or 172 wild horses) appears to have minimal impacts to growth rates, as demonstrated by the growth rates being quite similar for the Alternative I, Proposed Action and Alternative III (fertility control alternatives) and for Alternative II and IV (no fertility control alternatives).

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

Alternative	I	II	III	IV	V(No Action)
Minimum Median Trial	**204**	**205**	**215**	**217**	**885**
Average Median Trial	**367**	**380**	**383**	**399**	**1196**
Maximum Median Trial	**888**	**877**	**882**	**886**	**1557**

The level to which the population is gathered (lower or upper limit of the management range) appears to be more of an influence to population size than fertility control (Alt I and II versus Alt I and III) as the lowest population numbers occur there (204 and 205 animals). Comparing action Alternatives (Alt 1 – IV), Average Median Trial results indicate that fertility control with a gather to the lower limit of the management range (Alt I) would produce the lowest average population at 367 animals, and no fertility control with a gather to the upper limit of the management range would produce the highest average population at

399 animals (Alt IV). As expected, Alternative V, the No Action Alternative results in the highest average population at 1196 animals as animal removal would be delayed.

In comparing fertility control Alternatives (Alt 1 and Alt III), gathering to the upper limit of the management range rather than to the lower limit of the management range results in an average medial population size that is slightly larger (16 animals). The difference between gathering to the lower limit of the management range (Alt II), but applying fertility control (Alt I) is 13 animals. Both are gathered to lower limit of the management range but fertility control is not implemented in Alternative II. The largest difference (excluding Alternative V, No Action) is noted between the Proposed Action, Alternative I and Alternative IV, where the average median population size is approximately 10% larger when fertility control is not implemented and the population is gathered to the upper limit of the management range (399 animals versus 367 animals).

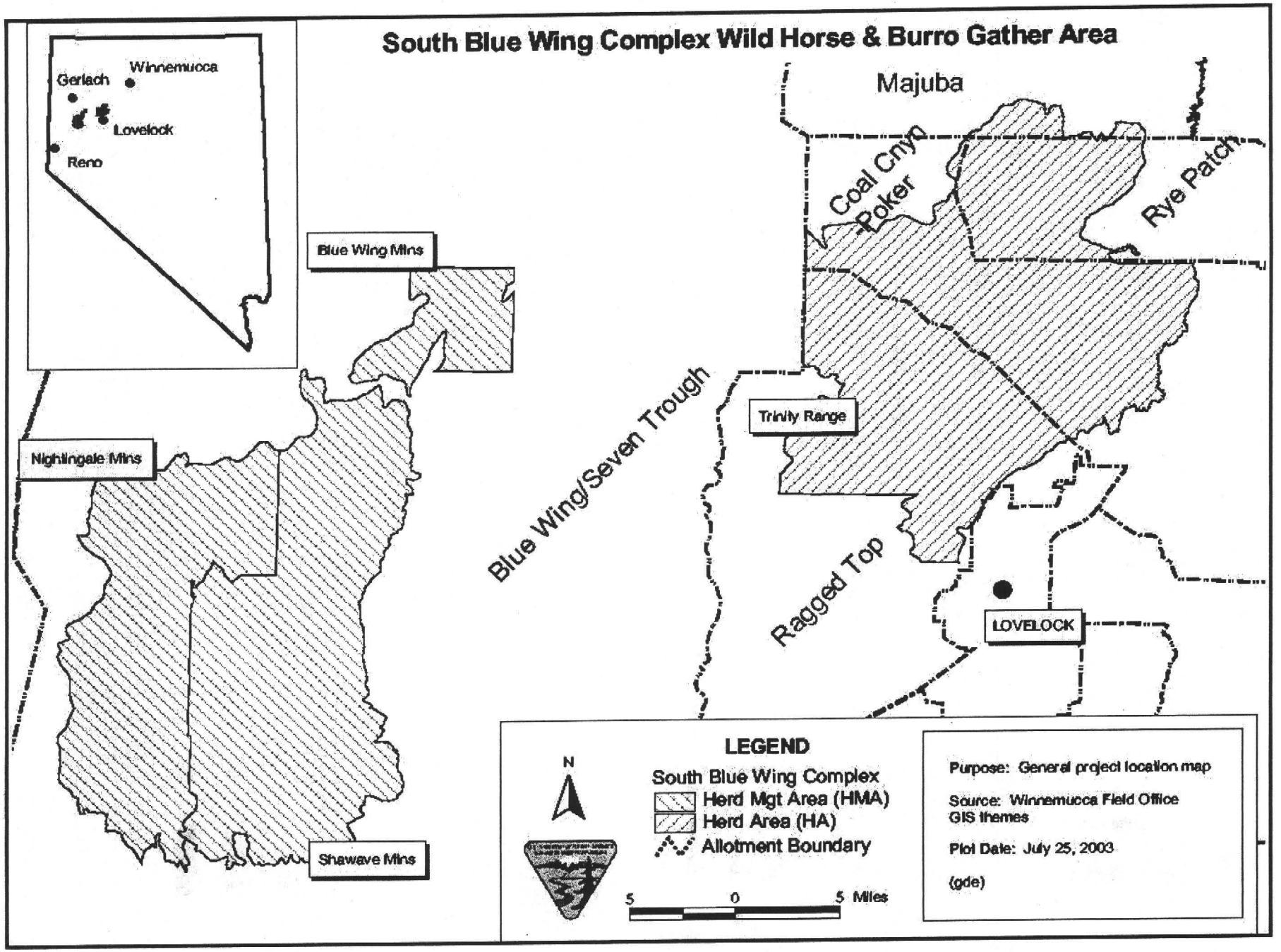

Exhibit 1: Project Location Map